S.C. Department of Health and Environmental Control

Bureau of Air Quality
Preliminary Determination
And Notice of MACT Approval

Showa Denko Carbon, Inc.
478 Ridge Road
Ridgeville, South Carolina 29472
Dorchester County

Permit No. 0900-0025-CZ
April 13, 2012 (original), Revised January 25, 2017

This review was performed by the Bureau of Air Quality of the South Carolina Department of Health and Environmental Control in accordance with South Carolina Regulations for the Prevention of Significant Air Quality Deterioration.

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1.0 Time Line (Permitting Action History)

June 14, 2011	The South Carolina Department of Health and Environmental Control (SC DHEC), Bureau of Air Quality (BAQ), received a Prevention of Significant Deterioration (PSD) Construction Permit application from Showa Denko Carbon, Inc. under the Expedited Review Program, requesting permission to increase its production capacity from 45,000 tons per year to 85,000 tons per year.
June 15, 2011	BAQ Engineering Services Division (ESD) advised Mr. Jeff Felker (Showa Denko Carbon, Inc.) of receipt of the application via e-mail and phone message. BAQ ESD sent a Completeness Determination letter to Mr. Jeff Felker (Showa Denko Carbon, Inc.) stating the application was deemed incomplete and could not be accepted into the Expedited Program at this time. Air dispersion modeling was not included in the application. BAQ ESD also sent Completeness Determination letters to Ms. Catherine Collins (USPHS) and Ms. Heather Ceron (EPA) that included a copy of the PSD application.
June 22, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD) participated in a conference call with representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering to go over preliminary findings of the PSD application.
June 30, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD) participated in a conference call with representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering to go over preliminary findings of Greenhouse Gas BACT analysis for the PSD application. BAQ ESD mailed out a review letter to Showa Denko Carbon, Inc. requesting additional information.

July 19, 2011	Ms. Veronica Barringer (BAQ ESD), representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
July 20, 2011	BAQ ESD mailed out a review letter to Jeff Felker (Showa Denko Carbon, Inc.) requesting additional information.
July 26, 2011	Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
August 2, 2011	Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), Mr. John Glass (BAQ Modeling) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application. Showa Denko Carbon, Inc. sent an electronic version of all responses to BAQ ESD review letters dated June 30, 2011 and July 19, 2011 as one document. BAQ ESD mailed out a review letter to Mr. Jeff Felker (Showa Denko Carbon, Inc.) requesting additional information regarding calculations in the application. Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD) held a conference call with Mr. Andrew Parks (EPA) to discuss his initial comments on the application.
August 8, 2011	Copies of the air dispersion modeling and an expedited review request were hand delivered to BAQ ESD. BAQ ESD delivered the copies of the air dispersion modeling to BAQ Modeling. BAQ ESD mailed a copy of the facility responses to the June 30 and July 19, 2011 review letters to Ms. Heather Ceron (EPA) (Heather Ceron).

August 9, 2011	Ms. Rhonda Banks Thompson, Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), Mr. John Glass (BAQ Modeling) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
August 10, 2011	Responses from Showa Denko Carbon, Inc. to the BAQ ESD, August 2, 2011 review letter were received.
August 11, 2011	BAQ ESD mailed the Completeness Determination and Acceptance into the Expedited Review Program letter to Mr. Jeff Felker (Showa Denko Carbon, Inc.) and carbon copied Ms. Catherine Collins (USPHS) and Ms. Heather Ceron (EPA). BAQ ESD also e-mailed and left a phone message for Mr. Jeff Felker (Showa Denko Carbon, Inc.) regarding completeness determination and acceptance into the expedited review program.
August 15, 2011	BAQ ESD mailed out a review letter to Mr. Jeff Felker (Showa Denko Carbon, Inc.) requesting additional information which included items needed for modeling review.
August 16, 2011	Ms. Sheila Watts (BAQ ESD) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application. BAQ ESD received comments from Mr. Gregg Worley (EPA) and these comments were sent electronically to Showa Denko Carbon, Inc.
August 17, 2011	Mr. John Glass (BAQ Modeling) received comments from Mr. Stanley Krivo (EPA) and these comments were sent electronically to Mr. John McLure (GEL Engineering).
August 22, 2011	Representatives from BAQ ESD and Modeling, EPA Region IV, Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a meeting to discuss details of Showa's overall process, modeling issues, and questions/comments on the PSD application.

August 26, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD) Mr. John Glass, Ms. Veronica Gorman (BAQ Modeling) held a conference call with representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering to go over updates and issues needing further clarification.
August 28, 2011	BAQ ESD mailed out a review letter to Mr. Jeff Felker (Showa Denko Carbon, Inc.) requesting additional information.
August 30, 2011	Ms. Sheila Watts (BAQ ESD) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
September 2, 2011	Mr. John Glass, Mr. Tracy Price, Ms. Veronica Gorman, Mr. Paul Martin (BAQ Modeling), and representatives from GEL and Exponent participated in a conference call to discuss items needed for the facility modeling analysis.
September 6, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
September 9, 2011	Mr. John Glass participated in a conference call with Showa Denko to discuss options for receptor grids and locations.
September 13, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.

September 15, 2011	Mr. John Glass, Mr. Tracy Price, Ms. Veronica Gorman (BAQ Modeling), Mr. Joe Scire, and Mr. John Patella participated in a conference call to discuss emission rates, receptor fields, and application of SILs for short term and long term SO_2 and NO_2 modeling.
September 20, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
September 26, 2011	Conference call with EPA , Showa Denko, consultant, and Ms. Myra Reece; meeting on fence lines and 'through' road issues and modeling items pertaining to 1-hr standards.
September 27, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
September 30, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss proposed BACT limits.
October 4, 2011	Conference call with Mr. John Glass, Mr. Tracy Price, Ms. Ruthie Hall (BAQ Modeling), Showa Denko, Mr. Joe Scire (Exponent), and GEL to discuss modeling issues.
October 11, 2011	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.

October 18, 2011	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
October 24, 2011	BAQ ESD e-mailed the draft preliminary determination, draft permit, and draft statement of basis to Mr. Jeff Felker (Showa Denko Carbon, Inc.) for review and comment.
October 25, 2011	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and draft statement of basis and updates.
November 1, 2011	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and draft statement of basis and updates.
November 8, 2011	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and draft statement of basis and updates.
November 15, 2011	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and draft statement of basis and updates.

November 18, 2011	Representatives from BAQ Management, ESD and Modeling, EPA Region IV, Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a meeting at the Showa Denko facility to discuss details of Showa's overall process, modeling issues, and questions/comments on the PSD application.
November 23, 2011	Mr. Jeff Felker (Showa Denko Carbon, Inc.) e-mailed comments on the draft preliminary determination and draft permit to BAQ.
November 28, 2011	Mr. Jeff Felker (Showa Denko Carbon, Inc.) e-mailed the summary of stack engineering testing results to BAQ.
November 29, 2011	Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and updates.
December 6, 2011	Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and updates.
December 8, 2011	Conference call was held with GEL, Showa Denko, EPA, and DHEC to discuss modeling issues.
December 13, 2011	Ms. Rhonda Banks Thompson, Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and updates.

January 11, 2012	Representatives from BAQ ESD and Modeling, Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a meeting to discuss updates on permitting/modeling, specifically Showa Denko's efforts towards the feasibility of installing emissions abatement equipment on existing sources.
January 17, 2012	Ms. Veronica Barringer, Ms. Sheila Watts, and Mr. Jake Frick (BAQ), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
January 24, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
January 31, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
February 7, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
February 14, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
February 17, 2012	Showa Denko e-mailed a revised PSD application, excluding modeling, to the BAQ.
February 21, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.

February 28, 2012	Ms. Elizabeth Basil and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
March 6, 2012	Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
March 13, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
March 20, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
March 21, 2012	BAQ ESD e-mailed the revised draft preliminary determination and draft permit to Mr. Jeff Felker (Showa Denko Carbon, Inc.) for review and comment.
March 27, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates along with any comments on the revised draft preliminary determination and draft permit.
March 28, 2012	Mr. Keith McCullock (GEL Engineering) e-mailed comments on the revised draft preliminary determination and draft permit to BAQ. BAQ ESD e-mailed an updated draft statement of basis to Jeff Felker (Showa Denko Carbon, Inc.) for review and comment.

March 29-30, 2012	Mr. Joe Scire and Ms. Irene Lee of Exponent met with Mr. John Glass, Mr. Tracy Price, Mr. Greg Quina, Mr. Paul Martin, and Ms. Ruthie Hall (BAQ Modeling) to discuss modeling issues and provided additional files not previously received.
March 30, 2012	Ms. Elizabeth Basil and Ms. Veronica Barringer (BAQ ESD) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any comments and to discuss timeframes.
April 2, 2012	Ms. Veronica Barringer and Mr. Jeff Felker (Showa Denko Carbon, Inc.) held a phone conversation to discuss the monitoring of the baghouses.
April 4, 2012	Mr. Matthew Wike (GEL Engineering) e-mailed comments on the updated draft statement of basis to BAQ.
April 10, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates and timeframes.
April 13, 2012	The BAQ placed the PSD Preliminary Determination and PSD Construction Permit No. 0900-0025-CZ on public notice by publication in The Journal Scene newspaper in Summerville, South Carolina. All appropriate Federal and State Officials were notified.
April 17, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any updates.
April 24, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any updates.

April 27, 2012	A conference call was held with Mr. Joe Scire, representatives from Showa Denko Carbon, Inc., representatives from GEL Engineering, and representatives from BAQ Modeling (Mr. John Glass, Mr. Tracy Price, Mr. Greg Quina, Mr. Paul Martin, and Ms. Ruthie Hall) to discuss modeling issues.
May 1, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any updates.
May 8, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any updates.
May 14, 2012	A public hearing regarding the draft PSD Construction Permit was held at the Ridgeville Town Hall Auditorium, 105 School Street, Ridgeville, South Carolina.
May 18, 2012	DHEC extended the original public comment period for the proposed project through close of business on May 31, 2012.
May 22, 2012	Ms. Elizabeth Basil and Ms. Sheila Watts (BAQ ESD) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss comments received during the public hearing.
May 29, 2012	Ms. Veronica Barringer (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any updates or comments received during the public comment period.
June 1, 2012	Ms. Myra Reece, Ms. Elizabeth Basil, Mr. Henry Porter, and Mr. John Glass (BAQ) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Exponent Consulting held a conference call to discuss comments received during the public notice period.

June 5, 2012	Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), Mr. John Glass (BAQ Modeling) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates on responses to comments received during the public comment period.
June 8, 2012	Issuance of PSD and NESHAP (40 CFR 63) Construction Permit (0900-0025-CZ).
November 18, 2016	Mr. Henry Porter, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), Mr. John Glass (BAQ Modeling), Mr. Bryan Nichols (BAQ Source Evaluation) and representatives from Showa Denko Carbon, Inc. and GEL Engineering held a conference to discuss VOC and methane emissions, found during facility engineering testing, from the existing graphitizing furnaces and how this may impact emissions from the new graphitizing furnaces.
December 20, 2016	BAQ received a Prevention of Significant Deterioration (PSD) Construction Permit Revision application from Showa Denko Carbon, Inc. to address potential additional VOC, methane, and HAP emissions from the new graphitizing furnaces.
January 25, 2017	The BAQ placed the revised PSD Preliminary Determination and PSD Construction Permit No. 0900-0025-CZ-R6 on public notice by publication in *The Journal Scene* newspaper in Summerville, South Carolina. All appropriate Federal and State Officials were notified .

2.0 Introduction and Preliminary Determination

2.1 Project Overview

Showa Denko Carbon, Inc. (Showa Denko) submitted a PSD Construction Permit application and a Case-by-Case MACT Determination, also known as 112(g), application to the SC DHEC BAQ (Department) to increase production capacity of graphite electrodes from 45,000 to 85,000 metric tons per year (TPY) at the facility's Dorchester County location. This facility, which is located at 478 Ridge Road in Ridgeville, South Carolina, currently holds a Title V Operating Permit. Draft Construction Permit Number 0900-0025-CZ was prepared by the Department for this proposed project.

The application addressed the following modifications to the facility that will involve the use of existing processes and/or new processes:

- New Mill, Mix, and Extrusion Process (new equipment)
- New Bake/Rebake Process (new equipment)
- Existing Rebake Load and Unload/Graphitizing Preparation Process (relocating existing process, increased throughput)
- Existing Bake Load and Unload and Baked Electrode Cleaning Process (use of existing process, increased throughput)
- Existing Pitch Impregnation Process (use of existing process, increased throughput)
- New Pitch Impregnation Process (new equipment)
- Existing Insulating media Receiving Process (use of existing process, increased throughput)
- New Graphitizing Process (new equipment)
- Existing Graphitizing Process (modification of existing equipment)
- Existing Cleaning and Inspection Process (relocating existing process, increased throughput)

- Existing Machining and Shipping Process (use of existing process, increased throughput)
- New Emergency Generator (new equipment)

After completion of the proposed expansion, Showa Denko will have two (2) processes for the Mill, Mix, and Extrusion, the Bake/Rebake, the Pitch Impregnation, and the Graphitizing and remain with only one (1) process for the Rebake Load and Unload/Graphitizing Preparation, the Bake Load and Unload and Baked Electrode Cleaning, the Insulating media Receiving, the Cleaning and Inspection, and the Machining and Shipping.

The facility is currently a major source for PSD. The facility does anticipate that a creditable emission decrease will occur as a result of modification to the existing graphitizing process, as part of the PSD, therefore a netting analysis was performed. The proposed modification resulted in increases that exceeded the PSD significant thresholds for the following pollutants; particulate matter (PM), particulate matter with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}), particulate matter with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$), nitrogen oxides (NO_X), carbon monoxide (CO), volatile organic compounds (VOC), and carbon dioxide equivalent (CO_2e). Therefore, the project is subject to review under SC Regulation 61-62.5, Standard No. 7 Prevention of Significant Deterioration. SC Regulation 61-62.5, Standard No. 7 is equivalent to the Federal Prevention of Significant Deterioration of Air Quality regulations in Title 40 CFR Section 52.21. Pursuant to these regulations, new major stationary sources and modifications to major stationary sources of air pollution must demonstrate that they will not significantly deteriorate the air quality in their region. Dorchester County, SC is currently in attainment for all criteria pollutants.

A PSD review for PM, PM_{10}, $PM_{2.5}$, NO_X, CO, VOC, and CO_2e emissions and a BACT determination and Air Quality Impact Analysis was completed. A 112(g) review for HAP emissions that includes a Case-by-Case MACT determination was also completed.

The facility has submitted a revision to the PSD in order to account for recently discovered VOC, Methane, and HAP emissions found from their existing graphitizing furnaces. Emissions from existing graphitizing furnaces were used to estimate emissions from the proposed new graphitizing furnaces. This Preliminary Determination has been revised to include previously unaccounted for potential emissions from the proposed new graphitizing furnaces. Although this revised

Preliminary Determination includes all applicable requirements from the Preliminary Determination issued April 13, 2012, the only items impacted by the current permit decision are limited to those accounting for the above-referenced emissions from the new graphitizing operation. The additional VOC, methane, and HAP emissions required updates to the VOC BACT Analysis and GHG BACT Analysis (increase in CO_2e limit for new graphitizing furnaces).

Also, due to previously issued PSD revision #2, the SO_2 controlled emissions has decreased further and the value is reflected in Table 1. Showa Denko – PSD Applicability Analysis.

2.2 Regulatory Applicability

The increased production capacity results in potential emissions that exceed the PSD significant thresholds. By virtue of the proposed increase, this project is subject to review under the following standards in S.C. Regulation 61-62 and Federal standards:

- S.C. Regulation 61-62.5, Standard No. 1, *Emissions from Fuel Burning Operations*
- S.C. Regulation 61-62.5, Standard No. 2, *Ambient Air Quality Standards*
- S.C. Regulation 61-62.5, Standard No. 3, *Waste Combustion and Reduction*
- S.C. Regulation 61-62.5, Standard No. 4, *Emissions from Process Industries*
- S.C. Regulation 61-62.5, Standard No. 7, *Prevention of Significant Deterioration*
- S.C. Regulation 61-62.5, Standard No. 8, *Toxic Air Pollutants*
- S.C. Regulation 61-62.6, *Control of Fugitive Particulate Matter*
- S.C. Regulation 61-62.7, *Good Engineering Practice Stack Height*
- S.C. Regulation 61-62.60, *South Carolina Designated Facility Plan and New Source Performance Standards*
- 40 CFR 60, *Standards of Performance of New Stationary Sources*, Subpart A, *General Provisions*
- 40 CFR 60, *Standards of Performance of New Stationary Sources*, Subpart IIII, *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines*
- S.C. Regulation 61-62.63 and 40 CFR 63, *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories*, Subpart A, *General Provisions*
- S.C. Regulation 61-62.63 and 40 CFR 63, *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories*, Subpart B,

Requirements for Control Technology Determinations for Major Sources in Accordance With Clean Air Act Sections, Sections 112(g) and 112(j)

- 40 CFR 63, *National Emission Standards For Hazardous Air Pollutants For Source Categories*, Subpart ZZZZ, *National Emission Standards For Hazardous Air Pollutants For Stationary Reciprocating Internal Combustion Engines*
- 40 CFR 63, *National Emission Standards For Hazardous Air Pollutants For Source Categories*, Subpart DDDDD, *National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters*
- S.C. Regulation 61-62.70, *Title V Operating Permit Program*
- 40 CFR 52, *Approval And Promulgation Of Implementation Plans*, Section 52.21, *Prevention Of Significant Deterioration Of Air Quality*

3.0 Detailed Process Description

Showa Denko is a graphite electrode manufacturing facility located in Ridgeville, South Carolina, which has been operating since 1983. The manufactured graphite electrodes are primarily used by the steelmaking industry as a means of transporting electrical energy into the electric arc steelmaking furnace. The facility currently includes the following nine processes – Mill, Mix, and Extrusion; Bake/Rebake Process; Rebake Load and Unload/Graphitizing Preparation; Bake Load and Unload and Baked Electrode Cleaning; Pitch Impregnation; Insulating media Receiving; Graphitizing; Cleaning and Inspection; and Machining and Shipping.

Mill, Mix, and Extrusion Process

During the Mill, Mix, and Extrusion process, needle coke and binder pitch (pitch) are mixed and formed into green electrodes. Needle coke is delivered to the facility, stored in various silos according to particle size and transferred from the silos and further sorted by size or crushed to specific-sized particles. Needle coke with various size specifications is mixed to achieve the required particle size distribution. Iron oxide is added to the needle coke and this dry mix is then combined with binder pitch and a lubricant, stearic acid, in heated mixers. The mix is fed to a cooling system and then charged to the extrusion press to form green electrodes of a desired diameter and length. The extruded green electrodes are cooled in a water trough and then transferred for further cooling. The iron oxide is stored at the facility in bags. The binder pitch and stearic acid are stored in electrically-heated tanks. Heat is supplied to the mixers and extruder by a hot oil heater.

Bake/Rebake Process

During the Bake Process, the green electrode is converted to a hard, rigid structure (brittle, abrasive and difficult to machine). The bake cycle for the green electrodes takes several days and occurs in a rich, non-oxidizing atmosphere. After reaching final temperature, the furnace is cooled with water sprays and the carbottom platforms returned to a building for off-loading. The furnace is generally reloaded within one day. The Rebake Process also involves the use of the carbottom furnaces but is for electrodes that are impregnated with pitch. The Rebake Process is used to transform the added impregnating pitch into carbon. The rebake cycle is shorter than the bake cycle. Exhaust gases from the proposed carbottom furnaces will exit to the atmosphere in two ways: through a common stack that receives exhaust gases continuously from the furnaces and from Clean Air stacks that are attached to each furnace and that open for a short time at the end of a charging cycle for an individual furnace.

Rebake Load and Unload/Graphitizing Preparation

After the pitch impregnated electrodes are rebaked in the carbottom furnaces, the electrodes are "end faced" to prepare them for graphitizing. The baskets are cleaned to recover the residual pitch coke which accumulated in the basket during rebake. Larger pieces of residual pitch coke are transferred to a storage bin where they are loaded onto trucks, as product, at the carbon chips loading station. Smaller residual pitch coke particles are crushed and stored in a pitch coke storage silo. The pitch coke fines are bagged and sold as product.

Bake Load and Unload and Baked Electrode Cleaning

Before baking, green electrodes are loaded upright into stainless steel cylinders (saggers) and the void space is packed with sand to support the electrodes. The saggers are loaded on carbottom platforms and then rolled into carbottom furnaces for baking (Bake Process). After baking, the baked electrodes are unloaded from the saggers and the sand is recycled back to the feed process. The baked electrode is then cleaned to remove residual sand and surface debris.

Pitch Impregnation

The baked and cleaned electrodes are fed to preheaters to prepare the electrodes for pitch impregnation. Pitch impregnation increases the density, strength, and electrical end-product conductivity of the electrodes by exposing them to pitch under elevated pressure and temperature in autoclaves. The duration of this exposure varies based on electrode diameter. Following impregnation, the electrodes are cooled in water spray coolers and a water trough; placed in non-supporting baskets; and loaded on carbottom platforms for the rebake process. Both solid and liquid pitch are used. A hot oil heater supplies heat for the oil jackets on the new storage tanks. Pitch is transferred from the two storage tanks into an existing storage tank and fed to the autoclaves from dosing tanks. Heat for the autoclaves is supplied by a hot oil heater.

Insulating media Receiving

The insulating media used is metallurgical coke and will be referred to as insulating media throughout this document. The insulating media is delivered by truck and transferred to a storage silo. The insulating media is then transferred from the storage silo to the graphitizing building in hoppers and is then transferred to the graphitizing furnaces by a crane mounted vacuum system (gulper system).

Graphitizing

The crystalline structure of the amorphous carbon is converted to graphitic carbon, which results in increased conductivity and machinability. This conversion takes place by intense heating of the rebaked electrodes (up to 3,000 degrees Centigrade) in electrically powered graphitizing furnaces. The rebaked electrodes are placed horizontally, end to end on a bed of insulating media (used for thermal insulation), making two parallel columns. The two columns are then connected into a direct current circuit. The electrodes are covered with additional insulating media and power is supplied to the electrodes from one of four rectifiers. The total firing time ranges from five to 24 hours. After completion of the graphitizing furnace cycle, several days are required for the met coke to cool to a temperature at which it can be removed from the furnace. Once the insulating media has reached a temperature where it can be removed, it is transferred pneumatically by the gulper system. The graphite electrodes are then transferred for cleaning and inspection. The insulating media is sorted to remove fines which are unusable in the furnaces. Coarse materials are stored in the gulper system and replaced into the furnaces for reuse. Sorted fines are stored in an outside silo.

Cleaning and Inspection

During this process, the graphitized electrodes are cleaned to remove residual insulating media.

Machining and Shipping

The cleaned graphitized electrodes are transferred to machining and finishing. As part of the machining process, the electrodes are turned to final diameter and threaded sockets are machined into the ends. Matching threaded graphite connecting pins are then inserted into one end of the electrode. In addition, stripes and other identifying marks may be painted on the electrodes. Graphite tailings and chips generated by the machining process are screened and stored in various bins as part of the granular graphite area. This material is bagged and otherwise packaged for delivery to customers.

4.0 Significant Emission Rates

As shown in Table 1, this project exceeds the significant threshold as defined under PSD for PM, PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO, VOC, and CO_2e emissions. HAP emissions are also shown in this table.

Table 1. Showa Denko – PSD Applicability Analysis

Pollutant	Controlled Emissions Increase	PSD Significant Threshold	Significant Increase?
	TPY	TPY	
PM	93.4	25	Yes
PM_{10}	93.08	15	Yes
$PM_{2.5}$	92.8	10	Yes
SO_2	-342.7	40	No
NO_X	324.6	40	Yes
CO	4,757	100	Yes
VOC	129.9	40	Yes
Lead	0.0001	0.6	No
CO_2e	258,176	75,000	Yes
HAP (single greatest)	75.4	10	Yes
HAP (total)	75.4	25	Yes

5.0 Best Available Control Technology (BACT) Determination

5.1 BACT Requirement

BACT is defined as "an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant, taking into account energy, environmental, and economic impacts." As per S.C. Regulation 61-62.5, Standard No. 7, the BACT requirement applies to each individual new or modified affected emissions unit and pollutant emitting activity at which a net emissions increase would occur. In no case can the application of BACT result in emissions of any pollutant which would exceed emissions allowed under any applicable standard under 40 CFR 60, *New Source Performance Standard (NSPS)*, 61, *NESHAP,* or 63, *NESHAP for Source Categories*.

Chapter B of the draft *New Source Review Workshop Manual* (October 1990) defines the BACT determination process as a 5-step process.

Step 1 – Identify All Control Technologies
Step 2 – Eliminate Technically Infeasible Options
Step 3 – Rank Remaining Control Technologies by Control Effectiveness
Step 4 – Evaluate Most Effective Controls and Document Results
Step 5 – Select BACT

Opacity is not considered to be a PSD pollutant and therefore, opacity itself does not require a BACT evaluation and establishment of a BACT limit. However, BACT can include the use of visible emission limitations or work practice standards for regulated PSD pollutants. Opacity limits have been included in the draft permit as required by State and Federal regulations. BACT cannot be less stringent than an applicable NSPS or NESHAP as outlined in 40 CFR 60, 61, and 63.

The primary resource for establishing BACT is the RACT/BACT/LAER Clearinghouse (RBLC) on the Technology Transfer Network (TTN) maintained by the EPA. To establish BACT for a PSD source, state regulatory agencies query the RBLC. This database contains information about available control technologies for specific industry sources and lists the limits that other pollution control agencies have established for similar source types.

BAQ queried the RBLC for all process types and NSR applicable pollutants. An RBLC advanced search was queried using a standard industrial classification (SIC) code of 3624. In addition to the RBLC, operating permits for existing facilities with similar

processes and the various control options used by those facilities were reviewed along with 40 CFR 63, Subpart LL – *National Emission Standards for Hazardous Air Pollutants for Primary Aluminum Reduction Plants*. Information provided by Showa Denko included queries of the RBLC using numerous variables such as SIC code, process type, facility name and pollutant. The facility also reviewed the California EPA Air Resources Board and the South Coast Air Quality Management District database, operating permits for existing facilities with similar processes and their control devices. BAQ compared information gathered to the information provided in the application to identify BACT sources.

Showa Denko has stated that there will be no emissions of NSR regulated pollutants from the Clean Air stacks on the carbottom furnaces. Therefore, BACT evaluations of the carbottom furnaces do not consider this stack. The permit requires stack testing to verify these assumptions.

5.2 BACT for Filterable Particulate Matter (PM, PM_{10}, $PM_{2.5}$) and Condensable Particulate Matter (PM_{10}, $PM_{2.5}$)

The proposed project includes nine (9) process areas that are subject to PSD review and that will have PM, PM_{10}, and $PM_{2.5}$ emissions increases requiring a BACT evaluation. Table 2 below presents these process areas and the estimated maximum annual PM, PM_{10}, $PM_{2.5}$, filterable and PM_{10}, $PM_{2.5}$ condensable emissions from these areas without add-on control devices. The types of PM, PM_{10}, $PM_{2.5}$ emissions are labeled as "process" or "combustion." Condensable PM_{10} and $PM_{2.5}$ emissions are from combustion sources and the graphitizing furnaces.

Table 2 – Estimated Annual Uncontrolled Filterable Particulate Matter (PM, PM_{10}, $PM_{2.5}$) and Condensable Particulate Matter (PM_{10}, $PM_{2.5}$) Emissions

Process Area/Equipment Description	Equipment ID No.	Estimated Maximum Annual Particulate Matter Emissions Without Add-On Control Devices (ton/yr)
New Mill, Mix and Extrusion Process: ● Green Scrap Service Bins and Weigh Scale (process) ● Service Bins, Bucket Elevators, Crusher Bins, Crushers, Screens and Weigh Scales (process) ● Conveyors, Scale Retractable Spouts, Pre-heaters, Hoppers (process) ● Mill Feed Bin (process)	See Permit # 0900-0025-CZ-R6	PM (filterable) = 896.5 PM_{10} (filterable) = 425.97 $PM_{2.5}$ (filterable)= 64.3 PM_{10} (condensable) = 0.1 $PM_{2.5}$ (condensable)= 0.1

Table 2 – Estimated Annual Uncontrolled Filterable Particulate Matter (PM, PM_{10}, $PM_{2.5}$) and Condensable Particulate Matter (PM_{10}, $PM_{2.5}$) Emissions		
Process Area/Equipment Description	**Equipment ID No.**	**Estimated Maximum Annual Particulate Matter Emissions Without Add-On Control Devices (ton/yr)**
● Iron Oxide Bin and Scale (process) ● Mixers, Mixer Discharge Belt (process) ● Screw Spreader (process) ● Cooling Belts (process) ● Homogenizer (process) ● Homogenizer Discharge Belt (process) ● Coke Silos and Conveyor Belts (process) ● Hot Oil Heater (combustion)		
New Bake/Rebake Process: ● Carbottom Furnaces (process and combustion)	E-210-2-4271-18/32	PM (filterable) = 1780 PM_{10} (filterable) = 1780 $PM_{2.5}$ (filterable)= 1780 PM_{10} (condensable) = 1210 $PM_{2.5}$ (condensable)= 1210
Existing Rebake Load and Unload/Graphitizing Preparation: ● End Facing Machine (process) ● Basket Cleaner (process) ● Pitch Coke Crusher (process) ● Pitch Coke Storage Silo (process) ● Pitch Coke Loading Station (process) ● Storage Bin (process)	E-220-01 E-220-02 E-220-03 E-220-04 E-220-05 E-220-06	PM = 0.21 PM_{10} = 0.10 $PM_{2.5}$ = 0.02
Existing Bake Load and Unload and Baked Electrode Cleaning: ● Sand Storage Bin (process) ● Sagger Loading System (process) ● Sagger Unloading System (process) ● Sagger Cleaning (process) ● Electrode Cleaner (process)	E-250-02 E-250-03 E-250-04 E-250-06 E-250-07	PM = 0.45 PM_{10} = 0.35 $PM_{2.5}$ = 0.27
New Pitch Impregnation Process: ● Preheater (combustion) ● Hot Oil Heater (combustion)	E-310-2-4272-21 E-310-2-4275-01	PM (filterable) = 0.17 PM_{10} (filterable) = 0.17 $PM_{2.5}$ (filterable)= 0.17 PM_{10} (condensable) = 0.41 $PM_{2.5}$ (condensable)= 0.41
Existing Insulating media Receiving: ● Insulating media Unloading Station (process) ● Insulating media Silo (process) ● Transport Hopper Loading (process)	E-410-01 E-410-02 E-420-03	PM = 3.28 PM_{10} = 3.28 $PM_{2.5}$ = 3.28
New Graphitizing Process: ● Graphitizing Furnaces (process)	E-460-4271-01/10	PM (filterable) = 40.4 PM_{10} (filterable) = 36.6

Table 2 – Estimated Annual Uncontrolled Filterable Particulate Matter (PM, PM_{10}, $PM_{2.5}$) and Condensable Particulate Matter (PM_{10}, $PM_{2.5}$) Emissions		
Process Area/Equipment Description	**Equipment ID No.**	**Estimated Maximum Annual Particulate Matter Emissions Without Add-On Control Devices (ton/yr)**
● Sodium Carbonate Storage Bin (process) ● Gulper System (process) ● Insulating media Dust Bins (process) ● Insulating media Recycle (process)	E-460-4349-02 E-460-4225-01 E-460-4202-01 and E-460-4202-06 E-460-4202-02	$PM_{2.5}$ (filterable)= 33.8 PM_{10} (condensable) = 22.1 $PM_{2.5}$ (condensable)= 22.1
Existing Cleaning and Inspection: ● Electrode Cleaning Machine (process)	E-490-01	PM = 0.06 PM_{10} = 0.06 $PM_{2.5}$ = 0.06
Existing Machining and Shipping: ● Station No. 1 – Rough Bore and Face Ends (process) ● Station No. 2 – Finish Turn OD and Face Ends (process) ● Station No. 3 - Threading (process) ● Graphite Chip Screen (process) ● Graphite Storage Bins (process)	E-510-01 E-510-02 E-510-03 E-510-06 E-510-07, E-510-08, E-510-09	PM = 0.23 PM_{10} = 0.11 $PM_{2.5}$ = 0.02
New 1,500 kW Diesel Fuel-Fired Emergency Generator (combustion)	E-240-2-4365-01	Infrequent operation; minimal emissions

*Emissions for existing equipment reflect the net increase in TPY resulting from the proposed expansion. The net increase for existing equipment was calculated by subtracting actual potential controlled emissions from future potential controlled emissions.

Another source of filterable PM, PM_{10}, and $PM_{2.5}$ emissions and condensable PM_{10} and $PM_{2.5}$ emissions is the installation of a 1,500 kW emergency generator. The filterable and condensable particulate emissions from this source will be limited by the size of the generator and an operating restriction of no more than 100 hours per year for maintenance. Therefore, a full BACT analysis was not performed for the emergency generator.

5.2.1 Step 1: Identify All Available Control Technologies

The BACT analysis identifies the following control technologies that could reduce PM, PM_{10}, and $PM_{2.5}$ emissions:

Baghouse (Fabric Filters)

A baghouse (also known as a fabric filter) involves the use of fabric bags, in different shaped tubes or cartridges, where particulate-laden gas is drawn through the bags (or outside the bags) and forms a layer of dust on the filter media. The fabric used may be made of cotton, nylon, polyester, fiberglass, or other materials. Gas stream characteristics (moisture content and temperature) will affect which material is chosen. When a certain pressure drop occurs across the filter media (fabric), the cleaning process begins. Baghouses are highly efficient in particulate matter removal, commonly designed with a 99.9% collection efficiency.

Electrostatic Precipitator (ESP) (Wet/Dry)

An ESP involves use of the force created by an induced electrostatic charge to remove particulate matter from a gas stream. The charged particles are collected on plates and loosened from the plates during the cleaning process. Removal of the charged particles from the plates may involve mechanical hammers called rappers or water. When using water for removing particles from the plates, the control device is referred to as a Wet ESP. ESPs are considered highly efficient in particulate matter collection because energy is applied directly to the particulate-laden gas stream. An ESP has a typical collection efficiency of 97% to over 99%.

Wet Scrubbers

Wet Scrubbers use a liquid spray to remove particles and acid gases from a waste gas stream. The primary function of wet scrubbers is to remove gaseous emissions, with a secondary function of particulate removal. Removal of pollutants is primarily achieved through impaction, diffusion, interception, and/or absorption of the pollutant onto droplets of liquid. The liquid effluent is then collected and disposed. The control efficiencies for wet scrubbers are typically 99.9%.

Spray Dryer Absorber (SDA) with Baghouse (Fabric Filters)

A waste gas stream is sent through a spray dryer absorber tower that has been injected with an alkaline slurry, usually lime mixed with water. The alkaline slurry is atomized and acid gases in the waste gas stream are absorbed by the alkaline mist to form particulate and products of the reaction. These particulates and products of reaction are discharged to a baghouse (fabric filters) located downstream of the spray dryer tower. The baghouse (fabric filters) is used to capture the formed particulates.

Condensers

Condensation is the process of converting a gas or vapor to a liquid. The conversion takes place by decreasing the temperature and/or increasing the pressure.

Good Combustion Practices

Good combustion practices imply that the combustion sources (preheater, hot oil heaters and carbottom furnaces) will be operated within parameters promoting efficient and complete fuel combustion, thereby reducing combustion emissions. Showa Denko will be using good combustion practices, low NO_X burners and will utilize natural gas/propane exclusively as fuel for the two hot oil heaters, preheater and 15 new carbottom furnaces.

Showa Denko has listed the following as good combustion practices:

1. Good air/fuel mixing in the combustion zone;

2. Sufficient residence time to complete combustion;

3. Proper fuel gas supply system design and operation in order to minimize the effect of contaminants and fluctuations in pressure and flow on the fuel gas quality delivered to combustions units;

4. Operator and maintenance practices including good burner maintenance and operation;

5. High temperatures and low oxygen levels in the primary combustion zone;

6. Overall excess oxygen levels high enough to complete combustion while maximizing thermal efficiency.

Good combustion practices #1 through #6 listed above will apply to the hot oil heaters. Good combustion practices #1 through #5 listed above will apply to the preheater and carbottom furnaces.

Combinations of Control Methods

For combustion units, good combustion practices can be used in combination with other control methods.

5.2.2 Step 2: Technical Feasibility of Options

The control options were analyzed for their technical feasibility as applied to all process/point sources resulting in PM, PM_{10} and $PM_{2.5}$ emissions at the facility. A summary is presented below.

Baghouse (Fabric Filters)
Several different types of material may be used to manufacture baghouses, including a polytetrafluoroethylene (PTFE) membrane bag to control $PM_{2.5}$ emissions. Showa Denko attempted to use the PTFE membrane bags on some of their existing sources but the coating degraded quickly; therefore, the use of a PTFE membrane bags is not technically feasible. Other common materials used for baghouses, such polyester, Nomex, and fiberglass are deemed technically feasible for all sources excluding the combustion units. Exhaust gas temperatures from the combustion units would result in higher than maximum inlet temperatures for baghouses. Baghouses are considered technically feasible for the proposed Mill, Mix and Extrusion Process mixers. But the mixers will also need to have VOC control; therefore, a baghouse equipped with a dry fume scrubber is being considered. Baghouses are deemed technically feasible for the remaining new process sources and all of the existing sources with increased hours of operation or annual throughput that have particulate matter emissions. All the existing sources that are subject to the PM BACT analysis currently have baghouses as control devices.

Electrostatic Precipitator (ESP) Wet/Dry
The inlet gas flow for ESPs can range from 1,000 to 1,000,000 standard cubic feet per minute (scfm). Dry ESPs are able to handle inlet gas temperatures of up to 1300 ºF. Wet ESPs are able to handle inlet gas temperatures of up to 190 ºF. ESPs can be very sensitive to gas stream fluctuations. Although the carbottom furnaces have a high exhaust gas temperature (1,562 ºF), a cooling technology could be utilized to lower the high exhaust temperature, therefore a wet or dry ESP is deemed technically feasible for the carbottom furnaces. Dry and wet ESPs are deemed technically feasible for all remaining proposed sources contributing to PM emissions except for the hot oil heaters and sodium carbonate storage bin. Dry and wet ESPs are deemed not technically feasible for the hot oil heaters and sodium carbonate storage bin due to relatively low exhaust gas flows. Dry and wet ESPs are deemed technically infeasible for existing sources with increased hours of operation or annual throughput due to variable and low exhaust flow.

Wet Scrubbers

The inlet gas flow for wet scrubbers normally range from 1,000 to 100,000 scfm. Wet scrubbers can typically handle inlet gas flow temperatures in a range from 40 to 750 ºF. Wet scrubbers are deemed technically feasible to all proposed sources contributing to PM emissions except for the hot oil heaters and sodium carbonate storage bin. The hot oil heaters and sodium carbonate storage bin have relatively low exhaust gas flows and are therefore deemed technically infeasible. Although the carbottom furnaces have a high exhaust gas temperature (1,562ºF), a cooling technology could be utilized to lower the high exhaust temperature, therefore a wet scrubber is deemed technically feasible for the carbottom furnaces. Although the exhaust gas flow from the graphitizing furnaces exceeds the normal range for wet scrubbers, units can be designed to handle the higher gas flow and therefore the wet scrubber is deemed technically feasible for the graphitizing furnaces. Wet scrubbers are also deemed technically feasible for all of the existing sources with increased hours of operation or annual throughput that have particulate matter emissions.

Spray Dryer Absorber (SDA) with Baghouse (Fabric Filters)

A SDA with baghouse (fabric filters) could be used to control any condensable or filterable particulate matter being emitted. Sources emitting condensable particulate matter include the hot oil heaters, preheater, carbottom furnaces, and graphitizing furnaces. Exhaust gas temperatures from the hot oil heaters, preheater, and carbottom furnaces would result in higher than maximum inlet temperatures for baghouses, therefore a SDA with baghouse (fabric filters) is not technically feasible for these units. The SDA with baghouse (fabric filters) is considered technically feasible for the proposed Mill, Mix and Extrusion Process mixers. But the mixers will also need to have VOC control; therefore, a baghouse equipped with a dry fume scrubber is being considered. The SDA with baghouse (fabric filters) is deemed technically feasible for the remaining new sources and existing sources with increased hours of operation or annual throughput that emit particulate matter. All the existing sources that are subject to the PM BACT analysis currently have baghouses as control devices.

Condensers

Condensers can be used in the removal of condensable particulate matter, however all sources that contribute to condensable particulate matter also emit filterable particulate matter. It is not technically feasible to use condensers for any of these sources due to the “sticky” nature of collected solids that would cause a build up and render the condensers ineffective.

Good Combustion Practices

Based on data included in the RBLC database, BACT/LAER determinations for control of PM emissions from miscellaneous boilers, furnaces, and heaters (process type code 19.600) have included good combustion practices. Good combustion practices are deemed technically feasible for the combustion units. Showa Denko will use good combustion practices and natural gas as the primary fuel with propane as back-up fuel for the hot oil heaters, preheater, and carbottom furnaces.

5.2.3 Step 3: Ranking of Control Technologies

The available control technologies deemed technically feasible for PM/PM_{10}/$PM_{2.5}$ control are ranked in Table 3 from the most to least effective based on emission reduction potential (% control efficiency).

Table 3 – Ranking of Technically Feasible PM Control Technologies

Technology	PM, PM_{10}, $PM_{2.5}$ Control Efficiency (%)
SDA with Baghouse	99.9 (Filterable only)
Wet Scrubber	99.9 (Filterable only)
Baghouse (Fabric Filters)	99.9 (Filterable only)
Electrostatic Precipitator (Wet/Dry)	97 (Filterable only)
Good Combustion Practices	N/A

5.2.4 Step 4: Evaluation of Most Effective Controls

This step requires a case-by-case analysis of energy, environmental, and economic impacts. The SDA with baghouse (fabric filters), wet scrubber, and baghouse (fabric filters) result in the highest PM control efficiencies and are therefore considered. The SDA with baghouse (fabric filters) will contribute to higher costs with the capability of removing the same amount of filterable particulate matter as a baghouse (fabric filter), therefore it is considered not cost effective. Although the wet scrubber was deemed technically feasible for the preheater, it would not be cost effective. Annual operating costs for the preheater would be approximately $75,884 to control 0.41 tons per year of filterable and condensable particulate matter with a wet scrubber. Use of a wet scrubber is cost prohibitive for the carbottom furnaces, due to the need of adding methods to lower the exhaust gas of the carbottom furnaces prior to entering the wet scrubber. Good combustion practices are also considered for the proposed equipment in which baghouses and wet scrubbers were deemed not technically feasible or not cost effective. No additional costs, energy impacts, or

environmental impacts are associated with good combustion practices for the new combustion units. As stated previously, the existing units are already equipped with baghouses. The addition of a baghouse or wet scrubber to further control the pollutant stream would be cost prohibitive, therefore existing controls are deemed BACT.

The baghouse and wet scrubber are agreed by Showa Denko as being cost effective in controlling new sources emitting particulate matter. Increased energy consumption by use of the baghouse or wet scrubber is not considered great enough to disqualify either control methods. Use of the baghouse or wet scrubber could result in some degree of adverse environmental impacts. Operation of baghouses will result in solids that require offsite disposal at the local landfill. Operation of the wet scrubber will result in increased amounts of wastewater requiring treatment. Potential environmental impacts are not sufficient in and of themselves to eliminate any of the control methods.

5.2.5 Step 5: Select BACT

The evaluation of the most effective control (Step 4) did not reach a conclusion between the wet scrubber and baghouse. The baghouse is selected as the preferred control method since the facility has proposed this control as part of the design for the expansion. The control method for filterable and condensable PM, PM_{10}, and $PM_{2.5}$ control along with proposed BACT limits are listed in Table 4 below:

Table 4 – Selection of Filterable Particulate Matter (PM, PM_{10}, $PM_{2.5}$) and Condensable Particulate Matter (PM_{10}, $PM_{2.5}$) BACT Limits

Process/Equipment	Control Method	Proposed BACT Limit
New Mill, Mix and Extrusion Process (all equip. excluding Mixers, Mixer Discharge Belt, Screw Spreader, Cooling Belts, Homogenizer, Homogenizer Belt and Hot Oil Heater)	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Mill, Mix and Extrusion Process/ Mixers, Mixer Discharge Belt, Screw Spreader, Cooling Belts, Homogenizer and Homogenizer Belt	Baghouse/Dry Fume Scrubber, see footnote (1)	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Mill, Mix and Extrusion Process/	Good Combustion Practices; Annual Tune	0.0022 lb/million Btu (Filterable PM)

Table 4 – Selection of Filterable Particulate Matter (PM, PM_{10}, $PM_{2.5}$) and Condensable Particulate Matter (PM_{10}, $PM_{2.5}$) BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
Hot Oil Heater	Up; natural gas as primary/propane as back-up fuel source	0.0022 lb/million Btu (Filterable PM_{10}) 0.0022 lb/million Btu (Filterable $PM_{2.5}$) 0.0056 lb/million Btu (Condensable PM_{10}) 0.0056 lb/million Btu (Condensable $PM_{2.5}$) Good Combustion Practices #1-6
New Bake/Rebake Process/ 15 Carbottom Furnaces	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as back-up fuel source; Thermal Oxidizer; Low NO_X Burners, see footnote (2)	4.14 lb/hr (Filterable PM) 4.14 lb/hr (Filterable PM_{10}) 4.14 lb/hr (Filterable $PM_{2.5}$) 2.85 lb/hr (Condensable PM_{10}) 2.85 lb/hr (Condensable $PM_{2.5}$) Good Combustion Practices #1-5
Existing Rebake Load and Unload/Graphitizing Preparation Process	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Sand Storage Bin	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Sagger Unloading and Loading System	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Electric Shot Blaster	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Sagger Cleaning and Electrode Cleaner	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Pitch Impregnation Process/ Preheater	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as	0.0023 lb/million Btu (Filterable PM) 0.0023 lb/million Btu (Filterable PM_{10})

Table 4 – Selection of Filterable Particulate Matter (PM, PM_{10}, $PM_{2.5}$) and Condensable Particulate Matter (PM_{10}, $PM_{2.5}$) BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
	back-up fuel source	0.0023 lb/million Btu (Filterable $PM_{2.5}$) 0.0056 lb/million Btu (Condensable PM_{10}) 0.0056 lb/million Btu (Condensable $PM_{2.5}$) Good Combustion Practices #1-5
New Pitch Impregnation Process/ Hot Oil Heater	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as back-up fuel source	0.0022 lb/million Btu (Filterable PM) 0.0022 lb/million Btu (Filterable PM_{10}) 0.0022 lb/million Btu (Filterable $PM_{2.5}$) 0.0056 lb/million Btu (Condensable PM_{10}) 0.0056 lb/million Btu (Condensable $PM_{2.5}$) Good Combustion Practices #1-6
Existing Insulating media Receiving Process	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Graphitizing Process/ 10 Graphitizing Furnaces	Wet Scrubber, see footnote (3)	4.19 lb/hr (Filterable PM) 4.15 lb/hr (Filterable PM_{10}) 4.12 lb/hr (Filterable $PM_{2.5}$) 2.65 lb/hr (Condensable PM_{10}) 2.65 lb/hr (Condensable $PM_{2.5}$)
New Graphitizing Process/ Gulper System and Insulating media Dust Bins	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Graphitizing Process/ Insulating media Recycle (Gulper System)	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Cleaning and Inspection Process/ Electrode Cleaning Machine	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Machining and Shipping Process/Station No. 1, Station No. 3, Graphite Chip Screen, and Graphite Storage Bins	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Machining and	Baghouse	0.005 gr/dscf (Filterable PM)

Table 4 – Selection of Filterable Particulate Matter (PM, PM_{10}, $PM_{2.5}$) and Condensable Particulate Matter (PM_{10}, $PM_{2.5}$) BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
Shipping Process/Station No. 2		0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Machining and Shipping/ Powderizer System, Cyclone Collector, and Bag Packer	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Emergency Generator	Annual Tune Up	Operational limit of 100 hours for maintenance

(1) Mixers will also require VOC control. Therefore a baghouse equipped with a dry fume scrubber was selected as the control option.
(2) For the carbottom furnaces there is a need to control several pollutants other than PM, therefore a thermal oxidizer and low NO_X burners were selected. Filterable and condensable particulate emissions from the carbottom furnaces will be controlled by the thermal oxidizer (99% control efficiency for PM). The proposed BACT limit takes into account combustion filterable and condensable particulate emissions from the thermal oxidizer.
(3) The wet scrubber was selected for PM control because it will also provide SO_2 control. Since primary control is for SO_2, Showa Denko has estimated a 50% control efficiency would be achieved for filterable and condensable particulate based on vendor data obtained. The wet scrubber controls 95% of the graphitizing furnaces emissions, the remaining uncontrolled 5% exhaust through the roof. The proposed BACT limit represents the total of the controlled stack plus uncontrolled roof monitor emissions.

Baghouses have been selected to achieve BACT for proposed process units where PM is the primary pollutant of concern. Baghouses in-place on existing units subject to PSD review are deemed appropriate to achieve BACT emissions limits. The PM BACT analysis did not conclude that any other control option, deemed technically feasible, would be any more effective for process PM emissions than baghouses, except in cases where the sources emitted other criteria pollutants in higher levels (carbottom furnaces and graphitizing furnaces).

A BACT limit of 0.005 grains/dscf has been proposed for the new units that will be controlled by baghouses. This limit has been chosen due to research indicating that a BACT limit of 0.005 grains/dscf is in place for similar sources and is a widely used industry standard for baghouses. The existing units at Showa Denko, Ridgeville that have baghouses in-place currently have a 0.005 grains/dscf limit and this has been deemed an appropriate BACT limit.

<u>Testing/Monitoring/Record Keeping/Reporting:</u>

All proposed baghouses will be subject to an initial source test for filterable PM, PM_{10}, and $PM_{2.5}$ emissions shall be conducted within 180 days after startup and every three (3) years thereafter. An initial source test to verify no condensable PM_{10} and $PM_{2.5}$ emissions are present shall be conducted within 180 days after startup. All existing baghouses will be subject to an initial source test for filterable PM, PM_{10}, and $PM_{2.5}$ emissions shall be conducted within 180 days after startup of this project and every three (3) years thereafter. An initial source test to verify no condensable PM_{10} and $PM_{2.5}$ emissions are present shall be conducted within 180 days after startup of this project. The owner/operator shall install and maintain a bag leak detection system (BLDS) on each module of the baghouses.

The thermal oxidizer that will be installed on the carbottom furnaces will be subject to an initial source test for filterable PM, PM_{10}, and $PM_{2.5}$ emissions and condensable PM_{10} and $PM_{2.5}$ emission that will be conducted 180 days after startup and every three (3) years thereafter. Depending upon stack test results, a less frequent stack testing schedule may be granted, as per permit conditions. Combustion zone and/or afterburner temperature indicators will be installed and maintained on the thermal oxidizer. Temperature readings shall be recorded at least every fifteen (15) minutes and maintained on site. The thermal oxidizer will be in place and operational whenever the carbottom furnaces are running, except during periods of thermal oxidizer malfunction or mechanical failure.

The wet scrubber that will be installed on the graphitizing furnaces will be subject to an initial source test for filterable PM, PM_{10}, and $PM_{2.5}$ emissions and condensable PM_{10} and $PM_{2.5}$ emissions that will be conducted within 180 days after startup and every three (3) years thereafter. The owner/operator shall install and maintain liquid pressure indicators on each scrubber module. Each parameter shall be recorded each shift during source operation. The scrubber shall be in place and operational whenever processes controlled by the scrubber are running, except during periods of scrubber malfunction or mechanical failure. Prior to the first source test, the facility shall use manufacturer's recommendations for operational ranges. These operational ranges for the monitored parameters shall be derived from stack test data, which demonstrate the proper operation of the equipment in compliance. These ranges, with supporting documentation and quality assurance procedures, shall be submitted to the Bureau for approval within 180 days of startup. The operating ranges may be updated using this procedure, following Bureau approval.

5.3 BACT for CO

The proposed project includes process areas that are subject to PSD review and that will have CO emissions increases requiring a BACT evaluation. The table below presents these process areas and the estimated maximum annual CO emissions from these areas without add-on control devices. The types of CO emissions are labeled as "process" or "combustion."

Table 5 – Estimated Annual Uncontrolled CO Emissions

Process Area/Equipment Description	Equipment ID No.	Estimated Maximum Annual CO Emissions Without Add-On Control Devices (ton/yr)
New Mill, Mix and Extrusion Process: ● Hot Oil Heater (combustion)	E-110-2-4275-01	1.81
New Bake/Rebake Process: ● Carbottom Furnaces (process and combustion)	E-210-2-4271-18/32	98.01
New Pitch Impregnation Process: ● Preheater (combustion) ● Hot Oil Heater (combustion)	 E-310-2-4272-21 E-310-2-4275-01	 4.36 1.81
New Graphitizing Process: ● Graphitizing Furnaces (process)	E-460-4271-01/10	4,572
New 1,500 kW Diesel Fuel-Fired Emergency Generator (combustion)	E-240-2-4365-01	Infrequent operation; minimal emissions

No existing sources that are part of this project emit CO so the CO BACT was performed for only new sources emitting CO. The combustion CO emissions are generated from natural gas combustion emissions with propane used as the backup fuel. Exhaust gases from the proposed carbottom furnaces will exit to the atmosphere in two ways: through a common stack (TO) that receives exhaust gases continuously from the furnaces and from clean air stacks that are attached to each furnace and that open for a short time at the end of a charging cycle for an individual furnace. Showa Denko has stated that there will be no emissions of NSR regulated pollutants (including CO) from the clean air stacks. Therefore, this CO BACT evaluation considers only those emissions from the common stack (TO). Exhaust gases from the proposed graphitizing furnaces will exit the atmosphere in two ways: through a common stack (TO) that receives exhaust gases from each individual furnace and from the roof monitor. The CO emissions are generated during the actual graphitizing process, where the electrodes, along with the packing media

(metallurgical coke) undergo degradation, i.e. a small amount of metallurgical coke is actually being combusted.

Another source of CO emissions is the installation of a 1,500 kW emergency generator. The CO emissions from this source will be limited by the size of the generator and an operating restriction of no more than 100 hours per year for maintenance. Therefore, a full BACT analysis was not performed for the emergency generator.

5.3.1 Step 1: Identify All Available Control Technologies

Afterburners

There are several types of afterburners, such as thermal oxidation systems, direct flame (flares), thermal recuperative oxidizer (TRO), regenerative thermal oxidizer (RTO) and thermal oxidizers (TO). These systems all operated on the concept of oxidizing combustible materials at a temperature high enough and a time frame long enough (typically 0.5-2 seconds) to convert the pollutants to CO_2, water vapors and heat. All of these types of systems have been used to control CO emissions. BAQ reviewed source test data for a facility using an RTO for CO control, which showed a control efficiency around 80-90%. Vendor data provided by Showa Denko has an estimated control efficiency of 97% for CO. A TO is currently utilized by Showa Denko to control VOC emissions from the existing carbottom furnaces.

Regenerative Catalytic Oxidizer (RCO)

The typical oxidation catalyst for CO-containing exhaust gases is rhodium or platinum (noble metal) catalyst on an alumina support material. This catalyst is installed in an enlarged duct or reactor with flue gas inlet and outlet distribution plates. Acceptable catalyst operating temperatures range from 400 to 1250 °F, with the optimal range being 850 to 1,100 °F. Installation of oxidation catalyst in flue gas containing more than trace levels of SO_2 will result in poisoning and deactivation of the catalyst by sulfur-containing compounds.

Good Combustion Practices

Good combustion practices imply that the combustion sources (preheater, hot oil heaters and carbottom furnaces) will be operated within parameters promoting efficient and complete fuel combustion, thereby reducing combustion emissions. Showa Denko will be using good combustion practices, low NO_X burners and will

utilize natural gas/propane exclusively as fuel for the two hot oil heaters, preheater, and 15 new carbottom furnaces.

Showa Denko has listed the following as good combustion practices:

1. Good air/fuel mixing in the combustion zone;
2. Sufficient residence time to complete combustion;
3. Proper fuel gas supply system design and operation in order to minimize the effect of contaminants and fluctuations in pressure and flow on the fuel gas quality delivered to combustions units;
4. Operator and maintenance practices including good burner maintenance and operation;
5. High temperatures and low oxygen levels in the primary combustion zone;
6. Overall excess oxygen levels high enough to complete combustion while maximizing thermal efficiency.

Good combustion practices #1 through #6 listed above will apply to the hot oil heaters. Good combustion practices #1 through #5 listed above will apply to the preheater and carbottom furnaces.

5.3.2 Step 2: Technical Feasibility of Options

The available control options were analyzed for their technical feasibility as applied to the hot oil heaters, preheater, carbottom furnaces and graphitizing furnaces.

<u>Afterburner</u>

Afterburners are currently being used to control CO from other graphitizing facilities. Showa Denko has recently performed engineering tests on the existing TO, however no inlet and outlet testing was conducted, so a control efficiency could not be established. Afterburners generally require an exhaust flow rate greater than 5,000 scfm for proper operation. As per information provided by equipment suppliers, the exhaust flow rate from the hot oil heaters is 967 acfm and the exhaust flow rate from the preheater is 4,600 acfm, hence the flow rate would be considered too low for an afterburner to be technically feasible. Afterburners are deemed technically feasible for the carbottom furnaces and the graphitizing furnaces, which have exhaust flow

rates of 95,426 and 200,000 acfm respectively.

Regenerative Catalytic Oxidizer (RCO)

Because of the required exhaust gas temperatures and potential of catalyst poisoning, oxidation catalyst is not deemed technically feasible for the hot oil heaters, preheater and carbottom furnaces.

Good Combustion Practices

Good combustion practices are deemed technically feasible for all the natural gas and propane fired sources. Showa Denko will use good combustion practices and natural gas as the primary fuel and propane as a backup fuel for the two (2) hot oil heaters, preheater and fifteen (15) carbottom furnaces. Good combustion practices are deemed technically feasible for the diesel-fired emergency generator.
Baghouse (Fabric Filters)

5.3.3 Step 3: Ranking of Control Technologies

The available control technologies deemed technically feasible for CO control are ranked below from most to least effective based on their CO emission reduction potential (% control efficiency).

Table 6 – Ranking of Technically Feasible CO Control Technologies

Technology	Control Efficiency (%)
Afterburner (TO)	97 (based on vendor data)
Good Combustion Practices	N/A

5.3.4 Step 4: Evaluation of Most Effective Controls

This step requires a case-by-case analysis of energy, environmental, and economic impacts. The afterburner (TO) and good combustion practices will be considered.

Carbottom Furnaces

Since Showa Denko is installing a TO for the purpose of VOC control (see the BACT evaluation for VOC emissions in this preliminary determination), there will be no adverse energy and environmental impacts, from using this TO to also control CO emissions, from the new carbottom furnaces.

Graphitizing Furnaces (stack and roof emissions)

A cost analysis was submitted for the installation and operation of a 7.5 million Btu/hr natural gas fired afterburner. The cost analysis was based on a 97% CO control efficiency and 4,435 tons of CO being removed, for a total cost of $289 per ton CO removed. Based on this data, this would make the installation of an afterburner cost effective. Although the addition of an afterburner is economically feasible, it would result in adverse energy and environmental impacts. An afterburner increases natural gas utilization which would result in an increase in criteria pollutants, especially NO_X. As a state, SC has an ample margin of compliance with the CO NAAQS. Even though SC is currently in attainment with the ozone standard, we are a NO_X limited area (see ozone discussion in the air impact analysis section). The CO monitor at Cape Romain is less than 4% of the 1-hr and 8-hr standard compared to Bushy Park and Cape Romain monitors for ozone being at less than 80%. Additionally, Showa Denko's NAAQS Class II full impact analysis shows 1-hr NO_2 at 85% of the standard while the 1-hr CO is 14% of the standard. Based on this information, an afterburner has been eliminated from the BACT review and no CO control is required for the new graphitizing furnaces.

5.3.5 Step 5: Select BACT

Table 7 – Selection of CO BACT Limits

Process/Equipment	Control Method	Proposed BACT Limit
New Mill, Mix and Extrusion Process/Hot Oil Heater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	0.082 lb/million Btu Good Combustion Practices #1-6
New Bake/Rebake Process/ 15 Carbottom Furnaces	TO; Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	2.0 lb/hr Good Combustion Practices #1-5
New Pitch Impregnation Process/ Preheater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune up	0.083 lb/million Btu Good Combustion Practices #1-5

Table 7 – Selection of CO BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
New Pitch Impregnation Process/ Hot Oil Heater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	0.082 lb/million Btu Good Combustion Practices #1-6
New Graphitizing Process/ 10 Graphitizing Furnaces	None	1,690 lb/hr (total for stack and roof emissions)
New Emergency Generator	Annual Tune Up	Operational limit of 100 hours for maintenance

5.4 BACT for Nitrogen Oxides (NO_X)

The proposed project includes process areas that are subject to PSD review and that will have NO_X emissions increases requiring a BACT evaluation. The table below presents these process areas and the estimated maximum annual NO_X emissions from these areas without add-on control devices except for low NO_X burners on proposed sources that are sold equipped with low NO_X burners. The types of NO_X emissions are labeled as "process" or "combustion."

Table 8 – Estimated Annual Uncontrolled NO_X Emissions		
Process Area/Equipment Description	**Equipment ID No.**	**Estimated Maximum Annual NO_X Emissions Without Add-On Control Devices (ton/yr)**
New Mill, Mix and Extrusion Process: ● Hot Oil Heater (combustion)	E-110-2-4275-01	2.20
New Bake/Rebake Process: ● Carbottom Furnaces (process and combustion)	E-210-2-4271-18/32	233.38
New Pitch Impregnation Process: ● Preheater (combustion) ● Hot Oil Heater (combustion)	 E-310-2-4272-21 E-310-2-4275-01	 5.29 2.20
New Graphitizing Process: ● Graphitizing Furnaces (process)	E-460-4271-01/10	11.1
New 1,500 kW Diesel Fuel-Fired Emergency Generator (combustion)	E-240-2-4365-01	Infrequent operation; minimal emissions

No existing sources that are part of this project emit NO_X so the NO_X BACT was performed for only new sources emitting NO_X. The combustion NO_X emissions are

generated from natural gas combustion emissions with propane used as the backup fuel and the process NO_X emissions are generated from the carbottom furnaces and the graphitizing furnaces. Exhaust gases from the proposed carbottom furnaces will exit to the atmosphere in two ways: through a common stack (TO) that receives exhaust gases continuously from the furnaces and from clean air stacks that are attached to each furnace and that open for a short time at the end of a charging cycle for an individual furnace. Showa Denko has stated that there will be no emissions of NSR regulated pollutants (including NO_X) from the clean air stacks. Showa Denko will be required to perform an initial screening to verify no NO_X emissions are present in the clean air stacks. Therefore, this NO_X BACT evaluation considers only those emissions from the common stack (TO).

Another source of NO_X emissions is the installation of a 1,500 kW emergency generator. The NO_X emissions from this source will be limited by the size of the generator and an operating restriction of no more than 100 hours per year for maintenance. Therefore, a full BACT analysis was not performed for the emergency generator. Another source of filterable PM, PM_{10}, and $PM_{2.5}$ emissions and condensable PM_{10} and $PM_{2.5}$ emissions is the installation of a 1,500 kW emergency generator. The filterable and condensable particulate emissions from this source will be limited by the size of the generator and an operating restriction of no more than 100 hours per year for maintenance. Therefore, a full BACT analysis was not performed for the emergency generator.

5.4.1 Step 1: Identify All Available Control Technologies

The BACT analysis identifies the following control technologies that could be used to reduce NO_X emissions:

<u>Selective Catalytic Reduction</u>

Selective Catalytic Reduction (SCR) works by injecting a reagent (ammonia or urea) into the ductwork, downstream of a combustion source. The reagent combines with NO_X in the gas stream and the combined gas stream comes into contact with a catalyst. The result of the NO_X reduction chemical reaction is the formation of nitrogen and water. Depending on the type of catalyst and the gas stream composition, an optimum operating range for a SCR can vary from 480 ºF to 800 ºF. The unreacted ammonia (also known as ammonia slip) can be emitted from the SCR system at 5 to 10 parts per million. Depending on the type of application, SCR systems can result in a range of 70 to 95% NO_X control efficiency.

Selective Noncatalytic Reduction

Selective Noncatalytic Reduction (SNCR) works similar to an SCR system but without the catalyst. In a SNCR system a reagent (ammonia or urea) is injected into the post combustion exhaust gas, usually within the source's radiant and convective regions. The combustion unit will act as a reactor chamber for the reagent and nitrogen oxides. The result of this NO_X reduction reaction is the formation of nitrogen and water. This reaction normally occurs at temperatures ranging from 1600 ºF to 2100 ºF. Depending on the type of application, SNCR systems can result in a range of 30 to >60% NO_X control efficiency.

Low NOx Burners

Low NO_X burners are used in industry to reduce the amount of NO_X formation from combustion sources. Design parameters for low NO_X burners, which aid in lowering NO_X emissions, include limiting excess air and reducing peak flame temperature.

Flue Gas Recirculation with Low NOx Burners

Flue gas recirculation is a process that involves recirculating a portion source flue gas (up to 20%) into the source combustion chamber. Recirculating the flue gas reduces the peak combustion temperature and lowers the percentage of oxygen in the combustion air/flue gas mixture. This process results in a decrease of thermal NO_X emissions (formation of NO_X through high flame temperatures).

Restrict Nitrogen Content in Raw Materials

Restricting the nitrogen content in raw materials provided by suppliers can correlate to low NO_X process emissions. Showa Denko uses needle coke, binder pitch, and impregnation pitch provided by suppliers as their raw materials for the graphite electrode production process.

Good Combustion Practices

Good combustion practices imply that the combustion sources (preheater, hot oil heaters and carbottom furnaces) will be operated within parameters promoting efficient and complete fuel combustion, thereby reducing combustion emissions. Showa Denko will be using good combustion practices, low NO_X burners and will utilize natural gas/propane exclusively as fuel for the two hot oil heaters, preheater and 15 new carbottom furnaces.

Showa Denko has listed the following as good combustion practices:

1. Good air/fuel mixing in the combustion zone;

2. Sufficient residence time to complete combustion;

3. Proper fuel gas supply system design and operation in order to minimize the effect of contaminants and fluctuations in pressure and flow on the fuel gas quality delivered to combustions units;

4. Operator and maintenance practices including good burner maintenance and operation;

5. High temperatures and low oxygen levels in the primary combustion zone;

6. Overall excess oxygen levels high enough to complete combustion while maximizing thermal efficiency.

Good combustion practices #1 through #6 listed above will apply to the hot oil heaters. Good combustion practices #1 through #5 listed above will apply to the preheater and carbottom furnaces.

Combinations of Control Methods

Low NO_X materials can be used in combination with other control methods, and low NO_X burners and good combustion practices can be used together and in combination with other control methods for combustion units.

5.4.2 Step 2: Technical Feasibility of Options

The control options were analyzed for their technical feasibility as applied to all process/point sources resulting in NO_X emissions at the facility. A summary is presented below.

Selective Catalytic Reduction (SCR)

SCR has been applied to a variety of industrial applications to reduce NO_X emissions. SCR has been used to control NO_X emissions from utility/industrial/solid waste boilers, process heaters, gas turbines, and reciprocating internal combustion engines. Although the optimum operating range for an SCR can vary from 480 ºF to 800 ºF and the exhaust gas temperature of the carbottom furnaces is 1,562 ºF, an air

cooler could be used to bring down the exhaust gas temperature of the carbottom furnaces to be within the optimum operating temperature range of the SCR. SCR is deemed technically feasible for the hot oil heaters, preheater, carbottom furnaces, and graphitizing furnaces.

Selective Noncatalytic Reduction (SNCR)

SNCR has been used on sources that utilize coal, oil, gas, biomass, and waste as fuel to reduce NO_X emissions. The NO_X emission reduction reaction normally occurs at temperatures between 1600 ºF and 2100 ºF. The exhaust gas from the hot oil heaters, preheater, and graphitizing furnaces are below 1600 ºF; therefore the SNCR is deemed not technically feasible for these sources. SNCR is deemed technically feasible for the carbottom furnaces.

Low NOx Burners

The use of low NO_X burners has been widely applied to fuel burning sources to reduce NO_X emissions. Low NO_X burners are deemed technically feasible for the hot oil heaters, preheater, and carbottom furnaces as these are the only fuel burning sources contributing to NO_X emissions.

Flue Gas Recirculation with Low NOx Burners

Flue gas recirculation with low NO_X burners has been shown to significantly reduce NO_X emissions from industrial boilers. The preheaters and carbottom furnaces are direct fired sources, therefore flue gas recirculation with low NO_X burners is deemed not technically feasible. Flue gas recirculation with low NO_X burners is deemed technically feasible for the hot oil heaters.

Restrict Nitrogen Content in Raw Materials

In addition to the generation of NO_X emissions from fuel combustion, nitrogen present in raw materials also contributes to NO_X emissions. The use of low nitrogen content materials is deemed not technically feasible for the hot oil heaters and preheater, since NO_X emissions from these units are related to fuel combustion not process emissions (nitrogen in raw materials). The carbottom furnaces and graphitizing furnaces generate process NO_X emissions. Showa Denko uses needle coke binder pitch, and impregnation pitch as the raw materials for their graphite electrode production process. Any lower nitrogen content materials that may be

used to produce graphite electrodes would not meet Showa Denko's product requirements. Therefore, limiting nitrogen content in raw materials that will still allow Showa Denko to meet product requirements is deemed technically feasible for the carbottom furnaces and graphitizing furnaces.

Good Combustion Practices

Based on data included in the RBLC database, the BACT/LAER determinations for NO_X emissions from combustion sources firing natural-gas or propane have primarily been good combustion practices combined with the use of low NO_X burners. Good combustion practices are deemed technically feasible for the hot oil heaters, preheater, and carbottom furnaces.

Combinations of Control Methods

The combination of low NO_X burners and good combustion practices along with other technically feasible control methods is deemed to be technically feasible.

5.4.3 Step 3: Ranking of Control Technologies

The available control technologies deemed technically feasible for NO_X control are ranked in Table 9 from most to least effective based on their NO_X emission reduction potential (% control efficiency).

Table 9 – Ranking of Technically Feasible NO_X Control Technologies

Technology	NO_X Control Efficiency (%)
Selective Catalytic Reduction (SCR)	95, 90*
Selective Noncatalytic Reduction (SNCR)	65*
Low NOx Burners	N/A
Flue Gas Recirculation with Low NOx Burners	N/A
Restrict Nitrogen Content in Raw Materials	N/A
Good Combustion Practices	N/A
Combinations of Control Methods	N/A

*The NO_X control efficiency is for the carbottom furnaces.

5.4.4 Step 4: Evaluation of Most Effective Controls

This step requires a case-by-case analysis of energy, environmental, and economic impacts. The SCR, SNCR, low NO_X burners, flue gas recirculation w/low NO_X burners, restrict nitrogen content in raw materials, good combustion practices, and combinations of control methods will be considered. Based on vendor information, flue gas recirculation is typically not found on hot oil heaters with combustion blower size of 100 Hp. The proposed 5 million Btu/hr hot oil heaters will each have a 15 Hp combustion blower. Therefore, flue gas recirculation for the hot oil heaters is deemed not cost effective.

Engineering testing at Showa Denko has revealed that restricting the nitrogen content in raw materials provided by suppliers does not result in a direct correlation to lowering NO_X process emissions. Testing information provided by the facility demonstrated that lb/hr NO_X emissions from the carbottom or graphitizing furnaces did not increase when higher nitrogen content in the raw materials was utilized. The lb/hr NO_X BACT limits for the carbottom and graphitizing furnaces remain in place. However, the PSD construction permit has a condition listing the maximum nitrogen content (% by weight) for binder pitch, impregnation pitch, needle coke and insulating media (sampling) for the furnaces, and the limits may be increased provided the Department is given prior notification (this change has been established through revision 5 of the PSD).

No additional costs, energy impacts, or environmental impacts are associated with good combustion practices for the new combustion sources. A cost analysis of the energy, environmental, and economical impacts for the SCR on the hot oil heaters and preheaters was evaluated. Also, a cost analysis of the energy, environmental, and economical impacts for the SCR and SNCR on the carbottom furnaces has been evaluated. All evaluations represent controls for the highest amount of uncontrolled NO_X emissions (using propane as the fuel source).

<u>Economic Impacts Analysis</u>

Each hot oil heater had a cost of $36,014 /ton of NO_X removed. The preheaters had a cost of $15,026/ton of NO_X removed. For the carbottom furnaces an SCR resulted in a cost of $28,091/ton of NO_X removed and a SNCR resulted in a cost of $33, 666/ton of NO_X removed. The Department considers SCR and SNCR not to be cost effective in controlling NO_X emissions for the hot oil heaters, preheaters, or carbottom furnaces. This conclusion is based on typical cost effectiveness values for types of

emissions units where SCR and SNCR have been used for NO_X emissions control.

Energy Impacts Analysis

Operation of the SCR or SNCR would not require a substantial amount of increased energy usage (in the form of electricity consumption).

Environmental Impacts Analysis

Operation of the SCR and SNCR could result in some degree of adverse environmental impacts. Ammonia slip could result from the operation of either the SCR or SNCR. In addition, spent catalyst resulting from SCR use might be deemed a hazardous waste depending on the constituents of the material. These adverse environmental impacts are not considered sufficient in and of themselves to eliminate the SCR or SNCR as control methods.

5.4.5 Step 5: Select BACT

The control options for NO_X emissions are low NO_X burners, restrict nitrogen content in raw materials, and good combustion practices. The low NO_X burners, restrict nitrogen content in raw materials, and good combustion practices will result in a lower formation of NO_X emissions without added environmental impacts and high costs to the facility. Showa Denko will use good combustion practices and will utilize natural gas (primary) and propane (back-up) as fuel for the hot oil heaters, preheater, and carbottom furnaces. Additionally, the hot oil heaters, preheater, and carbottom furnaces will be equipped with low NO_X burners. There will be a limit on nitrogen content in raw materials used in carbottom furnaces and graphitizing furnaces. The control options along with proposed limits are listed in Table 10 below:

Table 10 – Selection of NO_X BACT Limits

Process/Equipment	Control Method	Proposed BACT Limit
New Mill, Mix and Extrusion Process/Hot Oil Heater	Low NOx Burners; Good Combustion Practices; Natural gas or propane as fuel; Annual Tune Up	0.10 lb/million Btu Good Combustion Practices #1-6
New Bake/Rebake Process/ 15 Carbottom Furnaces	Low NOx Burners; Good Combustion Practices;	75.22 lb/hr needle coke nitrogen content:

Table 10 – Selection of NO_X BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
	Natural gas or propane as fuel; Annual Tune Up	0.24% by weight; binder pitch nitrogen content: 0.89% by weight; impregnation pitch nitrogen content: 1.14% by weight; Maximum Nitrogen Content (% by weight), subject to change based on prior Departmental notification Good Combustion Practices #1-5
New Pitch Impregnation Process/ Preheater	Low NOx Burners and Good Combustion Practices	0.10 lb/million Btu Good Combustion Practices #1-5
New Pitch Impregnation Process/ Hot Oil Heater	Low NOx Burners; Good Combustion Practices; Natural gas or propane as fuel; Annual Tune Up	0.10 lb/million Btu Good Combustion Practices #1-6
New Graphitizing Process/ 10 Graphitizing Furnaces	None	2.5 lb/hr (total for stack and roof emissions) needle coke nitrogen content: 0.24% by weight; binder pitch nitrogen content: 0.89% by weight; impregnation pitch nitrogen content: 1.14% by weight; Maximum Nitrogen Content (% by weight), subject to change based on prior Departmental notification Perform initial analysis for nitrogen content on insulating media
New Emergency Generator	Annual Tune Up	Operational limit of 100 hours for maintenance

*Proposed BACT limits are based on propane usage with a low NOx emission factor of 9.1 lbs/1000gal derived from AP-42, Vol.I, 5th Ed., Chapter 1, Section 1.5, Table 1.5-1, Liquefied Petroleum Gas Combustion emission factor of 13 lbs/1000 gal and applying a 30% reduction.

Testing/Monitoring/Record Keeping/Reporting:

An initial source test for the carbottom furnaces and the graphitizing furnaces will be conducted within 180 days after startup. Source tests will need to be conducted every three (3) years after an initial source test for the carbottom furnaces and graphitizing furnaces. Initially, vendor information for the natural gas and propane burners for the preheater, carbottom furnaces and hot oil heaters, verifying that low NO_X burners was installed on the combustion sources shall be submitted to the Department within 180 days after startup and then kept on-site. Fuel use is limited to natural gas or propane for all equipment listed in Table 10 except for the emergency generator. Fuel usage must be monitored, recorded and kept on site. Good combustion practices apply.

5.5 BACT for Volatile Organic Compounds (VOC)

The proposed project includes process areas that are subject to PSD review and that will have VOC emissions increases requiring a BACT evaluation. The table below presents these process areas and the estimated maximum annual VOC emissions from these areas without add-on control devices. The types of VOC emissions are labeled as "process" or "combustion."

Table 11 – Estimated Annual Uncontrolled VOC Emissions

Process Area/Equipment Description	Equipment ID No.	Estimated Maximum Annual Particulate Matter Emissions Without Add-On Control Devices (ton/yr)
New Mill, Mix and Extrusion Process:		
● Mixers (process)	E-110-2-4253-01, 02, 03, 04	
● Mixer Discharge Belt (process)	E-110-2-4221-10	3.12
● Screw Spreader (process)	E-110-2-4221-20	
● Cooling Belts (process)	E-110-2-4221-11, 12	
● Homogenizer (process)	E-110-2-4253-05	0.30
● Homogenizer Discharge Belt (process)	E-110-2-4221-13	0.24
● Binder Pitch Tank (process)	E-110-25	
● Hot Oil Heater (combustion)	E-110-2-4275-01	
New Bake/Rebake Process:		
● Carbottom Furnaces (process and combustion)	E-210-2-4271-18/32	6,204.07
New Pitch Impregnation Process:		
● Autoclave/spray cooler/cooling bath (process)	E-310-2-4201-01	1,313
● Preheater (combustion)	E-310-2-4272-21	0.58

Table 11 – Estimated Annual Uncontrolled VOC Emissions		
Process Area/Equipment Description	**Equipment ID No.**	**Estimated Maximum Annual Particulate Matter Emissions Without Add-On Control Devices (ton/yr)**
● Hot Oil Heater (combustion)	E-310-2-4275-01	0.24
New Graphitizing Process: ● Graphitizing Furnaces (process)	E-460-4271-01/10	14.4
Existing Pitch Impregnation Process: ● Impregnation Pitch Storage Tanks (existing, process)	E-310-04, E-310-09, E-310-10	0.032*
New 1,500 kW Diesel Fuel-Fired Emergency Generator (combustion)	E-240-2-4365-01	Infrequent operation; minimal emissions

*VOC emissions for existing equipment reflect the net increase in TPY resulting from the proposed expansion. The net increase for existing equipment was calculated by subtracting actual potential controlled emissions from future potential controlled emissions.

The combustion VOC emissions are generated from natural gas combustion emissions with propane used as the backup fuel. Exhaust gases from the proposed carbottom furnaces will exit to the atmosphere in two ways: through a common stack (TO) that receives exhaust gases continuously from the furnaces and from clean air stacks that are attached to each furnace and that open for a short time at the end of a charging cycle for an individual furnace. Showa Denko has stated that there will be no emissions of NSR regulated pollutants (including VOC) from the clean air stacks. Showa Denko will be required to perform an initial screening to verify no VOC emissions are present in the clean air stacks. Therefore, this VOC BACT evaluation considers only those emissions from the common stack (TO).

Currently Showa Denko utilizes a thermal oxidizer to control VOC emissions from the existing carbottom furnaces and also utilizes a backup thermal oxidizer. The existing backup thermal oxidizer will also be used as a backup for the proposed carbottom furnaces as well.

Another source of VOC emissions is the installation of a 1,500 kW emergency generator. The VOC emissions from this source will be limited by the size of the generator and an operating restriction of no more than 100 hours per year for maintenance. Therefore, a full BACT analysis was not performed for the emergency generator.

5.5.1 Step 1: Identify All Available Control Technologies

The BACT analysis identifies the following control technologies that could be used to reduce VOC emissions:

Carbon Adsorption

Carbon adsorption has been used to remove VOCs from a low to medium concentration gas stream. The process of carbon adsorption involves gas molecules passing through a bed of solid particles (carbon). Physical attractive forces, not chemical bonds, allow the gas molecules to hold onto the bed of solid particles. After the VOCs have been adsorbed, the carbon can be either regenerated on site (released by heat or vacuum) or transported off site for disposal or regeneration.

Catalytic Oxidizer

Catalytic oxidizers are used to control VOCs and volatile hazardous air pollutant (HAP) emissions. A catalyst is used to promote the oxidation of VOCs and allows this to occur at lower temperatures when compared to thermal oxidizers. The efficiency of catalytic oxidizers depends on several design factors such as temperature, residence time, the inlet gas VOC concentration and species, mixing of combustion air with the waste gas, catalyst characteristics, and any masking agents present in the waste gas.

Regenerative Thermal Oxidizer (RTO)

A regenerative thermal oxidizer (RTO) has been used to control VOC emissions by destruction of VOCs through thermal oxidation. Destruction of VOC emissions by utilizing an RTO depend on several factors such as temperature, residence time, inlet VOC concentration, type of compound, level of mixing, etc.

Thermal Oxidizer

Thermal oxidizers have been used in industrial applications to reduce VOC emissions. Thermal oxidation takes place in a controlled combustion chamber. The exhaust gas passes through the combustion chamber and the VOCs in the exhaust gas are destroyed due to the high operating temperature. Residence time, temperature, mixing, and oxygen availability are design efficiency parameters that need to be considered for a thermal oxidizer.

Thermal Oxidizer with Concentrator

A concentrator in conjunction with a thermal oxidizer is used when there is a low temperature, high-volume exhaust air stream with a low concentration of VOC. The rotary concentrator is an adsorption technology (similar to carbon adsorption) that is used to concentrate emissions into smaller air-streams with much high concentrations that can be handled by a thermal oxidizer. Purified air is exhausted to the atmosphere while the adsorbed VOCs go through a desorption process for removal with higher temperatures and a low volume airstream. The high concentration desorption air is then sent through a thermal oxidizer for VOC destruction.

Biofiltration Technology

Biofiltration can be used to remove VOCs. The use of biofiltration involves a supported media for microbial growth that aids in the removal of VOCs from air streams. The filter is a closed chamber where exhaust air flows through a packed bed and the VOCs transfer into a thin biofilm on the surface of the packing material (compost-based materials, earth, plastic, or wood-product based material). Microbial growth that occurs in the biofilm aids in degrading the pollutant (VOCs). Trickling filters and bioscrubbers rely on a biofilm and the bacterial action in their recirculating waters.

Wet Scrubber

Wet scrubbers use a liquid spray to remove VOCs from a waste gas stream. The primary function of wet scrubbers is to remove gaseous emissions, with a secondary function of particulate removal. Removal of pollutants is primarily achieved through impaction, diffusion, interception, and/or absorption of the pollutant onto droplets of liquid. The liquid effluent is then collected and disposed.

Condenser

Condensation is the process of converting a gas or vapor to a liquid. The conversion takes place by decreasing the temperature and/or increasing the pressure. A vent condenser allows for condensable vapors to accumulate within the liquid seal of the unit. The seal consists of fluid and acts to isolate the stored materials from contact with the atmosphere.

Low VOC Materials

Using low VOC materials as part of the production process can correlate to low VOC process emissions. Showa Denko uses needle coke and binder pitch as the two main

raw materials for their graphite electrode production process. A baghouse (also known as a fabric filter) involves the use of fabric bags, in different shaped tubes or cartridges, where particulate-laden gas is drawn through the bags (or outside the bags) and forms a layer of dust on the filter media. The fabric used may be made of cotton, nylon, polyester, fiberglass, or other materials. Gas stream characteristics (moisture content and temperature) will affect which material is chosen. When a certain pressure drop occurs across the filter media (fabric), the cleaning process begins. Baghouses are highly efficient in particulate matter removal, commonly designed with a 99.9% collection efficiency.

Good Combustion Practices

Good combustion practices imply that the combustion sources (preheater, hot oil heaters and carbottom furnaces) will be operated within parameters promoting efficient and complete fuel combustion, thereby reducing combustion emissions.

Showa Denko has listed the following as good combustion practices:

1. Good air/fuel mixing in the combustion zone;

2. Sufficient residence time to complete combustion;

3. Proper fuel gas supply system design and operation in order to minimize the effect of contaminants and fluctuations in pressure and flow on the fuel gas quality delivered to combustions units;

4. Operator and maintenance practices including good burner maintenance and operation;

5. High temperatures and low oxygen levels in the primary combustion zone;

6. Overall excess oxygen levels high enough to complete combustion while maximizing thermal efficiency.

Good combustion practices #1 through #6 listed above will apply to the hot oil heaters. Good combustion practices #1 through #5 listed above will apply to the preheater and carbottom furnaces.

Combinations of Control Methods

Low VOC materials can be used in combination with other control methods, and good combustion practices can be used in combination with other control methods for combustion units.

5.5.2 Step 2: Technical Feasibility of Options

The control options were analyzed for their technical feasibility as applied to all process/point sources resulting in VOC emissions at the facility. A summary is presented below.

Carbon Adsorption

Carbon adsorption has been applied by industries for the removal and recovery of VOCs. Optimal VOC removal, for the carbon adsorption process, normally occurs when temperatures of the exhaust gas are at or lower than 150 ºF. Also, carbon adsorption design requires a maximum gas loading rate (cfm) per square foot of bed surface be maintained. The exhaust temperatures of the hot oil heaters, preheaters, carbottom furnaces, and autoclaves are higher than 150 ºF. Although these exhaust temperatures do not result in ideal operating conditions, carbon adsorption is deemed to be technically feasible for the hot oil heaters, preheater, carbottom furnaces, autoclave, and equipment in the mill, mix, and extrusion process (excluding the binder pitch tank). Carbon adsorption is deemed not technically feasible for the binder pitch tank and existing impregnation pitch storage tanks due to the low exhaust flow rate. Carbon adsorption is deemed not technically feasible for the graphitizing furnaces due to the molecular weight of the VOCs being too low for adsorption on carbon. Carbon adsorbers (dry scrubbers) are currently being utilized at Showa Denko. VOC emissions from the existing mixers, coal tar pitch weigh scale, stearic acid storage tank and weigh scale, cooling system, and extruder are controlled by a dry fume scrubber.

Catalytic Oxidizer

Typical gas flow rates for catalytic oxidizers start at or above 700 scfm. Catalytic oxidizers generally have a temperature operating range between 650 ºF and 1000 ºF, depending on the type of catalyst used. The typical oxidation catalyst for VOC-containing exhaust gases is a rhodium or platinum (noble metal) catalyst on an alumina support material. This catalyst is installed in an enlarged duct or reactor with flue gas inlet and outlet distribution plates. Acceptable catalyst operating temperatures range from 400 ºF to 1250 °F, with the optimal range being 850 ºF to

1,100 °F. Installation of an oxidation catalyst in flue gas containing more than trace levels of SO_2 will result in poisoning and deactivation of the catalyst by sulfur-containing compounds. Because of the required exhaust gas temperatures and potential of catalyst poisoning, a catalytic oxidizer is not deemed technically feasible for the hot oil heaters, preheater, autoclave, carbottom furnaces, equipment in the mill, mix and extrusion process (excluding the binder pitch tank). A catalytic oxidizer is not deemed technically feasible for the graphitizing furnaces due to the potential of catalyst poisoning. Due to the low exhaust flow rate of the binder pitch tank and existing impregnation pitch tanks, a catalytic oxidizer is deemed not technically feasible.

Regenerative Thermal Oxidizer (RTO)

A regenerative thermal oxidizer (RTO) is normally used to control VOC emissions on exhaust gases that have a low average VOC concentration. The typical gas flow rates for RTOs are from 5,000 to 500,000 scfm. The RTO uses natural gas to heat the waste exhaust gas to approximately 1400 ºF to 1500 ºF, but is capable of operating at a temperature of up to 2000 ºF. Due to the low exhaust flow rate of the binder pitch tank, hot oil heaters, preheater, and existing impregnation pitch tanks, a RTO is deemed not technically feasible. The RTO is deemed technically feasible for the remaining equipment in the mill, mix, and extrusion process, carbottom furnaces, autoclave, and graphitizing furnaces.

Thermal Oxidizer

The use of thermal oxidizers is applied to a wide variety of industrial processes for VOC removal. Typical gas flow rates for thermal oxidizers start at or above 5,000 scfm. Thermal destruction of most VOCs occurs between 1100 ºF and 1200 ºF. Due to the low exhaust flow rate, a thermal oxidizer is deemed not technically feasible for the binder pitch tank, existing impregnation pitch tanks, hot oil heaters, and preheater. A thermal oxidizer is deemed technically feasible for control of for the autoclave, carbottom furnaces, graphitizing furnaces, and remaining equipment in the mill, mix and extrusion process. Showa Denko currently controls VOC emissions from their existing carbottom furnaces with a thermal oxidizer and controls VOC emissions from their existing autoclaves, spray coolers, and dosing tanks with a thermal oxidizer.

Thermal Oxidizer with Concentrator

A concentrator is used on exhaust gases that have a high volume, low temperature, and low VOC concentration. Based on discussions with equipment vendors and review of reference material, use of a thermal oxidizer with concentrator on the carbottom furnaces is deemed not technically feasible, due to relatively low VOC concentration and high exhaust temperature. Exhaust gases from the autoclave have high VOC concentrations, therefore a concentrator is deemed not technically feasible. Typical gas flow rates for thermal oxidizers start at or above 5,000 scfm. Due to the low exhaust flow rate, a thermal oxidizer is deemed not technically feasible for the binder pitch tank, existing impregnation pitch tanks, hot oil heaters, and preheater. Due to the particulate loading, a thermal oxidizer with concentrator is deemed not technically feasible for the remaining equipment in the mill, mix and extrusion process. A thermal oxidizer with concentrator is deemed not technically feasible for the graphitizing furnaces due to the molecular weight of the VOCs being too low for adsorption on carbon.

Biofiltration Technology

Exhaust gas stream characteristics that work best with biofiltration are very low (< 2000 ppm) VOC concentrations and temperatures between 50 ºF and 105 ºF. Stack gas temperature exceed 105 ºF for the hot oil heaters, carbottom furnaces, preheater and autoclave. Biofiltration is deemed not technically feasible for the graphitizing furnaces due to methane not being sufficiently soluble in water. Although biofiltration is not ideal for these sources, it is deemed technically feasible for the hot oil heaters, carbottom furnaces, preheater, and autoclave. Biofiltration is deemed technically feasible for the binder pitch tank, existing impregnation pitch tanks, and remaining equipment in the mill, mix and extrusion process.

Wet Scrubber

The inlet gas flow rate for wet scrubbers ranges from 1,000 to 100,000 scfm. Wet scrubbers can typically handle inlet gas flow temperatures in a range from 40 to 750 ºF. Wet scrubbers are deemed not technically feasible for the binder pitch tank and existing impregnation pitch tanks due to low exhaust flow rate. Wet scrubbers are deemed not technically feasible for the carbottom furnaces due to a high exhaust gas temperature (1,562 ºF). Based on vendor information, a wet scrubber is deemed not technically feasible for the autoclave and remaining equipment in the mill, mix and extrusion process (excluding the hot oil heater) due to relatively low VOC concentration to high volumetric exhaust flow rate ratio. A wet scrubber is deemed not technically feasible for the graphitizing furnaces due to methane not being

sufficiently soluble in water. Wet scrubbers are deemed technically feasible for the hot oil heaters and preheater.

Condenser

Condensers are used on storage tanks when reclaim or removal of VOCs is necessary. Condensers are deemed not technically feasible for the hot oil heaters, preheater, carbottom furnaces, autoclave, graphitizing furnaces, and equipment in the mill, mix and extrusion process (excluding the binder pitch tank). Condensers are deemed technically feasible for the binder pitch tank and the existing pitch storage tanks. Showa Denko currently controls VOC emissions from the existing pitch storage tanks with vent condensers.

Low VOC Materials

In addition to the generation of VOC emissions from fuel combustion, volatiles present in raw materials also contribute to VOC emissions. The use of low VOC materials is deemed not technically feasible for the hot oil heaters and preheater, since VOC emissions from these units are related to fuel combustion not process emissions (volatiles in raw materials). The carbottom furnaces generate combustion and process VOC emissions. Process VOC emissions are generated from the carbottom furnaces by the liberation of pitch during baking. Process VOC emissions are generated from the graphitizing furnaces. Showa Denko uses needle coke and binder pitch as the two main raw materials for their graphite electrode production process. Any lower VOC materials that may be used to produce graphite electrodes would not meet Showa Denko's product requirements. Therefore, use of low VOC materials is deemed not technically feasible for the carbottom furnaces, graphitizing furnaces, autoclaves, binder pitch tank, and remaining equipment in the mill, mix and extrusion process. Several different types of material may be used to manufacture baghouses, including a polytetrafluoroethylene (PTFE) membrane bag to control $PM_{2.5}$ emissions. Showa Denko attempted to use the PTFE membrane bags on some of their existing sources but the coating degraded quickly; therefore, the use of a PTFE membrane bags is not technically feasible. Other common materials used for baghouses, such polyester, Nomex, and fiberglass are deemed technically feasible for all sources excluding the combustion units. Exhaust gas temperatures from the combustion units would result in higher than maximum inlet temperatures for baghouses. Baghouses are considered technically feasible for the proposed Mill, Mix and Extrusion Process mixers. But the mixers will also need to have VOC control; therefore, a baghouse equipped with a dry fume scrubber is being considered.

Baghouses are deemed technically feasible for the remaining new process sources and all of the existing sources with increased hours of operation or annual throughput that have particulate matter emissions. All the existing sources that are subject to the PM BACT analysis currently have baghouses as control devices.

Good Combustion Practices

Based on data included in the RBLC database, the BACT/LAER determinations for VOC emissions from combustion of natural gas or propane in miscellaneous boilers, furnaces, and heaters have been good combustion practices. Good combustion practices are deemed not technically feasible for the graphitizing furnaces due to the furnaces being electrically heated (no combustion emissions). Showa Denko will use good combustion practices and natural gas as the primary fuel with propane as back-up fuel for the hot oil heaters, preheater, and carbottom furnaces. Good combustion practices are deemed technically feasible for the hot oil heaters, preheater, and carbottom furnaces.

Combinations of Control Methods

For combustion units, good combustion practices can be used in combination with other technically feasible control methods. For the remainder of this VOC BACT evaluation, BAQ bases the assessment of various combustion unit VOC control methods on the presumption that good combustion practices will also be employed. This presumption will be made enforceable through permit conditions.

5.5.3 Step 3: Ranking of Control Technologies

The available control technologies deemed technically feasible for VOC control are ranked in Table 12 from most to least effective based on their VOC emission reduction potential (% control efficiency).

Table 12 – Ranking of Technically Feasible VOC Control Technologies

Technology	VOC Control Efficiency (%)
Thermal Oxidizer	99
Wet Scrubber	70-99
Regenerative Thermal Oxidizer	95-99
Carbon Adsorption	90
Biofiltration Technology	90
Condenser	90

Table 12 – Ranking of Technically Feasible VOC Control Technologies	
Technology	**VOC Control Efficiency (%)**
Good Combustion Practices	N/A
Combinations of Control Methods	N/A

5.5.4 Step 4: Evaluation of Most Effective Controls

This step requires a case-by-case analysis of energy, environmental, and economical impacts. The wet scrubber, thermal oxidizer, regenerative thermal oxidizer, carbon adsorption, biofiltration technology, and good combustion practices will be considered. A wet scrubber used to reduce VOC emissions from the hot oil heaters and preheater is not cost effective due to the low VOC concentration. Showa Denko has a cyclical operation that is not conducive to utilizing a regenerative thermal oxidizer. The use of a regenerative thermal oxidizer on the equipment in the mill, mix, and extrusion process (excluding binder pitch tank and hot oil heater), carbottom furnaces, and autoclave when compared to that of a thermal oxidizer is not as cost effective with relatively the same VOC control efficiency. Due to the high flow rate of the graphitizing furnaces, two (2) regenerative thermal oxidizers (RTO) would be required (each 6.5 million Btu/hr). Showa Denko has documented a vendor guarantee of 98% control of VOCs from the graphitizing furnaces, however the cost to reduce VOCs would be approximately $93,210 per ton removed (based on 14.4 uncontrolled tpy of VOC) and is therefore not cost effective. Also, the use of a regenerative thermal oxidizer to control VOC emission from the graphitizing furnaces would result in an increase of 5.58 tpy of NO_X emissions and would therefore contribute to adverse environmental impacts (South Carolina is a NO_X limited state for ozone formation). Using this same methodology, the use of thermal oxidizers is also deemed not cost effective or environmentally beneficial.

The exhaust temperatures of the hot oil heaters, preheater, carbottom furnaces, and autoclaves are higher than ideal operating conditions for carbon adsorption or biofiltration technology. The exhaust temperatures would need to be cooled prior to carbon adsorption or biofiltration treatment and therefore is not considered to be cost effective. Due to the low exhaust flow rate and low amount of VOC emissions from the binder pitch tank, existing impregnation pitch tanks, and remaining equipment in the mill, mix and extrusion process, biofiltration is deemed not cost effective.

The existing pitch impregnation storage tanks are equipped with vent condensers,

therefore there are no additional costs associated with the condensers as a control device. Use of a condenser for the binder pitch is a cost effective method of controlling VOC emissions.

No additional costs, energy impacts, or environmental impacts are associated with good combustion practices for the new combustion sources.

A thermal oxidizer in combination with good combustion practices is determined to be the most effective control for the carbottom furnaces. A thermal oxidizer is deemed the most effective control for the autoclave. A vent condenser is determined to be the most effective control for the new binder pitch tank and existing impregnation pitch tanks (currently equipped with vent condensers). Good combustion practices are the most effective control for the hot oil heaters and preheater.

5.5.5 Step 5: Select BACT

The emissions limits deemed BACT for VOC emissions are those associated with the use of condensers, thermal oxidizers, and good combustion practices. The new emergency generator will have a VOC emission rate resulting from diesel fuel combustion of less than 1 lb/hr. The proposed BACT limit for the emergency generator will be an operational restriction of no more than 100 hours per year for maintenance. The control options along with proposed limits are listed in Table 13 below:

Table 13 – Selection of VOC BACT Limits

Process/Equipment	Control Method	Proposed BACT Limit
New Mill, Mix and Extrusion Process – Mixers, Mixer Discharge Belt, Screw Spreader, Cooling Belts, Homogenizer, and Homogenizer Discharge Belt	Dry Fume Scrubber/Baghouse	0.07 lb/hr
New Mill, Mix and Extrusion Process - Binder Pitch Tank	Vent Condenser	0.40 lb/hr
New Mill, Mix and Extrusion Process - Hot Oil Heater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	0.012 lb/million Btu Good Combustion Practices #1-6
New Bake/Rebake Process – 15 Carbottom Furnaces	Thermal Oxidizer; Good Combustion Practices;	17.3 lb/hr

Table 13 – Selection of VOC BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
	Natural gas and propane as sole fuels; Annual Tune Up	Good Combustion Practices #1-5
New Pitch Impregnation Process - Hot Oil Heater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	0.012 lb/million Btu Good Combustion Practices #1-6
New Pitch Impregnation Process - Preheater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	0.011 lb/million Btu Good Combustion Practices #1-5
New Pitch Impregnation Process -Autoclave/spray cooler/cooling bath	Thermal Oxidizer	3.083 lb/hr
New Graphitizing Process/ 10 Graphitizing Furnaces	None	3.3 lb/hr, total for stack and roof emissions (based on 96 hour block average)
Existing Pitch Impregnation Process – Impregnation Pitch	Vent Condenser	0.055 TPY (total)
New 1,500 kW Diesel Fuel-Fired Emergency Generator (combustion)	Annual Tune Up	Operational limit of 100 hours for maintenance

Testing/Monitoring/Record Keeping/Reporting:

An initial source test for VOC emissions from the carbottom furnaces will be conducted within 180 days after startup. Source tests will need to be conducted every three (3) years after an initial source test for the thermal oxidizers. Combustion zone and/or afterburner temperature indicators will be installed and maintained on the thermal oxidizers. Temperature readings will be recorded at least every fifteen (15) minutes and maintained on site. The thermal oxidizers will be in place and operational whenever the autoclave and carbottom furnaces are running, except during periods of thermal oxidizer malfunction or mechanical failure. For the new and existing vent condensers, the owner/operator shall utilize work practice standards consisting of the inspection and cleaning of the condenser coils on a semiannual basis. The vent condenser shall be in place and operational whenever processes controlled by the vent condenser are running, except during periods of condenser malfunction or mechanical failure. Records shall be kept on-site, verifying that the work practice standards are met and made available to the Department upon request.

An initial source test for VOC as VOC emissions shall be conducted within 180 days after startup and every three (3) years thereafter. During the initial performance test and any subsequent testing, the facility shall test for VOC emissions from the roof monitor and graphitizing scrubber stack for 96 hours according to a Department approved site-specific source test plan. Less frequent source testing for VOC emissions from the source may be conducted if at least two (2) consecutive performance tests show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test shall be conducted during the fifth year and no more than 60 months after the previous performance test. To demonstrate continuous compliance with the VOC emission limitations, the owner/operator is limited to the use of metallurgical coke only as the insulation medium for the new graphitizing furnaces. Records shall be kept on-site, verifying that only metallurgical coke is utilized as the insulating medium. Alternate materials may be utilized as insulating media, if the VOC content in the alternate insulating media, is less than or equal to the VOC content in the metallurgical coke. The owner/operator shall submit a request to the Department, and receive approval in writing, prior to utilizing any such alternate insulating media.

Good combustion practices will be used for all equipment resulting in VOC combustion emissions except for the diesel emergency generator. Fuel use for hot oil heaters, carbottom furnaces, and preheater is limited to natural gas or propane. Fuel usage will be monitored, recorded and kept on site. Annual tune-ups are required for the hot oil heaters, carbottom furnaces, preheater, and diesel emergency generator.

5.6 BACT for Carbon Dioxide Equivalent (CO_2e)

Beginning on January 2, 2011, greenhouse gases (GHGs) became subject to regulation under the PSD major source permitting program and a regulated NSR pollutant when emitted in amounts greater than certain applicability thresholds. South Carolina has adopted the Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule through a South Carolina General Assembly joint resolution (H4888) issued on June 11, 2010. GHGs are a single air pollutant defined in 40 CFR 52.21(b)(49)(i) as the aggregate group of the following six gases:

Carbon dioxide (CO_2);

Nitrous oxide (N_2O);

Methane (CH_4);

Hydrofluorocarbons (HFCs);

Perfluorocarbons (PFCs); and

Sulfur hexafluoride (SF_6).

Due to the nature of GHGs and their incorporation into the definition of subject to regulation, the process for determining whether a source is emitting GHGs in an amount that would make the GHGs a regulated NSR pollutant includes a calculation of, and applicability threshold for, the source based on CO_2 equivalent (CO_2e) emissions as well as its GHG mass emissions. Consequently, when determining the applicability of PSD to GHGs, there is a two-part applicability process that evaluates both: the sum of the CO_2e emissions in TPY of the six GHGs, in order to determine whether the source's emissions are a regulated NSR pollutant; and, if so; the sum of the mass emissions in TPY of the six GHGs, in order to determine if there is a major source or major modification of such emissions.

For PSD permits issued on or after July 1, 2011, PSD applies to the GHG emissions from a proposed major modification if the source is subject to PSD for another pollutant and the potential to emit GHGs is greater than or equal to 75,000 TPY on a CO_2e basis and greater than zero TPY on a mass basis. Mass based emissions from the Showa Denko expansion are greater than zero TPY and CO_2e emissions are over 75,000 TPY; therefore, this expansion project triggers BACT for CO_2e.

The proposed project includes process areas that are subject to PSD review and that will have CO_2e emissions increases requiring a BACT evaluation. The table below presents these process areas and the estimated maximum annual CO_2e emissions from these areas, including emissions generated from the formation of CO_2 from the thermal oxidizers. The CO_2e emissions generated are labeled as "process" or "combustion." No existing sources that are being utilized as part of this project emit CO_2e so CO_2e BACT was performed for only new sources emitting CO_2e. The combustion CO_2e emissions are generated from natural gas combustion with propane used as the backup fuel and the GHG pollutants emitted are CO_2, N_2O and CH_4. CO_2 is emitted from hot oil heaters, carbottom furnaces and preheater because it is a combustion product of any carbon-containing fuel. In the combustion of a fossil fuel, the fuel carbon is oxidized into CO and CO_2. N_2O will be emitted due to partial

oxidation of nitrogen in the air used as the oxygen source for the combustion process. CH_4 is emitted as a result of incomplete combustion. Process CO_2 emissions are generated from the combustion of binder pitch volatiles in the bake process and combustion of impregnation pitch volatiles in the rebake process and for the graphitizing furnaces, combustion of insulating media.

Table 14 – Estimated Annual CO_2e Emissions

Process Area/Equipment Description	Equipment ID No.	Estimated Maximum Annual CO_2 Emissions (ton/yr)	Estimated Maximum Annual CH_4 Emissions (ton/yr)	Estimated Maximum Annual N_2O Emissions (ton/yr)	Estimated Maximum Annual CO_2e Emissions (ton/yr)
New Mill, Mix and Extrusion Process: ● Hot Oil Heater (combustion)	E-110-2-4275-01	3,025	0.05	0.22	3,093
New Bake/Rebake Process: ● 15 Carbottom Furnaces (process and combustion) - 18 million BTU/hr, each furnace and 16 million Btu/hr thermal oxidizer (process and combustion)	E-210-2-4271-18/32	196,087	2.82	12.46	200,009
New Pitch Impregnation Process: ● 12 million BTU/hr Preheater (combustion)	E-310-2-4272-21	7,260	0.12	0.52	7,424
New Pitch Impregnation Process: ● Hot Oil Heater (combustion)	E-310-2-4275-01	3,025	0.05	0.22	3,093
New Pitch Impregnation Process: ● 7.5 million BTU/hr Incinerator, VOC control equipment for autoclave (combustion)	CD-310-2-4333-01	8,870	0.07	0.33	8,973
New Graphitizing Process: ● 10 Graphitizing Furnaces (process)	E-460-4271-01/10	32,852	104.5	N/A	35,464
New 1,500 kW Diesel Fuel-Fired Emergency Generator (combustion)	E-240-2-4365-01	118.22	0.0645	0.000948	120.12

Table 14 – Estimated Annual CO_2e Emissions					
Process Area/Equipment Description	**Equipment ID No.**	**Estimated Maximum Annual CO_2 Emissions (ton/yr)**	**Estimated Maximum Annual CH_4 Emissions (ton/yr)**	**Estimated Maximum Annual N_2O Emissions (ton/yr)**	**Estimated Maximum Annual CO_2e Emissions (ton/yr)**
Total		251,237	107.67	13.75	258,176

At the time of permit application submittal, there was no available CO_2e process data for the graphite electrode process that is currently utilized by the Show Denko facility. GHG emission factors in 40 CFR 98 Mandatory Greenhouse Gas Reporting, Subpart F - Aluminum Production were used to estimate the process CO_2e emissions from the graphitizing furnaces and carbottom furnaces. The green anode baking furnaces in the aluminum industry are similar to the anode baking furnaces (carbottom) at Show Denko; therefore, the pitch volatiles combustion factors were used. There is no graphitizing process in the primary aluminum industry, but the packing media in the bake furnace (fluid coke- a needle coke product) is similar to the media used in graphitizing furnaces (insulating media); therefore, the bake furnace packing material emissions factors were used. Carbonization does not begin until temperatures reach over 900 °F. Because the low temperature of the autoclave/pitch impregnation (500 °F) indicates no baking/carbonization occurs, CO_2e is emitted only through the thermal oxidizer combusting the process volatiles. The facility has since performed CO_2 engineering tests on the following three existing sources to confirm the presence of CO_2 emissions and to verify the appropriateness of the Subpart F emission factor use: carbottom furnaces thermal oxidizer, pitch impregnation thermal oxidizer and the graphitizing stack and roof vent. Further testing on the existing graphitizing stack has revealed methane emissions that contribute to CO_2e emissions.

<u>Process design</u>

The Showa Denko process uses specific temperature, cycle times and raw material to manufacture the size and quality of graphite electrode required by their customers. The use of the carbottom furnaces as well as the process operation is critical to the expansion of the existing facility and the use of any other type of furnace would be considered redesigning the source and therefore, not considered in the BACT analysis. However, the discussion below has been added for informational purposes only to demonstrate the carbottom furnaces are the most efficient furnace design. Showa Denko's processes operate 24 hours per day, 7 days

a week. The process is designed so that the individual carbottom furnaces are in different stages of cycling so the overall bake and rebake process is always operating. The carbottom furnace's firing process takes approximately 14-17 days to complete and the furnaces are used for both the bake and rebake process. Showa Denko's plant in Japan is older and the design requires two separate furnaces for the bake and rebake process: ring furnaces for the bake and tunnel furnaces for the rebake. Ring furnaces can take up to 28 days to complete a bake. Another older furnace design is a pit furnace. The firing process for a pit furnace takes approximately 30-40 days to complete. The carbottom furnace is used almost exclusively in the United States for new or expanding facilities. Based on the amount of time to cycle the bake and rebake process, the use of carbottom furnaces in the bake and rebake process are the most efficient design.

Carbon capture and storage (CCS)

The expanded process at Showa Denko is expected to emit 258,176 tons per year of CO_2e, 251,237 (97%) being CO_2 emissions. In the March, 2011 EPA document titled, "PSD and Title V Permitting Guidance for Greenhouse Gases," EPA states they classify CCS as being available control technology for large emitters (power plants), including industrial facilities with "high purity CO_2 streams…" CO_2e emissions from large power plants burning fossil fuels are at the very least an order of magnitude greater than those in the Showa Denko expansion. For example, a recently permitted power plant's (Wolverine-Michigan) allowable emission rate is over 6 million tons per year CO_2e. The pollutant streams from this facility are not highly pure CO_2. Engineering tests indicate that CO2 is less than 1 % of the stream from the existing graphitizing furnaces and less than 10% of the stream for the carbottom furnaces. Therefore, CCS is not considered an available control technology for this permit. However, the discussion below has been added to further clarify the difficulties/hurdles of CCS for this permit action.

- Carbon capture and sequestration

Based on Showa Denko's review of available technologies, sorbents and solvents, cryogenic separation, and/or membrane separation are potential means for separating CO_2 from exhaust gases. Separating CO_2 from exhaust gases like those at Showa Denko is challenging in that trace impurities (particulate matter, sulfur oxides, NO_X, etc.) can degrade the CO_2 capture materials. Captured CO_2 gases must then be compressed so that they can be transported to a storage/sequestration site. Compressing captured CO_2 from near atmospheric pressure to pipeline pressure (about 2,000 pounds per square inch absolute) is an extremely energy intensive

process. Producing the energy needed to compress the captured CO_2 will result in increased CO_2 emissions and increases in traditional criteria pollutants. It is cost prohibitive given the additional equipment and energy necessary to compress the captured CO_2. Therefore, capture and compression is currently impractical for both economic and environmental reasons.

- Carbon transport

The transportation of captured and then compressed CO_2 is a vital component of the CCS process. There is no CO_2 pipeline in the region to transport CO_2 from Showa Denko to a storage site. The cost of building a CO_2 pipeline (planning, engineering, extensive permitting, right-of-way acquisition, construction, and operation) to an as yet undetermined storage site is not economically feasible for a single facility such as Showa Denko. Transportation via tanker truck would require the liquefaction of the CO_2 and is not cost effective based on the energy costs to liquefy the CO_2 (which would generate additional CO_2 in itself) and the transport costs. Therefore, transportation of compressed or liquefied CO_2 is not a technically or economically viable option.

- Carbon storage

Storage of CO_2 is possible by underground injection and enhanced oil and/or gas recovery and geologic sequestration. Appropriate storage sites for geological sequestration would need to be assessed where the geology could hold the CO_2 and prevent it from leaking back up to the surface where it could have the potential to impact human health and ecosystems or potentially contaminate drinking water sources. A few potential CO_2 storage locations have been identified (for example, off shore underneath the Atlantic Ocean, Tuscaloosa (AL), Mt. Simon (KY) and Knox (KY)) as meeting the minimum sustainability criteria for geologic storage sites; however, each site has barriers to permanent and safe CO_2 storage, such as inadequate seals or lack of depth to prevent CO_2 leakage or potential fresh water contamination. Additionally, the University of South Carolina is conducting research on the viability of permanent and safe CO_2 storage in the South Georgia Rift Basin. The project is still in the first phase of research and the viability of this area for safe and permanent carbon dioxide storage is unknown. Additionally, no suitable depleted natural gas reserves, depleted oil reserves, or deep unmineable coal seams are as yet identified in the vicinity of the Showa Denko facility. Therefore, the storage option is not technically or economically feasible at this time.

5.6.1 Step 1: Identify All Available Control Technologies

The RBLC database was reviewed as well as other PSD permits, such as Nucor Steel-Louisiana, Hyperion Energy Center-South Dakota, PacifiCorp Energy – Utah, Russell City Energy Company, LLC - California and WE Energies – Biomass Fueled Cogeneration-Wisconsin. There were no similar sources to the Showa Denko facility. The BACT analysis identifies the following control technologies that could reduce CO_2e emissions:

Restrict fuel use to fossil fuels with inherently lower carbon content

Restriction of fuel use to lower carbon emitting fuels is technically feasible if it does not redefine the source.

Good Combustion Practices

Good combustion practices imply that the combustion sources (preheater, hot oil heaters and carbottom furnaces) will be operated within parameters promoting efficient and complete fuel combustion, thereby reducing the combustion CO_2e emissions of CO_2, N_2O and CH_4.

Energy efficient design

An efficient combustion unit requires less fuel. Elements affecting energy efficiency for the combustion sources include combustion air preheat and excess air monitoring/control. Air preheat recovers heat from the flue gas by heat exchange with the combustion air before it enters the combustion chamber or furnace. Preheating the combustion air reduces the amount of fuel required in the furnace because the combustion air does not have to be heated all the way from ambient temperature to the fuel combustion temperature by combusting fuel. Furnace air/fuel control, which is the installation of oxygen monitors in the combustion unit stack and damper controls on the combustion air dampers, control the air and fuel ratio on a continuous basis. Hot process gases may also be re-circulated to pre-heat the furnaces to reduce the amount of fuel used.

Raw material, insulator usage

Another option is specification of restrictions on the content of raw material needle coke, binder pitch, and impregnation pitch and restrictions on the content of the insulating media as the insulator material provided by suppliers.

Thermal Oxidation of Methane

Methane (CH_4) emissions are emitted from combustion of natural gas (propane as back up) and in the process. When incinerated, methane is converted to CO_2 and water. This provides a benefit for GHG control because CO_2 has a much lower global warming potential than methane.

Oxidation Catalyst

Oxidation catalyst has been widely applied as a control technology for CO and volatile organic compound (VOC) emissions for numerous types of natural gas-fired sources and would provide reduction in CH_4 emissions. This technology utilizes excess air present in the combustion exhaust, and the activation energy required for the reaction to proceed is lowered in the presence of a catalyst. Reactants are introduced into a catalytic bed, with the optimum temperature range for these systems being approximately 850 °F to 1,100 °F. No chemical reagent addition is required.

5.6.2 Step 2: Technical Feasibility of Options

The control options were analyzed for their technical feasibility as applied to all process/point sources resulting in CO_2e emissions at the facility.

Lower carbon emitting fuels

In the combustion of a fossil fuel, the fuel carbon is oxidized into CO and CO_2. Full oxidation of fuel carbon to CO_2 (complete combustion) is desirable because it reduces overall pollutant emissions. Natural gas and propane contain less carbon than coal, residual oil or diesel fuel. Showa Denko has proposed, and BAQ will require, that the proposed combustion sources combustion be restricted to use of fossil fuels that emit lower emitting carbon gaseous fuels, specifically natural gas or propane.

Good Combustion Practices

Good combustion practices imply that the combustion sources (preheater, hot oil heaters and carbottom furnaces) will be operated within parameters promoting efficient and complete fuel combustion, thereby reducing combustion emissions. Although CH4 emissions can be reduced by operating the combustion devices at higher flame temperatures, higher excess oxygen levels, and longer furnace residence time, these techniques for reducing CH_4 emissions can increase NO_X

emissions, which is not desirable. Showa Denko will be using good combustion practices and low NO_X burners and will utilize natural gas (and propane as backup) exclusively as fuel for the two hot oil heaters, preheater and 15 new carbottom furnaces.

Showa Denko has listed the following as good combustion practices:

1. Good air/fuel mixing in the combustion zone;
2. Sufficient residence time to complete combustion;
3. Proper fuel gas supply system design and operation in order to minimize the effect of contaminants and fluctuations in pressure and flow on the fuel gas quality delivered to combustions units;
4. Operator and maintenance practices including good burner maintenance and operation;
5. High temperatures and low oxygen levels in the primary combustion zone;
6. Overall excess oxygen levels high enough to complete combustion while maximizing thermal efficiency.

Good combustion practices #1 through #6 listed above will apply to the hot oil heaters. Good combustion practices #1 through #5 listed above will apply to the preheater and carbottom furnaces. This option is technically feasible. Good combustion practices are deemed not technically feasible for the graphitizing furnaces due to the furnaces being electrically heated (no combustion emissions).

<u>Energy efficient design</u>

Preheater and furnace air/fuel control: Due to the low exhaust temperature for the preheater, air preheat is not technically feasible based on information from the equipment suppliers. The proposed hot oil heaters have air preheat as an integral part of the design. Continuous excess air monitoring/control is technically feasible for the hot oil heaters. The carbottom furnaces and preheater are direct fired units. Multiple low NO_X burners are installed in the furnaces. While the low NO_X burners will ensure good combustion in the burner itself, the atmosphere in the furnaces requires very low oxygen levels to prevent oxidation and ensure a quality product. Air preheat and furnace air/fuel control is determined to be technically infeasible for the carbottom furnaces.

Furnace waste heat recovery: No combustion sources are used in the graphitizing furnaces. The question is whether hot carbottom furnaces gases collected in the central thermal oxidizer system can be re-circulated to the carbottom furnaces to reduce the amount of fuel needed to pre-heat the furnaces or reduce the amount of fuel used in the bake and rebake process. The furnaces operate under positive pressure and volatile gases from the process are vented to a central thermal oxidizer. In the bake and rebake operation, the carbottom furnaces are cycled such that they are all in use and in a different stage of the process to ensure continuous production. Some furnaces will be in the pre-heat stage, others are in full volatile stage (fuming cycle), and others are in cool down stage. Waste heat could be vented from the central oxidizer system to preheat furnaces, thus reducing the fuel required to heat the furnaces. Or, waste heat from the carbottom furnaces themselves in the volatile stage could be used, in part, to heat the furnaces in the preheat stage.

The carbottom furnaces require a low oxygen environment to prevent oxidation to create the desired product. The oxygen level is maintained at 1-2% in the furnaces. The volatile gases from the furnaces are continually vented to the central thermal oxidizer system. To ensure complete combustion of the volatiles in the central thermal oxidizer system, excess air is introduced into the central thermal oxidizer system prior to combustion and oxygen levels are maintained at 3%. Re-circulating air with oxygen levels at 3% on a bare electrode during any cycle (stage) of the rebake process is technically infeasible. In the bake process, the electrode is protected by sand, so degradation of the electrode by oxidation is not as much of a concern as it is in the rebake process. However, there is a safety issue with re-circulating the volatile rich air from the central thermal oxidizer system to the furnaces in both the bake and rebake cycles. Oxygen must be prevented from entering the furnaces while in the volatile stage (fuming cycle) to avoid explosions. This would require shut off valves at that furnace to avoid any air from the central thermal oxidation system from entering into that furnace. The vendor could not guarantee no-leak valves; vendor representatives stated that they have found no valves that did not have some leakage. Therefore, re-circulating the gases during the bake cycle is technically infeasible. Even if there were no leaks from the valves and re-circulated gases were prevented from entering the bake furnaces during the volatile stage, the pre-volatile bake stage is the only stage in which re-circulation of the gases would be useful to pre-heat the furnace.

<u>Raw material, insulator usage</u>

Showa Denko's process requires specific grades of needle coke and pitch as raw materials to meet the specified electrode standards. Showa Denko has stated that few suppliers of required raw materials are available; therefore raw material choices are limited. Furthermore, there are no raw material replacements that could be used to lower CO_2e emissions, and therefore raw material replacement is technically infeasible.

The graphitizing furnaces do not utilize fuel in the process. Rather, electrical resistivity is used to convert the carbon to graphite. Process GHGs are created from the degradation of the insulating media (metallurgical coke) used as an insulator for the electrodes. The insulating media, here, metallurgical coke, is the product of a purification process where unstable components of bituminous coal are released. These unstable components include volatile organic compounds and ammonia. Electrode graphitizing operations in North Carolina and Arkansas, as well as the primary aluminum production industry, use needle coke (petroleum coke-oil derived) as an insulator rather than metallurgical coke. Other insulating alternatives are anthracite. Data provided by the facility indicates the carbon content of metallurgical coke (85-90%) is less than that of needle coke (99%) but similar to anthracite (86.3%). Restricting the carbon content of the insulating media of the graphitizing process is technically feasible. Additionally, the metallurgical coke has desirable qualities for HAP reduction (see case-by-case MACT discussion).

<u>Thermal oxidation of methane</u>

When incinerated, CH_4 is converted to CO_2 and water. Thermal oxidation of the CH_4 in the carbottom furnaces is technically feasible. The facility has proposed, and the draft permit requires the installation of a thermal oxidizer for the carbottom furnaces. Therefore, thermal oxidation of methane is considered technically feasible for the carbottom furnace. Small combustion units are identified the New Mix Mill and Extrusion hot oil heater, Pitch Impregnation preheater and the Pitch Impregnation hot oil heater. The exhaust flow rate of each hot oil heater is 967 acfm and the exhaust flow rate of the preheater is 4,600 acfm. Afterburners generally require an exhaust flow rate greater than 5,000 scfm for proper operation; therefore, a thermal oxidizer is not technically feasible for the hot oil heaters and preheater. A thermal oxidizer is considered technically feasible for control of methane from the graphitizing furnaces.

<u>Oxidation Catalyst</u>

The typical oxidation catalyst for CO-containing exhaust gases is rhodium or platinum (noble metal) catalyst on an alumina support material. This catalyst is installed in an enlarged duct or reactor with flue gas inlet and outlet distribution plates. Acceptable catalyst operating temperatures range from 400 to 1250 °F, with the optimal range being 850 to 1,100 °F. Installation of oxidation catalyst in flue gas containing more than trace levels of SO_2 will result in poisoning and deactivation of the catalyst by sulfur-containing compounds. Because of the required exhaust gas temperatures and potential of catalyst poisoning, oxidation catalyst is deemed technically infeasible for the hot oil heaters, preheater and carbottom furnaces. An oxidation catalyst is not deemed technically feasible for the graphitizing furnaces due to the potential of catalyst poisoning.

5.6.3 Step 3: Ranking of Control Technologies and Step 4: Evaluation of Most Effective Controls (Energy, Environmental and Economic Impacts)

Small Combustion Sources

New Mix Mill and Extrusion hot oil heater, Pitch Impregnation preheater and the Pitch Impregnation hot oil heater: The only available control option not eliminated as technically infeasible is the use of natural gas/propane as fuel and good combustion practices. Therefore, there is no need for a ranking of the remaining control technologies or for an evaluation of energy, environmental and economic impacts. CO_2e emission limits have been assigned to these sources based on the fuel emission factor.

Carbottom Furnaces

The facility has proposed, and the draft permit requires, the installation of a thermal for the carbottom furnaces to control volatiles, CO and PM. This control device will, ipso facto, control methane emissions. Uncontrolled methane emissions from the carbottom furnaces are estimated to be 2.82 tons per year, including methane generated from natural gas combustion in the incinerator. There is documentation that an incinerator will have a 95% control efficiency with an inlet concentration of 20 ppm; however, the vendor could not provide a control efficiency for a 2.5 ppm inlet concentration. Due to the difficulty of estimating methane destruction efficiency and the small amount of methane emissions, BACT will require a thermal incinerator for the methane, but the emission rate will reflect the uncontrolled methane emissions.

Because GHG BACT is efficiency based, an output based emission limit was explored as well as critical parameter limitations. GHG emissions are generated from three sources: binder pitch volatile combustion, impregnation pitch volatile combustion and natural gas fuel consumption. Non fuel consumption emissions were calculated using Equation F-7 of 40 CFR Part 98 Subpart F, Greenhouse Gas Reporting for Aluminum Production. Review of the variables included in the Equation F-7 reflects the green electrode weight, baked weight, hydrogen loss and waste binder pitch/impregnation pitch.

Equation F-7 is as follows:
ECO2PV = (GA – Hw – BA – WT) x (44/12)
where:
ECO2PV = annual CO_2 emissions from pitch volatile combustion (metric tons)
GA = initial weight of green anodes (metric tons)
Hw = annual hydrogen content in green anodes (metric tons)
BA = annual baked anode production (metric tons)
WT = annual waste tar collected (metric tons) = zero for carbottom operation
44/12 = ratio of molecular weights (CO_2 to carbon)

Simply manipulating the equation to output based function does not promote efficiency. The purpose of the bake process is to coke the binder pitch in the green electrodes, locking the needle coke particles in place to yield one strong carbon structure. Efficient operation of the bake/rebake process relies on efficient operation of each of the carbottom furnaces for the process they are being used for (bake or rebake) and optimum flue draft and incineration. The carbottom furnace efficiency is driven by control to bake or rebake schedule (temperature ramp rate), which is predicated by carbon yield. The facility has stated that poor control of the schedule is typically a result of equipment malfunction, which can result in overuse of gas, loss of product, and loss of oxygen/pressure control in the furnace. Furnaces in draft to the collector flue are operated to maintain very low levels of oxygen concentration not only to minimize product loss through oxidation and improve carbon yield and to avoid safety hazards. The oxygen is controlled to very low levels by tightly sealing each furnace prior to operation and allowing the heat and volatiles evolved from the coking of the pitch to increase and develop a positive pressure within the furnace during the heating cycle. The efficiency of the carbottom complex operation can be tracked in three ways: oxidizer control (temperature and O_2 concentration), process optimization and gas consumption. The oxidizer temperature and oxygen are continuously monitored, the input and output weight of each electrode is measured, and fuel consumption is continuously measured.

BACT is determined to be a CO_2e limit of 200,009 TPY (12- month rolling sum), the operation of the thermal oxidizer, process optimization, good combustion practices and the use of natural gas/propane as fuel. Process Optimization implies the carbottom furnaces will be operated within parameters promoting efficiency, thereby reducing CO_2 emissions. Showa Denko has listed the following as process optimization:

1. Proper furnace scheduling for control to temperature ramp rate
2. Monitoring of thermal oxidizer temperature and oxygen levels
3. Operator and maintenance practices, including training in the proper sealing of each furnace prior to operation
4. Optimum product yield

Graphitizing Furnaces

Because GHG BACT is efficiency based, an output based emission limit was explored as well as critical parameter limitations. GHG emissions were calculated using Equation F-8 of 40 CFR Part 98 Subpart F, Greenhouse Gas Reporting for Aluminum Production.

ECO2PC = PCC x BA x ([100-Spc-Ashpc]/100) x (44/12)
where:
ECO2PC = annual CO_2 emissions from furnace packing material (metric tons)
PCC = annual packing coke consumption (metric tons/metric ton baked)
BA = annual baked anode production (metric tons)
Spc = sulfur content in packing coke (weight percent)
Ashpc = ash content in packing coke (weight percent)
44/12 = ratio of molecular weights (CO_2 to carbon)

Simply manipulating the equation to output based function does not promote efficiency. The packing coke consumption rate, packing coke sulfur content, and packing coke ash content are the main variables affecting CO_2 emissions. Increasing the sulfur and ash contents of the packing coke will reduce the CO_2 emissions. However, increased sulfur and ash contents will increase sulfur dioxide and particulate matter emissions which have established ambient air quality standards. Therefore, there will be no requirement to maximize sulfur and ash content. BACT for SO_2 and PM have been established in this permit.

The purpose of the Graphitization process is to convert the amorphous carbon structure of needle coke and coked pitch that comprise the electrode into a tighter, more conductive graphitic structure. In preparation, rebaked electrodes are placed horizontally, end to end in a furnace to create a conductive circuit. Electrodes are packed within the furnace using an insulating media. The goal of the insulating media is to minimize the potential for oxidation of the electrodes, isolate current flow, and provide a controlled dissipation of heat during the furnace's operation. Once a furnace is prepared, electric current is charged through the electrode circuit via a rectiformer, resistively heating the electrodes to 2900°C in order to graphitize them. A graphitization building is comprised of a number of electrically fired furnaces which are lined up within one building. Furnaces are tied together to a common duct and stack when hooded, and emissions draft to a common roof vent when not hooded. The building is divided into groups of furnaces, which share a common rectiformer. Each rectiformer is only used to heat one furnace at a time. Due to plant power supply and related costs, the power consumption of each rectiformer is generally staggered so as to minimize peak power demand. Since peak power consumption is in-line with the peak in the graphitization cycle, this impacts the cycling and emissions of the furnaces.

Efficient operation of the graphitization line relies on furnace scheduling that synchronizes product flow with rectiformer power demand. The graphitizing furnace efficiency is driven by control to firing schedule, which is predicated carbon yield and effectiveness of the furnace packing. Poor control to the schedule is typically a result of equipment malfunction or poor furnace loading practices, and can result in overuse of power, loss of product, or excessive loss of packing media. Reducing insulating media will reduce CO_2 emissions. Effective packing will minimize media consumption, and dissipate heat at a rate in keeping with the furnaces heating and cooling cycles. A packing media that is too high in ash will break down into fine particles that can lead to too dense of a furnace pack, extending cooling times, and may also increase particulate emissions. The carbon content of the packing media is the contributor to CO_2 emissions, and increasing ash or even sulfur content of the packing media would result in a lower carbon content of the packing media. However, similarly to increased ash, a packing media that is too high in sulfur will lead to increases in other emissions, in this case SO_2. The efficiency of the graphitization building is measured by: maximizing graphite production yield, minimizing electrical cost; and minimizing packing media consumption.

Due to the high flow rate of the graphitizing furnaces, two (2) regenerative thermal oxidizers (RTOs) would be required (each 6.5 million Btu/hr). Showa Denko has

documented a vendor guarantee of 98% control of methane from the graphitizing furnaces, however the cost to reduce methane would be approximately $12,844 per ton removed (based on 104.5 uncontrolled tpy of methane) and is therefore not cost effective. Also, the use of RTOs to control methane emissions from the graphitizing furnaces would result in an increase of 5.58 tpy of NO_X emissions and 6,739 tpy of CO_2e and would therefore contribute to adverse environmental impacts. The RTOs would contribute to more CO_2e than it would control (2,612 tpy CO_2e from methane). Using this same methodology, the use of thermal oxidizers is also deemed not cost effective or environmentally beneficial.

BACT is determined to be a CO_2e limit of 32,852 TPY (12-month rolling sum), insulating media carbon content 90 % or less and process optimization. Process Optimization implies the graphitizing furnaces will be operated within parameters promoting efficiency, thereby reducing CO_2 emissions. Showa Denko has listed the following as process optimization:

1. Proper furnace scheduling to minimize power demand
2. Operator and maintenance practices, including training in effective furnace packing
3. Optimum product yield available control technologies deemed technically feasible for $PM/PM_{10}/PM_{2.5}$ control are ranked in Table 3 from the most to least effective based on emission reduction potential (% control efficiency).

5.6.4 Step 5: Select BACT

The evaluation of the most effective control (Step 4) did not reach a conclusion between the wet scrubber and baghouse. The baghouse is selected as the preferred control method since the facility has proposed this control as part of the design for the expansion. The control method for filterable and condensable PM, PM_{10}, and $PM_{2.5}$ control along with proposed BACT limits are listed in Table 15 below:

Table 14 – Selection of CO_2e BACT Limits

Process/Equipment	Control Method	Proposed BACT Limit
New Mill, Mix and Extrusion Process/ Hot Oil Heater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	3,093 TPY CO_2e
New Bake/Rebake Process/ 15 Carbottom Furnaces	Good Combustion Practices;	200,009 TPY CO_2e

Table 14 – Selection of CO_2e BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
	Natural gas and propane as sole fuels; Annual Tune Up Thermal Oxidizer Process optimization	
New Pitch Impregnation Process/ Preheater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	7,424 TPY CO_2e
New Pitch Impregnation Process/ Hot Oil Heater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	3,093 TPY CO_2e
New Pitch Impregnation Process/ Fume Incinerator	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	8,973 TPY CO_2e
New Graphitizing Process/ 10 Graphitizing Furnaces	Insulating media carbon content Process optimization	32,852 TPY CO_2e insulating media carbon content 90%
New Emergency Generator	Good Combustion Practices	Operational limit of 100 hours for maintenance

6.0 Summary of BACT Limits

Table 16 - Summary of BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
New Mill, Mix and Extrusion Process (all equip. excluding Mixers, Mixer Discharge Belt, Screw Spreader, Cooling Belts, Homogenizer, Homogenizer Belt and Hot Oil Heater)	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Mill, Mix and Extrusion Process/ Mixers, Mixer Discharge Belt, Screw Spreader, Cooling Belts, Homogenizer and Homogenizer Belt	Baghouse/Dry Fume Scrubber	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$) 0.07 lb VOC/hr
New Mill, Mix and Extrusion Process/ Hot Oil Heater	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as back-up fuel source; Low NO_X burners	0.0022 lb/million Btu (Filterable PM) 0.0022 lb/million Btu (Filterable PM_{10}) 0.0022 lb/million Btu (Filterable $PM_{2.5}$) 0.0056 lb/million Btu (Condensable PM_{10}) 0.0056 lb/million Btu (Condensable $PM_{2.5}$) 0.082 lb CO/million Btu 0.10 lb NO_X/million Btu 0.012 lb VOC/million Btu 3,093 TPY CO_2e Good Combustion Practices #1-6
New Mill, Mix and Extrusion Process/Binder Pitch Tank	Vent Condenser	0.40 lb VOC/hr
New Bake/Rebake Process/ 15 Carbottom Furnaces	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as back-up fuel source; Thermal Oxidizer; Low NO_X Burners, Process	4.14 lb/hr (Filterable PM) 4.14 lb/hr (Filterable PM_{10}) 4.14 lb/hr (Filterable $PM_{2.5}$) 2.85 lb/hr (Condensable PM_{10}) 2.85 lb/hr (Condensable$PM_{2.5}$) 2.0 lb CO/hr 75.22 lb NO_X/hr needle coke nitrogen content: 0.24% by

Table 16 - Summary of BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
	Optimization	weight; binder pitch nitrogen content: 0.89% by weight; impregnation pitch nitrogen content: 1.14% by weight; Maximum Nitrogen Content (% by weight), subject to change based on prior Departmental notification 17.3 lb VOC/hr 200,0009 TPY CO_2e Good Combustion Practices #1-5
Existing Rebake Load and Unload/Graphitizing Preparation Process	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Sand Storage Bin	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Sagger Unloading and Loading System	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Bake Load and Unload and Baked Electrode Cleaning Process	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Sagger Cleaning and Electrode Cleaner	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Pitch Impregnation Process/ Preheater	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as back-up fuel source; Low NO_X burners	0.0023 lb/million Btu (Filterable PM) 0.0023 lb/million Btu (Filterable PM_{10}) 0.0023 lb/million Btu (Filterable $PM_{2.5}$) 0.0056 lb/million Btu (Condensable PM_{10}) 0.0056 lb/million Btu (Condensable $PM_{2.5}$) 0.083 lb CO/million Btu 0.10 lb NO_X/million Btu

Table 16 - Summary of BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
		0.011 lb VOC/million Btu 7,424 TPY CO_2e Good Combustion Practices #1-5
New Pitch Impregnation Process/ Hot Oil Heater	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as back-up fuel source; Low NO_X burners	0.0022 lb/million Btu (Filterable PM) 0.0022 lb/million Btu (Filterable PM_{10}) 0.0022 lb/million Btu (Filterable $PM_{2.5}$) 0.0056 lb/million Btu (Condensable PM_{10}) 0.0056 lb/million Btu (Condensable $PM_{2.5}$) 0.082 lb CO/million Btu 0.10 lb NO_X/ million Btu 0.012 lb VOC/million Btu 3,093 TPY CO_2e Good Combustion Practices #1-6
New Pitch Impregnation Process -Autoclave/spray cooler/cooling bath	Thermal Oxidizer	3.083 lb VOC/hr 8,973 TPY CO_2e
Existing Pitch Impregnation Process/Impregnation Pitch Storage Tanks	Vent Condenser	0.055 TPY (total)
Existing Insulating media Receiving Process	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Graphitizing Process/ 10 Graphitizing Furnaces	Wet Scrubber; Process Optimization	4.19 lb/hr (Filterable PM) 4.15 lb/hr (Filterable PM_{10}) 4.12 lb/hr (Filterable $PM_{2.5}$) 2.65 lb/hr (Condensable PM_{10}) 2.65 lb/hr (Condensable $PM_{2.5}$) 1,690 lb CO/hr (total for stack and roof emissions) 2.5 lb NO_X/hr (total for stack and roof emissions) needle coke nitrogen content: 0.24% by

Table 16 - Summary of BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
		weight; binder pitch nitrogen content: 0.89% by weight; impregnation pitch nitrogen content: 1.14% by weight; Maximum Nitrogen Content (% by weight), subject to change based on prior Departmental notification Perform initial analysis for nitrogen content on insulating media 3.3 lb/hr VOC, total for stack and roof emissions (based on 96 hour block average) 32,852 TPY CO_2e insulating media 90% carbon
New Graphitizing Process/ Gulper System and Insulating media Dust Bins	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Graphitizing Process/ Insulating media Recycle (Gulper System)	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Cleaning and Inspection Process/ Electrode Cleaning Machine	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Machining and Shipping Process/Station No. 1, Station No. 3, Graphite Chip Screen, and Graphite Storage Bins	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Machining and Shipping Process/Station No. 2	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Machining and Shipping/ Powderizer System, Cyclone Collector, and Bag Packer	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Emergency Generator	Annual Tune Up	Operational Limit of 100 hours for maintenance

7.0 Air Quality Impact Analysis

For a major facility, PSD regulations require an applicant to analyze the impact from the construction of a proposed new source(s) on the following areas:

1. Compliance with the National Ambient Air Quality Standards (NAAQS);
2. Compliance with the PSD Increments;
3. Significant impact on PSD Class I Areas, including Class I PSD increments;
4. Impairments to visibility, soil, and vegetation; and
5. Air Quality impact of general growth associated with the source.

All minor and major sources proposing new construction or construction modifications in South Carolina (SC) are also required to demonstrate that their facility will remain in compliance with South Carolina Regulation 61-62.5 Standards 2 (AAQS), 7 (Class II PSD Increments), and Standard 8 (air toxics).

General results of this compliance demonstration indicate that there will be no exceedances of Full Impact or South Carolina ambient air quality standards or PSD increments. It is also predicted that this project will not cause any adverse effects on visibility, vegetation, or soils nor will there be any adverse effects caused by growth associated with this project. It is predicted that there will also be no adverse effects on visibility, vegetation, or soils in any of the Class I areas within 300 km of the facility/source nor will there be any significant impact on the Class I increments at any Class I area.

7.1 PSD Class II Modeling Analysis

The PSD Review requires pollutants, which are determined to be “major”, be evaluated by an Air Quality Impact Analysis and Additional Impacts Analysis. The Air Quality Impact Analysis consists of (1) a Preliminary Modeling Analysis to determine which pollutants from the proposed project at the facility only**,** exceed their Class II Significant Impact Levels (SIL); and (2) a more comprehensive Full Impact Analysis based on concentrations of pollutants that exceed the SIL for the facility and additional ‘facility-wide’ impacts from other facilities that may impact the Significant Impact Area (SIA). The Additional Impacts Analysis evaluates the impacts on soils, vegetation, and visibility effects.

For this project, all emissions for NO_2 were modeled as NO_X. Then, the ambient ratio method value of 0.80 was applied to all of the modeled concentrations to obtain the final concentrations for NO_2. This ratio method is allowed under *40 CFR 51 Appendix*

W and the *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard, 3/1/2012* memo from EPA.

7.1.1 PSD Class II Preliminary Modeling Analysis

Potential emission rates or net emission rate increases for each pollutant determined to be significant (Table 17) at the facility were modeled to determine (a) the Significant Impact Level (SIL); (b) the impact area within which a Full Impact Analysis must be performed; and (c) whether or not the facility may be exempted from the ambient monitoring data requirements. Each of these three preliminary Class II analyses is discussed below.

7.1.1.1 Significant Impact Level (SIL) Analysis

If an impact is less than the SIL, then no further PSD analysis is required. Table 17 provides the results of the SIL modeling analysis for this project for the major pollutants. This analysis shows SILs were exceeded for PM_{10} 24-hour, $PM_{2.5}$ 24-hour, NO_2 1-hour and annual, and CO 1-hour and 8-hour. Therefore, a Full Impact analysis is required for these pollutants. No further PSD analysis is required for PM_{10} Annual and $PM_{2.5}$ Annual. However, they are included along with SO_2 (which was not significant for PSD), in the facility-only South Carolina Standards 2/7 modeling. The Full Impact analysis assessed the combined impacts of the significant impact pollutants from the facility sources along with those from other sources in the SIA and the Screening Area as appropriate.

Maximum concentrations are used for the SIL analysis (i.e. Highest-First-High), except for $PM_{2.5}$ and NO_2-1hr. For these newer standards, the following apply.

- 24-hour $PM_{2.5}$: the highest 5-year average of the maximum 24-hour averages over 5 years of meteorological data modeled
- Annual $PM_{2.5}$: the highest 5-year average of the annual averages over 5 years of meteorological data modeled
- 1-hour NO_2: the highest 5-year average of the daily maximum 1-hour averages over 5 years of meteorological data modeled

Table 17 – Class II PSD (PSD) Significant Impact Level

Pollutant	Averaging Time	Model Used	Maximum Impact ($\mu g/m^3$)	Note	SIL ($\mu g/m^3$)	Exceeds SIL (Yes/No)	Significant Impact Area (km)
PM_{10}	24 Hour	AERMOD	5.7	B	5	Yes	0.77
	Annual	AERMOD	0.16	B	1	No	0
$PM_{2.5}$	24 Hour	AERMOD	4.6	C	1.2	Yes	1.96
	Annual	AERMOD	0.12	D	0.3	No	0
NO_2	1 Hour	AERMOD	48.0	A	7.5(1)	Yes	6.27
	Annual	AERMOD	1.3	B	1	Yes	0.92
CO	1 Hour	AERMOD	3061	B	2000	Yes	2.83
	8 Hour	AERMOD	2047	B	500	Yes	4.93

Ozone is not modeled, but a general impact assessment is to be made if the source is major for ozone as determined in Table 17.

There is no SIL for fluorides, lead, H_2S, and H_2SO_4. These pollutants will be modeled in Section E – SC State modeling as applicable. The toxic air pollutants are subject to 40 CFR 63 Case by Case MACT.

TSP is not considered a criteria pollutant for this analysis.

(1) The South Carolina interim SIL for 1-hr NO_2 modeling is 8 but the facility used 7.5, which is conservative.

Notes:

A) Highest 5-year average of the daily maximum predicted 1-hour average at any receptor.
B) Maximum predicted average at any receptor.
C) Highest 5-year average of the maximum predicted 24-hr averages at any receptor.
D) Highest 5-year average of the predicted annual average at any receptor.

The Southeastern United States, including South Carolina, is NO_X limited with regards to ozone formation. This means that there is an excess of VOC in the atmosphere with regards to ozone formation and increases in VOC do not lead to increases in ozone production. The excess VOC is in part due to natural sources in the environment. Due to the excess VOC, only increases in NO_X in this region are a concern with regards to ozone formation. Ambient impacts from NO_X are addressed in NO_2 modeling.

Due to the highly complex reactions involving formation of ozone in the atmosphere, there is no preferred EPA guideline ozone model for individual NO_X source emissions and, hence, ambient air quality demonstrations are not required to be included for NO_X (precursor for ozone). In order to estimate impacts on ozone, increases in NO_X from the project were compared with the total NO_X emissions from the surrounding area of South Carolina. The project NO_X emissions increase is 369.53 tons/year. The proposed project emissions of NO_X represent approximately 0.5% of the stationary point source emissions of NO_X in South Carolina in 2008 and less than 0.2% of the sum of non-point and mobile source emissions of NO_X in South Carolina in 2008. The

representative ozone monitoring stations for this area, located approximately 28 km and 40 km from the project location, are the Cape Romain monitor in Charleston County and the Bushy Park monitor in Berkeley County. The Cape Romain design value of 0.061 ppm (2011-2013) and the Bushy Park design value of 0.057 ppm (2013-2015) show that the area is currently in attainment with the 8-hour ozone standard of 0.075 ppm. Based on the relatively minor increases in VOC emissions and the fact that SC is a NO_X limited state, the project emissions should not cause or contribute to an exceedance of the current 8-hr ozone standard.

7.1.1.2 Significant Impact Area (SIA) Analysis

The impact area is a circular area with a radius extending from the source to (1) the most distant point where approved dispersion modeling predicts a significant ambient impact will occur (greater than or equal to the SIL), or (2) a modeling receptor distance of 50 km, whichever is less. An impact area is initially established for each pollutant for every averaging time. Sources within the SIA will be used for this analysis. Table 17 indicates the maximum distances to significant impacts. All sources within the pollutant respective radius were included for each pollutant accordingly.

In order to insure that the significant impact area was not underestimated, the distance to the most distant significant impact from the Showa Denko facility was increased by a buffer equal to the next more distant receptor beyond the receptor that was equal to or greater than the SIL.

7.1.1.3 Significant Monitoring Concentration Analysis

Modeling significance results for PM_{10}, SO_2, NO_2, and CO are shown below along with significant monitoring concentrations for these pollutants. The significant monitoring concentrations are from SC Regulation 61-62.5, Standard No. 7. Impacts are the maximum modeled concentrations for each pollutant (i.e. Highest First High) except for $PM_{2.5}$ and NO_2-1hr. For these newer standards, the following apply.

- 24-hour $PM_{2.5}$: the highest 5-year average of the maximum 24-hour averages over 5 years of meteorological data modeled
- Annual $PM_{2.5}$: the highest 5-year average of the annual averages over 5 years of meteorological data modeled
- 1-hour NO_2: the highest 5-year average of the daily maximum 1-hour averages over 5 years of meteorological data modeled

Table 15 – Significant Monitoring Concentrations				
Pollutant	**Averaging Period**	**Max. Impact (μg/m³)**	**Significant Monitoring Concentration (μg/m³)**	**Exceeds (Yes or No)**
PM_{10}	24 Hour	5.7	10	No
$PM_{2.5}$	24 Hour	4.6	4	Yes
NO_2	Annual	1.3	14	No
CO	8 Hour	2047	575	Yes

The maximum impacts for NO_2 Annual and PM_{10} 24-hour are below the significant monitoring concentration (SMC) levels, therefore, no pre-construction monitoring is required for these pollutants. The $PM_{2.5}$ and CO concentrations exceed the SMC. Since SO_2 is not considered significant for this project as previously determined, pre-construction monitoring for SO_2 is not required. Also, since this site is significant for VOCs, ozone monitoring data also needs to be reviewed. Section 2.4 of U.S. EPA's *Ambient Monitoring Guidelines for Prevention of Significant Deterioration* (EPA-450/4-87-007) permits the use of existing representative air quality data in place of preconstruction monitoring data, provided monitor location, quality of data, and currentness of data are acceptable. According to the EPA document listed above, monitoring data from a regional site may be used as representative data in these cases.

The facility location is in an area that is generally free from the impact of other point sources and area sources associated with human activities. Additionally, the site is located in an area with no complex terrain. According to the EPA document listed above, monitoring data from a regional site may be used as representative data in these cases.

The nearest regional monitor for $PM_{2.5}$ is the Charleston FFA Beacon monitor. The monitoring site and the facility have similar base elevations and there are no significant land features between the facility and monitoring site. The Showa Denko facility is located in a rural area while the FAA site is in a suburban area that would be expected to experience somewhat higher $PM_{2.5}$ concentrations due to local particulate contributions.

The closest CO monitor is located at the Cape Romain station. Since the Cape Romain CO monitor is located in a Class I area on the coast of South Carolina and may not be entirely representative of a more inland, rural area, an alternative monitoring location was sought. The only other candidate site for CO background data in South Carolina is the Greenville County Health Department monitoring station. While this monitoring station is located over 270 km from the project facility, it is in a major

urban area with significant CO emissions and is a very conservative alternative that easily satisfies the background monitoring requirements.

Although there is no 1-hr SMC for NO_2, since the significant impact results were above the interim SIL for this averaging period, background monitoring data was needed for the 1-hr NO_2 for the full impact analysis. The Jenkins NO_2 monitor in North Charleston is the closest NO_2 monitoring station to the project location. The Jenkins station is located in an urban area with commercial land use and significant NO_X emissions. The Jenkins Avenue monitor would be expected to provide a very conservative background for the Showa Denko modeling.

Background PM_{10} monitoring data is also needed since cumulative modeling is required for this pollutant. The Jenkins PM_{10} monitor is the closest PM_{10} monitoring station to the project location. The Jenkins station is located in an urban area with commercial land use and significant PM_{10} emissions. Again, the Jenkins Avenue monitor would be expected to provide a very conservative background for the Showa Denko modeling.

The representative ozone monitoring stations for this area, located approximately 28 km and 40 km from the project location, are the Cape Romain monitor in Charleston County and the Bushy Park monitor in Berkeley County. The Cape Romain design value of 0.061 ppm (2011-2013) and the Bushy Park design value of 0.057 ppm (2013-2015) show that the area is currently in attainment with the 8-hour ozone standard of 0.075 ppm. Based on the relatively minor increases in VOC emissions and the fact that SC is a NO_X limited state, the project emissions should not cause or contribute to an exceedance of the current 8-hr ozone standard.

It has been determined that the data the BAQ has obtained for background concentrations are representative (or conservative) of the ambient pollutant concentrations in the area of the proposed facility. In accordance with Chapter C, Section III of the New Source Review Manual (Draft document, dated October 1990), the BAQ approves the use of ambient data collected at DHEC monitoring stations for pre-construction monitoring requirements.

7.1.2 PSD Class II Full Impact Modeling Analysis

A Full Impact Analysis is required for any pollutant for which the proposed source's estimated ambient pollutant concentrations meet or exceed the SIL's (determined in Table 17). Separate analyses are performed for determining compliance with the NAAQS and PSD increments. The Full Impact Analysis consists of modeling all

facilities within the SIA, those in the SA that are not excluded by the screening protocol, and background pollutant concentrations (for the NAAQS analysis). The SA used is an area extending 50 km beyond the SIA for each pollutant and averaging period.

The "Screening Threshold Method for PSD Modeling" or "20D Rule" was used to determine which sources within the Screening Area to include. In order to exclude a source, the annual emissions of a pollutant must be less than 20 times the distance (km) from the SIA to the source in the Screening Area. Sources within 1 km of each other were summed prior to applying the 20D Rule. Each calculated 20D distance was compared to the annual emission of each pollutant. Those sources with annual emissions greater than or equal to 20D were retained and considered in the Full Impact modeling analysis for the Class II NAAQS. For the Class II PSD Increment analysis, all the increment consuming sources in the Screening Area were included (no screening was performed).

In addition, Showa Denko performed a significant concentration gradient analysis for the 1-hr NO_2 modeling as an additional screen for sources to exclude in the Screening Area. In that analysis, modeling was performed for those sources that did not screen out using the 20D rule to determine the lateral and longitudinal concentration gradient between the source and the Showa Denko facility. In agreement with the requirements of the EPA "Guideline on Air Quality Models," those sources whose emissions do not cause a significant concentration gradient in the vicinity of the Showa Denko facility were screened out of the full impact modeling.

7.1.2.1 PSD Class II Full Impact - National Ambient Air Quality Standards (NAAQS) Analysis

Table 19 shows a list of facilities that are included in the full impact analysis for NAAQS modeling.

Table 16 – Class II Full Impact Analysis – NAAQS Sources

PM_{10} 24-Hour	$PM_{2.5}$ 24-Hour	SO_2	NO_2 1-Hour	NO_2 Annual	CO 1-Hour	CO 8-Hour
Showa Denko	Showa Denko	--	Showa Denko	Showa Denko	Showa Denko	Showa Denko
Santee Cooper - Jefferies	Santee Cooper - Jefferies	--	Santee Cooper - Jefferies	Santee Cooper - Jefferies	Roseburg Forest Products	Roseburg Forest Products
SCE&G Williams	SCE&G Williams	--	SCE&G Williams	SCE&G Williams	Georgia-Pacific Corp -	Georgia-Pacific Corp -

Table 16 – Class II Full Impact Analysis – NAAQS Sources						
PM_{10} 24-Hour	**$PM_{2.5}$ 24-Hour**	**SO_2**	**NO_2 1-Hour**	**NO_2 Annual**	**CO 1-Hour**	**CO 8-Hour**
					Resins	Resins
C. R. BARD	C. R. BARD	--	E.I.Dupont	E.I.Dupont	SCE&G Williams	SCE&G Williams
Santee Cooper - Cross	Santee Cooper - Cross	--	American-LaFrance	C. R. BARD	Georgia-Pacific Russellville Resin	Georgia-Pacific Russellville Resin
MeadWestvaco	MeadWestvaco	--	C. R. BARD	BP-Amoco Cooper River	Alcoa - Mt. Holly	Alcoa - Mt. Holly
MeadWestvaco Chemical Division	MeadWestvaco Chemical Division	--	BP-Amoco Cooper River	Santee Cooper - Cross	American-LaFrance	American-LaFrance
Cogen South LLC	Cogen South LLC	--	Santee Cooper - Cross	Nucor Steel	BP-Amoco Cooper River	BP-Amoco Cooper River
Charleston Technical Center	Charleston Technical Center	--	Nucor Steel	Air Liquide Large	Santee Cooper - Cross	Santee Cooper - Cross
SCE&G Canadys	SCE&G Canadys	--	Air Liquide Large	Corning Inc.	Nucor Steel	Nucor Steel
Georgia Pacific Sawmill	Georgia Pacific Sawmill	--	Corning Inc.	DAK Americas LLC	Air Liquide Large	Air Liquide Large
Holcim Inc.	Holcim Inc.	--	DAK Americas LLC	MeadWestvaco	MeadWestvaco	MeadWestvaco
Georgia Pacific - MDF	Georgia Pacific - MDF	--	MeadWestvaco	Rhodia	Rhodia	Rhodia
--	--	--	Rhodia	Charleston AFB	SCE&G - Hagood	SCE&G - Hagood
--	--	--	Charleston AFB	SCE&G - Hagood	Kinder Morgan Bulk Terminals	Kinder Morgan Bulk Terminals
--	--	--	SCE&G - Hagood	Kinder Morgan Bulk Terminals	MeadWestvaco Chemical Division	MeadWestvaco Chemical Division
--	--	--	Kinder Morgan Bulk Terminals	MeadWestvaco Chemical Division	BASF North Charleston	BASF North Charleston
--	--	--	MeadWestvaco Chemical Division	Cogen South LLC	Cogen South LLC	Cogen South LLC
--	--	--	Cogen South	Charleston	Charleston	Charleston

Table 16 – Class II Full Impact Analysis – NAAQS Sources						
PM_{10} 24-Hour	**$PM_{2.5}$ 24-Hour**	**SO_2**	**NO_2 1-Hour**	**NO_2 Annual**	**CO 1-Hour**	**CO 8-Hour**
			LLC	Technical Center	Technical Center	Technical Center
--	--	--	Charleston Technical Center	SCE&G Canadys	Tri County Paving Inc.	Tri County Paving Inc.
--	--	--	SCE&G Canadys	Giant Cement	SCE&G Canadys	SCE&G Canadys
--	--	--	Giant Cement	Blue Circle Cement	Giant Cement	Giant Cement
--	--	--	Blue Circle Cement	Chamber Oakridge Landfill	Blue Circle Cement	Blue Circle Cement
--	--	--	Chamber Oakridge Landfill	Holcim Inc.	Chamber Oakridge Landfill	Chamber Oakridge Landfill
--	--	--	Holcim Inc.	Georgia Pacific - MDF	Holcim Inc.	Holcim Inc.
--	--	--	Georgia Pacific - MDF	--	Georgia Pacific - MDF	Georgia Pacific - MDF
--	--	--	--	--	Tri County Paving Inc.	Tri County Paving Inc.
SO_2 is not significant for PSD and is not included in any further PSD analysis.						

Table 20 shows that when proposed facility emissions are modeled with other sources in the SIA and SA, and background values are added, the National Ambient Air Quality Standards are not exceeded and compliance has been demonstrated.

Table 7 – National Ambient Air Quality Standards Class II Full Impact Analysis							
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration ($\mu g/m^3$)**	**Background Concentration ($\mu g/m^3$)**	**Total ($\mu g/m^3$)**	**Standard ($\mu g/m^3$)**	**% of Standard**
PM_{10}	24 Hour	AERMOD/ BLP	27.3	49	76	150	51
$PM_{2.5}$	24 Hour	AERMOD/ BLP	14.9	19.9	35	35	100
NO_2	1 Hour	AERMOD/ BLP	83.2	72.1	155.3	188	82
	Annual	AERMOD/ BLP	6.6	12.4	19	100	19

Table 7 – National Ambient Air Quality Standards Class II Full Impact Analysis							
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration (μg/m³)**	**Background Concentration (μg/m³)**	**Total (μg/m³)**	**Standard (μg/m³)**	**% of Standard**
CO	1 Hour	AERMOD/ BLP	15010.0	1450.3	16460.3	40,000	41
	8 Hour	AERMOD/ BLP	4488.2	916	5404.2	10,000	54
1) The highest-first-high modeled concentrations for the 5 years of Meteorological data are listed for annual averaging periods and the highest second-high for short-term averaging periods.							
2) Worst-case scenario considers maximized emission rate released from the existing roof vent LO1.							
3) Backgrounds are summarized in Section E.							
4) Controlling concentration is based on the 8th high averaged over the 5-years of modeling.							
5) The ambient ratio method value of 0.80 was applied to all of the modeled concentrations of NOx to obtain the final concentrations for NO_2.							

The dispersion parameters of each off-site source, as well as each respective modeled emission rate included in the Class II NAAQS Full Impact Analysis, is included in the facility's application (dated June 2011 and subsequent revisions and/or additions) and the corresponding electronic modeling files. Those tables were not re-produced for this summary.

Secondary particulate matter (PM) can form as a result of chemical reactions in the atmosphere of primary precursor emissions of SO_2 and NO_X to form ammonium sulfate and ammonium nitrate, respectively. The project will result in a net reduction of 342.7 tpy and a net increase of 324.6 tpy of NO_X emissions. In South Carolina, nitrate is a small contributor to $PM_{2.5}$ (less than 8%) according to IMPROVE measurements. Due to the relatively high average temperatures in South Carolina, nitrate formation is inhibited resulting in generally low nitrate formation rates. Sulfate is the largest contributor to $PM_{2.5}$ (41-46%) and organic carbon is second (35-41%). The project will reduce SO_2 emissions significantly (342.7 TPY), resulting in the benefit of decreased regional secondary sulfate formation and mitigating any project-related increase of nitrate. Because of the higher molecular weight of sulfate and the general unfavorable conditions for forming nitrate in the state, the net effects of the SO_2 reductions should completely offset any nitrate formation and produce a net benefit of reduced $PM_{2.5}$ as a result of the project.

A detailed listing of dispersion parameters of each source, as well as each respective modeled emission rate included in the Class II NAAQS Full Impact Analysis, is included in the facility's application (Dated June 2011 and subsequent revisions and/or

additions) and the corresponding electronic modeling files. Those tables were not re-produced for this summary.

7.1.2.2 PSD Class II – PSD Increment Analysis

The full impact analysis for PSD increment consuming sources is performed in the same manner as the full impact analysis for the NAAQS shown above. The sources included are all increment consuming sources from the facility and those previously identified within the SIA and SA.

Table 8 – PSD Class II Increment Analysis
SIA and 20D PSD Increment Consuming Sources

PM_{10} 24-Hour	$PM_{2.5}$ 24-Hour[(a)]	SO_2[(b)]	NO_X Annual
Allied Terminal	--	--	Medical University of South Carolina
Kinder Morgan Bulk Terminals	--	--	City of Chas. Plum Island Sludge Inciner
Macalloy Corporation	--	--	GS Roofing Products
Charleston AFB	--	--	SCE&G - Hagood
Medical University of South Carolina	--	--	Siebe North Inc.
GS Roofing Products	--	--	Charleston Steel & Metal Co.
SCE&G - Hagood	--	--	Kinder Morgan Bulk Terminals
Siebe North Inc.	--	--	Lockheed Martin Aeronautical
Charleston Steel & Metal Co.	--	--	Roper Hospital
Kinder Morgan Bulk Terminals	--	--	R.H. Johnson VA Medical Center
Lockheed Martin Aeronautical	--	--	Moore Drums
Roper Hospital	--	--	South Carolina Farm Bureau
R.H. Johnson VA Medical Center	--	--	Trident Medical Center
Moore Drums	--	--	Broyhill Furniture
South Carolina Farm Bureau	--	--	MeadWestvaco Chemical Division
Trident Medical Center	--	--	North Charleston Sewer Dist.
Chem-Marine Terminal	--	--	Foster Wheeler
Broyhill Furniture	--	--	The Scotts Company

Table 8 – PSD Class II Increment Analysis SIA and 20D PSD Increment Consuming Sources			
PM_{10} 24-Hour	**$PM_{2.5}$ 24-Hour[(a)]**	**SO_2[(b)]**	**NO_X Annual**
MeadWestvaco Chemical Division	--	--	BASF North Charleston
Siebe North Inc.-Butyl 2	--	--	ExxonMobil
North Charleston Sewer Dist.	--	--	Deytens Shipyards
Foster Wheeler	--	--	Carolina Starches
The Scotts Company	--	--	Bon Secours St. Francis Xavier
BASF North Charleston	--	--	Cogen South LLC
ExxonMobil	--	--	Palmetto Lime LLC
Deytens Shipyards	--	--	Charleston Technical Center
Metal Trades Inc.	--	--	Green Oasis Environmental
Bon Secours St. Francis Xavier	--	--	National Starch LLC
Cogen South LLC	--	--	SCE&G Faber Place
Charleston Marine Container	--	--	American Tank Fabrication Co.
Palmetto Lime LLC	--	--	Heritage Synfuel Binders
Charleston Technical Center	--	--	Vought Aircraft Industries Inc.
Green Oasis Environmental	--	--	Charleston County Detention Center
Vickers Inc.	--	--	Holset Engineering
Charleston Cement Company	--	--	Tri County Paving Inc.
National Starch LLC	--	--	Chamber Oakridge Landfill
SCE&G Faber Place	--	--	DBW Inc (formerly Lauscha Fiber International)
American Tank Fabrication Co.	--	--	SRE Dorchester
Heritage Synfuel Binders	--	--	Holcim Inc.
Cummins MerCruiser Diesel LLC	--	--	Carolina Pole Inc
Vought Aircraft Industries Inc.	--	--	V.P. Kiser Lumber Co. Inc.
Charleston County	--	--	Orangeburg County

Table 8 – PSD Class II Increment Analysis SIA and 20D PSD Increment Consuming Sources			
PM_{10} 24-Hour	**$PM_{2.5}$ 24-Hour[(a)]**	**SO_2[(b)]**	**NO_X Annual**
Detention Center			Biomass
Holset Engineering	--	--	Tri County Paving Inc.
Tri County Paving Inc.	--	--	Banks Construction Co.
Giant Cement	--	--	--
Blue Circle Cement	--	--	--
Westvaco Lumber Mill	--	--	--
Robert Bosch Corporation	--	--	--
Summerville Medical Center	--	--	--
Lauscha Fiber International-Summerville	--	--	--
Geocycle	--	--	--
Chamber Oakridge Landfill	--	--	--
Dausey	--	--	--
Raisio Staest US Inc	--	--	--
Cemplank Inc.	--	--	--
DBW Inc (formerly Lauscha Fiber International)	--	--	--
SRE Dorchester	--	--	--
Banks Construction Co.	--	--	--
Holcim Inc.	--	--	--
Georgia Pacific – MDF	--	--	--
Carolina Pole Inc	--	--	--
V.P. Kiser Lumber Co. Inc.	--	--	--
Lumber Components	--	--	--
Pennington Crossarm Co.	--	--	--
Orangeburg County Biomass	--	--	--
Tri County Paving Inc.	--	--	--
Sanders Brothers	--	--	--
Banks Construction Co.	--	--	--
(a) There are no increment consuming $PM_{2.5}$ sources other than those at the Showa Denko facility.			
(b) SO_2 is not significant for PSD and is not included in any further PSD analysis.			

The emissions from the Showa Denko facility project were combined with those from additional non-facility sources identified in Table 21 and included in the PSD Class II Full Impact Increment modeling analysis. Table 22 indicates that the maximum impact for each averaging period and each pollutant was determined to be less than the PSD increment standard for each averaging period.

Table 22 – Prevention of Significant Deterioration Class II Increment Analysis

Pollutant	Averaging Time	Model Used	Maximum Modeled Concentration ($\mu g/m^3$)	Standard ($\mu g/m^3$)	% of Standard
PM_{10}	24 Hour	AERMOD/BLP	27(1)	30	90
$PM_{2.5}$	24 Hour	AERMOD/BLP	5(2)	9	56
NO_2	Annual	AERMOD/BLP	2(2,3)	25	8

1) Worst-case scenario considers maximized emission rate released from the existing roof vent LO1.

2) Worst-case scenario considers maximized emission rate released from the existing scrubber stack MP68.

3) The ambient ratio method value of 0.80 was applied to all of the modeled concentrations of NO_X to obtain the final concentrations for NO_2.

The highest-first-high modeled concentrations for the 5 years of Meteorological data are listed for annual averaging periods and the highest second-high for other averaging periods.

7.2 Additional Impacts Analysis – Growth, Soils and Vegetation, and Visibility Impairment

PSD review requires an analysis of any potential impairment to visibility, soils, and vegetation that may occur as a result of the proposed or modified facility/sources. The review also requires an analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial, and other growth associated with the expansion.

7.2.1 Growth

The SC PSD rules require the applicant to provide information relating to the nature and extent of air quality impacts from all commercial, residential, industrial and other growth, which has occurred since August 7, 1977, in the area the facility, or modification, would affect. For the purposes of this report, the area the facility would affect is defined as the area of significant impact. The greatest significant impact distance was determined to be 6.27 km. The facility will hire approximately 140 new employees, and it is anticipated that the workforce will come from existing local population. The facility modifications will be completed by local contractors. Therefore, there will be little or no commercial or industrial growth associated with the construction and modification of the facility and any workforce growth associated

residential and commercial growth is not expected to cause or contribute a quantifiable adverse impact on local ambient air quality.

7.2.2 Soils and Vegetation

Maximum predicted offsite impacts (highest first high) were compared to EPA secondary NAAQS or screening levels. Modeling of all the proposed emissions for the soils and vegetation analysis indicates that there will be no adverse impacts expected on soils or vegetation caused by the proposed facility emissions.

The facility used the power law relationship to obtain concentrations for averaging periods which were not modeled and there were EPA screening values. This was taken from Chapter 5 of the EPA "Workbook of Atmospheric Dispersion Estimates", revised 1970.

X(t2) = X(t1)(t1/t2)0.2

X = concentrations

t2 = needed averaging period

t1 = other averaging period

However, the table below contains BAQ modeling results as demonstrated from the 5/25/2012 modeling analysis since the facility did not model for highest first high for all pollutants and averaging times. BAQ ran the actual averaging times in the model and did not use the "power law" equation as shown above. The maximum impacts were determined by summing the results of the AERMOD and BLP runs without using CALPOST to combine the outputs on an hour-of-day basis (except for the SO_2 1-hr, which used the Level 2b data). This is a more conservative approach. It is expected that the facility will be in compliance with all EPA screening concentrations since concentration changes related to the PSD revisions are minor and modeled concentrations in the original PSD modeling analysis are well below (less than 60% of) the screening concentrations for all pollutants and averaging periods. Thus, the soils and vegetation analysis is not updated in 2015, but Showa Denko would be in compliance if a modeling compliance demonstration was completed based on the original PSD modeling analysis.

Table 9 – Soils and Vegetation Analysis

Pollutant	Averaging Time	Model Used	Max. Impact (μg/m³)	Back-ground (μg/m³)	Facility / Regional Impact (μg/m³)(2)	EPA Screening Concentration (μg/m³)	AAQS Standard (μg/m³)	Exceeds
PM_{10}	24 Hour	AERMOD /BLP	15.1	47.0	59.6	N/A	150	No
	Annual	AERMOD /BLP	2.7(1)	17.2	19.9	N/A	50	No
$PM_{2.5}$	24 Hour	AERMOD /BLP	15.1	20.0	29.9	N/A	35	No
	Annual	AERMOD /BLP	2.4(1)	9.4	11.7	N/A	15.0	No
SO_2	1 Hour	AERMOD /BLP	Level 2b(1)	Level 2b	136.2	917	196	No
	3 Hour	AERMOD /BLP	126.3(1)	65.7	157.5	786	1300	No
	Annual	AERMOD /BLP	6.7(1)	3.1	9.9	18	80	No
NO_2	4 Hour	AERMOD /BLP	129	N/A	92.5	3760	N/A	No
	8 Hour	AERMOD /BLP	96(4)	N/A	80.5	3760	N/A	No
	1 Month	AERMOD /BLP	12(4)	N/A	32.6	564	N/A	No
	Annual	AERMOD /BLP	6.6	15.2	21.8	94	100	No
CO	1 Week	AERMOD /BLP	3713(1,4)	N/A	1947	1,800,000	N/A	No
Lead	3 Month	AERMOD /BLP	0.00002 (1,3)	0.006	0.006	0.15	--	No

1) This concentration includes only the facility impacts since this pollutant did not exceed the Significant Impact Levels, or no SIL was available. All other values include full impact sources.

2) Results include background values when available.

3) Lead is the maximum 3-month rolling average over the modeling period.

4) Used 1-hour averaging time results as a conservative comparison.

7.2.3 Visibility

This visibility impairment analysis is distinct from the Class I visibility impact analysis. The procedure consists of a screening process done through several levels. Visibility analyses for Class II areas are not necessary for this project, as there are no visibility sensitive areas located within any of the project's Significant Impact Areas (SIAs).

7.3 PSD Class I Impact Analysis

A facility within 100 km of a Class I area must perform a Class I modeling analysis to determine the impact on the Class I area. For the visibility and deposition analyses, the recommendations in the; 1) *Interagency Workgroup on Air Quality Modeling Phase II Summary Report and Recommendations for Modeling Long Range Transport Impacts (IWAQM)* (EPA-454/R-98-019, December 1998); 2) *Federal Land Managers' Air Quality Related Values Workgroup Phase I Report (FLAG 2010)* (U.S. Forest Service- Air Quality Program, the National Park Service – Air Resources Division, and the U.S. Fish & Wildlife Service – Air Quality Branch, December 2000); 3) *Regional Haze Regulations and Guidelines for Best Available Retrofit Technology* (U.S. EPA, June 15, 2005); and 4) U.S. EPA's *Guidelines on Air Quality Models (Guideline)*, are to be followed.

The 2010 version of the FLAG document allows the screening of sources based on total emissions of certain pollutants and distance from the source to the Class I area. When a source is screened out with Q/D ≤ 10 (where D = distance from the source to the Class I area in kilometers; Q = TPY of SO_2 + NO_X + PM_{10} + H_2SO_4), the facility is not required to do an AQRV analysis. For modified sources, applicants should only consider the emissions increases associated with the proposed project modification when calculating Q/D.

For this project, the source was below the screening level and no AQRV analysis was required. [Q/D = 8.9 ≤ 10 where D = 67 kilometers (Cape Romain) and Q = 599 TPY].

7.3.1 Class I Significant Impact Level Analysis

Table 24 shows the maximum impacts on Cape Romain for NO_2, PM_{10}, and $PM_{2.5}$. The air quality impacts are less than the Class I SILs for all pollutants. No further air modeling analyses are required to demonstrate compliance with the PSD increments.

Table 24 – Class I PSD Significant Impact Level Analysis					
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration (μg/m³)**	**SIL (μg/m³)**	**Significant Impact?**
PM_{10}	24 Hour	CALPUFF	0.05	0.32	No
	Annual	CALPUFF	0.002	0.16	No
$PM_{2.5}$	24 Hour	CALPUFF	0.05	0.07	No
	Annual	CALPUFF	0.002	0.06	No
NO_2	Annual	CALPUFF	0.005	0.1	No
Highest First-high values are shown for all pollutants and averaging periods.					
All PM_{10} was assumed to be $PM_{2.5}$ for this analysis.					

7.3.2 Class I Increment Consumption Impact Analysis

Table 25 shows the maximum impacts on Cape Romain for NO_2, PM_{10}, and $PM_{2.5}$ from the facility project emissions. The air quality impacts are less than the Class I SILs for all pollutants. No further air concentration analyses are required to demonstrate compliance with the PSD increments.

Table 25 – Class I PSD Increment Impacts Cape Romain National Wildlife Refuge						
Pollutant	**Averaging Time**	**Model Used**	**Year**	**Maximum Modeled Concentration (μg/m³)**	**Standard (μg/m³)**	**Exceeds Standard?**
PM_{10}	24 Hour	CALPUFF	2001	0.05	8.0	No
			2002	0.04	8.0	No
			2003	0.05	8.0	No
	Annual	CALPUFF	2001	0.002	4.0	No
			2002	0.002	4.0	No
			2003	0.002	4.0	No
$PM_{2.5}$	24 Hour	CALPUFF	2001	0.05	2.0	No
			2002	0.04	2.0	No
			2003	0.05	2.0	No
	Annual	CALPUFF	2001	0.002	1.0	No
			2002	0.002	1.0	No
			2003	0.002	1.0	No
NO_2	Annual	CALPUFF	2001	0.005	2.5	No
			2002	0.005	2.5	No
			2003	0.005	2.5	No
Highest First-high values are shown for all pollutants and averaging periods.						
Standards are from SC Regulation 61-62.5 Standard 7, Class I Area limits.						

7.4 South Carolina Facility-Wide Compliance Demonstration

All minor and major sources proposing new construction or construction modifications in South Carolina are required to demonstrate compliance with South Carolina Regulation No. 62.5 Standards Nos. 2 (NAAQS), 7 (Class II PSD Increment), and 8 (Air Toxics). Standard No. 7 (PSD) Part k - "Source Impact Analysis" and Part p - "Sources Impacting Federal Class I Areas - Additional Requirements" require Class II modeling. Facility-wide emissions from the Showa Denko facility only were modeled to demonstrate compliance with Standards 2, 7, and 8.

Table 26 – Standard No. 2 – Ambient Air Quality Standards Modeling Analysis

Pollutant	Averaging Time	Model Used	Maximum Modeled Concentration ($\mu g/m^3$) (1,9)	Background Concentration ($\mu g/m^3$)	Total ($\mu g/m^3$)	Standard ($\mu g/m^3$)	% of Standard
PM_{10}	24 Hour	AERMOD/ BLP	27.0	49	76	150	51
$PM_{2.5}$	24 Hour	AERMOD/ BLP	14.1(3)	19.9	34	35	97
	Annual	AERMOD/ BLP	3.5(5)	8.9	12	15	80
SO_2	1 Hour	AERMOD/ BLP	(7)	Level 2b	192(2,7)	196	98
	3 Hour	AERMOD/ BLP	151.9	40.5	192	1300	15
	24 Hour	AERMOD/ BLP	66.5	16.5	83	365	23
	Annual	AERMOD/ BLP	10.5	2.4	13	80	16
NO_2	1 Hour	AERMOD/ BLP	78.8(4,8)	72.1	151	188	80
	Annual	AERMOD/ BLP	4.4	12.4	17	100	17
CO	1 Hour	AERMOD/ BLP	15,027.0	1,450.3	16,477	40,000	41
	8 Hour	AERMOD/ BLP	4,486.5	916.0	5,403	10,000	54
Lead	3 Month	AERMOD/ BLP	0.00003(6)	0.006	0.0	0.15	0

1) The highest-first-high modeled concentration was used for annual averaging periods and the highest-second-high was used for all other averaging periods, except Lead and unless otherwise noted.

2) The highest 4th high was used.

3) The 8th high averaged over the five years of modeling was used.

Table 26 – Standard No. 2 – Ambient Air Quality Standards Modeling Analysis							
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration ($\mu g/m^3$) (1,9)**	**Background Concentration ($\mu g/m^3$)**	**Total ($\mu g/m^3$)**	**Standard ($\mu g/m^3$)**	**% of Standard**
4) Highest 8th high was used.							
5) The 1st high averaged over the five years of modeling was used.							
6) Lead is the maximum 3-month rolling average over the modeling period.							
7) Total impact is based on the sum of predicted and a background value that varies with season and hour-of-day.							
8) The ambient ratio method value of 0.80 was applied to all of the modeled concentrations of NO_X to obtain the final concentrations for NO_2.							
9) Worst-case scenario considers maximized emission rate released from the existing roof vent LO1.							

Table 27 – Background Monitoring Data ($\mu g/m^3$)									
Pollutant	**Site Name**	**County**	**Year**	**1-Hr**	**3-Hr**	**8-Hr**	**24-Hr**	**3-Mo**	**Annual**
PM_{10}	Jenkins Ave	Charleston	11-13				49		
$PM_{2.5}$	Charleston FAA	Berkeley	11-13				19.9		8.9
SO_2	Jenkins Ave	Charleston	10-12	Level 2b Or 47.1	40.5		16.5		2.4
NO_2	Jenkins Ave	Charleston	11-13	72.1					12.4
CO	Greenville CHD	Greenville	11-13	1450.3		916			
Pb	Jenkins Ave	Charleston	10-12					0.006	
Lead is the maximum 3-month rolling average over the three-year period. $PM_{2.5}$ annual is the three year design value, and the $PM_{2.5}$ 24-hour is based on the quarterly max. design value. PM_{10} 24-hr is the fourth-high over three-year period. Annual for pollutants other than $PM_{2.5}$ is the average of the annual averages over the three-year period. All other averaging periods are the average of the three year second-high values.									

Table 28 – Standard No. 7 – Class II PSD Modeling Analysis					
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration ($\mu g/m^3$) (1)**	**Standard ($\mu g/m^3$)**	**% of Standard**
PM_{10}	24 Hour	AERMOD/BLP	27(3)	30	90
	Annual	AERMOD/BLP	5(3)	17	29
$PM_{2.5}$	24 Hour	AERMOD/BLP	8(3)	9	89
	Annual	AERMOD/BLP	1(3)	4	25
SO_2	3 Hour	AERMOD/BLP	152	512	30
	24 Hour	AERMOD/BLP	67	91	74
	Annual	AERMOD/BLP	11	20	55
NO_2	Annual	AERMOD/BLP	1(2,4)	25	4

Table 28 – Standard No. 7 – Class II PSD Modeling Analysis					
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration (μg/m³) (1)**	**Standard (μg/m³)**	**% of Standard**
1) The highest-first-high modeled concentration was used for annual averaging periods and the highest-second-high was used for all other averaging periods.					
2) The ambient ratio method value of 0.80 was applied to all of the modeled concentrations of NO_X to obtain the final concentrations for NO_2.					
3) Worst-case scenario considers maximized emission rate released from the existing roof vent LO1.					
4) Worst-case scenario considers maximized emission rate released from the existing scrubber stack MP68.					

Since the Showa Denko facility is subject to Section 112(g) of the Clean Air Act and will be required to be in compliance with this regulation upon startup of the proposed project, the facility is exempt from Standard 8 and corresponding Standard 8 modeling requirements.

Table 29 – Standard No. 8 – Toxic Air Pollutants Analysis					
Pollutant	**CAS Number**	**Basis**	**Maximum Concentration (μg/m³)(1)**	**Standard (μg/m³)**	**% Of Standard**
Benzene	71-43-2	AERMOD	0.56	150.00	0
Carbon Disulfide	75-15-0	AERMOD	1.77	150.00	1
Hexane	110-54-3	AERMOD	0.16	900.00	0
Methyl Chloride	74-87-3	AERMOD	0.83	515.00	0
Polycyclic Organic Matter	+	AERMOD	29.89	160.00	19
1) Concentrations are rounded to two decimal places to compare to the standards.					
(+) There is no CAS number for this pollutant.					

Table 30 – Standard No. 8 – Toxic Air Pollutants Level I De Minimis Analysis			
Pollutant	**CAS Number**	**Emission Rate (lbs/day)(1,2)**	**De Minimis (lbs/day)**
1,4-Dioxane	123-91-1	0.570	5.400
Methylene Chloride	75-09-02	1.470	105.000
Toluene	108-88-3	3.720	24.000
Vinyl Acetate	108-05-4	0.650	2.1112
Xylene	1330-20-7	2.210	52.200
1) Emission rates are rounded to three decimal places to compare to the de minimis threshold.			
2) There is a small discrepancy between the lb/hr and the lb/day emission rates due to rounding.			

8.0 Case-by-Case Maximum Achievable Control Technology (MACT) Determination

SC Regulation 61-62.63, Section 63.43 applies to an owner/operator who constructs or reconstructs a major source of hazardous air pollutant (HAP) subject to a case-by-case determination of maximum achievable control technology (MACT) pursuant to SC Regulation 61-62.63, Section 63.42(c). When a case-by-case determination of MACT is required by Section 63.42, the owner or operator shall obtain from the BAQ an approved MACT determination according to Section 63.43(c). Section 112 of the Clean Air Act (CAA or Act) requires emission limits be established for source categories emitting HAPs in the form of MACT standards. The Section 112(g) provision is designed to ensure that emissions of HAPs do not increase if a facility is constructed or reconstructed before EPA issues a MACT for that particular category of sources for facilities. Section 112(g) applies to new or reconstructed sources and requires a case-by-case MACT determination when a MACT standard has not yet been promulgated under Section 112(d) of the Act.

The CAA requires an approach for setting standards for HAPs that includes the development of technology-based MACT standards. These standards are developed under the authorities of Section 112(d), 112(g), and 112(j) of the CAA. MACT standards are based on the performance of technology, and not on the health and environmental effects of HAPs. Section 112(f) of the CAA requires the EPA to set health-based standards eight years after a MACT standard is developed for each regulated source category to address any residual (or remaining) risk after MACT has been applied to provide an “ample margin of safety to public health.” Therefore, the Notice of MACT Approval (NOMA) will only address the available control technologies to reducing HAP emissions and does not address the health and environmental effects the HAP emissions may impose.

The United States Court of Appeals for the District of Columbia vacated 40 CFR 63.(f)(1) and 63.(h)(1). These two sections are part of a regulation, commonly referred to as the “General Provisions Rule”, that exempt sources from the requirement to comply with Section 112(d) emission limits during periods of startup, shutdown, and malfunction (“SSM”). The requirement to develop a written startup, shutdown, and malfunction plan in 40 CFR 63.6(e)(3) was not vacated from the General Provision Rule. Therefore, affected sources subject to the General Provision Rule are still required to comply with 40 CFR 63.6(e)(3).

Showa Denko manufactures graphite electrodes for use in the steel manufacturing industry at their Ridgeville, SC facility. The facility proposes to increase production of finished graphite electrodes from 45,000 metric tons per year to 85,000 metric tons per year. In doing this, some existing processes will be required for the new processes. Therefore, this project will be referred to as new construction/reconstruction. The proposed new construction/reconstruction has the potential to emit polycyclic organic matter (POM) which is a regulated HAP, VOC and SC toxic air pollutant (TAP), in amounts greater than 10 tons per year. POMs are also considered to be semi-volatile. Since the EPA has not promulgated a National Emission Standards for Hazardous Air Pollutants (NESHAP) for graphite electrode manufacturing where the facility is a major source of HAPs and the increased production consists of new or reconstructed processes that have the potential to emit a HAP in excess of the major source threshold, the facility must undergo a 112(g) determination.

Emissions

Showa Denko submitted an application to the BAQ to obtain a case-by-case MACT, also known as 112(g), determination for HAP emissions from the proposed new construction/reconstruction project. The application was deemed complete on June 30, 2011. In this project, the manufacturing processes will either be duplicated or have the existing annual throughputs modified. The processes are: Mill, Mix, and Extrusion (duplicate process), Bake/Rebake Process (duplicate process), Rebake Load (existing process only), Unload/Graphitizing Preparation (relocated existing process only), Bake Load and Unload and Baked Electrode Cleaning (existing process only), Pitch Impregnation (duplicate process), Insulating media Receiving (existing process only), Graphitizing (duplicate process), Cleaning and Inspection (existing process only), and Machining and Shipping (existing process only). This 112(g) determination has been prepared for the new construction/reconstruction with HAP emissions.

As discussed in the Preliminary Determination, Showa Denko manufactures graphite electrodes from two primary ingredients: needle coke (coke) and binder pitch. POM, is emitted from processing of the graphite electrodes in the autoclave and carbottom furnaces. Small amounts of HAPs from the insulating media (metallurgical coke) are emitted from the processing of graphite electrodes in the graphitizing furnaces. The facility proposes to install four (4) new mixers, cooling belts, homogenizer and a binder pitch tank (Equipment ID Nos. as listed below in Table 31) in the Mill, Mix and Extrusion process, fifteen (15) new carbottom furnaces (Equipment ID Nos. E-210-2-

4271-18 through E-210-2-4271-32) in the Bake/Rebake Process, one (1) new autoclave/spray cooler/cooling bath (Equipment ID No. E-310-2-4201) will be installed in the new Pitch Impregnation area, and ten (10) new graphitizing furnaces (Equipment ID Nos. E-460-4271-01 through E-460-4271-20), as a part of this new construction/reconstruction project.

Carbottom Furnaces

POM emissions are generated from the heating of binder pitch and the pyrolysis of these materials in the carbottom furnaces. POM emissions are controlled by the thermal oxidizers. POM emissions to the incinerators are determined from process weights of the electrodes before and after the bake/rebake process. The difference in the process weight pre and post the bake/rebake process is assumed to be POM materials exhausted to and combusted by the incinerators. However, a portion of the difference in the pre and post weight is due to the emissions of PM and SO_2 from the furnaces during heating, the reclaim of pitch accumulated in the kiln baskets, and accumulation of carbon in the sand located in the saggers. The recovered sand contains approximately 10% carbon.

The fumes in this process have a heat content of approximately 17,500 Btu/lb. Due to the generation of the fumes within the carbottom furnaces under elevated temperature, it is believed that a large portion of these fumes are combusted within the furnace prior to being exhausted to the incinerator. This is based on the diminished burner feed during the periods of high fume conditions while the furnace continues to increase in temperature along its programmed cycle. Unburned fumes from the carbottom furnaces are then exhausted to one of the two thermal oxidizers. The existing thermal oxidizer (Equip ID CE-210-01) maintains its oxidation chamber at 800 to 1,225 ^{o}C with excess air provided during the upper range of this scale. The retention time of this unit is greater than one second with a standard retention time of approximately 2.0 to 2.8 seconds. The existing backup thermal oxidizer (Equipment ID CE-210-02) operates at 800 to 1,100 ^{o}C and also utilizes excess air to control excess temperatures. The retention time of this unit as provided by the manufacturer is a minimum of one second.

Uncontrolled emissions for the carbottom furnaces are based on an electrode feed rate of 6.63 tons/hour for baked and 7.29 tons/hour for rebaked. The controlled emission rate was calculated based on a control device (thermal oxidizer) with 99% removal efficiency. Subsequently, POM emissions from the new carbottom furnaces are estimated to be 6,191 tons per year (uncontrolled) and 61.91 tons per year (controlled).

Autoclave/Spray Cooler/Cooling Bath

POM emissions from the autoclaves and spray coolers were based on a mass balance equation. The current facility-wide throughput of finished electrodes is 45,000 metric tons per year and the proposed project will result in an increase to 85,000 metric tons per year. This ratio was used in calculating the production rate on the proposed autoclaves and resulting POM emissions. Based on operation evaluation by Showa Denko, approximately 0.0965 tons of pitch is absorbed by each ton of electrode.

Uncontrolled emissions from the autoclave/cooling section are based on 54,427 tons/year of electrodes. The controlled emission rate was calculated based on a control device (thermal oxidizer) with 99% removal efficiency. Subsequently, POM emissions from the new autoclave/spray cooler/cooling bath are estimated to be 1,313 tons per year (uncontrolled) and 13.13 tons per year (controlled).

Small HAP Emission Units

In addition to the carbottom furnaces, autoclave/cooling section and graphitizing furnaces, other HAP-emitting sources have been identified. The new hot oil heaters, and preheater will generate low amounts of HAP emissions due to the combustion of natural gas, and propane. Small HAP emissions will also be generated from the insulating media handling equipment and the binder pitch tank.

All small HAP emission units has been given work practice standards.

Summary

POM emissions for the new sources were derived from the sample equations below. Tables 31 and 32 provide the estimated POM emission rates from the Mill, Mix, and Extrusion, Bake/Rebake, and Pitch Impregnation processes. Table 33 provides HAP emissions from the Graphitizing process.

Table 31 – Estimated HAP Emission Rates (Uncontrolled)

Equip ID	Description	Control Device ID	Stack ID	POM (lbs/hr)	POM (tons/yr)
Mill, Mix and Extrusion 110-2 (New)					
E-110-2-4253-01	Mixer No. 1	CD-110-4345-28	S-110-2-4349-03	0.71	3.12
E-110-2-4253-02	Mixer No. 2				
E-110-2-4253-03	Mixer No. 3				
E-110-2-4253-04	Mixer No. 4				
E-110-2-4221-10	Mixer Discharge Belt				

Table 31 – Estimated HAP Emission Rates (Uncontrolled)					
Equip ID	**Description**	**Control Device ID**	**Stack ID**	**POM (lbs/hr)**	**POM (tons/yr)**
E-110-2-4222-20	Screw Spreader				
E-110-2-4221-11	Cooling Belt position 1				
E-110-2-4221-12	Cooling Belt position 2				
E-110-2-4253-05	Homogenizer				
E-110-2-4221-13	Homogenizer Discharge Belt				
E-110-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	S-110-2-4349-01	-	-
E-110-25	Binder Pitch Tank	CD-110-14	S-110-14	3.96	0.30
			Total	4.67	3.42
Bake/Rebake Process 210-2 (New)					
E-210-2-4271-18/32	Carbottom Furnaces Nos. 18-32 + Incinerator	CD-210-2-4333-01	S-210-2-4333-01	1,414	6,191
			Total	1,414	6,191
Pitch Impregnation 310-2 (New)					
E-310-2-4272-21	Preheater (6.0 million Btu/hr x 2 zones)	N/A	S-310-2-4349-23/ S-310-2-4349-24	-	-
E-310-2-4201-01	Autoclave/spray cooler/cooling bath	CD-310-2-4333-01	S-310-2-4349-02	300	1,313
-	Thermal Oxidizer (Control Device)	CD-310-2-4333-01	S-310-2-4349-02	-	-
E-310-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	S-310-2-4349-01	-	-
			Total	300	1,313
			New Project Total	1,718.67	7,507.42

Table 32 – Estimated HAP Emission Rates (Controlled)					
Equip ID	**Description**	**Control Device ID**	**Stack ID**	**POM (lbs/hr)**	**POM (tons/yr)**
Mill, Mix and Extrusion 110-2 (New)					
E-110-2-4253-01	Mixer No. 1	CD-110-4345-28	S-110-2-4349-03	0.071	0.31
E-110-2-4253-02	Mixer No. 2				
E-110-2-4253-03	Mixer No. 3				
E-110-2-4253-04	Mixer No. 4				
E-110-2-4221-10	Mixer Discharge Belt				
E-110-2-4222-20	Screw Spreader				
E-110-2-4221-11	Cooling Belt position 1				
E-110-2-4221-12	Cooling Belt position 2				

Table 32 – Estimated HAP Emission Rates (Controlled)					
Equip ID	**Description**	**Control Device ID**	**Stack ID**	**POM (lbs/hr)**	**POM (tons/yr)**
E-110-2-4253-05	Homogenizer				
E-110-2-4221-13	Homogenizer Discharge Belt				
E-110-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	S-110-2-4349-01	-	-
E-110-25	Binder Pitch Tank	CD-110-14	S-110-14	0.40	0.03
			Total	0.471	0.34
Bake/Rebake Process 210-2 (New)					
E-210-2-4271-18/32	Carbottom Furnaces Nos. 18-32 + Incinerator	CD-210-2-4333-01	S-210-2-4333-01	14.17	62.08
			Total	14.17	62.08
Pitch Impregnation 310-2 (New)					
E-310-2-4272-21	Preheater (6.0 million Btu/hr x 2 zones)	N/A	S-310-2-4349-23/ S-310-2-4349-24	-	-
E-310-2-4201-01	Autoclave/spray cooler/cooling bath	CD-310-2-4333-01	S-310-2-4349-02	3.00	13.13
-	Thermal Oxidizer (Control Device)	CD-310-2-4333-01	S-310-2-4349-02	-	-
E-310-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	S-310-2-4349-01	-	-
			Total	3.00	13.13
			New Project Total	17.64	75.4

Table 33 – Estimated HAP Emission Rates					
Equip ID	**Description**	**Control Device ID**	**Stack ID**	**HAP (lbs/hr)**	**HAP (tons/yr)**
Graphitizing Furnaces E-460-4247-01/10 (New)					
E-460-4247-01/10	Graphitizing Furnaces (total of 10)	N/A	S-460-4349-03 / Roof Monitor	Utilizing metallurgical coke as the only insulating media or utilizing an alternate insulating media as approved by the Department	

112(g) Determination Approach

This 112(g) determination will establish MACT emission limits for the proposed expansion. Emission limits applicable to new sources will be the basis for this 112(g) determination since this is a new production unit at an existing plant site that inherently emits HAPs in amounts that exceed the major source threshold. Therefore, this analysis will evaluate only those HAP emissions resulting from the new Bake/Rebake, Pitch Impregnation, and Graphitizing processes.

MACT Requirements

The MACT emission limitation for new sources is defined in SC Regulation 61-62.63, Section 63.41 and in 40 CFR 63.41 as "the emission limitation which is not less stringent than the emission limitation achieved in practice by the best controlled similar source, and which reflects the maximum degree of reduction in emissions that the permitted authority, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable by the constructed or reconstructed major source." In determining the MACT emission limits, the BAQ must take into account all HAPs emitted from the proposed new construction/reconstruction project.

Similar Sources

SC Regulation 61-62.63.41(s) defines similar source as a stationary source or process that has comparable emissions and is structurally similar in design and capacity to a constructed or reconstructed major source such that the source could be controlled using the same control technology. The facility has identified similar manufacturing operations at Graftech in Columbia, Tennessee, Graftech in St. Mary, Pennsylvania, and SGL Carbon (SGL) in Morganton, North Carolina; however, a review of the operating permits indicated that POM limits have not been established for those sources. Similar sources were found at Graftech in Harrison County, West Virginia, SGL in Ozark, Arkansas, Metaullics Systems Division of Pyrotech, Inc. (Metaullics) in Sanborn, NY, and Showa Denko Carbon in Ridgeville, SC. Refer to Tables 34, 35, and 36, respectively for those findings.

Showa Denko currently has existing similar sources installed. Emissions limitations for the existing sources are tabulated in Table 37.

Table 34 – POM Emissions Limitations (Graftech, Harrison County, WV)		
Source Description	**Emission Rate (lbs/hr)**	**Emission Rate (tons/yr)**
Small carbottom furnace (2 million Btu/hr) controlled by thermal oxidizer (1.5 million Btu/hr)	0.3	0.51
Carbottom furnace nos. 1-3 (2.1 million Btu/hr, each) and two walk-in ovens (1 million Btu/hr, each) controlled by thermal oxidizer (3.5 million Btu/hr)	0.75	0.5
Carbottom furnace nos. 4-7 (2.1 million Btu/hr, each) controlled by thermal oxidizer (3.5 million Btu/hr)	0.75	0.5

Table 35 – POM Emissions Limitations (SGL Carbon, Ozark, AR)		
Source Description	**Emission Rate (lbs/hr)**	**Emission Rate (tons/yr)**
Eight carbottom furnaces controlled by thermal oxidizer (maximum of two furnaces firing simultaneously)	1.48	6.48
Pitch impregnation controlled by thermal oxidizer	0.5	2.19
Preheater No. 1	0.5	-
Preheater No. 2	1.0	-

Table 36 – POM Emissions Limitations (Metaullics Systems Division of Pyrotech, Inc., Sanborn, NY)	
Source Description	**Control Efficiency (%)**
Twelve electric and three natural gas-fired carbottom furnaces controlled by a natural gas-fired incinerator	99
Pitch impregnation controlled by a natural gas-fired incinerator	99

Table 37 – POM Emissions Limitations (Showa Denko Carbon, Inc., Ridgeville, SC)			
Source Description	**Emission Rate (lbs/hr)**	**Emission Rate (tons/yr)**	**Control Efficiency (%)**
Seventeen carbottom furnaces controlled by 15 million Btu/hr thermal oxidizer	0.41	1.78	99
6.1 million Btu/hr Feist-Icon Co. thermal oxidizer	0.08	0.36	99

In summary, Showa Denko has existing sources (carbottom furnaces) that are equipped with a control device (thermal oxidizer/fume incinerator) capable of achieving 99% efficiency. Additionally, research has identified other similar sources that are equipped with control equipment for HAPs.

The Primary Aluminum MACT (40 CFR 63, Subpart LL) was also reviewed by the facility for the similar source category. The primary aluminum manufacturing facilities manufacture green anodes, for the consumption in the aluminum pot lines. The green electrodes are preheated, baked and cooled in natural gas fired ring furnaces, and it takes around 28 days for the complete process. Fluid coke is utilized as a packing medium in the baking pits, to fill voids, enhance heat transfer and assist in providing an inert atmosphere during the baking process. Emissions consist of POM and other hydrocarbons from the heating and carbonization of the paste binder pitch, as well as hydrogen fluoride (HF) and particulate fluoride from the spent anode butts that are recycled from the potlines back into the anode production process. As such, this industry utilizes dry alumina scrubbers which have an estimated control efficiency of around 97% for HF and around 84% for POM. The dry alumina scrubbers also utilize alumina, a raw material in the actual manufacturing process, as a scrubbing media, and once it has been utilized in the scrubber it is added to the pot lines to produce molten aluminum. As such the utilization of such a scrubber system doesn't produce any reside, such as sludge. The baking process at Showa Denko has some significant differences to the processes of the primary aluminum manufacturing facilities, in that carbottom furnaces are utilized and sand is utilized as a packing medium for the electrodes. There are also no fluoride emissions from the process at Showa Denko, hence a different control technology is utilized in the form of a thermal oxidizer, which will combust the POMs and the exhaust gas at a 99% control efficiency, rather than utilizing a scrubber. As such, the control strategy utilized for the primary aluminum manufacturing is not transferable to Showa Denko's process. The primary aluminum industry doesn't have a rebake or a graphitizing process, hence those processes have not been discussed.

8.1 112(g) Determination

<u>Establishment of the Floor</u>

<u>Floor</u>

MACT floor for new sources means the emission limitation achieved in practice by the best controlled similar source. To establish the MACT floor, several sources were reviewed. Among them were the following:

(1) NESHAP regulations related to graphite electrode manufacturing were searched. No NESHAP regulations (area or major source) were identified as similar. In addition, information from the Control Technology Center developed pursuant to Section 113

of the CAA, the Aerometric Informational Retrieval System (AIRS), and the MACT database or 112(g) MACT Determination State Permit Engineers Clearinghouse were reviewed.

(2) The RBLC database was queried for all processes using POM as the only query variable. As shown in Table 38, the search resulted in the following processes: natural gas-fired duct burners, natural gas-fired turbine, and coal-fired boiler. The control technologies for POM emission control were listed as low sulfur natural gas and good combustion practices.

Table 38 – Case-by-Case MACT Determination Research

Process Type	Process Description
19.600	Duct Burners (DB-1 and DB-2)
15.110	Turbine, Combustion, Natural Gas
11.110	Boiler, Pulverized Coal

The RBLC database was also queried using a SIC code of 3624. Carbottom furnaces equipped with thermal oxidization (afterburner) were identified, but no similar sources for the autoclave/cooling section were identified.

(3) Information on air releases is contained in the AIRS, a computer-based repository for information about air pollution in the United States. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. The AIRS database was searched using a SIC code of 3624. No similar sources were found with add-on control equipment. Also, the 112(g) MACT Determination State Permit Engineers Clearinghouse revealed no similar sources.

(4) Additional research was conducted via internet searches for control technologies used at similar manufacturing operations. Air operating permits were reviewed for SGL in Morganton, Graftech in Harrison County, Metaullics in Sanborn, and Showa Denko Carbon in Ridgeville. Emissions from the autoclaves at Graftech are controlled by an electrostatic precipitator (ESP). The autoclaves at SGL and Metaullics are not equipped with any control device.

(5) Thermal Oxidizer

Thermal oxidation is the process of oxidizing combustible materials by increasing the temperature of the material above its auto-ignition point in the presence of oxygen, and maintaining it at a high temperature for sufficient time to complete combustion to carbon dioxide (CO2) and water. Time, temperature, turbulence (for mixing), and the availability of oxygen all affect the rate and efficiency of the combustion process. There are three basic types of thermal oxidation systems: direct flame, recuperative, and regenerative. Direct flames systems have been used to control POM emissions, and Showa Denko is currently utilizing thermal oxidizers on their existing carbottom furnaces for the control of POM. Thermal oxidizers are deemed technically feasible for the carbottom furnaces and autoclave/cooling section.

(6) Insulating Media

Showa Denka is currently utilizing metallurgical coke as the insulating media for its graphitizing furnaces. An analysis of the metallurgical coke indicated that small amounts of HAP emissions were present, in particular mercury and chromium. Petroleum coke is utilized at other facilities as an insulating media.

Alternate materials may be utilized by Showa Denko as insulating media, if the HAP content of all regulated HAP pollutants in the alternate insulating media, is less than or equal to the HAP content in the metallurgical coke.

Table 39 – MACT Floor Emission Limitations (POM)

New Process/Source	Controls	Emission Limit (lb/hr)	Control Efficiency (%)
Mill, Mix and Extrusion	N/A	0.071 lb/hr (total from Dry Fume Scrubber/Baghouse)	N/A
Mill, Mix and Extrusion	Work practice standards for the vent condenser, controlling the Binder Pitch Tank	N/A	N/A
Bake/Rebake (Carbottom Furnaces)	Thermal Oxidizer	14.17	99
Pitch Impregnation (Autoclaves/Spray Cooler/Cooling bath)	Thermal Oxidizer	3.00	99
Graphitizing Furnaces	Utilizing metallurgical coke as the only insulating media or utilizing an alternate	N/A	N/A

Table 39 – MACT Floor Emission Limitations (POM)			
New Process/Source	**Controls**	**Emission Limit (lb/hr)**	**Control Efficiency (%)**
	insulating media as approved by the Department		

Beyond the MACT Floor

After determining the "MACT floor," the BAQ must consider possible "beyond the floor" control technologies and emission limitations. The term "beyond the floor" signifies an emission limit more stringent than the limit established as the floor that can be achieved through further application of technology or other capability. Three factors must be taken into consideration: (a) the cost of achieving further reductions, (b) any non-air quality health and environmental impacts of achieving further reductions, and (c) energy requirements of achieving further reductions.

Showa Denko provided information on three (3) available control technologies that were considered for possible further POM emissions reductions beyond the floor. They are: baghouse, electrostatic precipitator (ESP), and wet scrubber.

(1) Baghouse

A baghouse (also known as fabric filter) consists of one or more isolated compartments containing rows of fabric bags in the form of round, flat, or shaped tubes, or pleated cartridges. Particle-laden gas passes up (usually) along the surface of the bags and the cleaned gas stream is vented to the atmosphere. The filter is operated cyclically, alternating between relatively long periods of filtering and short periods of cleaning. During cleaning, dust that has accumulated on the bags is removed from the fabric surface and deposited in a hopper for subsequent disposal.

Baghouses have been widely applied to control PM emissions from various sources. The maximum inlet temperature for a baghouse ranges from 275 – 500°F depending on the type of bag that is used. The exhaust gas temperature for the carbottom furnaces is 1,400 – 2,300°F and greatly exceeds this range. The exhaust gas temperature for the autoclave/cooling section at 480°F is on the upper range of an acceptable temperature. Therefore, baghouses are deemed not technically feasible for controlling POM for the carbottom furnaces and autoclave/cooling section.

(2) ESP

ESPs have been widely applied to control PM emission from various sources in industrial settings. One of the advantages of the ESP is its ability to handle large volumes of gas at elevated temperatures if necessary with a reasonably small pressure drop and the removal of particles in the micrometer range. Inlet air flows for ESPs range from 1,000 to 1,000,000 standard cubic feet per minute (scfm). Based on information provided by the control equipment supplier, dry ESPs are much larger than wet ESPs and require much larger ductwork and supports. Therefore, cost estimates were obtained for wet ESPs for the autoclave/cooling section. ESPs are deemed not technically feasible for the carbottom furnaces due to the exhaust gas temperature exceeding the maximum inlet temperature for ESPs.

(3) Wet Scrubber

Different types of wet scrubbers (including condensation scrubbers, fiber bed scrubbers, impingement plate/tray tower scrubbers, mechanically-aided scrubber, orifice scrubber, packed bed/packed tower scrubbers, spray chamber/spray tower scrubbers and venture scrubbers) have been widely applied to control PM emissions from various industrial sources. Inlet air flows for wet scrubbers range from 1,000 to 100,000 scfm. Wet scrubbers can handle inlet gas temperatures of 40 ^{o}F-750 ^{o}F.

Wet scrubbers are deemed not technically feasible for the carbottom furnaces, since the exhaust gas temperature of the carbottom furnaces exceeds the maximum inlet temperature for wet scrubbers. Based on conversation with the equipment vendor, Beltran Technologies, Inc., a wet scrubber is not technically feasible for the autoclaves, due to the low VOC concentration and high volumetric flow rate of the exhaust gas.

In summary, installation and operation of add-on control equipment to control POM emissions from the carbottom furnaces and autoclave/spray cooler/cooling bath, as a beyond-the floor requirement are deemed not technically feasible.

8.2 Proposed MACT Limits and Requirements

Several similar sources have been identified that have hourly and annual

emission limitations for carbottom furnaces and pitch impregnation. These sources were also controlled by thermal oxidizer with 99% removal efficiency. Showa Denko has proposed a thermal oxidizer as the MACT control and 99% control efficiency as the MACT limit for the carbottom furnaces and autoclave/cooling section. Showa Denko has proposed the utilization of metallurgical coke only as the packing medium for the graphitizing furnaces.

The BAQ has made an initial decision to approve Showa Denko's application for a MACT determination subject to the terms and conditions set forth in this NOMA. SC Regulation 61-62.63, Section 63.43(g) establishes that the BAQ will determine a MACT emission limitation or standard and include it along with any specific notification, operation and maintenance, performance testing, monitoring, reporting and recordkeeping requirements in a NOMA.

In conformity with the general principles of MACT determinations set forth in SC Regulation 61-62.63, Section 63.43(d), the BAQ's determination includes whether the MACT emission limitations or requirements recommended by the applicant and approved by the BAQ are not less stringent than the emission control which is achieved in practice by the best controlled similar source. The BAQ's determination is based upon available information on emission limitations and control technology, taking into consideration the associated costs of achieving such emission reduction and any non-air quality health and environmental impacts and energy requirements.

1. Emission Limits

a. Pursuant to 40 CFR 63.43(g) and SC Regulation 61-63.43(g)(1) MACT determination, the owner/operator shall not discharge or cause to be discharged into the atmosphere any emissions of POM in excess of the limits in Table 40.

Table 40 – MACT Emission Limitations (POM)

New Process/Source	Emission Limit	Emission Limit (lb/hr)	Control Efficiency (%)
Mill, Mix and Extrusion	N/A	0.071 lb/hr (total from Dry Fume Scrubber/Baghouse)	N/A
Mill, Mix and Extrusion	Work practice standards for the vent condenser, controlling the Binder Pitch Tank	N/A	N/A

Table 40 – MACT Emission Limitations (POM)			
New Process/Source	**Emission Limit**	**Emission Limit (lb/hr)**	**Control Efficiency (%)**
Bake/Rebake (Carbottom Furnaces)	N/A	14.17	99
Pitch Impregnation (Autoclaves/Spray Cooler/Cooling bath)	N/A	3.00	99
Graphitizing Furnaces	Utilizing metallurgical coke as the only insulating media or utilizing an alternate insulating media as approved by the Department	N/A	N/A

2. General Compliance Requirements

a. The owner/operator must be in compliance with the emissions limitations in Table 40 including operating limits, at all times. Compliance is demonstrated when the emission rate of POM is equal to or less than the emission limit in Table 40 and when the insulating media of the graphitizing furnaces is metallurgical coke only.

b. The owner/operator must always operate and maintain each carbottom furnaces and autoclave/spray cooler/cooling bath including air pollution control and monitoring equipment, according to the provisions in 40 CFR 63.6(e)(1)(i).

c. The owner/operator must develop a written startup, shutdown, and malfunction plan, as outlined in 40 CFR 63.6(e)(3), that describes, in detail, procedures for operating and maintaining each carbottom furnaces and autoclave/spray cooler/cooling bath during periods of startup, shutdown, and malfunction; and a program of corrective action for malfunctioning process, air pollution control, and monitoring equipment used to comply with the emission limitations in Table 40. The startup, shutdown, and malfunction plan does not need to address any scenario that would not cause either equipment to exceed an emission limitation. This plan must be developed by the owner/operator by startup. During periods of startup, shutdown, and malfunction, the owner/operator must operate each carbottom furnaces and autoclave/spray cooler/cooling bath in accordance with the startup, shutdown, and malfunction plan.

d. The carbottom furnaces and autoclave/spray cooler/cooling bath are permitted to

burn only natural gas or propane (back-up) as fuel. The use of any other substances as fuel is prohibited without prior written approval from the Bureau of Air Quality.

3. Initial Compliance Requirements

In order to demonstrate initial compliance with the emissions limitations in Table 40, the owner/operator must conduct an initial performance tests, establish a 3-hour block average minimum operating temperature, and conduct monitoring equipment performance evaluations within 60 days after achieving the maximum production rate at which the facility will be operated, but not later than 180 days after initial startup.

During the initial performance test, the facility must continuously monitor the firebox temperature during each of the required 1-hour test runs. The facility may measure the temperature in multiple locations (e.g., one location per burner) in the combustion chamber and calculate the average of the temperature measurements prior to reducing the temperature data to 15-minute averages for purposes of establishing the minimum firebox temperature. The minimum firebox temperature must then be established as the average of the three minimum 15-minute firebox temperatures monitored during each of the three 1-hour test runs.

Table 41 – Initial Compliance Requirements

Pollutant	Emission Limit	Method
POM	0.071 lb/hr (total) (Mill, Mix and Extrusion)	As Approved by the Bureau
HAP	Work practice standards consisting of the inspection and cleaning of the condenser coils on a semiannual basis (Binder Pitch Tank)	Recordkeeping
POM	14.7 lb/hr (carbottom furnaces)	As Approved by the Bureau
POM	3.00 lb/hr (autoclave/cooling section)	As Approved by the Bureau
HAPs	Utilizing metallurgical coke as the only insulating media or utilizing an alternate insulating media as approved by the Department (Graphitizing Furnaces)	Recordkeeping

4. Continuous Compliance Requirements

Pursuant to 40 CFR 63.43 (g)(2)(ii) and SC Regulation 61-63.43(g)(2), the owner/operator shall conduct the following monitoring to assure continuous compliance with the applicable emission limitations in Table 40.

Table 42 – Continuous Compliance Requirements	
Pollutant/Parameter	**Monitoring**
Work practice standards consisting of the inspection and cleaning of the condenser coils on a semiannual basis (Binder Pitch Tank)	Recordkeeping
Dry Fume Scrubber/Baghouse(Mill, Mix and Extrusion)	Rotary vane rpm (coke flow) and fan amperage (air flow)
POM (thermal oxidizers)	Source Tests as specified below
Thermal Oxidizer Temperature (Carbottom Furnaces)	Continuous temperature monitoring
Thermal Oxidizer Temperature (autoclave/cooling section)	Continuous temperature monitoring
Utilizing metallurgical coke as the only insulating media or utilizing an alternate insulating media as approved by the Department (graphitizing furnaces)	Recordkeeping

To demonstrate continuous compliance with the POM emission limitations in Table 40, the owner/operator will record the 3-hour block average of all recorded readings, calculated after every 3 hours of operation as the average of the evenly spaced recorded readings in the previous 3 operating hours and maintain the 3-hour block average temperature above the minimum temperature established during the performance test.

A source test of the Fume Incinerator and the Thermal Oxidizer needs to be performed every three (3) years after the initial performance test. Less frequent source testing for POM from these two sources can be conducted if at least two (2) consecutive performance tests show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source or air pollution control equipment that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test must be conducted during the fifth year and no more than 60 months after the previous performance test.

5. Monitoring Installation, Operation, And Maintenance Requirements

Each continuous parameter monitoring system (CPMS) must be capable of completing a minimum of one cycle of operation (sampling, analyzing, and recording) for each successive 15-minute period.

At all times, you must maintain the monitoring equipment including, but not limited to, maintaining necessary parts for routine repairs of the monitoring equipment.

Record the results of each inspection, calibration, and validation check.

For each temperature monitoring device, the facility must meet the following requirements:

(1) Locate the temperature sensor in a position that provides a representative temperature.

(2) Use a temperature sensor with a minimum accuracy of 4°F or 0.75 percent of the temperature value, whichever is larger.

(3) Perform an electronic calibration at least semiannually according to the procedures in the manufacturer's owners manual. Following the electronic calibration, conduct a temperature sensor validation check in which a second or redundant temperature sensor placed nearby the process temperature sensor must yield a reading within 30°F of the process temperature sensor's reading.

(4) Conduct calibration and validation checks any time the sensor exceeds the manufacturer's specified maximum operating temperature range or install a new temperature sensor.

(5) At least quarterly, inspect all components for integrity and all electrical connections for continuity, oxidation, and galvanic corrosion.

Appendix A – Class I Area Map

No Class I Area was effected

Appendix B – Site Location Map

Google Earth

miles 1

km 1

Appendix C – PSD Permit Application

GEL Engineering LLC

Environmental | Engineering | Surveying

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CONSTRUCTION PERMIT APPLICATION

GASEOUS ORGANIC EMISSIONS FROM GRAPHITIZING

SHOWA DENKO CARBON, INC.
RIDGEVILLE, SOUTH CAROLINA

Submitted to:

SCDHEC-BAQ
2600 Bull Street
Columbia, South Carolina 29201

Prepared by:
GEL Engineering, LLC
Post Office Box 30712
Charleston, South Carolina 29417

December 2016

CONSTRUCTION PERMIT APPLICATION

GASEOUS ORGANIC COMPOUND EMISSIONS FROM GRAPHITIZING

SHOWA DENKO CARBON, INC.
RIDGEVILLE, SOUTH CAROLINA

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Permit Application Forms

DHEC Form 2566	Facility Information
DHEC Form 2567	Equipment/Processes
DHEC Form 2569	Emissions
DHEC Form 2570	Regulatory Review
DHEC Form 2573	Emission Point Information

Appendices

I Assumptions and Calculations for Gaseous Organic Emissions from Graphitizing

II Assumptions and Calculations for Speciated Non-Methane Gaseous Organic Emissions from Graphitizing; South Carolina Standard No. 8 De Minimis Modeling Analysis

III Best Available Control Technology Supplement

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 16933 John W. McLure IV

John W. McLure IV 12/15/16

John W. McLure IV, P.E.
South Carolina Registration No. 16933

SOUTH CAROLINA GEL ENGINEERING, LLC No. C02649 CERTIFICATE OF AUTHORIZATION

GEL Engineering, LLC
Certificate of Authorization No. C02649

CONSTRUCTION PERMIT APPLICATION SUMMARY
GASEOUS ORGANIC EMISSIONS FROM GRAPHITIZING

SHOWA DENKO CARBON, INC.
RIDGEVILLE, SOUTH CAROLINA

1.0 OVERVIEW OF PERMIT APPLICATION

Showa Denko Carbon, Inc. (Showa Denko) operates a graphite electrode manufacturing facility located in Ridgeville, South Carolina. Showa Denko is submitting this construction permit application to:

1) Document identified gaseous organic emissions from the Existing Graphitizing process at the facility, and
2) Update the Prevention of Significant Deterioration (PSD) construction permit for the PFC-75 project (0900-0025-CZ) to include gaseous organic emissions from the New Graphitizing process.

The majority of the gaseous organic emissions from the Graphitizing process have been identified in the form of the greenhouse gas (GHG) methane. While methane is not a regulated volatile organic compound (VOC), indications are that a portion of the gaseous organic emissions from the Graphitizing process are in the form of VOCs and hazardous air pollutants (HAPs). Further information on these emissions is presented in the Assumption and Calculations section (Appendices I and II) of this submittal.

A detailed description of the Graphitizing process is provided in Section 2.0. A narrative summary of state and federal regulations that could apply to the potential gaseous organic emissions from the Graphitizing process is provided in Section 3.0.

2.0 DESCRIPTION OF THE GRAPHITIZING PROCESS

The Existing Graphitizing process is located in Building 430 and includes 27 furnaces. The New Graphitizing process is located in Building 460 and includes eight furnaces installed as part of the PFC-75 project. The Graphitizing process changes the crystalline structure of electrodes. Electrodes are placed in the Graphitizing furnaces horizontally and end-to-end on a bed of packing/insulating material (metallurgical coke), making two parallel columns. The two columns are then connected into a direct current (DC) circuit. The electrodes are covered with additional insulating material for thermal insulation and electricity is applied to "fire" the electrodes.

After completion of the firing cycle, the insulating material is allowed to cool to a temperature at which it can be removed from the furnace. The graphite electrodes are then transferred for cleaning and inspection. The insulating material is sorted to remove fines which are unusable in the furnaces. Coarse materials are reused in the furnaces.

As part of the PFC-75 project, wet scrubbers were installed on both the Existing and New Graphitizing processes for control of sulfur dioxide (SO_2) emissions.

The PFC-75 PSD construction permit application included documentation on emissions of the following pollutants from the Graphitizing process:

- Particulate matter
- Particulates with aerodynamic diameter of less than or equal to 10 microns
- Particulates with aerodynamic diameter of less than or equal to 2.5 microns
- Carbon monoxide
- Nitrogen oxides (NO_x)
- SO_2
- The GHG carbon dioxide (CO_2)

As noted in Section 1.0 above, this construction permit application includes documentation on recently identified gaseous organic emissions from the Graphitizing process, including:

- The GHG methane
- VOCs, including the HAPs chloromethane, carbon disulfide, hexane, benzene, 1,4-dioxane, toluene, xylenes, methylene chloride, and vinyl acetate.

Assumptions and Calculations for the gaseous organic emissions from the Graphitizing process are provided in Appendices I and II.

3.0 SUMMARY OF REGULATORY COMPLIANCE

This section addresses the following regulations with respect to the gaseous organic emissions identified from the Graphitizing process.

- South Carolina Volatile Organic Compounds Standard (R.61-62.5, Standard No. 5)
- South Carolina Prevention of Significant Deterioration (PSD) Standard (R.61-62.5, Standard No. 7)
- Greenhouse Gas Tailoring Rule
- South Carolina Toxic Air Pollutants Standard (R.61-62.5, Standard No. 8)
- National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61)
- National Emission Standards for Hazardous Air Pollutants for Source Categories (40 CFR Part 63)

South Carolina Volatile Organic Compounds Standard (Standard No. 5)

The South Carolina Volatile Organic Compounds Standard (R.61-62.5, Standard No. 5) applies to specific existing industrial sources constructed before July 1, 1979 or July 1, 1980, that have total potential VOC emissions of more than 550 pounds in any one day or more than 150 pounds in any one hour. This standard applies to existing processes statewide except in the following six counties: Anderson, Bamberg, Barnwell, Chesterfield, Darlington, and Hampton (Standard No. 5, Part B.1). This standard is not applicable since both the Existing (1983) and New Graphitizing processes were constructed after July 1, 1980.

South Carolina PSD Standard (Standard No. 7) – Major Source Review and Best Available Control Technology (BACT) Analysis for VOCs

The PFC-75 project underwent PSD evaluation for VOC emissions, including a BACT Analysis for new VOC emission sources. (Table 1)

Based on available information, no VOC emissions were identified for the Graphitizing process. Based upon the raw materials and the temperatures at which these materials are processed prior to being introduced to the Graphitizing operations, there was no expectation for the emission of VOCs.

Based upon recent information, Showa Denko has identified potential gaseous organic emissions associated with the Graphitizing operations. Based on recent test results from Existing Graphitizing, potential VOC emissions from New Graphitizing (once it is placed into

operation) are projected at approximately 14.4 tpy, and the PSD Applicability Analysis in Table 1 has been updated accordingly. A BACT Supplement is provided to address VOC emissions from New Graphitizing and is included as Appendix III.

The BACT analysis and considerations for control of VOC emissions from New Graphitizing is analogous to the rationale previously provided for the facility that has already been approved by the DHEC in 2012, in the determination associated with PSD construction permit 0900-0025-CZ. A regenerative thermal oxidizer (RTO) is technically feasible for control of VOC emissions from New Graphitizing but only from a functional aspect, and not from the perspective of ability to provide beneficial environmental impact control.

South Carolina is a NO_x-limited state with respect to ozone formation. The control of VOC emissions, in this case 14.1 tpy, would result in emissions of 5.58 tpy of NO_x from natural gas combustion in an RTO and thus, does not provide a net positive environmental benefit. In controlling VOC emissions, there would be a greater new formation of ozone as the result of new NO_x emissions from emission controls.

GHG Tailoring Rule – Major Source Review and BACT Analysis for GHGs

During Phase II implementation of the GHG Tailoring Rule, a new industrial source that is major for criteria pollutants and will emit or have the potential to emit 75,000 tpy CO_2 equivalents (CO_{2e}) will be subject to PSD permitting requirements for GHGs. The PFC-75 project is a major source of the traditional non-GHG PSD pollutants. Therefore, the 2012 PSD construction permit application included a BACT analysis for each of the new GHG emission sources to be installed as part of the PFC-75 project.

The BACT Analysis submitted in 2012 includes emissions of the GHG CO_2 from New Graphitizing. As explained above, based on available information, no methane GHG emissions were expected for the Graphitizing process. Therefore, the GHG BACT Analysis did not include methane emissions from New Graphitizing.

New information identified gaseous organic emissions. Based on recent source test results from Existing Graphitizing, potential methane emissions from New Graphitizing (once it is placed into operation) are projected at approximately 104.5 tpy (2,612 tpy CO_{2e}), and the PSD Applicability Analysis in Table 1 has been updated accordingly. A BACT Supplement has been prepared to address methane emissions from New Graphitizing and is included as Appendix III.

The BACT analysis and considerations for control of methane emissions from New Graphitizing is analogous to the rationale previously provided for the facility that has already been approved by the DHEC in 2012 in the determination associated with PSD construction permit 0900-0025-CZ. An RTO is technically feasible for control of methane emissions from New Graphitizing but only from a functional aspect, and not from the perspective of ability to provide beneficial environmental impact control. To control 104.5 tpy methane emissions (2,612 tpy CO_{2e}) from New Graphitizing, the combustion of natural gas in an RTO would result in 6,739 tpy CO_{2e} emissions. An RTO would emit more GHGs than it will control. An RTO would also emit NO_x and other criteria pollutants.

South Carolina Toxic Air Pollutants Standard (Standard No. 8)

Under the South Carolina Toxic Air Pollutants Standard (R.61-62.5, Standard No. 8), Showa Denko has identified and quantified emissions of South Carolina TAPs from the facility as compared with established ambient air quality standards for these TAPs. This regulation establishes values for approximately 255 TAPs, including most of the 187 HAPs established by Title III of the Clean Air Act Amendments.

Based on the results of recent tests, nine South Carolina TAPs may be emitted from the Existing and New Graphitizing processes at Showa Denko. A de minimis analysis for these potential TAP emissions is included in Appendix II. This analysis indicates that facility-wide emissions of five toxic air pollutants (1,4-dioxane, toluene, xylenes, methylene chloride, and vinyl acetate) would be below the de minimis levels established by DHEC, while facility-wide emissions of four TAPs (chloromethane, carbon disulfide, hexane, and benzene) require further analysis.

Based on the results of the de minimis modeling analysis, Showa Denko has engaged Exponent to prepare a Standard No. 8 modeling compliance demonstration for chloromethane, carbon disulfide, hexane, and benzene emissions. Based on the minimal hourly emission rates, the modeling results are expected to be well below Standard No. 8 ambient air limits. Exponent's modeling results will be submitted to DHEC in mid-January 2017.

National Emission Standards for HAPs (40 CFR Part 61)

Title 40 of the Code of Federal Regulations Part 61 (40 CFR Part 61) establishes National Emission Standards for Hazardous Air Pollutants (NESHAPs) in Subparts A through FF. None of the NESHAPs found in 40 CFR Part 61 apply to the Graphitizing process at Showa Denko.

National Emission Standards for HAPs for Source Categories (40 CFR Part 63)

Title 40 of the Code of Federal Regulations Part 63 (Section 112 – 40 CFR Part 63) establishes technology-based regulations for specific source categories emitting any of the 187 compounds designated by EPA as HAPs. None of the MACT source categories apply to the Graphitizing process at Showa Denko.

National Emissions Standards for HAPs – Case-by-Case MACT Section 112(g)

Under relevant circumstances, 40 CFR Part 63, provides for evaluation of case-by-case MACT "[t]o fabricate, erect, or install at any developed site a *new process or production unit* which *in and of itself* emits or has the potential to emit 10 tons per year of any HAP or 25 tons per year of any combination of HAP…" 40 CFR Part 63.41 (Definition of Construct a major source) (emphasis added). Under 40 CFR Part 63.41 (§ 63.41 Definitions), *"process or production unit"* is defined as *"any collection of structures and/or equipment, that processes assembles, applies, or otherwise uses material inputs to produce or store an intermediate or final product. A single facility may contain more than one process or production unit."*

New Graphitizing would be considered an individual "process or production unit" as defined at § 63.41. It produces a distinct intermediate or product at the facility. Emissions information from the October 2016 source test program in Existing Graphitizing indicates that HAP emissions from New Graphitizing (once it is placed into operation) will be below the 10 tpy single HAP and 25 tpy combination of HAPs thresholds. Therefore, Section 112(g) need not be applied to New Graphitizing for consideration in this situation.

However, even if Section 112(g) is considered applicable and evaluated for New Graphitizing, no additional emission controls would be warranted based upon the following considerations:

- Section 7.D (page 53) of the PSD Construction Permit contains a MACT Determination/Work Practice Standard for the New Graphitizing furnaces: *"Utilizing metallurgical coke as the only insulating media or utilizing an alternate insulating media as approved by the Department."* Showa Denko will operate the New Graphitizing furnaces in accordance with this permit condition.

- No other sources in Showa Denko's source category were previously identified as controlling volatile HAP emissions from Graphitizing furnaces.
- The October 2016 source test program indicates that volatile HAPs (i.e. VOCs) are emitted from Graphitizing. The control technology evaluation completed for VOC and methane emissions identified an RTO as the only technically feasible control technology for these emissions. However as previously explained and addressed below, an RTO is feasible only from a functional aspect, and not from the perspective of ability to provide any beneficial environmental impact control.

  From an economic perspective, the cost per ton of pollutant controlled is high ($93,210 per ton of VOC controlled). From an environmental perspective, there are substantial adverse impacts. South Carolina is a NO_x-limited state with respect to ozone formation. The control of VOC emissions, in this case 14.1 tpy, would result in emissions of 5.58 tpy of NO_x from natural gas combustion in an RTO and thus, does not provide a net positive environmental benefit. In controlling VOC emissions, there would be a greater new formation of ozone as the result of new NO_x emissions from emission controls. From a GHG perspective, an RTO will emit more CO_{2e} than it controls.

Table 1

PFC-75 Project - PSD Applicability Analysis for VOCs and GHGs

Showa Denko Carbon, Inc.
Ridgeville, South Carolina

As submitted in 2012 PSD construction permit application

	VOC (tpy)	CO_{2e} (tpy)
Emissions Increase from PFC-75 Project	115.5	255,445
PSD Significant Value	40	75,000
PSD Review Trigger?	**Yes**	**Yes**

December 2016 update including VOC and methane emissions from New Graphitizing (14.4 tpy VOC, 2,612 tpy CO_{2e}).

	VOC (tpy)	CO_{2e} (tpy)
Emissions Increase from PFC-75 Project	129.9	258,057
PSD Significant Value	40	75,000
PSD Review Trigger?	**Yes**	**Yes**

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Bureau of Air Quality
Construction Permit Application
Facility Information
Page 1 of 2

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FACILITY IDENTIFICATION	
SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)* 0900 - 0025	Application Date December 2016
Facility Name *(This should be the name used to identify the facility at the physical address listed below)* Showa Denko Carbon, Inc.	Facility Federal Tax Identification Number *(Established by the U.S. Internal Revenue Service to identify a business entity)* 58-1787336

FACILITY PHYSICAL ADDRESS		
Physical Address: 478 Ridge Road		County: Dorchester
City: Ridgeville	State: SC	Zip Code: 29472
Facility Coordinates *(Facility coordinates should be based at the front door or main entrance of the facility.)*		
Latitude: 33 05 17 N	Longitude: 80 20 32 W	☐ NAD27 *(North American Datum of 1927)* Or ☒ NAD83 *(North American Datum of 1983)*

CO-LOCATION DETERMINATION
Are there other facilities in close proximity that could be considered co-located? ☒ No ☐ Yes*
List potential co-located facilities, including air permit numbers if applicable:

**If yes, please submit co-location applicability determination details in an attachment to this application.*

COMMUNITY OUTREACH
What are the potential air issues and community concerns? Please provide a brief description of potential air issues and community concerns about the entire facility and/or specific project. Include how these issues and concerns are being addressed, if the community has been informed of the proposed construction project, and if so, how they have been informed. This permit does not present any new issues for community concern. A public meeting was held at the facility on December 14, 2016; an update on the status of the PFC-75 project was provided at that time.

FACILITY'S PRODUCTS / SERVICES	
Primary Products / Services *(List the primary product and/or service)* Graphite Electrodes	
Primary SIC Code *(Standard Industrial Classification Codes)* 3624	Primary NAICS Code *(North American Industry Classification System)* 335991
Other Products / Services *(List any other products and/or services)*	
Other SIC Code(s):	Other NAICS Code(s):

AIR PERMIT FACILITY CONTACT *(Person at the facility who can answer technical questions about the facility and permit application.)*			
Title/Position: EHS Manager	Salutation: Mr.	First Name: Jeff	Last Name: Felker
Mailing Address: 478 Ridge Road			
City: Ridgeville		State: SC	Zip Code: 29472
E-mail Address: jfelker@sdkc.com		Phone No.: 843-851-5426	Cell No.: 843-834-2105
One hard copy of the signed permit will be mailed to the designated Air Permit Contact. If additional individuals need electronic copies of the permit, please provide their names and e-mail addresses.			
Name		**E-mail Address**	
John McLure, GEL Engineering, LLC		jwm@gel.com	

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Bureau of Air Quality
Construction Permit Application
Facility Information
Page 2 of 2

CONFIDENTIAL INFORMATION / DATA
Does this application contain confidential information or data? ☒ No ☐ Yes*

**If yes, include a sanitized version of the application for public review and ONLY ONE COPY OF CONFIDENTIAL INFORMATION SHOULD BE SUBMITTED*

LIST OF FORMS INCLUDED (Identify all forms included in the application package)	
Form Name	**Included (Y/N)**
Expedited Review Request (DHEC Form 2212)	☐ Yes ☒ No
Equipment/Processes (DHEC Form 2567)	☒ Yes
Emissions (DHEC Form 2569)	☒ Yes
Regulatory Review (DHEC Form 2570)	☒ Yes
Emissions Point Information (DHEC Form 2573)	☒ Yes ☐ No (If No, Explain)

OWNER OR OPERATOR			
Title/Position: Vice President and COO	Salutation: Mr.	First Name: Dan	Last Name: Pascazio
Mailing Address: 478 Ridge Road			
City: Ridgeville		State: SC	Zip Code: 29472
E-mail Address: dpascazio@sdkc.com		Phone No.: 843-851-5408	Cell No.: 843-214-4962

OWNER OR OPERATOR SIGNATURE

I certify, to the best of my knowledge and belief, that no applicable standards and/or regulations will be contravened or violated. I certify that any application form, report, or compliance certification submitted in this permit application is true, accurate, and complete based on information and belief formed after reasonable inquiry. I understand that any statements and/or descriptions, which are found to be incorrect, may result in the immediate revocation of any permit issued for this application.

Dan Pascazio — December 15, 2016

Signature of Owner or Operator — Date

PERSON AND/OR FIRM THAT PREPARED THIS APPLICATION (If not the same person as the Professional Engineer who has reviewed and signed this application.)			
Consulting Firm Name:			
Title/Position:	Salutation:	First Name:	Last Name:
Mailing Address:			
City:		State:	Zip Code:
E-mail Address:		Phone No.:	Cell No.:
SC Professional Engineer License/Registration No. (if applicable):			

PROFESSIONAL ENGINEER INFORMATION			
Consulting Firm Name: GEL Engineering, LLC			
Title/Position: Principal	Salutation: Mr.	First Name: John	Last Name: McLure
Mailing Address: Post Office Box 30712			
City: Charleston		State: SC	Zip Code: 29417
E-mail Address: jwm@gel.com		Phone No.: 843-769-7378	Cell No.: 843-906-3636
SC License/Registration No.: 16933			

PROFESSIONAL ENGINEER SIGNATURE

I have placed my signature and seal on the engineering documents submitted, signifying that I have reviewed this construction permit application as it pertains to the requirements of *South Carolina Regulation 61-62, Air Pollution Control Regulations and Standards.*

John W. McLure IV — 12/15/16

Signature of Professional Engineer — Date

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 16933 John W. McLure IV

SOUTH CAROLINA GEL ENGINEERING, LLC No. C02849 CERTIFICATE OF AUTHORIZATION

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South Carolina Department of Health and Environmental Control

Bureau of Air Quality
Construction Permit Application
Equipment / Processes

APPLICATION IDENTIFICATION *(Please ensure that the information list in this table is the same on all of the forms and required information submitted in this construction permit application package.)*		
Facility Name *(This should be the name used to identify the facility)*	SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)*	Application Date
Showa Denko Carbon, Inc.	0900 - 0025	December 2016

PROJECT DESCRIPTION
Brief Project Description (What, why, how, etc.): Document identified gaseous organic emissions from the Graphitizing process

ATTACHMENTS	
☒ Process Flow Diagram	Location in Application: See PSD Construction Permit Application for Process Flow Diagrams
☒ Detailed Project Description	Location in Application: See Construction Permit Application Summary and Assumptions and Calcs for Gaseous Organic Emissions

EQUIPMENT / PROCESS INFORMATION

Equipment ID Process ID	Action	Equipment / Process Description	Maximum Design Capacity (Units)	Control Device ID(s)	Pollutants Controlled (Include CAS#)	Capture System Efficiency and Description	Emission Point ID(s)
New Graphitizing Process – E-460-4271-01/08	☐ Add ☐ Remove ☐ Modify ☒ Other	New Graphitizing Process: 8 furnaces were installed instead of 10; document identified gaseous organic emissions	35,000 metric tons finished electrodes/yr	CD-460-4349-03	SO2; NA for gaseous organic emissions	NA for gaseous organic emissions	S-460-4349-03 scrubber stack/roof monitor

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CONTROL DEVICE INFORMATION					
Control Device ID	Action	Control Device Description	Maximum Design Capacity (Units)	Inherent/Required/Voluntary (Explain)	Destruction/Removal Efficiency Determination
NA	☐ Add ☐ Remove ☐ Modify ☐ Other	NA - there are no gaseous organic control devices			

RAW MATERIAL AND PRODUCT INFORMATION			
Equipment ID Process ID Control Device ID	Raw Material(s)	Product(s)	Fuels Combusted
Please see Assumptions and Calculations for Gaseous Organic Emissions from Graphitizing			

MONITORING AND REPORTING INFORMATION					
Equipment ID Process ID Control Device ID	Pollutant(s)/Parameter(s) Monitored	Monitoring Frequency	Reporting Frequency	Monitoring/Reporting Basis	Averaging Period(s)
Please see Construction Permit Application Summary and BACT Supplement					

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South Carolina Department of Health and Environmental Control

Bureau of Air Quality
Construction Permit Application
Emissions

APPLICATION IDENTIFICATION *(Please ensure that the information list in this table is the same on all of the forms and required information submitted in this construction permit application package.)*		
Facility Name *(This should be the name used to identify the facility)* Showa Denko Carbon, Inc.	SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)* 0900-0025	Application Date December 2016

ATTACHMENTS *(Check all the appropriate checkboxes if included as an attachment)*	
☒ Sample Calculations, Emission Factors Used, etc.	☒ Detailed Explanation of Assumptions, Bottlenecks, etc.
☐ Supporting Information: Manufacturer's Data, etc.	☒ Source Test Information Source test report was submitted to DHEC on 11/28/16
☒ Details on Limits Being Taken for Limited Emissions	☒ NSR Analysis

SUMMARY OF PROJECTED CHANGE IN FACILITY WIDE POTENTIAL EMISSIONS
(Calculated at maximum design capacity.)

Pollutants	Emission Rates Prior to Construction / Modification (tons/year)			Emission Rates After Construction / Modification (tons/year)		
	Uncontrolled	Controlled	Limited	Uncontrolled	Controlled	Limited
Particulate Matter (PM)	Please see Assumptions and Calculations for Gaseous Organic Emissions from Graphitizing and Table 1, PFC-75 Project - PSD Applicability Analysis for VOCs and GHGs					
Particulate Matter <10 Microns (PM_{10})						
Particulate Matter <2.5 Microns ($PM_{2.5}$)						
Sulfur Dioxide (SO_2)						
Nitrogen Oxides (NO_x)						
Carbon Monoxide (CO)						
Volatile Organic Compounds (VOC)						
Lead (Pb)						
Highest HAP Prior to Construction (CAS #:)						
Highest HAP After Construction (CAS #:)						
Total HAP Emissions*						

Include emissions from exempt equipment and emission increases from process changes that were exempt from construction permits.
(*All HAP emitted from the various equipment or processes must be listed in the appropriate "Potential Emission Rates at Maximum Design Capacity" Table)

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Construction Permit Application
Emissions

POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY									
Equipment ID / Process ID	**Emission Point ID**	**Pollutants (Include CAS #)**	**Calculation Methods / Limits Taken / Other Comments**	**Uncontrolled**		**Controlled**		**Limited**	
				lbs/hr	**tons/yr**	**lbs/hr**	**tons/yr**	**lbs/hr**	**tons/yr**
Please see Assumptions and Calculations for Gaseous Organic Emissions from Graphitizing and Table 1, PFC-75 Project - PSD Applicability Analysis for VOCs and GHGs									

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South Carolina Department of Health and Environmental Control

Bureau of Air Quality
Construction Permit Application
Regulatory Review

APPLICATION IDENTIFICATION *(Please ensure that the information list in this table is the same on all of the forms and required information submitted in this construction permit application package.)*		
Facility Name *(This should be the name used to identify the facility)*	SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)*	Application Date
Showa Denko Carbon, Inc.	0900 - 0025	December 2016

*****Please see Section 3.0 of the Construction Permit Application Summary for a detailed discussion of regulations with respect to the gaseous organic emissions identified from Graphitizing.***

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
Regulation 61-62.1, Section II(E) Synthetic Minor Construction Permits	☐	☒			
Regulation 61-62.1, Section II(G) Conditional Major Operating Permits	☐	☒			
Regulation 61-62.5, Standard No. 1 Emissions from Fuel Burning Operations	☐	☒			
Regulation 61-62.5, Standard No. 2 Ambient Air Quality Standards	☐	☒			
Regulation 61-62.5, Standard No. 3 Waste Combustion and Reduction	☐	☒			
Regulation 61-62.5, Standard No. 4 Emissions from Process Industries	☐	☒			
Regulation 61-62.5, Standard No. 5 Volatile Organic Compounds	☐	☒			
Regulation 61-62.5, Standard No. 5.2 Control of Oxides of Nitrogen	☐	☒			
Regulation 61-62.5, Standard No. 7 Prevention of Significant Deterioration*	☒	☐	See Construction Permit Application Summary and BACT Supplement		
Regulation 61-62.5, Standard No. 7.1 Nonattainment New Source Review*	☐	☒			
Regulation 61-62.5, Standard No. 8 Toxic Air Pollutants	☒	☐	See Construction Permit Application Summary and De Minimis Analysis		
Regulation 61-62.6 Control of Fugitive Particulate Matter	☐	☒			

Bureau of Air Quality
Construction Permit Application
Regulatory Review

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
Regulation 61-62.68 Chemical Accident Prevention Provisions	☐	☒			
Regulation 61-62.70 Title V Operating Permit Program	☒	☐	Showa Denko is a Title V facility		
40 CFR Part 64 - Compliance Assurance Monitoring (CAM)	☐	☒			
40 CFR 60 Subpart A - General Provisions	☐	☒			
40 CFR 61 Subpart A - General Provisions	☐	☒			
40 CFR 63 Subpart A - General Provisions	☐	☒			

* Green House Gas emissions must be quantified if these regulations are triggered.

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South Carolina Department of Health and Environmental Control

Bureau of Air Quality
Emission Point Information

A. APPLICATION IDENTIFICATION	
1. Facility Name: Century Showa Denko Carbon, Inc.	
2. SC Air Permit Number (if known; 8-digits only): 0900 - 0025	3. Application Date: December 2016
4. Project Description: Document identified gaseous organic emissions from the Graphitizing process	

B. FACILITY INFORMATION	
1. Is your company a Small Business? ☐ Yes ☒ No	2. If a Small Business or small government facility, is Bureau assistance being requested? ☐ Yes ☐ No
3. Are other facilities collocated for air compliance? ☐ Yes ☒ No	4. If Yes, provide permit numbers of collocated facilities:

C. AIR CONTACT			
Consulting Firm Name (if applicable): GEL Engineering, LLC			
Title/Position: Principal	Salutation: Mr.	First Name: John	Last Name: McLure
Mailing Address: Post Office Box 30712			
City: Charleston		State: SC	Zip Code: 29417
E-mail Address: jwm@gel.com		Phone No.: 843.769.7378	Cell No.: 843.906.3636

D. EMISSION POINT DISPERSION PARAMETERS
Source data requirements are based on the appropriate source classification. Each emission point is classified as a point, area, volume, or flare source. Contact the Bureau of Air Quality for clarification of data requirements. Include sources on a scaled site map. Also, a picture of area or volume sources would be helpful but is not required. A user generated document or spreadsheet may be substituted in lieu of this form provided all of the required emission point parameters are submitted in the same order, units, etc. as presented in these tables.
Abbreviations / Units of Measure: UTM = Universal Transverse Mercator; °N = Degrees North; °W = Degrees West; m = meters; AGL = Above Ground Level; ft = feet; ft/s = feet per second; ° = Degrees; °F = Degrees Fahrenheit

E. POINT SOURCE DATA

(Point sources such as stacks, chimneys, exhaust fans, and vents.)

Emission Point ID	Description/Name	Point Source Coordinates Projection:				Release Height AGL (ft)	Temp. (°F)	Exit Velocity (ft/s)	Inside Diameter (ft)	Discharge Orientation	Rain Cap? (Y/N)	Distance To Nearest Property Boundary (ft)	Building		
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)								Height (ft)	Length (ft)	Width (ft)

Please see De Minimis Analysis. Showa Denko has engaged Exponent prepare a Standard No. 8 modeling compliance demonstration for TAP emissions above the de minimis criteria. Based on the mimimal hourly emission rates, the modeling results are expected to be well below Standard No. 8 ambient air limits. Exponent's modeling results will be submitted to DHEC in mid-January 2017.

F. AREA SOURCE DATA

(Area sources such as storage piles, and other sources that have low level or ground level releases with no plumes.)

Emission Point ID	Description/Name	Area Source Coordinates Projection:				Release Height AGL (ft)	Easterly Length (ft)	Northerly Length (ft)	Angle From North (°)	Distance To Nearest Property Boundary (ft)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (° W)					
NA										

G. VOLUME SOURCE DATA

(Volume sources such as building fugitives that have initial dispersion vertical depth prior to release.)

Emission Point ID	Description/Name	Volume Source Coordinates Projection:				Release Height AGL (ft)	Initial Horizontal Dimension (ft)	Initial Vertical Dimension (ft)	Distance To Nearest Property Boundary (ft)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (° W)				
NA									

H. FLARE SOURCE DATA

(Point sources where the combustion takes place at the tip of the stack.)

Emission Point ID	Description/Name	Flare Source Coordinates Projection:				Release Height AGL (ft)	Heat Release Rate (BTU/hr)	Distance To Nearest Property Boundary (ft)	Building		
		UTM E (m)	UTM N (m)	Lat (°N)	Long (° W)				Height (ft)	Length (ft)	Width (ft)
NA											

I. AREA CIRCULAR SOURCE DATA

Emission Point ID	Description/Name	Area Circular Source Coordinates Projection:				Release Height AGL (ft)	Radius of Area (ft)	Distance To Nearest Property Boundary (ft)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (° W)			
NA								

J. AREA POLY SOURCE DATA

Emission Point ID	Description/Name	Area Poly Source Coordinates Projection:		Release Height AGL (ft)	Number of Vertices
		UTM E (m)	UTM N (m)		
NA					

K. OPEN PIT SOURCE DATA

Emission Point ID	Description/Name	Open Pit Source Coordinates Projection:		Release Height AGL (ft)	Easterly Length (ft)	Northerly Length (ft)	Volume (ft^3)	Angle From North (°)
		UTM E (m)	UTM N (m)					
NA								

L. EMISSION RATES						
Emission Point ID	**Pollutant Name**	**CAS #**	**Emission Rate (lb/hr)**	**Same as Permitted (1)**	**Controlled or Uncontrolled**	**Averaging Period**
Please see Assumption and Calculations for Speciated Non-Methane Gaseous Organic Emissions from Graphitizing.						

(1) Any difference between the rates used for permitting and the air compliance demonstration must be explained in the application report.

ASSUMPTIONS AND CALCULATIONS
GASEOUS ORGANIC EMISSIONS FROM GRAPHITIZING

Showa Denko Carbon, Inc.
Ridgeville, South Carolina

The following assumptions and calculations are presented for gaseous organic emissions from the Existing and New Graphitizing processes at the Showa Denko Carbon, Inc. (Showa Denko) facility in Ridgeville, South Carolina.

Existing Graphitizing

- Gaseous organic emissions from Existing Graphitizing are based on the results of an engineering source test conducted on the sulfur dioxide (SO_2) scrubber stack during October 2016. The test report was submitted to the South Carolina Department of Health and Environmental Control on November 28, 2016.
- During the test event, Environmental Protection Agency (EPA) Method 25A was used to determine methane and non-methane gaseous organic emissions. EPA Methods 0030 and 0040 were used to speciate the non-methane gaseous organic emissions. The Method 0030 and 0040 results are discussed in the Assumptions and Calculations for speciated non-methane gaseous organics included as Appendix II.
- The Method 25A testing was conducted for 36 hours. The pound per hour (lb/hr) results for all 36 hours of testing are shown on the attached emission calculation spreadsheet. The volatile organic carbon (VOC) emission rate is calculated by subtracting the methane emission rate from the total hydrocarbon emission rate.
- The source testing results confirm that the gaseous organic emissions are tied to the portion of the graphitizing process cycle that precedes a furnace reaching "high-fire." Gaseous organic emissions peak during this portion the graphitizing process cycle, and are much lower before and after.
- Methane emissions from the Existing Graphitizing scrubber stack are calculated on the attached spreadsheet and summarized in the table below. Annual ton per year (tpy) emissions are estimated by multiplying the average lb/hr emission rate for the 36-hour stack test by 8,760 hours per year and dividing by 2,000 lbs to convert to tons.

Source	Methane (as methane) lb/hr, maximum	Methane (as methane) lb/hr, average	Methane (as methane) tpy
Existing Graphitizing Scrubber	122.2	23.4	102.6

- VOC emissions from the Existing Graphitizing scrubber stack are calculated on the attached spreadsheet and summarized in the table below. Because methane was the calibration gas used for the Method 25A testing, the stack test results for VOCs are expressed "as methane." Methane has a molecular weight of approximately 16. Carbon has a molecular weight of approximately 12. The emission calculations covert the "as methane" VOC results to an "as carbon" basis by multiplying by the ratio of the molecular weight of carbon to methane (12/16). Annual tpy emissions are estimated by multiplying the average lb/hr emission rate over the 36-hour stack test by 8,760 hours per year and dividing by 2,000 lbs to convert to tons.

Source	VOC (as carbon) lb/hr, maximum	VOC (as carbon) lb/hr, average	VOC (as carbon) tpy
Existing Graphitizing Scrubber	40.9	3.2	14.2

- Based on recent environmental retrofits to the furnaces and ventilation system of Existing Graphitizing (related to installation of the new SO_2 scrubber), it is estimated that 84 percent of gaseous organic emissions will be captured and directed to the scrubber. The remaining 16 percent of gaseous organic emissions are assumed to exhaust through the roof vent. Previous engineering testing has shown that the new SO_2 scrubber has nominal or no control efficiency for gaseous organics. Therefore, where the gaseous organics are emitted (scrubber stack versus roof vent) is of no consequence as no emission reduction is assumed at either location.
- Total methane and VOC emissions from the Existing Graphitizing (scrubber stack and roof vent are estimated on the attached emission calculations spreadsheet by multiplying the engineering test result for the scrubber stack by 100/84 to account for emissions from the roof vent in addition to the scrubber stack.

Source	Methane (as methane) lb/hr, maximum	Methane (as methane) lb/hr, average	Methane (as methane) tpy
Total for Existing Graphitizing, Scrubber Stack and Roof Vent	145.5	27.9	122.1

Source	VOC (as carbon) lb/hr, maximum	VOC (as carbon) lb/hr, average	VOC (as carbon) tpy
Total for Existing Graphitizing, Scrubber Stack and Roof Vent	48.7	3.9	16.9

- Referring to the facility's Title V operating permit (Table 5.12, Unit ID 07, Equipment ID E-430-01), the VOC emission limit for Existing Graphitizing is 58.69 tpy. The VOC emissions estimate (16.9 tpy) calculated from the October engineering test indicate that VOC emissions from Existing Graphitizing are well below the Title V permit limit of 58.69 tpy.
- The methane emissions from Existing Graphitizing can be converted to carbon dioxide equivalents (CO_{2e}) by multiplying the annual methane emissions (122.1 tpy) by the Global Warming Potential factor for methane (25), 122.1 tpy x 25 = 3,053 tpy CO_{2e}.

New Graphitizing

- The emission estimates for Existing Graphitizing must be scaled to New Graphitizing. The scaling factors used on the attached emissions calculation spreadsheet are discussed below.
- Existing Graphitizing can produce 45,000 metric tons per year of finished electrodes. Taking into account that two of the ten furnaces included in the Prevention of Significant Deterioration (PSD) construction permit were not installed, Showa Denko estimates that the eight furnaces installed in New Graphitizing can produce approximately 35,000 metric tons of finished electrodes per year. Thus the production scaling factor (New Graphitizing to Existing Graphitizing) is 35,000/45,000.

- The emission calculations must also take into account differences between Existing Graphitizing and New Graphitizing. The furnaces installed in New Graphitizing are larger than the furnaces in Existing Graphitizing. Thus, New Graphitizing will be capable of processing longer, larger diameter electrodes. The formation mechanism for gaseous organics emissions during the graphitizing process is not completely understood. Thus, there is some uncertainty in applying gaseous organic test results from a single source test on Existing Graphitizing to New Graphitizing.

  For these reasons, a variability factor of 1.1 is applied to calculations of average hourly and annual emissions from New Graphitizing, while a variability factor of 1.25 is applied to the calculations for maximum hourly emissions.

- Based on the above assumptions and as shown on the attached emission calculations spreadsheet, total methane and VOC emissions from New Graphitizing (the sum of the emissions from the scrubber stack and roof vent) are as follows.

Source	Methane (as methane) lb/hr, maximum	Methane (as methane) lb/hr, average	Methane (as methane) tpy
Total for New Graphitizing, Scrubber Stack and Roof Vent	141.4	23.9	104.5

Source	VOC (as carbon) lb/hr, maximum	VOC (as carbon) lb/hr, average	VOC (as carbon) tpy
Total for New Graphitizing, Scrubber Stack and Roof Vent	47.3	3.3	14.4

- The methane emissions from New Graphitizing can be converted to CO_{2e} by multiplying the annual methane emissions (104.5 tpy) by the Global Warming Potential factor for methane (25), 104.5 tpy x 25 = 2,612 tpy CO_{2e}.

- Condition 5.B.3.h(4) of the PSD construction permit contains a limit for CO_{2e} emissions from New Graphitizing of 32,852 tpy. This limit was based on information available at the time the PSD permit application was submitted

and includes only CO_2 emissions from the process. Accounting for the identified 2,612 tpy of CO_{2e} emissions in the form of methane, Showa Denko proposes that the updated PSD CO_{2e} emission limit for New Graphitizing be 32,852 + 2,612 = 35,464 tpy CO_{2e}. Please see the Best Available Control Technology Supplement for more information on this subject.

- For the identified VOC emissions from New Graphitizing, Showa Denko proposes a PSD limit of 14.4 tpy (as carbon). Please see the Best Available Control Technology Supplement for more information on this subject.

EMISSION CALCULATIONS - GASEOUS ORGANIC EMISSIONS FROM GRAPHITIZING

Existing Graphitizing Source Testing	Day 1 - October 4												Day 2 - October 5					
	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	Hour 9	Hour 10	Hour 11	Hour 12	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6
Total Hydrocarbons, lbs/hr (as methane)	35.1	5.0	4.3	21.8	107.8	176.7	34.9	9.5	4.4	3.2	3.9	3.4	2.7	5.0	57.5	23.2	3.5	19.3
Methane, lbs/hr, (as methane)	27.0	4.6	3.5	14.3	73.1	122.2	25.5	7.4	3.2	2.8	2.9	2.0	2.2	4.4	52.8	20.8	2.7	17.9
VOC, lbs/hr, (as methane)	8.1	0.4	0.8	7.5	34.7	54.5	9.4	2.1	1.2	0.4	1.0	1.4	0.5	0.6	4.7	2.4	0.8	1.4

Day 3 - October 13													Day 4 - October 14					
Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	Hour 9	Hour 10	Hour 11	Hour 12	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6
6.0	51.2	68.8	28.5	8.2	4.2	21.6	72.3	51.6	16.9	5.4	3.2	3.0	31.4	25.3	4.1	46.9	27.5
5.5	47.7	63.8	25.9	7.5	3.8	21.2	72.9	47.8	15.1	4.6	2.8	2.8	31.9	25.0	3.7	44.7	27.0
0.5	3.5	5.0	2.6	0.7	0.4	0.4	0.0	3.8	1.8	0.8	0.4	0.2	0.0	0.3	0.4	2.2	0.5

Existing Graphitizing Scrubber Stack Methane, lbs/hr, (as methane), maximum	122.2		
Existing Graphitizing Scrubber Stack VOC, lbs/hr, (as methane), maximum	54.5	40.9	lb/hr as carbon
Existing Graphitizing Scrubber Stack Methane, lbs/hr, (as methane), average	23.4		
Existing Graphitizing Scrubber Stack VOC, lbs/hr, (as methane), average	4.3	3.2	lb/hr as carbon
Existing Graphitizing Scrubber Stack Methane, TPY, (as methane)	102.6		
Existing Graphitizing Scrubber Stack VOC, TPY, (as methane)	18.9	14.2	TPY as carbon

EXISTING GRAPHITIZING SCRUBBER STACK

Total Emissions, Existing Graphitizing Scrubber Stack and Roof Vent			
Existing Graphitizing Methane, lbs/hr, (as methane), maximum	145.5		
Existing Graphitizing VOC, lbs/hr, (as methane), maximum	64.9	48.7	lb/hr as carbon
Existing Graphitizing Methane, lbs/hr, (as methane), average	27.9		
Existing Graphitizing VOC, lbs/hr, (as methane), average	5.1	3.9	lb/hr as carbon
Existing Graphitizing Methane, TPY, (as methane)	122.1	3,053	TPY CO2 Equivalents (based on methane GWP of 25)
Existing Graphitizing VOC, TPY, (as methane)	22.5	16.9	TPY as carbon

EXISTING GRAPHITIZING TOTAL

Scale to New Graphitizing			
Production scaling factor of 35,000/45,000; Maximum hourly emissions variability factor of 1.25; Average hourly and annual emissions variability factor of 1.1.			
Total Emissions, New Graphitizing Scrubber Stack and Roof Vent			
New Graphitizing Methane, lbs/hr, (as methane), maximum	141.4		
New Graphitizing VOC, lbs/hr, (as methane), maximum	63.1	47.3	lb/hr as carbon
New Graphitizing Methane, lbs/hr, (as methane), average	23.9		
New Graphitizing VOC, lbs/hr, (as methane), average	4.4	3.3	lb/hr as carbon
New Graphitizing Methane, TPY, (as methane)	104.5	2,612	TPY CO2 Equivalents (based on methane GWP of 25)
New Graphitizing VOC, TPY, (as methane)	19.3	14.4	TPY as carbon

NEW GRAPHITIZING TOTAL

ASSUMPTIONS AND CALCULATIONS
SPECIATED NON-METHANE GASEOUS ORGANIC EMISSIONS FROM GRAPHITIZING
SOUTH CAROLINA STANDARD NO. 8 DE MINIMIS MODELING ANALYSIS

Showa Denko Carbon, Inc.
Ridgeville, South Carolina

The following assumptions and calculations are presented for speciated non-methane gaseous organic emissions from the Existing and New Graphitizing processes at the Showa Denko Carbon, Inc. (Showa Denko) facility in Ridgeville, South Carolina. This document also contains a South Carolina Standard No. 8 de minimis modeling analysis for these emissions.

Existing Graphitizing

- Speciated non-methane gaseous organic emissions from Existing Graphitizing are based on the results of an engineering source test conducted on the sulfur dioxide (SO_2) scrubber stack during October 2016. The test report was submitted to the South Carolina Department of Health and Environmental Control (DHEC) on November 28, 2016.
- During the test event, Environmental Protection Agency (EPA) Method 25A was used to determine methane and non-methane gaseous organic emissions. EPA Methods 0030 (a sorbent tube method) and 0040 (a Tedlar bag method) were used to speciate the non-methane gaseous organic emissions. Samples were collected using both sorbent tubes and Tedlar bags in case the composition of the exhaust gas stream caused interferences with target analytes in one or the other the sampling media/methodology.
- The Method 25A testing was conducted for 36 hours. The Method 0030 testing consisted of 15 separate sets of sorbent tube samples. The Method 0040 testing consisted of 10 separate Tedlar bag samples. Gaseous organic concentration readings from the Method 25A analyzer were monitored over the course of the 36-hour test event, and the Method 0030 and 0040 samples were collected during periods of peak gaseous organic emissions. Thus, the Method 0030 and 0040 results should represent worst-case, short-term speciated gaseous organic emissions from the Existing Graphitizing process.
- Approximately 40 speciated organics were detected in one or more of the 15 sets of sorbent tube samples. Approximately 20 speciated organics were detected in one or more of the 10 Tedlar bag samples. The majority of these speciated organics were present at extremely low concentrations, often below method detection limits. The mass emission rates for the majority of the speciated organics are in the thousandths of a pound per hour (lb/hr) (i.e. the third place after the decimal).

- The Method 0030 and 0040 results for the Existing Graphitizing scrubber stack are summarized on the attached emissions calculation spreadsheet. To focus on the meaningful test data, the nine regulated organic compounds with results of 0.01 lb/hr or greater are shown. The summarized data identifies the maximum peak lb/hr results for the 15 sorbent tube sets and the 10 Tedlar bags, as well as the average peak lb/hr results for the 15 sorbent tube sets and the 10 Tedlar bags. The highest maximum peak lb/hr result for each pollutant is indicated in bold text. These bolded results are carried forward for the purposes of calculating worst-case, short term emission rates and the Standard No. 8 de minimis analysis.
- Based on recent environmental retrofits to the furnaces and ventilation system of Existing Graphitizing (related to installation of the new SO_2 scrubber), it is estimated that 84 percent of gaseous organic emissions will be captured and directed to the scrubber. The remaining 16 percent of gaseous organic emissions are assumed to exhaust through the roof vent. Previous engineering testing has shown that the new SO_2 scrubber has nominal or no control efficiency for gaseous organics. Thus, the assumed emission point (scrubber stack or roof vent) does not impact the mass of pollutant exhausted to the atmosphere.
- Speciated maximum peak lb/hr emissions from the Existing Graphitizing roof vent are estimated by multiplying the maximum peak engineering test result for the scrubber stack by 16/84.

New Graphitizing

- The emission estimates from Existing Graphitizing must be scaled to New Graphitizing. The scaling factors used on the attached emissions calculation spreadsheet are discussed below.
- Existing Graphitizing can produce 45,000 metric tons per year of finished electrodes. Taking into account that two of the ten furnaces included in the Prevention of Significant Deterioration (PSD) construction permit were not installed, Showa Denko estimates that the eight furnaces installed in New Graphitizing can produce approximately 35,000 metric tons of finished electrodes per year. Thus the production scaling factor (New Graphitizing to Existing Graphitizing) used in the calculations is 35,000/45,000.
- In New Graphitizing, it is estimated that 95 percent of gaseous organic emissions will be captured and directed to the scrubber. The remaining 5 percent of gaseous organic emissions are assumed to exhaust through the roof vent. Previous engineering testing has shown that the new SO_2

scrubbers have nominal or no control efficiency for gaseous organics. Thus, the assumed emission point (scrubber stack or roof vent) does not impact the mass of pollutant exhausted to the atmosphere.

- Based on the above, a scaling factor of 95/100 is used in the calculations for the maximum peak lb/hr emission rate for the New Graphitizing scrubber stack. A scaling factor of 5/100 is used in the calculations for the maximum peak lb/hr emission rate for the New Graphitizing roof vent.

Standard No. 8 De Minimis Modeling Analysis

- Based on review of the results from the October 2016 engineering test event, the mix of speciated organic compounds detected will likely change with each subsequent test event. The facility's Standard No. 8 modeling demonstration will need to be evaluated and updated as necessary based on the results of future test events.
- The estimated maximum peak lb/hr emission rates derived from the October 2016 engineering test are shown on the attached spreadsheet. These maximum peak lb/hr emission rates emission rates are intended for use in evaluating ambient air impacts relative to the South Carolina Toxic Air Pollutants Standard No. 8. These emission rates are not to be considered as enforceable limitations.
- As is shown on the attached spreadsheet, a Standard No. 8 de minimis analysis was performed using the maximum peak lb/hr emission rates derived from the October 2016 engineering test. The maximum peak lb/hr emission rates for the Existing Graphitizing scrubber stack, Existing Graphitizing roof vent, New Graphitizing scrubber stack, and New Graphitizing roof vent are summed and multiplied by 24 to obtain a worst-case lb/day emission rate.

  The lb/day emission rates for the Existing and New Graphitizing are added to lb/day emissions for other sources at the facility (there are none in this instance), and the facility-wide lb/day total is then compared to the de minimis lb/day levels in the DHEC modeling guidelines.

  This analysis indicates that facility-wide emissions of five toxic air pollutants (1,4-dioxane, toluene, xylenes, methylene chloride, and vinyl acetate) are below the de minimis levels established by DHEC, and that facility-wide emissions of four TAPs (chloromethane, carbon disulfide, hexane, and benzene) require further analysis.

- Based on the results of the de minimis modeling analysis, Showa Denko has engaged Exponent to prepare a Standard No. 8 modeling compliance demonstration for chloromethane, carbon disulfide, hexane, and benzene emissions. Based on the minimal hourly emission rates, the modeling results are expected to be well below Standard No. 8 ambient air limits. Exponent's modeling results will be submitted to DHEC in mid-January 2017.

Emission Calculations and Standard No. 8 De Minimis Modeling Analysis - Speciated Gaseous Organic Emissions from Graphitizing

HAP or TAP	units	Existing Graph Scrubber Sorbent Tube Peak Maximum lb/hr	Existing Graph Scrubber Sorbent Tube Peak Average lb/hr	Existing Graph Scrubber Tedlar Bag Peak Maximum lb/hr	Existing Graph Scrubber Tedlar Bag Peak Average lb/hr	Existing Graph Scrubber Worst Case Peak Hourly lb/hr	Existing Graph Roof Vent Worst Case Peak Hourly lb/hr	New Graph Scrubber Worst Case Peak Hourly lb/hr	New Graph Roof Vent Worst Case Peak Hourly lb/hr	Total Existing and New Graph Worst Case Daily lb/day	Total All Other Facility Sources Daily lb/day	Facility-Wide Total Daily lb/day	Standard 8 de minimis Daily lb/day	Standard 8 Modeling Required? Yes/No
Chloromethane (aka methyl chloride)	lb/hr	**1.35**	0.098	0.0162	0.005	1.35	0.26	1.19	0.06	68.57	-	68.57	6.180	Yes
Carbon disulfide	lb/hr	0.40	0.110	**2.85**	0.901	2.85	0.54	2.51	0.13	144.76	-	144.76	1.800	Yes
Hexane	lb/hr	0.0153	0.00198	**0.254**	0.229	0.254	0.048	0.223	0.012	12.90	-	12.90	10.800	Yes
Benzene	lb/hr	0.344	0.08606	**0.918**	0.283	0.918	0.175	0.808	0.043	46.63	-	46.63	1.800	Yes
1,4-dioxane	lb/hr	**0.0112**	0.00183	-	-	0.0112	0.0021	0.0099	0.0005	0.57	-	0.57	5.400	No
Toluene	lb/hr	0.0659	0.01108	**0.073**	0.042	0.073	0.014	0.064	0.003	3.72	-	3.72	24.000	No
Xylenes (total)	lb/hr	0.0173	0.0053	**0.044**	0.020	0.044	0.008	0.038	0.002	2.21	-	2.21	52.200	No
Methylene chloride	lb/hr	less than 0.01	less than 0.01	**0.029**	0.019	0.029	0.006	0.026	0.001	1.47	-	1.47	105.000	No
Vinyl acetate	lb/hr	less than 0.01	less than 0.01	**0.0127**	0.0041	0.0127	0.0024	0.0112	0.0006	0.65	-	0.65	2.112	No

BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS SUPPLEMENT

VOLATILE ORGANIC COMPOUNDS AND GREENHOUSE GASES – NEW GRAPHITIZING

SHOWA DENKO CARBON, INC.
RIDGEVILLE, SOUTH CAROLINA

- This document is a supplement to Best Available Control Technology (BACT) Analysis included in February 2012 construction air permit application for the PFC-75 Project.
- This supplement addresses volatile organic compounds (VOCs) and the greenhouse gas (GHG) methane (CH_4) emissions identified for the new graphitizing furnaces (Equipment ID No. E-460-4271-01/10).
- The BACT analysis for these VOC and CH_4 emissions is analogous to that already approved by the South Carolina Department of Health and Environmental Control (DHEC) Bureau of Air Quality (BAQ) in the Preliminary Determination and Notice of MACT Approval (PDNMA) associated with Construction Permit No. 0900-0025-CZ.
- The following technologies were evaluated for VOC emissions:
  - Carbon Adsorption (Fume Scrubber)
  - Catalytic Oxidizer
  - Thermal Oxidizer
  - Thermal Oxidization with Concentrator
  - Biofiltration Control Technology
  - Wet Scrubber
  - Condenser
  - Low VOC Materials
  - Good Combustion Practices
- The following technologies were evaluated for CH_4 emissions:
  - Thermal Oxidizer
  - Catalytic Oxidizer
- Findings of technical feasibility evaluation for VOCs:
  - Carbon Adsorption: Not technically feasible (VOC loading too low and molecular weight of VOC too low for adsorption on carbon)
  - Catalytic Oxidizer: Not technically feasible (Poisoning and deactivation of catalyst due to sulfur compounds in exhaust gas)
  - Thermal Oxidizer: Regenerative thermal oxidizer (RTO) is technically feasible but only from a functional aspect, and not from the perspective of ability to provide beneficial environmental impact control. (See discussion below)

- Thermal Oxidization with Concentrator: Not technically feasible (molecular weight of VOC too low for adsorption on carbon)
- Biofiltration Control Technology: Not technically feasible (VOC, mainly CH_4, is not sufficiently soluble in water)
- Wet Scrubber: Not technically feasible (VOC, mainly CH_4, is not sufficiently soluble in water)
- Condenser: Not technically feasible (low VOC concentration and high flow rate)
- Low VOC Materials: Not technically feasible (lower VOC-containing materials cannot be accommodated within Showa Denko's product requirements)
- Good Combustion Practices: Not technically feasible (graphitizing furnaces are electrically heated)

- Findings of the technical feasibility evaluation for CH_4:
  - Thermal Oxidizer: RTO is technically feasible, but only from a functional aspect, and not from the perspective of ability to provide beneficial environmental impact control. (See discussion below)
  - Catalytic Oxidizer: Not technically feasible (Poisoning and deactivation of catalyst would occur due to sulfur compounds in exhaust gas)
- Further evaluation of the RTO yields the following conclusions:
  - Due to high flow rate, two RTOs would be required (6.5 MMBtu/hr each)
  - Vendor guarantee: 98% control for VOCs and CH_4
  - Cost to reduce VOCs would be $93,210 per ton removed (based on 14.4 uncontrolled tons/yr VOC)
  - Cost to reduce CH_4 would be $12,844 per ton removed (based on 104.5 uncontrolled tons/yr CH_4)
  - Environmental impact: Combustion of natural gas in RTOs would result in an **increase of 5.58 tons/yr of NOx and 6,739 tons/yr CO_{2e}**
  - Environmental impact:
    - To control 104.5 tons/yr CH_4 (that is 2,612 tons/yr CO_{2e}) emissions from New Graphitizing, the combustion of natural gas in RTOs would result in 6,739 tons/yr CO_{2e} emissions. **The RTOs would emit more GHGs than they will control.**
    - South Carolina is a NOx-limited state with respect to ozone formation. The control of VOC emissions, in this case at 14.1 tons/yr, would result in formation of 5.58 tons/yr of NOx and thus, does not provide a net

positive environmental benefit. **In controlling VOC emissions, there would be a greater new formation of ozone as the result of new NOx emissions from emission controls.**

- Final conclusions:
  - Add on control (RTOs) is not economically feasible and results in considerable adverse environmental impacts in terms of resulting ozone formation and in terms of added CO_{2e} impacts
  - As a result:
    - VOC BACT limit: 14.4 tons/yr (as carbon)
    - CO_{2e} BACT limit: 32,852 tons/yr CO_{2e} (existing limit for based on CO_2 emissions) + 2,612 tons/yr CO_{2e} (in the form of CH_4) = 35,464 tons/yr CO_{2e}

Table 1
RTO - New Graphitizing Furnaces
Showa Denko Carbon, Inc

Capital Cost		Notes	Reference
Direct Costs			
Purchased Equipment Costs			
RTO+auxiliary equipment	$2,020,000	A	2(a)
Sales Tax	$60,600	0.03A	1(a)
Freight	$101,000	0.05A	1(a)
Purchased Equipment Cost, PEC	$2,181,600	B	
Direct Installation Costs			
Foundations and Support	$174,528	0.08B	1(a)
Handling & Erection	$305,424	0.14B	1(a)
Electrical	$87,264	0.04B	1(a)
Piping	$43,632	0.02B	1(a)
Insulation for Ductwork	$21,816	0.01B	1(a)
Painting	$21,816	0.01B	1(a)
Direct Installation Costs	$654,480		
Total Direct Costs, DC	$2,836,080		
Indirect Costs (Installation)			
Engineering	$218,160	0.10B	1(a)
Construction and field expenses	$109,080	0.05B	1(a)
Contractor Fees	$218,160	0.10B	1(a)
Start-up	$43,632	0.02B	1(a)
Performance test	$21,816	0.01B	1(a)
Contingencies	$65,448	0.03B	1(a)
Total Indirect Costs, IC	$676,296		
Total Capital Investment	$3,512,376	TCI=DC+IC	
Operating Cost			
Direct Annual Costs, DAC			
Operating Labor			
Operator	$4,563	0.5 hr/day*365 d/y*$25/hr	1(b)
Supervisor	$684	15% of operator	1(b)
Total	$5,247		
Maintenance			
Labor	$4,563	0.5 hr/day*365 d/y*$25/hr	1(b)
Material	$4,563	100% of maintenance labor	1(b)
Total	$9,125		
Electricity Costs			
Requirement	400	kw	2(a)
Unit Cost	$0.053	$/kw-hr	3
Total	$185,684		
Fuel			
Natural gas	13.0	MMBtu/hr	2(a)
Cost	$5.20	$/1000 ft^3	3
Conversion	1,020	Btu/ft^3	
Total	$580,565		
Total Direct Annual Costs	$780,621		
Indirect Annual Costs, IDAC			
Overhead	$8,623	60%*(oper labor+maintenance)	1(b)
Administrative Charges	$70,248	2% of TCI	1(b)
Property Tax	$35,124	1% of TCI	1(b)
Insurance	$35,124	1% of TCI	1(b)
Annual Interest Rate	7%		
Economic Life	15		
Capital Recovery Factor	0.110		
Total Capital Recovery Cost	$385,640		
Total Indirect Annual Costs	$534,758		
Total Annual Cost	$1,315,379	TAC = DAC+IDAC	

1. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), September 2000, Section 3, Chapter 2
   a Table 2.8: Capital Cost for Thermal and Catalytic Incinerators
   b Table 2.10: Annual Costs for Thermal and Catalytic Incinerators Example Problem

2. Vendor Quotes
   a Anguil Environmental Systems, Inc.

3. Fuel cost provided by Showa Denko Carbon, Inc.

Table 2
VOC/Methane Cost Effectiveness Summary - RTO
Showa Denko Carbon, Inc.

Equipment Description	Stack Gas Exhaust (acfm)	Pollutant	Uncontrolled Emissions (tons/yr)	Control Efficiency	Emissions Reduction (tons/year)	Economic Impacts			Energy Impacts	Environmental Impacts
						Total Capital Cost ($)	Annual Cost ($/year)	Cost Effectiveness ($/ton)	Increase Over Baseline ($/yr)	Adverse Environmental Impacts?
New Graphitizing Furnaces	140,320	VOCs	14.4	98%	14.1	$3,512,376	$1,315,379	$93,210	$766,249	Yes
		CH_4	104.5	98%	102.4	$3,512,376	$1,315,379	$12,844	$766,249	Yes

Table 3
Natural Gas Combustion Emissions - RTO

Showa Denko Carbon, Inc.
Ridgeville, South Carolina

Fuel:	Natural Gas	
Btu Content:	1,020	Btu/ft^3
Sulfur Content:	NA	% wt

Source ID	A Btu Rating (Btu/hr)	Pollutant	Natural Gas Emissions B AP-42 Emission Factor (lbs/10^6 ft^3)	C Hourly Emissions (lbs/hr)	C Annual Emissions (tons/yr)	GHG Pollutants CO_2 Equivalents (tons/yr)
Two RTOs 6.5 MMBtu/hr each	13,000,000	PM	7.6	0.097	0.424	
		PM_{10}	7.6	0.097	0.424	
		$PM_{2.5}$	7.6	0.097	0.424	
		SO_2	0.6	7.65E-03	0.033	
		CO	84	1.07	4.69	
		NOx	100	1.27	5.58	
		Lead	5.00E-04	6.37E-06	2.79E-05	
		VOCs	5.5	7.01E-02	0.31	
		CO_2	120,000	1,529.4	6,699	6,699
		CH_4	2.3	2.93E-02	0.128	3.21
		N_2O	2.2	2.80E-02	0.123	36.60
						6,739

Appendix D – Draft Construction Permit

S.C. Department of Health and Environmental Control

Bureau of Air Quality
PSD and NESHAP (40 CFR 63)
Construction Permit

Showa Denko Carbon, Inc.
478 Ridge Road
Ridgeville, South Carolina 29472

Pursuant to the provisions of the *Pollution Control Act*, Sections 48-1-50(5) and 48-1-110(a), the 1976 *Code of Laws of South Carolina*, as amended, and *South Carolina Regulation 61-62*, *Air Pollution Control Regulations and Standards*, the Bureau of Air Quality authorizes the construction of this facility and the equipment specified herein in accordance with the plans, specifications, and other information submitted in the construction permit application received on June 14, 2011, as amended.

The construction and subsequent operation of this facility is subject to and conditioned upon the terms, limitations, standards, and schedules contained herein or as specified by this permit and its accompanying attachments.

Permit Number: 0900-0025-CZ-R6
Issue Date: DRAFT

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Director, Engineering Services Division
Bureau of Air Quality

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PART 1 - APPLICABILITY (S.C. Regulation 61-62.1, Section II)

Condition Number	Condition
1.1	Except as allowed under S.C. Regulation 61-62.1, Section II(A)(1) paragraphs (c) and (d), any person who plans to construct, alter or add to a source of air contaminants, including installation of any device for the control of air contaminant discharges, shall first obtain a construction permit from the Department prior to commencement of construction.
1.2	The owner/operator shall obtain Bureau authorization, as required under S.C. Regulation 61-62.1, Section II(A), prior to making modifications not covered under this construction permit.
1.3	No construction permits shall be required for the sources listed as exempt from the requirement to obtain a construction permit in S.C. Regulations 61-62.1, Section II(B); however, modifications at these facilities may trigger the requirement to obtain a construction permit.
1.4	All official correspondence, plans, permit applications, and written statements are an integral part of the permit. Any false information or misrepresentation in the application for a construction permit may be grounds for permit revocation.

PART 2 - GENERAL REQUIREMENTS

This part describes conditions and provisions applicable to all sources. Specific source category conditions and requirements are contained in Part 5 of this permit.

PART 2.A - PERMIT EXPIRATION AND EXTENSION (S.C. Regulation 61-62.1, Section II(A)(4))

Condition Number	Condition
2.A.1	Approval to construct shall become invalid if construction; a. is not commenced within 18 months after receipt of such approval, b. if discontinued for a period of 18 months or more, or c. if construction is not completed within a reasonable time as considered by the Department.
2.A.2	The Department may extend the construction permit for an additional 18-month period upon a satisfactory showing that an extension is justified. This request must be made prior to the permit expiration.
2.A.3	This provision does not apply to the time period between construction of the approved phases of a phased construction project; each phase must commence construction within 18 months of the projected and approved commencement date.

PART 2.B - PERMIT TO OPERATE (S.C. Regulation 61-62.1 Section II (A) & (F))

Condition Number	Condition
2.B.1	Any source that is required to obtain an air quality construction permit issued by the Department must obtain an operating permit when the new or altered source is placed into operation and shall comply with the requirements of S.C. Regulation 61-62.1 Section II(F).

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PART 2.B - PERMIT TO OPERATE (S.C. Regulation 61-62.1 Section II (A) & (F))

Condition Number	Condition
2.B.2	If construction is certified as provided in S.C. Regulation 61-62.1 Section II(F)(2), the permittee may operate the source in compliance with the terms and conditions of the construction permit until the operating permit is issued by the Department.
2.B.3	The owner/operator or professional engineer in charge of the project shall certify that, to the best of his/her knowledge and belief and as a result of periodic observation during construction, the construction under application has been completed in accordance with the specifications agreed upon in the construction permit issued by the Department.
2.B.4	If construction is not built as specified in the permit application and associated construction permit(s), the owner/operator must submit to the Department a complete description of modifications that are at variance with the documentation of the construction permitting determination prior to commencing operation.
2.B.5	Construction variances that would trigger additional requirements that have not been addressed prior to start of operation shall be considered construction without a permit.
2.B.6	The owner/operator shall submit written notification to the Director of Engineering Services and the Regional Air Section Manager of the date construction is commenced, postmarked no later than 30 days after such date.
2.B.7	The owner/operator shall submit written notification to the Director of Engineering Services and the Regional Air Section Manager of the actual date of initial startup of each new or altered source, postmarked within 15 days after such date.

PART 2.C - FEE ASSESSMENT AND PAYMENT (S.C. Regulation 61-30)

Condition Number	Condition
2.C.1	The permittee shall pay permit fees to the Department in accordance with the requirements of S.C. Regulation 61-30, Environmental Protection Fees.

PART 2.D - DUTY TO COMPLY (S.C. Regulation 61-62.1, Section II)

Condition Number	Condition
2.D.1	S.C. Regulation 61-62.1, Section II will not supersede any State or Federal requirements nor special permit conditions, unless this regulation would impose a more restrictive emission limit. The owner or operator shall comply with all terms, conditions, and limitations of any Department-issued permit for sources or activities at its facility. A source's permit status may change upon promulgation of new regulatory requirements.

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PART 2.E - INSPECTION AND ENTRY (S.C. Regulation 61-62.1, Section II(O))

Condition Number	Condition
2.E.1	Upon presentation of credentials and other documents as may be required by law, the permittee shall allow the Department or an authorized representative to perform the following: 1. Enter the facility where emissions-related activity is conducted, or where records must be kept under the conditions of the permit. 2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. 3. Inspect any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under this permit. 4. As authorized by the Federal Clean Air Act and/or the S.C. Pollution Control Act, sample or monitor at reasonable times substances or parameters for the purpose of assuring compliance with the permit or applicable requirements.

PART 3 - FACILITY WIDE GENERAL REQUIREMENTS

This part describes conditions and provisions applicable facility wide. Specific source category conditions and requirements are contained in Part 5 of this permit.

Condition Number	Condition
3.1	In accordance with SC Regulation 61-62.1, Section II(J), for sources not required to have continuous emissions monitors, any malfunction of air pollution control equipment or system, process upset or other equipment failure which results in discharges of air contaminants lasting for one hour or more and which are greater than those discharges described for normal operation in the permit application shall be reported to the Department's local Environmental Quality Control (EQC) Regional office within twenty-four (24) hours after the beginning of the occurrence. The contact information for the local EQC Regional office can be found at http://www.scdhec.gov/environment/envserv/regions.htm. The owner or operator shall also submit a written report within thirty (30) days of the occurrence. This report shall be submitted to the Manager of the Technical Management Section, Bureau of Air Quality (BAQ) and shall include as a minimum, the following: 1. The identity of the stack and/or emission point where the excess emissions occurred; 2. The magnitude of excess emissions expressed in the units of the applicable emission limitation and the operating data and calculations used in determining the excess emissions; 3. The time and duration of excess emissions; 4. The identity of the equipment causing the excess emissions; 5. The nature and cause of such excess emissions; 6. The steps taken to remedy the malfunction and the steps taken or planned to prevent the recurrence of such malfunction; 7. The steps taken to limit the excess emissions; and, 8. Documentation that the air pollution control equipment, process equipment, or processes were at all times maintained and operated, to the maximum extent practicable, in a manner

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PART 3 - FACILITY WIDE GENERAL REQUIREMENTS

This part describes conditions and provisions applicable facility wide. Specific source category conditions and requirements are contained in Part 5 of this permit.

Condition Number	Condition
	consistent with good practice for minimizing emissions.
3.2	Air dispersion modeling (or other method) has demonstrated that this facility's operation will not interfere with the attainment and maintenance of any state or federal ambient air standard. Any changes in the parameters used in the air dispersion modeling may require a review by the facility to determine continuing compliance with these standards. These potential changes include any decrease in stack height, decrease in stack velocity, increase in stack diameter, decrease in stack exit temperature, increase in building height or building additions, increase in emission rates, decrease in distance between stack and property line, changes in vertical stack orientation, and installation of a rain cap that impedes vertical flow. Parameters that are not required in the determination will not invalidate the demonstration if they are modified. The emission rates used in the determination are listed in Attachment A of this permit. Higher emission rates may be administratively incorporated into Attachment A of this permit provided a demonstration using these higher emission rates shows the attainment and maintenance of any state or federal ambient air quality standard or with any other applicable requirement. Variations from the input parameters in the demonstration shall not constitute a violation unless the maximum allowable ambient concentrations identified in the standard are exceeded. This is a State Only enforceable requirement.
3.3	The owner/operator shall maintain this facility at or below the emission rates as listed in Attachment A, not to exceed the pollutant limitations of this construction permit. Should the facility wish to increase the emission rates listed in Attachment A, not to exceed the pollutant limitations in the body of this permit, it may do so by the administrative process specified in condition 3.2.
3.4	The owner/operator shall submit a written request to the Director of the Engineering Services Division for a new or revised operating permit to cover any new or altered source postmarked no later than fifteen (15) days after the actual date of initial startup of each new or altered source unless a more stringent time frame is required by regulation. The request should be made using the appropriate Title V modification form. The modification request required by S.C. Regulation 61-62.70.7 shall serve as the request to operate for the purposes of S.C. Regulation 61-62.1 Section II(F)(3).

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PART 4 - PROJECT DESCRIPTION

Permission is hereby granted to modify the existing facility to accommodate an increased production of finished graphite electrodes from 45,000 to 85,000 metric tons per year. The expansion will involve installing new equipment and the increased throughput of some existing equipment. Modifications that involve installing new equipment are for the following new processes; 1) Mill, Mix, and Extrusion; (2) Bake/Rebake; (3) Pitch Impregnation; and (4) Graphitizing. Modifications that involve increased throughput of existing equipment are for the following existing processes; (1) Rebake Load and Unload/Graphitizing; (2) Bake Load and Unload and Baked Electrode Cleaning; (3) Pitch Impregnation; (4) Insulating Media Receiving; (5) Cleaning and Inspection; and (6) Machining and Shipping.

An emergency generator, fueled by ultra low sulfur diesel, will be provided for emergency power.

PART 5 - CONSTRUCTION PERMIT REQUIREMENTS

PART 5.A - GENERIC CONDITIONS

Condition Number	Equipment/Control Device ID	Condition
5.A.1	All	In accordance with S.C. Regulation 61-62.1, Section II(J), a copy of the Department issued construction and/or operating permit must be kept readily available at the facility at all times. A permittee shall maintain such operational records; make reports; install, use, and maintain monitoring equipment or methods; sample and analyze emissions or discharges in accordance with prescribed methods, at locations, intervals, and procedures as the Department shall prescribe; and provide such other information as the Department reasonably may require. All records required to demonstrate compliance with the limits established under this permit shall be maintained on site for a period of at least five (5) years and shall be made available to a Department representative upon request.
5.A.2	All	The owner/operator shall maintain on file all measurements including continuous monitoring system or monitoring device performance measurements; all continuous monitoring system performance evaluations; all continuous monitoring system or monitoring device calibration checks; adjustments and maintenance performed on these systems or devices; and all other information required in a permanent form suitable for inspection by Department personnel.

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PART 5.A - GENERIC CONDITIONS

Condition Number	Equipment/Control Device ID	Condition
5.A.3	All	All gauges shall be readily accessible and easily read by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level). Monitoring parameter readings (i.e., pressure drop readings, etc.) and inspection checks shall be maintained in logs (written or electronic), along with any corrective action taken when deviations occur. Each incidence of operation outside the operational ranges, including date and time, cause, and corrective action taken, shall be recorded and kept on site. Exceedance of operational range shall not be considered a violation of an emission limit of this permit, unless the exceedance is also accompanied by other information demonstrating that a violation of an emission limit has taken place. Reports of these incidences shall be submitted semiannually. If no incidences occurred during the reporting period then a letter shall indicate such. Any alternative method for monitoring control device performance must be preapproved by the Bureau and shall be incorporated into the permit as set forth in S.C. Regulation 61-62.70.7.
5.A.4	E-110-2-4275-01 CD-210-2-4333-01 CD-310-2-4333-01 E-310-2-4275-01	In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, the following good combustion practices apply : 1) Good air/fuel mixing in the combustion zone; 2) Sufficient residence time to complete combustion; 3) Proper fuel gas supply system design and operation in order to minimize the effect of contaminants and fluctuations in pressure and flow on the fuel gas quality delivered to combustion units; 4) Operator and maintenance practices including good burner maintenance and operation; 5) High temperatures and low oxygen levels in the primary combustion zone; and 6) Overall excess oxygen levels high enough to complete combustion while maximizing thermal efficiency.
5.A.5	E-210-2-4271-18/32 E-310-2-4272-21	In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, the following good combustion practices apply : 1) Good air/fuel mixing in the combustion zone; 2) Sufficient residence time to complete combustion; 3) Proper fuel gas supply system design and operation in order to minimize the effect of contaminants and fluctuations in pressure and flow on the fuel gas quality delivered to combustion units; 4) Operator and maintenance practices including good burner maintenance and operation; and 5) High temperatures and low oxygen levels in the primary combustion zone.

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PART 5.A - GENERIC CONDITIONS

Condition Number	Equipment/Control Device ID	Condition
5.A.6	All	When source tests are required, all test plans, notifications and final reports shall be submitted to the Bureau of Air Quality's Source Evaluation Section according to S.C. Regulation 61-62.1 Section IV. A protocol shall be submitted to the Source Test Evaluation Section of this Bureau for approval indicating the proposed initial source test date and test procedure at least 45 days prior to the proposed test date. The Bureau must be notified at least two weeks prior to a source test so that a Bureau Representative may be present, and the final test report must be submitted no later than 30 days after completion of on-site testing. Test methods, unless specified elsewhere in the permit, shall be approved by the Department.
5.A.7	All	The owner or operator shall install and maintain a bag leak detection system (BLDS) on each module of the baghouses, as outlined below: 1. A BLDS shall be installed and operate for each exhaust stack of the fabric filter. 2. Each BLDS shall be installed, operated, calibrated, and maintained in a manner consistent with the manufacturer's written specifications and recommendations and, as appropriate, in accordance with the guidance provided in EPA-454/R-98-015, September 1997. 3. The BLDS shall be certified by the manufacturer to be capable of detecting particulate matter emissions at concentrations of down to 0.01 mg/cubic meter. 4. The BLDS shall be equipped with a device to continuously record the output signal from the sensor, every 15 seconds. 5. The BLDS must be equipped with an alarm system that will alert an operator automatically when an increase in relative particulate matter emissions over a preset level is detected. The alarm must be located such that the alert is detected and recognized easily by an operator. 6. Where multiple bag leak detectors are required, the system's instrumentation and alarm may be shared among detectors. 7. For each BLDS, the owner or operator must initiate procedures to determine the cause of every alarm within 8 hours of the alarm. The owner or operator must alleviate the cause of the alarm within 24 hours of the alarm by taking whatever corrective action(s) are necessary. Corrective actions may include, but are not limited to the following: (i) Inspecting the fabric filter for air leaks, torn or broken bags or filter media, or any other condition that may cause an increase in particulate matter emissions; (ii) Sealing off defective bags or filter media;

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PART 5.A - GENERIC CONDITIONS

Condition Number	Equipment/Control Device ID	Condition
		(iii) Replacing defective bags or filter media or otherwise repairing the control device; (iv) Sealing off a defective fabric filter compartment; (v) Cleaning the bag leak detection system probe or otherwise repairing the bag leak detection system; or (vi) Shutting down the process producing the particulate matter emissions. The baghouses shall be in place and operational whenever processes controlled by the baghouses are running, except during periods of baghouse malfunction or mechanical failure. A BLDS monitoring plan, with supporting documentation and quality assurance procedures, shall be submitted to the Bureau for approval within 180 days of start up. Each incidence of corrective action taken shall be recorded and kept on site for five (5) years. Reports of these incidences shall be submitted semiannually. If no incidences occurred during the reporting period then a letter shall indicate such.
5.A.8	All	All source tests are required to demonstrate compliance with the emission limits and verify emissions used in the modeling demonstration. This requirement does not include the initial screening test listed in Condition 5.B.3.b(9).

PART 5.B - LIMITATIONS, MONITORING AND REPORTING

PART 5.B.1.a - EQUIPMENT FOR NEW MILL, MIX, AND EXTRUSION PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-110-2-4203-15	Green Scrap Service Bin No. 1&2; store green scrap	CD-110-2-4345-02	S-110-2-4349-05
E-110-2-4216-06	Green Scrap Weigh Scale; weigh green scrap for appropriate feed to mixers	CD-110-2-4345-02	S-110-2-4349-05
E-110-2-4203-01	Service Bin Nos. 1&2; store coke of specific size and specific material	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4203-03	Service Bin Nos. 3&4; store coke of specific size and specific material	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4203-07	Service Bin Nos. 5&6; store coke of specific size and specific material	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4203-09	Service Bin Nos. 7&8; store coke of specific size and specific material	CD-110-2-4345-01	S-110-2-4349-04

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PART 5.B - LIMITATIONS, MONITORING AND REPORTING

PART 5.B.1.a - EQUIPMENT FOR NEW MILL, MIX, AND EXTRUSION PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-110-2-4203-11	Service Bin Nos. 9&10; store coke of specific size and specific material	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4203-13	Service Bin Nos. 11&12; store coke of specific size and specific material	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4203-15	Service Bin Nos. 13&14; store coke of specific size and specific material	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4223-02	Coarse Coke Bucket Elevator	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4223-03	Fines Coke Bucket Elevator	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4202-02	Inside Coke Crusher Bin; sort coke of various size	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4291-02	Double Roll Crusher; crush coke to finer size	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4221-02	Primary Coarse Coke Screen; sort coke to various size	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4221-03	Secondary Coarse Coke Screen; sort coke to various sizes	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4221-04	Fines Screen; sort coke to various sizes	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4202-03	Cage Impactor Crusher Bin	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4293-01	Cage Impactor Crusher; crush coke to finer size	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4216-01	Coke Weigh Scale No. 1; weigh coke for appropriate feed to mixers	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4216-02	Coke Weigh Scale No. 2; weigh coke for appropriate feed to mixers	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4216-03	Coke Weigh Scale No. 3; weigh coke for appropriate feed to mixers	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4216-04	Coke Weigh Scale No. 4; weigh coke for appropriate feed to mixers	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4232-01	Mixer Feed System Pan Conveyor	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4227-29	Scale No. 1 Retractable Spout	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4227-30	Scale No. 2 Retractable Spout	CD-110-2-4345-01	S-110-2-4349-04

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PART 5.B - LIMITATIONS, MONITORING AND REPORTING

PART 5.B.1.a - EQUIPMENT FOR NEW MILL, MIX, AND EXTRUSION PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-110-2-4227-31	Scale No. 3 Retractable Spout	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4227-32	Scale No. 4 Retractable Spout	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4204-01	Pre-heat Hopper No. 1; preheats coke before discharge to mixers	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4204-02	Pre-heat Hopper No. 2; preheats coke before discharge to mixers	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4205-11	Coke Silo #11; store recycled coke of various sizes	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4223-04	Recycle Coke Bucket Elevator; transports coke from silo #11 through coarse coke loop	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4221-08	Coarse Belt Conveyor; transfer point between existing 110 and 110-2 buildings	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4221-09	Fines Belt Conveyor; transfer point between existing 110 and 110-2 buildings	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4221-23	Recycle Belt Conveyor; transfers material to coke silo #11	CD-110-2-4345-01	S-110-2-4349-04
E-110-2-4202-04	Mill Feed Bin	CD-110-2-4345-22	S-110-2-4345-22
E-110-2-4202-05	Iron Oxide Bin; store iron oxide	CD-110-2-4345-24	S-110-2-4345-24
E-110-2-4216-05	Iron Oxide Scale; weigh iron oxide for appropriate feed to mixers	CD-110-2-4345-24	S-110-2-4345-24
E-110-2-4253-01/ E-110-2-4253-02/ E-110-2-4253-03/ E-110-2-4253-04	Mixer Nos. 1 – 4	CD-110-4345-28	S-110-2-4349-03
E-110-2-4221-10	Mixer Discharge Belt	CD-110-4345-28	S-110-2-4349-03
E-110-2-4222-20	Screw Spreader	CD-110-4345-28	S-110-2-4349-03
E-110-2-4221-11	Cooling Belt Position 1	CD-110-4345-28	S-110-2-4349-03

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PART 5.B - LIMITATIONS, MONITORING AND REPORTING

PART 5.B.1.a - EQUIPMENT FOR NEW MILL, MIX, AND EXTRUSION PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-110-2-4221-12	Cooling Belt Position 2	CD-110-4345-28	S-110-2-4349-03
E-110-2-4253-05	Homogenizer	CD-110-4345-28	S-110-2-4349-03
E-110-2-4221-13	Homogenizer Discharge Belt	CD-110-4345-28	S-110-2-4349-03
E-110-2-4283-03	Coke Silo #2 Vibrating Feeder	CD-110-2-4345-03	S-110-2-4349-06
E-110-2-4283-04	Coke Silo #3 Vibrating Feeder	CD-110-2-4345-03	S-110-2-4349-06
E-110-2-4283-06	Coke Silo #4 Vibrating Feeder	CD-110-2-4345-03	S-110-2-4349-06
E-110-2-4283-07	Coke Silo #5 Vibrating Feeder	CD-110-2-4345-03	S-110-2-4349-06
E-110-2-4283-20	Coke Silo #1 Vibrating Feeder	CD-110-2-4345-03	S-110-2-4349-06
E-110-2-4283-24	Coke Silo #8 Vibrating Feeder	CD-110-2-4345-03	S-110-2-4349-06
E-110-2-4283-25	Coke Silo #7 Vibrating Feeder	CD-110-2-4345-03	S-110-2-4349-06
E-110-2-4205-09	Coke Silo #9; vibrating feeder x 2	CD-110-2-4345-03	S-110-2-4349-06
E-110-2-4205-10	Coke Silo #10; vibrating feeder x 2	CD-110-2-4345-03	S-110-2-4349-06
E-110-2-4221-03	Coarse Belt Conveyor; transfer point between silo conveyor and transfer conveyor	CD-110-2-4345-03	S-110-2-4349-06
E-110-2-4221-05	Fines Belt Conveyor; transfer point between silo conveyor and connecting conveyor	CD-110-2-4345-03	S-110-2-4349-06
E-110-2-4221-07	Fines Belt Conveyor; transfer point between connecting conveyor and transfer conveyor	CD-110-2-4345-03	S-110-2-4349-06
E-110-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	S-110-2-4349-01
E-110-25	Binder Pitch Tank	CD-110-14	S-110-14

N/A = Not Applicable

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PART 5.B.2.a - CONTROL DEVICES FOR NEW MILL, MIX, AND EXTRUSION PROCESS

Control Device ID	Control Device Description	Pollutant(s) Controlled
CD-110-2-4345-02	Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$
CD-110-2-4345-01	Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$
CD-110-2-4345-22	Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$
CD-110-2-4345-24	Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$
CD-110-4345-28	Dry Fume Scrubber/Baghouse	PM, PM_{10}, $PM_{2.5}$,VOC
CD-110-2-4345-03	Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$
CD-110-14	Vent Condenser	VOC

PART 5.B.3.a - CONDITIONS FOR NEW MILL, MIX, AND EXTRUSION PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td>5.B.3.a(1)</td><td>See Conditions Table</td><td>PM
PM_{10}
$PM_{2.5}$</td><td>Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on a BACT analysis, the PSD limit for filterable PM, filterable PM_{10}, and filterable $PM_{2.5}$ has been established. See below for limits that apply to specific equipment:
<table>
<tr><th>Equipment ID</th><th>Control Device ID</th><th>Limit</th></tr>
<tr><td>E-110-2-4203-15, E-110-2-4216-06</td><td>CD-110-2-4345-02</td><td>0.005 gr/dscf (Filterable PM)
0.005 gr/dscf (Filterable PM_{10})
0.005 gr/dscf (Filterable $PM_{2.5}$)</td></tr>
</table></td></tr>
</table>

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PART 5.B.3.a - CONDITIONS FOR NEW MILL, MIX, AND EXTRUSION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions			
				E-110-2-4203-01, E-110-2-4203-03, E-110-2-4203-07, E-110-2-4203-09, E-110-2-4203-11, E-110-2-4203-13, E-110-2-4203-15, E-110-2-4223-02, E-110-2-4223-03, E-110-2-4202-02, E-110-2-4291-02, E-110-2-4221-02, E-110-2-4221-03, E-110-2-4221-04, E-110-2-4202-03, E-110-2-4293-01, E-110-2-4216-01, E-110-2-4216-02, E-110-2-4216-03, E-110-2-4216-04, E-110-2-4232-01, E-110-2-4227-29, E-110-2-4227-30, E-110-2-4227-31, E-110-2-4227-32, E-110-2-4204-01, E-110-2-4202-02, E-110-2-4205-11, E-110-2-4223-04, E-110-2-4221-08, E-110-2-4221-09, E-110-2-4221-23	CD-110-2-4345-01	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
				E-110-2-4202-04	CD-110-2-4345-22	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)

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PART 5.B.3.a - CONDITIONS FOR NEW MILL, MIX, AND EXTRUSION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions			
				E-110-2-4202-05, E-110-2-4216-05	CD-110-2-4345-24	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
				E-110-2-4253-01, E-110-2-4253-02, E-110-2-4253-03, E-110-2-4253-04, E-110-2-4221-10, E-110-2-4222-20, E-110-2-4221-11, E-110-2-4221-12, E-110-2-4253-05, E-110-2-4221-13	CD-110-4345-28	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
				E-110-2-4283-03, E-110-2-4283-04, E-110-2-4283-06, E-110-2-4283-07, E-110-2-4283-20, E-110-2-4283-24, E-110-2-4283-25, E-110-2-4205-09, E-110-2-4205-10, E-110-2-4221-03, E-110-2-4221-05, E-110-2-4221-07	CD-110-2-4345-03	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
			State Only: No **Testing:** An initial source test for filterable PM, PM_{10}, and $PM_{2.5}$ emissions shall be conducted within 180 days after startup and every three (3) years thereafter. An initial source test to verify no condensable PM_{10} and $PM_{2.5}$ emissions are present shall be conducted within 180 days after startup. **Monitoring/Record Keeping/Reporting/Other:** See Generic Condition 5.A.7.			

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PART 5.B.3.a - CONDITIONS FOR NEW MILL, MIX, AND EXTRUSION PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td>5.B.3.a(2)</td><td>All (except E-110-2-4275-01)</td><td>PM</td><td>

Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section VIII - Other Manufacturing, particulate matter emissions shall be limited to the rate specified by use of the following equation: for process weight rates less than or equal to 30 tons per hour ($E = 4.10P^{0.67}$) where E = the allowable emission rate in pounds per hour and P = process weight rate in tons per hour. As such, each process's allowable particulate matter emission limit is limited to the amount shown in the table below at its nominal production rating:

<table>
<tr><th>Process</th><th>PM Allowable (lb/hr)</th><th>Process Weight Rate (tons/hr)</th></tr>
<tr><td>New Mill, Mix, and Extrusion</td><td>28.43</td><td>18</td></tr>
</table>

State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: See Generic Condition 5.A.7.

</td></tr>
</table>

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PART 5.B.3.a - CONDITIONS FOR NEW MILL, MIX, AND EXTRUSION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.a(3)	All (except E-110-2-4275-01)	Opacity	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section IX - Visible Emissions (Where Not Specified Elsewhere), where construction or modification began after December 31, 1985, emissions (including fugitive emissions) shall not exhibit an opacity greater than 20%, each. **State Only:** No **Testing:** None **Monitoring/Record Keeping/Reporting/Other:** The permittee shall perform a visual inspection on a daily basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports.

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PART 5.B.3.a - CONDITIONS FOR NEW MILL, MIX, AND EXTRUSION PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td>5.B.3.a(4)</td><td>See Conditions Table</td><td>VOC</td><td>
Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on a BACT analysis, the PSD limits for VOCs have been established. See below for limits that apply to specific equipment.
<table>
<tr><th>Equipment ID</th><th>Control Device ID</th><th>Pollutant</th><th>Limit</th></tr>
<tr><td>E-110-2-4253-01,
E-110-2-4253-02,
E-110-2-4253-03,
E-110-2-4253-04,
E-110-2-4221-10,
E-110-2-4222-20,
E-110-2-4221-11,
E-110-2-4221-12,
E-110-2-4253-05,
E-110-2-4221-13</td><td>CD-110-4345-28</td><td>VOC</td><td>0.071 lb/hr</td></tr>
</table>
State Only: No

Testing: An initial source test for VOC emissions shall be conducted within 180 days after startup and every three (3) years thereafter. Less frequent source testing for VOC may be done if at least two (2) consecutive stack tests shows that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source or air pollution control equipment that could increase emissions. In this case no source testing will be required for the next four (4) years. A source test shall be conducted during the fifth year and no more than 60 months after the previous source test.

Monitoring/Record Keeping/Reporting/Other: The owner/operator shall install and maintain gauges to monitor rotary vane rpm (coke flow) and fan amperage (air flow) on the fume scrubber. Each parameter shall be recorded daily during source operation. The fume scrubber shall be in place and operational whenever processes controlled by the fume scrubber are running, except during periods of condenser malfunction or mechanical failure. Records of recorded parameters shall be kept on-site and made available to the Department upon request.
</td></tr>
</table>

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PART 5.B.3.a - CONDITIONS FOR NEW MILL, MIX, AND EXTRUSION PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td>5.B.3.a(5)</td><td>E-110-25/ CD-110-14</td><td>VOC</td><td>Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on a BACT analysis, the PSD limit for VOC has been established at 0.40 lb/hr.

State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: The owner/operator shall utilize work practice standards consisting of the inspection and cleaning of the condenser coils on a semiannual basis. The vent condenser shall be in place and operational whenever processes controlled by the vent condenser are running, except during periods of condenser malfunction or mechanical failure. Records shall be kept on-site, verifying that the work practice standards are met and made available to the Department upon request.</td></tr>
<tr><td>5.B.3.a(6)</td><td>E-110-2-4275-01</td><td>PM
PM_{10}
$PM_{2.5}$
CO
NO_x
VOC
CO_2e</td><td>Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on a BACT analysis, the hot oil heater (E-110-2-4275-01) is subject to good combustion practices and the following PSD limits:
<table>
<tr><th>Pollutant</th><th>lb/million Btu</th></tr>
<tr><td>Filterable PM</td><td>0.0022</td></tr>
<tr><td>Filterable PM_{10}</td><td>0.0022</td></tr>
<tr><td>Filterable $PM_{2.5}$</td><td>0.0022</td></tr>
<tr><td>Condensable PM_{10}</td><td>0.0056</td></tr>
<tr><td>Condensable $PM_{2.5}$</td><td>0.0056</td></tr>
<tr><td>CO</td><td>0.082</td></tr>
<tr><td>NO_x</td><td>0.10</td></tr>
<tr><td>VOC</td><td>0.012</td></tr>
<tr><td>CO_2e</td><td>3,093 TPY</td></tr>
</table>
State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: Initially, vendor information verifying compliance with the PSD NO_x limit must be submitted to the Department within 180 days after startup and then kept on-site. See Facility Wide Condition 5.C.3.</td></tr>
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PART 5.B.3.a - CONDITIONS FOR NEW MILL, MIX, AND EXTRUSION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.a(7)	E-110-2-4275-01	PM SO_2 Opacity	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 1 – Fuel Burning Operations, the hot oil heater (E-110-2-4275-01) is subject to an opacity limit no greater than 20%, a PM limit of 0.6 lbs PM/million Btu heat input, and a SO_2 limit of 3.5 lbs SO_2/million Btu heat input. **State Only:** No **Testing:** None **Monitoring/Record Keeping/Reporting/Other:** See Facility Wide Condition 5.C.3.

PART 5.B.1.b. - EQUIPMENT FOR NEW BAKE/REBAKE PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-210-2-4271-18/32	Fifteen (15), 18 million Btu/hr Carbottom Furnaces (each)	CD-210-2-4333-01	S-210-2-4333-01

PART 5.B.2.b - CONTROL DEVICES FOR NEW BAKE/REBAKE PROCESS

Control Device ID	Control Device Description	Pollutant(s) Controlled
CD-210-2-4333-01	16 million Btu/hr Thermal Oxidizer	PM, PM_{10}, $PM_{2.5}$, CO, VOC, CH_4

PART 5.B.3.b - CONDITIONS FOR NEW BAKE/REBAKE PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.b(1)	E-210-2-4271-18/32	PM	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section VIII - Other Manufacturing, particulate matter emissions shall be limited to the rate specified by use of the following equation: for process weight rates less than or equal to 30 tons per hour ($E = 4.10P^{0.67}$) where E = the allowable emission rate in pounds per hour and P = process weight rate in tons per hour. As such, each process's allowable particulate matter emission limit is limited to the amount shown in the table below at its nominal production rating:

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PART 5.B.3.b - CONDITIONS FOR NEW BAKE/REBAKE PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th>Process</th><th>PM Allowable (lb/hr)</th><th>Process Weight Rate (tons/hr)</th></tr>
<tr><td>New Bake/Rebake</td><td>23.91</td><td>13.9</td></tr>
</table>

State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: The owner/operator shall install and maintain combustion zone and/or afterburner temperature indicators on the thermal oxidizer. All temperature indicators shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level). Temperature readings shall be recorded at least every fifteen (15) minutes and maintained on site. The thermal oxidizer shall be in place and operational whenever processes controlled by the thermal oxidizer are running, except during periods of thermal oxidizer malfunction or mechanical failure. Operational ranges for the monitored parameters (adequate temperature to allow for sufficient excess combustion) shall be established to provide a reasonable assurance of compliance. These operational ranges for the monitored parameters shall be derived from stack test data, vendor certification, and/or operational history and visual inspections, which demonstrate the proper operation of the equipment in compliance. The operating ranges may be updated pending Bureau approval. Each incidence of operation outside these operational ranges, including date and time, cause, and corrective action taken, shall be recorded and kept on site for five (5) years. Reports of these incidences shall be submitted semiannually. These semiannual reports shall include temperature readings. If no incidences occurred during the reporting period then a letter shall indicate such. See Facility Wide Condition 5.C.3.
</td></tr>
<tr><td>5.B.3.b(2)</td><td>E-210-2-4271-18/32
CD-210-2-4333-01</td><td>Opacity</td><td>
Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section IX - Visible Emissions (Where Not Specified Elsewhere), where construction or modification began after December 31, 1985, emissions (including fugitive emissions) shall not exhibit an opacity greater than 20%, each.

State Only: No

Testing: None
</td></tr>
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PART 5.B.3.b - CONDITIONS FOR NEW BAKE/REBAKE PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			Monitoring/Record Keeping/Reporting/Other: The permittee shall perform a visual inspection on a daily basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports.
5.B.3.b(3)	CD-210-2-4333-01	PM Opacity	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 3 – Waste Combustion/Reduction, a 0.5 lb PM per million Btu heat input limit and an opacity limit no greater than 20% has been established. **State Only:** Yes **Testing:** None **Monitoring/Record Keeping/Reporting/Other:** The permittee shall perform a visual inspection on a daily basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports.
5.B.3.b(4)	All	PM PM_{10} $PM_{2.5}$	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on a BACT analysis, the carbottom furnaces (E-210-2-4271-18/32) and thermal oxidizer (CD-CE-

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PART 5.B.3.b - CONDITIONS FOR NEW BAKE/REBAKE PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			210-2-4333-01) are subject to good combustion practices and a PSD limit of 4.14 lb/hr (each) for filterable PM, filterable PM_{10}, and filterable $PM_{2.5}$ and a PSD limit of 2.85 lb/hr (each) for condensable PM_{10} and condensable $PM_{2.5}$. **State Only:** No **Testing:** An initial source test of the thermal oxidizer for filterable PM, PM_{10}, and $PM_{2.5}$ emissions and condensable PM_{10} and $PM_{2.5}$ emissions shall be conducted within 180 days after startup and every three (3) years thereafter. Less frequent source testing for filterable and condensable particulate matter may be done if at least two (2) consecutive stack tests shows that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source or air pollution control equipment that could increase emissions. In this case no source testing will be required for the next four (4) years. A source test shall be conducted during the fifth year and no more than 60 months after the previous source test. **Monitoring/Record Keeping/Reporting/Other:** The owner/operator shall install and maintain combustion zone and/or afterburner temperature indicators on the thermal oxidizer. All temperature indicators shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level). Temperature readings shall be recorded at least every fifteen (15) minutes and maintained on site. The thermal oxidizer shall be in place and operational whenever processes controlled by the thermal oxidizer are running, except during periods of thermal oxidizer malfunction or mechanical failure. Operational ranges for the monitored parameters (adequate temperature to allow for sufficient excess combustion) shall be established to provide a reasonable assurance of compliance. These operational ranges for the monitored parameters shall be derived from stack test data, vendor certification, and/or operational history and visual inspections, which demonstrate the proper operation of the equipment in compliance. The operating ranges may be updated pending Bureau approval. Each incidence of operation outside these operational ranges, including date and time, cause, and corrective action taken, shall be recorded and kept on site for five (5) years. Reports of these incidences shall be submitted semiannually. These semiannual reports shall include temperature readings. If no incidences occurred during the reporting period then a letter shall indicate such. See Facility Wide Condition 5.C.3.

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PART 5.B.3.b - CONDITIONS FOR NEW BAKE/REBAKE PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.b(5)	All	CO	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, the carbottom furnaces (E-210-2-4271-18/32) and thermal oxidizer (CD-210-2-4333-01) are subject to good combustion practices and a PSD limit of 2.0 lb/hr for CO. **State Only:** No **Testing:** An initial source test for CO emissions shall be conducted within 180 days after startup and every three (3) years thereafter. A source test of the Thermal Oxidizer shall be performed every three (3) years after the initial performance test. Less frequent source testing for CO from the sources may be conducted if at least two (2) consecutive performance tests show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source or air pollution control equipment that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test shall be conducted during the fifth year and no more than 60 months after the previous performance test. **Monitoring/Record Keeping/Reporting/Other:** The owner/operator shall install and maintain combustion zone and/or afterburner temperature indicators on the thermal oxidizer. All temperature indicators shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level). Temperature readings shall be recorded at least every fifteen (15) minutes and maintained on site. The thermal oxidizer shall be in place and operational whenever processes controlled by the thermal oxidizer are running, except during periods of thermal oxidizer malfunction or mechanical failure. Operational ranges for the monitored parameters (adequate temperature to allow for sufficient excess combustion) shall be established to provide a reasonable assurance of compliance. These operational ranges for the monitored parameters shall be derived from stack test data, vendor certification, and/or operational history and visual inspections, which demonstrate the proper operation of the equipment in compliance. The operating ranges may be updated pending Bureau approval. Each incidence of operation outside these operational ranges, including date and time, cause, and corrective action taken, shall be recorded and kept on site for five (5) years. Reports of these incidences shall be submitted semiannually. These semiannual reports shall include temperature

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PART 5.B.3.b - CONDITIONS FOR NEW BAKE/REBAKE PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			readings. If no incidences occurred during the reporting period then a letter shall indicate such. See Facility Wide Condition 5.C.3.
5.B.3.b(6)	All	NO_x	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, the carbottom furnaces (E-210-2-4271-18/32) and thermal oxidizer (CD-CE-210-2-4333-01) are subject to good combustion practices and a PSD limit of 75.22 lb/hr for NO_x. **State Only:** No **Testing:** An initial source test for NO_x emissions shall be conducted within 180 days after startup. A source test of the Thermal Oxidizer shall be performed every three (3) years after the initial performance test. Less frequent source testing for NO_x emissions may be conducted if at least two (2) consecutive performance tests show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source or air pollution control equipment that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test shall be conducted during the fifth year and no more than 60 months after the previous performance test. **Monitoring/Record Keeping/Reporting/Other:** The owner/operator shall demonstrate compliance with the NO_x limit on a 1-hour rolling average basis, as established by a 1-hr NO_x source test and by the verification of the installation of low NOx burners on the carbottom furnaces and both sets of burners on the thermal oxidizer. The vendor information shall be submitted to the Department within 180 days after startup and then kept on-site. See Facility Wide Condition 5.C.3 and 5.C.6.
5.B.3.b(7)	All	VOC	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, the carbottom furnaces (E-210-2-4271-18/32) and thermal oxidizer (CD-CE-210-2-4333-01) are subject to good combustion practices and a PSD limit of 17.30 lb/hr for VOC. **State Only:** No **Testing:** An initial source test for VOC as VOC emissions shall be conducted within 180 days after startup and every three (3) years thereafter. During the initial performance test, the facility shall continuously monitor the firebox temperature during each of the required one (1) hour test runs. The

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PART 5.B.3.b - CONDITIONS FOR NEW BAKE/REBAKE PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			minimum firebox temperature must then be established as the average of the three minimum 15-minute firebox temperatures monitored during each of the three (3), one (1) hour test runs. A source test of the Thermal Oxidizer shall be performed every three (3) years after the initial performance test. Less frequent source testing for VOC emissions from the source may be conducted if at least two (2) consecutive performance tests show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source or air pollution control equipment that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test shall be conducted during the fifth year and no more than 60 months after the previous performance test. **Monitoring/Record Keeping/Reporting/Other:** To demonstrate continuous compliance with the VOC emission limitations for the Thermal Oxidizer, the owner/operator will record the 3-hour block average of all recorded firebox temperature readings, and maintain the 3-hour block average temperature above the minimum temperature established during the performance test. The firebox temperature indicator monitoring system must measure and record a temperature reading at least every fifteen minutes. Each continuous parameter monitoring system (CPMS) for the Thermal Oxidizer must be capable of completing a minimum of one cycle of operation (sampling, analyzing, and recording) for each successive 15-minute period. At all times, the owner/operator must maintain the monitoring equipment including, but not limited to, maintaining necessary parts for routine repairs of the monitoring equipment. Record the results of each inspection, calibration, and validation check. For each temperature monitoring device, the facility must meet the following requirements: (1) Locate the temperature sensor in a position that provides a representative temperature. (2) Use a temperature sensor with a minimum accuracy of 4°F or 0.75 percent of the temperature value, whichever is larger.

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PART 5.B.3.b - CONDITIONS FOR NEW BAKE/REBAKE PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			(3) Perform an electronic calibration at least semiannually according to the procedures in the manufacturer's owners manual. Following the electronic calibration, conduct a temperature sensor validation check in which a second or redundant temperature sensor placed nearby the process temperature sensor must yield a reading within 30°F of the process temperature sensor's reading. (4) Conduct calibration and validation checks any time the sensor exceeds the manufacturer's specified maximum operating temperature range or install a new temperature sensor. (5) At least quarterly, inspect all components for integrity and all electrical connections for continuity, oxidation, and galvanic corrosion. All temperature indicators shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level). Temperature readings shall be recorded at least every fifteen (15) minutes and maintained on site. The thermal oxidizer shall be in place and operational whenever processes controlled by the thermal oxidizer are running, except during periods of thermal oxidizer malfunction or mechanical failure. Each incidence of operation outside established operational ranges, including date and time, cause, and corrective action taken, shall be recorded and kept on site for five (5) years. Reports of these incidences shall be submitted semiannually. These semiannual reports shall include temperature readings. If no incidences occurred during the reporting period then a letter shall indicate such. See Facility Wide Condition 5.C.3.
5.B.3.b(8)	All	CO_2e	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, the carbottom furnaces (E-210-2-4271-18/32) and thermal oxidizer (CD-CE-210-2-4333-01) are subject to good combustion practices, operation of the thermal oxidizer, process optimization and a PSD limit of 200,009 TPY for CO_2e. **State Only:** No **Testing:** An initial source test for CO_2 emissions shall be conducted within 180 days after startup and every three (3) years thereafter. A source test of the Thermal Oxidizer shall be performed every three (3) years after the initial performance test. Less frequent source testing for CO_2 from the sources may be conducted if at least two (2) consecutive performance tests

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PART 5.B.3.b - CONDITIONS FOR NEW BAKE/REBAKE PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source or air pollution control equipment that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test shall be conducted during the fifth year and no more than 60 months after the previous performance test. **Monitoring/Record Keeping/Reporting/Other:** Compliance with the above limit will be demonstrated by calculating CO_2e emissions based on raw material and fuel usage records along with initial and subsequent performance testing on a 12-month rolling sum. See Facility Wide Condition 5.C.3. Process Optimization practices will be developed and maintained in an Operations and Maintenance Manual (O & M Manual) which specifies proper optimization practices, training, maintenance and repair. As a minimum this O & M Manual shall include: 1. Proper furnace scheduling and control to temperature ramp rate 2. Monitoring of thermal oxidizer temperature and oxygen levels 3. Operator and maintenance practices, including training in the proper sealing of each furnace prior to operation 4. Optimum product yield The original O & M Plan shall be submitted to the Department within 180 days of startup. This O & M Manual will be updated as required to reflect changes in operations, equipment, and emissions.
5.B.3.b(9)	E-210-2-4271-18/32	NO_x VOC	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, a representative Clean Air Stack on one of the carbottom furnaces shall be screened within 180 days after startup to verify no NO_x, or VOC emissions are present. **State Only:** No **Testing:** An initial screening for NO_x, and VOC emissions shall be conducted within 180 days after startup. **Monitoring/Record Keeping/Reporting/Other:** All test plans, notifications and final reports shall be submitted to the Bureau of Air

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PART 5.B.3.b - CONDITIONS FOR NEW BAKE/REBAKE PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			Quality's Source Evaluation Section according to SC Regulation 61-62.1 Section IV. A protocol shall be submitted to the Source Test Evaluation Section of this Bureau for approval indicating the proposed initial source test date and test procedure at least 45 days prior to the proposed test date. The Bureau must be notified at least two weeks prior to a source test so that a Bureau Representative may be present, and the final test report must be submitted no later than 30 days after completion of on-site testing, or as approved in a site specific test plan.

PART 5.B.1.c. - EQUIPMENT FOR EXISTING REBAKE LOAD AND UNLOAD/GRAPHITIZING PREPARATION PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-220-01	End Facing Machine; prepare electrode face	CD-220-01	S-220-01
E-220-02	Basket Cleaner; clean rebake baskets	CD-220-01	S-220-01
E-220-03	Pitch Coke Crusher; crush pitch chips from basket cleaner	CD-220-01	S-220-01
E-220-04	Pitch Coke Storage Silo; store crushed pitch chips	CD-220-01	S-220-01
E-220-05	By Product Loading Station; load petroleum pitch to transport vehicles as product	CD-220-01	S-220-01
E-220-06	Storage Bin; store pitch coke	CD-220-01	S-220-01

PART 5.B.2.c - CONTROL DEVICES FOR EXISTING REBAKE LOAD AND UNLOAD/GRAPHITIZING PREPARATION PROCESS

Control Device ID	Control Device Description	Pollutant(s) Controlled
CD-220-01	Carborundum Co. Model HP1015-S Baghouse	PM, PM_{10}, $PM_{2.5}$

PART 5.B.3.c – CONDITIONS FOR EXISTING REBAKE LOAD AND UNLOAD/GRAPHITIZING PREPARATION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.c(1)	All	PM	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section VIII - Other Manufacturing, particulate matter emissions shall be limited to the rate specified by use of

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PART 5.B.3.c – CONDITIONS FOR EXISTING REBAKE LOAD AND UNLOAD/GRAPHITIZING PREPARATION PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td></td><td></td><td></td><td>the following equation: for process weight rates less than or equal to 30 tons per hour ($E = 4.10P^{0.67}$) where E = the allowable emission rate in pounds per hour and P = process weight rate in tons per hour. As such, each process's allowable particulate matter emission limit is limited to the amount shown in the table below at its nominal production rating:
<table>
<tr><th>Process</th><th>PM Allowable (lb/hr)</th><th>Process Weight Rate (tons/hr)</th></tr>
<tr><td>Existing Rebake Load and Unload/Graphitizing Preparation</td><td>36.54</td><td>26.18</td></tr>
</table>
State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: See Generic Condition 5.A.7.</td></tr>
<tr><td>5.B.3.c(2)</td><td>All</td><td>Opacity</td><td>Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section IX - Visible Emissions (Where Not Specified Elsewhere), where construction or modification began after December 31, 1985, emissions (including fugitive emissions) shall not exhibit an opacity greater than 20%,each.

State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: The permittee shall perform a visual inspection on a daily basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. Logs shall be kept to record all visual inspections,</td></tr>
</table>

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PART 5.B.3.c – CONDITIONS FOR EXISTING REBAKE LOAD AND UNLOAD/GRAPHITIZING PREPARATION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports.
5.B.3.c(3)	All	PM PM_{10} $PM_{2.5}$	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, a PSD limit of 0.005 gr/dscf has been established for filterable PM, filterable PM_{10}, and filterable $PM_{2.5}$. **State Only:** No **Testing:** An initial source test for filterable PM, PM_{10}, and $PM_{2.5}$ emissions shall be conducted within 180 days after startup of this project and every three (3) years thereafter. An initial source test to verify no condensable PM_{10} and $PM_{2.5}$ emissions are present shall be conducted within 180 days after startup of this project. **Monitoring/Record Keeping/Reporting/Other:** See Generic Condition 5.A.7.

PART 5.B.1.d. - EQUIPMENT FOR EXISTING BAKE LOAD AND UNLOAD AND BAKED ELECTRODE CLEANING PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-250-02	Sand Storage Bin; store used sand from recycle system	CD-250-01	S-250-01
E-250-03	Sagger Loading System; load sagger can with sand and electrode	CD-250-02	S-250-02
E-250-04	Sagger Unloading System; remove electrode and sand from saggers	CD-250-02	S-250-02
E-250-06	Sagger Cleaning; clean sagger cans for reuse	CD-250-04	S-250-04
E-250-07	Electrode Cleaner; remove residual sand from electrode/surface preparation	CD-250-04	S-250-04

PART 5.B.2.d - CONTROL DEVICES FOR EXISTING BAKE LOAD AND UNLOAD AND BAKED ELECTRODE CLEANING PROCESS

Control Device ID	Control Device Description	Pollutant(s) Controlled
CD-250-01	Carborundum Co. Model W16 HPS-7B Bin Vent Filter	Filterable PM, PM_{10}, $PM_{2.5}$

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PART 5.B.2.d - CONTROL DEVICES FOR EXISTING BAKE LOAD AND UNLOAD AND BAKED ELECTRODE CLEANING PROCESS

Control Device ID	Control Device Description	Pollutant(s) Controlled
CD-250-02	Carborundum Co. Model HP1015-S Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$
CD-250-04	LSTC Air Vent Filter, Model 551 STC81, Style III Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$

PART 5.B.3.d - CONDITIONS FOR EXISTING BAKE LOAD AND UNLOAD AND BAKED ELECTRODE CLEANING PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment/ Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td>5.B.3.d(1)</td><td>All</td><td>PM</td><td>

Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section VIII - Other Manufacturing, particulate matter emissions shall be limited to the rate specified by use of the following equation: for process weight rates less than or equal to 30 tons per hour ($E = 4.10P^{0.67}$) where E = the allowable emission rate in pounds per hour and P = process weight rate in tons per hour. As such, each process's allowable particulate matter emission limit is limited to the amount shown in the table below at its nominal production rating:

<table>
<tr><th>Process</th><th>PM Allowable (lb/hr)</th><th>Process Weight Rate (tons/hr)</th></tr>
<tr><td>Existing Bake Load and Unload and Baked Electrode Cleaning</td><td>35.41</td><td>24.98</td></tr>
</table>

State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: See Generic Condition 5.A.7.

</td></tr>
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PART 5.B.3.d - CONDITIONS FOR EXISTING BAKE LOAD AND UNLOAD AND BAKED ELECTRODE CLEANING PROCESS

Condition Number	Equipment/ Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.d(2)	All	Opacity	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section IX - Visible Emissions (Where Not Specified Elsewhere), where construction or modification began after December 31, 1985, emissions (including fugitive emissions) shall not exhibit an opacity greater than 20%, each **State Only:** No **Testing:** None **Monitoring/Record Keeping/Reporting/Other:** The permittee shall perform a visual inspection on a daily basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. No periodic monitoring for opacity will be required during periods of burning natural gas or propane only. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports.

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PART 5.B.3.d - CONDITIONS FOR EXISTING BAKE LOAD AND UNLOAD AND BAKED ELECTRODE CLEANING PROCESS

Condition Number	Equipment/ Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.d(3)	All	PM PM_{10} $PM_{2.5}$	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, a PSD limit of 0.005 gr/dscf has been established for filterable PM, filterable PM_{10}, and filterable $PM_{2.5}$. **State Only:** No **Testing:** An initial source test for filterable PM, PM_{10}, and $PM_{2.5}$ emissions shall be conducted within 180 days after startup of this project and every three (3) years thereafter. An initial source test to verify no condensable PM_{10} and $PM_{2.5}$ emissions are present shall be conducted within 180 days after startup of this project. **Monitoring/Record Keeping/Reporting/Other:**. See Generic Condition 5.A.7.

PART 5.B.1.e. - EQUIPMENT FOR NEW PITCH IMPREGNATION PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-310-2-4272-21	One (1) Preheater, 12.0 million Btu/hr	N/A	S-310-2-4349-23 S-310-2-4349-24
E-310-2-4201-01	One (1) Autoclave/Spray Cooler/Cooling Bath	CD-310-2-4333-01	S-310-2-4349-02
E-310-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	S-310-02-4349-01

N/A = Not Applicable

PART 5.B.2.e - CONTROL DEVICES FOR NEW PITCH IMPREGNATION PROCESS

Control Device ID	Control Device Description	Pollutant(s) Controlled
CD-310-2-4333-01	7.5 million Btu/hr Thermal Oxidizer	VOC

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PART 5.B.3.e - CONDITIONS FOR NEW PITCH IMPREGNATION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.e(1)	E-310-2-4272-21; E-310-2-4201-01/CD-310-2-4333-01	Opacity	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section IX - Visible Emissions (Where Not Specified Elsewhere), where construction or modification began after December 31, 1985, emissions (including fugitive emissions) shall not exhibit an opacity greater than 20%, each. **State Only:** No **Testing:** None **Monitoring/Record Keeping/Reporting/Other:** The permittee shall perform a visual inspection on a daily basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports.

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PART 5.B.3.e - CONDITIONS FOR NEW PITCH IMPREGNATION PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td>5.B.3.e(2)</td><td>E-310-2-4272-21</td><td>PM
PM_{10}
$PM_{2.5}$
CO
NO_x
VOC</td><td>

Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on a BACT analysis, the preheater (E-310-2-4272-21) is subject to good combustion practices and the following PSD limits:

<table>
<tr><th>Pollutant</th><th>lb/million Btu</th></tr>
<tr><td>Filterable PM</td><td>0.0023</td></tr>
<tr><td>Filterable PM_{10}</td><td>0.0023</td></tr>
<tr><td>Filterable $PM_{2.5}$</td><td>0.0023</td></tr>
<tr><td>Condensable PM_{10}</td><td>0.0056</td></tr>
<tr><td>Condensable $PM_{2.5}$</td><td>0.0056</td></tr>
<tr><td>CO</td><td>0.083</td></tr>
<tr><td>NO_x</td><td>0.10</td></tr>
<tr><td>VOC</td><td>0.011</td></tr>
</table>

State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: Initially, vendor information verifying compliance with the PSD NO_x limit must be submitted to the Department within 180 days after startup and then kept on-site. See Facility Wide Condition 5.C.3.

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PART 5.B.3.e - CONDITIONS FOR NEW PITCH IMPREGNATION PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td>5.B.3.e(3)</td><td>E-310-2-4201-01/CD-310-2-4333-01; E-310-2-4272-21; E-310-2-4275-01</td><td>CO_2e</td><td>
Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, the thermal oxidizer (CD-310-2-4333-01) on the autoclave/spray cooler/cooling bath (E-310-2-4201-01), impregnation preheater (E-310-2-4272-21) and hot oil heater (E-310-2-4275-01) are subject to good combustion practices and a CO_2e limits:.
<table>
<tr><th>Source</th><th>CO_2e emission limit (TPY)</th></tr>
<tr><td>Impregnation preheater</td><td>7,424</td></tr>
<tr><td>Impregnation hot oil heater</td><td>3,093</td></tr>
<tr><td>Autoclave/spray cooler/cooling bath thermal oxidizer</td><td>8,973</td></tr>
</table>
State Only: No

Testing: An initial source test of CO_2 emissions shall be conducted within 180 days after startup and every three (3) years thereafter. A source test of the Thermal Oxidizer shall be performed every three (3) years after the initial performance test. Less frequent source testing for CO_2 from these two sources may be conducted if at least two (2) consecutive performance tests show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source or air pollution control equipment that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test shall be conducted during the fourth year and no more than 60 months after the previous performance test.

Monitoring/Record Keeping/Reporting/Other: Compliance with the above limits will be demonstrated by calculating CO_2e emissions based on raw material and fuel usage records along with initial and subsequent performance testing on a 12-month rolling sum. See Facility Wide Condition 5.C.3.
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PART 5.B.3.e - CONDITIONS FOR NEW PITCH IMPREGNATION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.e(4)	CD-310-2-4333-01	PM Opacity	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 3 – Waste Combustion/Reduction, a 0.5 lb PM per million BTU heat input limit and an opacity limit no greater than 20% has been established. **State Only:** Yes **Testing:** None **Monitoring/Record Keeping/Reporting/Other:** The permittee shall perform a visual inspection on a daily basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports.
5.B.3.e(5)	E-310-2-4201-01/CD-310-2-4333-01	VOC	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, the PSD limit for VOC has been established at 3.083 lb/hr. **State Only:** No **Testing:** An initial source test for VOC as VOC emissions shall be conducted within 180 days after startup and every three (3) years thereafter**.** During the initial performance test, the facility shall continuously monitor the firebox temperature during each of the required one (1) hour test runs. The minimum firebox temperature must then be established as the average of the three minimum 15-minute firebox temperatures monitored during each of the three (3), one (1) hour test runs. A source test of the Thermal Oxidizer shall be performed every three (3) years after the initial performance test. Less frequent source testing for VOC emissions from the source may be conducted if at least two (2) consecutive performance tests show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source or air pollution control

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PART 5.B.3.e - CONDITIONS FOR NEW PITCH IMPREGNATION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			equipment that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test shall be conducted during the fifth year and no more than 60 months after the previous performance test. **Monitoring/Record Keeping/Reporting/Other:** To demonstrate continuous compliance with the VOC emission limitations for the Thermal Oxidizer, the owner/operator will record the 3-hour block average of all recorded firebox temperature readings, and maintain the 3-hour block average temperature above the minimum temperature established during the performance test. The firebox temperature indicator monitoring system must measure and record a temperature reading at least every fifteen minutes. Each continuous parameter monitoring system (CPMS) for the Thermal Oxidizer must be capable of completing a minimum of one cycle of operation (sampling, analyzing, and recording) for each successive 15-minute period. At all times, the owner/operator must maintain the monitoring equipment including, but not limited to, maintaining necessary parts for routine repairs of the monitoring equipment. Record the results of each inspection, calibration, and validation check. For each temperature monitoring device, the facility must meet the following requirements: (1) Locate the temperature sensor in a position that provides a representative temperature. (2) Use a temperature sensor with a minimum accuracy of 4°F or 0.75 percent of the temperature value, whichever is larger. (3) Perform an electronic calibration at least semiannually according to the procedures in the manufacturer's owners manual. Following the electronic calibration, conduct a temperature sensor validation check in which a second or redundant temperature sensor placed nearby the process temperature sensor must yield a reading within 30°F of the process temperature sensor's reading.

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PART 5.B.3.e - CONDITIONS FOR NEW PITCH IMPREGNATION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			(4) Conduct calibration and validation checks any time the sensor exceeds the manufacturer's specified maximum operating temperature range or install a new temperature sensor. (5) At least quarterly, inspect all components for integrity and all electrical connections for continuity, oxidation, and galvanic corrosion. All temperature indicators shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level). Temperature readings shall be recorded at least every fifteen (15) minutes and maintained on site. The thermal oxidizer shall be in place and operational whenever processes controlled by the thermal oxidizer are running, except during periods of thermal oxidizer malfunction or mechanical failure. Each incidence of operation outside established operational ranges, including date and time, cause, and corrective action taken, shall be recorded and kept on site for five (5) years. Reports of these incidences shall be submitted semiannually. These semiannual reports shall include temperature readings. If no incidences occurred during the reporting period then a letter shall indicate such. See Facility Wide Condition 5.C.3.
5.B.3.e(6)	E-310-2-4275-01	PM SO_2 Opacity	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 1 – Fuel Burning Operations, the hot oil heater (E-310-2-4275-01) is subject to an opacity limit no greater than 20%, a PM limit of 0.6 lbs PM/million Btu heat input, and a SO_2 limit of 3.5 lbs SO_2/million Btu heat input. **State Only:** No **Testing:** None **Monitoring/Record Keeping/Reporting/Other:** See Facility Wide Condition 5.C.3.

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PART 5.B.3.e - CONDITIONS FOR NEW PITCH IMPREGNATION PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td>5.B.3.e(7)</td><td>E-310-2-4275-01</td><td>PM
PM_{10}
$PM_{2.5}$
CO
NO_x
VOC</td><td>

Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on a BACT analysis, the hot oil heater (E-310-2-4275-01) is subject to good combustion practices and the following PSD limits:

<table>
<tr><th>Pollutant</th><th>lb/million Btu</th></tr>
<tr><td>Filterable PM</td><td>0.0022</td></tr>
<tr><td>Filterable PM_{10}</td><td>0.0022</td></tr>
<tr><td>Filterable $PM_{2.5}$</td><td>0.0022</td></tr>
<tr><td>Condensable PM_{10}</td><td>0.0056</td></tr>
<tr><td>Condensable $PM_{2.5}$</td><td>0.0056</td></tr>
<tr><td>CO</td><td>0.082</td></tr>
<tr><td>NO_x</td><td>0.10</td></tr>
<tr><td>VOC</td><td>0.012</td></tr>
</table>

State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: Initially, vendor information verifying compliance with the PSD NO_x limit must be submitted to the Department within 180 days after startup and then kept on-site. See Facility Wide Condition 5.C.3.

</td></tr>
</table>

PART 5.B.1.f. - EQUIPMENT FOR EXISTING PITCH IMPREGNATION PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-310-04	40,000 Gallon Impregnation Pitch Storage Tank; store impregnation pitch from delivery truck	CD-310-07	S-310-07
E-310-09	25,345 Gallon Impregnation Pitch Storage Tank; store melted pitch	CD-310-08	S-310-08
E-310-10	25,345 Gallon Impregnation Pitch Storage Tank; store melted pitch	CD-310-09	S-310-09

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PART 5.B.2.f - CONTROL DEVICES FOR EXISTING PITCH IMPREGNATION PROCESS

Control Device ID	Control Device Description	Pollutant(s) Controlled
CD-310-07	Vent Condenser	VOC
CD-310-08	Vent Condenser	VOC
CD-310-09	Vent Condenser	VOC

PART 5.B.3.f - CONDITIONS FOR EXISTING PITCH IMPREGNATION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.f(1)	All	Opacity	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section IX - Visible Emissions (Where Not Specified Elsewhere), where construction or modification began after December 31, 1985, emissions (including fugitive emissions) shall not exhibit an opacity greater than 20%, each. **State Only:** No **Testing:** None **Monitoring/Record Keeping/Reporting/Other:** The permittee shall perform a visual inspection on a daily basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. No periodic monitoring for opacity will be required during periods of burning natural gas or propane only. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports.

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PART 5.B.3.f - CONDITIONS FOR EXISTING PITCH IMPREGNATION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.f(2)	All	VOC	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, a PSD limit of 0.055 TPY (total) for VOCs has been established. **State Only:** No **Testing:** None **Monitoring/Record Keeping/Reporting/Other:** The owner/operator shall utilize work practice standards consisting of the inspection and cleaning of the condenser coils on a semiannual basis. The vent condenser shall be in place and operational whenever processes controlled by the vent condenser are running, except during periods of condenser malfunction or mechanical failure. Records shall be kept on-site, verifying that the work practice standards are met and made available to the Department upon request.

PART 5.B.1.g. - EQUIPMENT FOR EXISTING INSULATING MEDIA RECEIVING PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-410-01	Insulating Media Unloading Station; unload insulating media from delivery truck	CD-410-01	S-410-01
E-410-02	Insulating Media Silo; store insulating media	CD-410-01	S-410-01
E-420-03	Transport Hopper Loading – hopper is transferred via forklift from building 410 to building 430	CD-410-01/CD-430-02	S-410-01/S-430-02

PART 5.B.2.g - CONTROL DEVICES FOR EXISTING INSULATING MEDIA RECEIVING PROCESS

Control Device ID	Control Device Description	Pollutant(s) Controlled
CD-410-01	Carborundum Co. Model HP1015-TH Baghouse	PM, PM_{10}, $PM_{2.5}$
CD-430-02	Mikropul Model 109-8-231 Baghouse	PM, PM_{10}, $PM_{2.5}$

PART 5.B.3.g - CONDITIONS FOR EXISTING INSULATING MEDIA RECEIVING PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.g(1)	All	PM	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No.

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PART 5.B.3.g - CONDITIONS FOR EXISTING INSULATING MEDIA RECEIVING PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td></td><td></td><td></td><td>4 - Emissions from Process Industries, Section VIII - Other Manufacturing, particulate matter emissions shall be limited to the rate specified by use of the following equation: for process weight rates less than or equal to 30 tons per hour ($E = 4.10P^{0.67}$) where E = the allowable emission rate in pounds per hour and P = process weight rate in tons per hour. As such, each process's allowable particulate matter emission limit is limited to the amount shown in the table below at its nominal production rating:
<table>
<tr><th>Process</th><th>PM Allowable (lb/hr)</th><th>Process Weight Rate (tons/hr)</th></tr>
<tr><td>Existing Insulating Media Receiving</td><td>9.42</td><td>3.46</td></tr>
</table>
State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: See Generic Condition 5.A.7.</td></tr>
<tr><td>5.B.3.g(2)</td><td>All</td><td>Opacity</td><td>Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section IX - Visible Emissions (Where Not Specified Elsewhere), where construction or modification began after December 31, 1985, emissions (including fugitive emissions) shall not exhibit an opacity greater than 20%, each.

State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: The permittee shall perform a visual inspection on a daily basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. Logs shall be kept to record all visual inspections,</td></tr>
</table>

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PART 5.B.3.g - CONDITIONS FOR EXISTING INSULATING MEDIA RECEIVING PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports.
5.B.3.g(3)	All	PM PM_{10} $PM_{2.5}$	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, a PSD limit of 0.005 gr/dscf has been established for filterable PM, filterable PM_{10}, and filterable $PM_{2.5}$. **State Only:** No **Testing:** An initial source test for filterable PM, PM_{10}, and $PM_{2.5}$ emissions shall be conducted within 180 days after startup of this project and every three (3) years thereafter. An initial source test to verify no condensable PM_{10} and $PM_{2.5}$ emissions are present shall be conducted within 180 days after startup of this project. **Monitoring/Record Keeping/Reporting/Other:** See Generic Condition 5.A.7.

PART 5.B.1.h - EQUIPMENT FOR NEW GRAPHITIZING PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-460-4271-01/10	Ten (10) Graphitizing Furnaces; graphitize electrodes	CD-460-4349-03/ N/A for Roof Monitor	S-460-4349-03/ Roof Monitor
E-460-4349-02	Sodium Carbonate Storage Bin (supports SO_2 scrubber system)	CD-460-4349-02	S-460-4349-02
E-460-4225-01	Gulper System; feed/remove insulating media to graphitizing furnaces	CD-460-02	S-460-02
E-460-4202-01	Insulating Media Dust Bin; stores fines of insulating media	CD-460-02	S-460-02
E-460-4202-06	Insulating Media Dust Bin; load insulating media fines to truck	CD-460-02	S-460-02
E-460-4202-02	Insulating Media Recycle (gulper system)	CD-460-04	Internal Vent

N/A = Not Applicable

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PART 5.B.2.h - CONTROL DEVICES FOR NEW GRAPHITIZING PROCESS

Control Device ID	Control Device Description	Pollutant(s) Controlled
CD-460-4349-03	Wet Scrubber	PM, PM_{10}, $PM_{2.5}$,SO_2
CD-460-4349-02	Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$
CD-460-02	Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$
CD-460-04	Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$

PART 5.B.3.h - CONDITIONS FOR NEW GRAPHITIZING PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.h(1)	E-460-4271-01/10 CD-460-4349-03 E-460-4202-02 CD-460-04	PM PM_{10} $PM_{2.5}$	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on a BACT analysis, the graphitizing furnaces (E-460-4271-01/10), wet scrubber (CD-460-4349-03), insulating media recycle (E-460-4202-02), and baghouse (CD-460-04) are subject to a PSD limit of 4.19 lb/hr for filterable PM, 4.15 lb/hr filterable PM_{10}, and 4.12 lb/hr filterable $PM_{2.5}$ and a PSD limit of 2.65 lb/hr (each) for condensable PM, condensable PM_{10}, and condensable $PM_{2.5}$. **State Only:** No **Testing:** An initial source test for filterable PM, PM_{10}, and $PM_{2.5}$ emissions and condensable PM_{10} and $PM_{2.5}$ emissions shall be conducted within 180 days after startup and every three (3) years thereafter. See Facility Wide Condition 5.C.4. **Monitoring/Record Keeping/Reporting/Other:** The owner/operator shall install and maintain liquid pressure indicators on each scrubber module. Each parameter shall be recorded each shift during source operation. The scrubber shall be in place and operational whenever processes controlled by the scrubber are running, except during periods of scrubber malfunction or mechanical failure. Prior to the first source test, the facility shall use manufacturer's recommendations for operational ranges. These operational ranges for the monitored parameters shall be derived from stack test data, which demonstrate the proper operation of the equipment in compliance. These ranges, with supporting documentation and quality assurance procedures, shall be submitted to the Bureau for approval within 180 days of startup. The operating ranges may be updated using this procedure, following Bureau approval.

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PART 5.B.3.h - CONDITIONS FOR NEW GRAPHITIZING PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.h(2)	E-460-4271-01/10	NO_x	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, a PSD limit of 2.5 lb/hr for NO_X (total for exhaust from the roof monitor and exhaust from the graphitizing stack) has been established. **State Only:** No **Testing:** An initial source test for NO_x emissions shall be conducted on the stack and roof monitor within 180 days after startup and every three (3) years thereafter. See Facility Wide Condition 5.C.4. **Monitoring/Record Keeping/Reporting/Other:** The owner/operator shall demonstrate compliance with the NO_x limit on a 1-hour rolling average basis, as established by a 1-hr NO_x source test. The vendor information shall be submitted to the Department within 180 days after startup and then kept on-site. See Facility Wide Condition 5.C.6.
5.B.3.h(3)	E-460-4271-01/10	CO	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, a PSD limit of 1,690 lb/hr for CO (total for exhaust from the roof monitor and exhaust from the graphitizing stack) has been established. **State Only:** No **Testing:** An initial source test for CO emissions shall be conducted on the stack and roof monitor within 180 days after startup. A stack test for CO emissions from the roof monitor shall be conducted every three (3) years thereafter. See Facility Wide Condition 5.C.4 and 5.C.5. **Monitoring/Record Keeping/Reporting/Other:** The owner or operator of the graphitizing furnaces shall install, calibrate, maintain, and operate a continuous emission monitor system (CEMS) for measuring CO mass emissions discharged to the atmosphere from the stack and record the output of the system. The CEMS shall consist of a CO monitor that meets 40 CFR, Appendix B, Performance Specification 4 and a flow monitor that meets 40 CFR, Appendix B, Performance Specification 6. The CEMS shall report mass emissions on a 30 day rolling average basis. The monitors must be installed and performance specification testing completed within 180 days after startup of the furnaces. Relative accuracy tests for the CO and flow monitors shall be conducted on an annual basis. For missing CO data, 40 CFR 60 Part 75 procedures shall be used. To determine compliance with the

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PART 5.B.3.h - CONDITIONS FOR NEW GRAPHITIZING PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			applicable CO emission limit, the owner or operator shall combine the results of the most recent stack testing results from the roof monitor system (lb/hr), with the CEMS results (lb/hr). Compliance with the CO limit shall be demonstrated on a 30 day rolling averaging period and semiannual reports shall be submitted to the Department.
5.B.3.h(4)	E-460-4271-01/10	VOC	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, a PSD limit of 3.3 lb/hr (96 hour block average) for VOC (total for exhaust from the roof monitor and exhaust from the graphitizing stack) has been established. **State Only:** No **Testing:** An initial source test for VOC as VOC emissions shall be conducted within 180 days after startup and every three (3) years thereafter. During the initial performance test and any subsequent testing, the facility shall test for VOC emissions from the roof monitor and graphitizing scrubber stack for 96 hours as per a Department approved site-specific test plan. Less frequent source testing for VOC emissions from the source may be conducted if at least two (2) consecutive performance tests show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test shall be conducted during the fifth year and no more than 60 months after the previous performance test. **Monitoring/Record Keeping/Reporting/Other:** To demonstrate continuous compliance with the VOC emission limitations, the owner/operator is limited to the use of metallurgical coke only as the insulation medium for the new graphitizing furnaces. Records shall be kept on-site, verifying that only metallurgical coke is utilized as the insulating medium. Alternate materials may be utilized as insulating media, if the VOC content in the alternate insulating media, is less than or equal to the VOC content in the metallurgical coke. The owner/operator shall submit a request to the Department, and receive approval in writing, prior to utilizing any such alternate insulating media.
5.B.3.h(5)	E-460-4271-01/10	CO_2e	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, the graphitizing furnaces are subject to a process optimization plan, insulating media carbon content of 90% or less and a PSD limit of 35,464 TPY for CO_2e.

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PART 5.B.3.h - CONDITIONS FOR NEW GRAPHITIZING PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			State Only: No **Testing:** An initial source test for CO_2 and CH_4 emissions shall be conducted within 180 days after startup and every three (3) years thereafter. Less frequent source testing for CO_2 and CH_4 may be conducted if at least two (2) consecutive performance tests show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source or air pollution control equipment that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test shall be conducted during the fifth year and no more than 60 months after the previous performance test. **Monitoring/Record Keeping/Reporting/Other:** Compliance with the above limit will be demonstrated by calculating CO_2e emissions based on raw material and fuel usage records along with initial and subsequent performance testing on a 12-month rolling sum. See Facility Wide Condition 5.C.3. The owner/operator shall maintain records for carbon content (% by weight) of insulating media on a monthly basis. These records shall be maintained on site and made available to the Department upon request. Process Optimization practices will be developed and maintained in an Operations and Maintenance Manual (O & M Manual) which specifies proper optimization practices, training, maintenance and repair. As a minimum this O & M Manual shall include: 1. Proper furnace scheduling to minimize power demand 2. Operator and maintenance practices, including training in effective furnace packing 3. Optimum product yield The original O & M Plan shall be submitted to the Department within 180 days of startup. This O & M Manual will be updated as required to reflect changes in operations, equipment, and emissions.
5.B.3.h(6)	See Conditions Table	PM PM_{10} $PM_{2.5}$	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on a BACT analysis, the PSD limit for filterable PM, filterable PM_{10}, and filterable $PM_{2.5}$ has been established. See below for limits that apply to specific equipment:

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PART 5.B.3.h - CONDITIONS FOR NEW GRAPHITIZING PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th>Equipment ID</th><th>Control Device ID</th><th>Limit</th></tr>
<tr><td>E-460-4349-02</td><td>CD-460-4349-02</td><td>0.005 gr/dscf (Filterable PM)
0.005 gr/dscf (Filterable PM_{10})
0.005 gr/dscf (Filterable $PM_{2.5}$)</td></tr>
<tr><td>E-460-4225-01,
E-460-4202-01,
E-460-4202-06</td><td>CD-460-02</td><td>0.005 gr/dscf (Filterable PM)
0.005 gr/dscf (Filterable PM_{10})
0.005 gr/dscf (Filterable $PM_{2.5}$)</td></tr>
<tr><td>E-460-4202-02</td><td>CD-460-04</td><td>0.005 gr/dscf (Filterable PM)
0.005 gr/dscf (Filterable PM_{10})
0.005 gr/dscf (Filterable $PM_{2.5}$)</td></tr>
</table>

State Only: No

Testing: An initial source test for filterable PM, PM_{10}, and $PM_{2.5}$ emissions shall be conducted within 180 days after startup and every three (3) years thereafter. An initial source test to verify no condensable PM_{10} and $PM_{2.5}$ emissions are present shall be conducted within 180 days after startup.

Monitoring/Record Keeping/Reporting/Other: See Generic Condition 5.A.7.
</td></tr>
<tr><td>5.B.3.h(7)</td><td>All</td><td>PM</td><td>**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section VIII - Other Manufacturing, particulate matter emissions shall be limited to the rate specified by use of the following equation: for process weight rates less than or equal to 30 tons per hour ($E = 4.10P^{0.67}$) where E = the allowable emission rate in pounds per hour and P = process weight rate in tons per hour. As such, each process's allowable particulate matter emission limit is limited to the amount shown in the table below at its nominal production rating:</td></tr>
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PART 5.B.3.h - CONDITIONS FOR NEW GRAPHITIZING PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th>Process</th><th>PM Allowable (lb/hr)</th><th>Process Weight Rate (tons/hr)</th></tr>
<tr><td>New Graphitizing</td><td>13.94</td><td>6.2</td></tr>
</table>

State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: See Generic Condition 5.A.7.
</td></tr>
<tr><td>5.B.3.h(8)</td><td>All</td><td>Opacity</td><td>
Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section IX - Visible Emissions (Where Not Specified Elsewhere), where construction or modification began after December 31, 1985, emissions (including fugitive emissions) shall not exhibit an opacity greater than 20%, each.

State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: The permittee shall perform a visual inspection on a daily basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports.
</td></tr>
</table>

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PART 5.B.1.i. - EQUIPMENT FOR EXISTING CLEANING AND INSPECTION PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-490-01	Electrode Cleaning Machine; remove residual insulating media from electrode	CD-490-01B	S-490-01B

PART 5.B.2.i - CONTROL DEVICES FOR EXISTING CLEANING AND INSPECTION PROCESS

Control Device ID	Control Device Description	Pollutant(s) Controlled
CD-490-01B	SLY ST J-811-10 Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$

PART 5.B.3.i - CONDITIONS FOR EXISTING CLEANING AND INSPECTION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.i(1)	All	PM	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section VIII - Other Manufacturing, particulate matter emissions shall be limited to the rate specified by use of the following equation: for process weight rates less than or equal to 30 tons per hour ($E = 4.10P^{0.67}$) where E = the allowable emission rate in pounds per hour and P = process weight rate in tons per hour. As such, each process's allowable particulate matter emission limit is limited to the amount shown in the table below at its nominal production rating: **Process** | **PM Allowable (lb/hr)** | **Process Weight Rate (tons/hr)** Existing Cleaning and Inspection | 35.43 | 25 **State Only:** No **Testing:** None **Monitoring/Record Keeping/Reporting/Other:** See Generic Condition 5.A.7.
5.B.3.i(2)	All	Opacity	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section IX - Visible Emissions (Where Not Specified Elsewhere), where construction or modification began after December 31, 1985, emissions (including fugitive emissions) shall not exhibit an opacity greater than 20%, each.

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PART 5.B.3.i - CONDITIONS FOR EXISTING CLEANING AND INSPECTION PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
			State Only: No **Testing:** None **Monitoring/Record Keeping/Reporting/Other:** The permittee shall perform a visual inspection on a daily basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. No periodic monitoring for opacity will be required during periods of burning natural gas or propane only. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports.
5.B.3.i(3)	All	PM PM_{10} $PM_{2.5}$	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, a PSD limit of 0.005 gr/dscf has been established for filterable PM, filterable PM_{10}, and filterable $PM_{2.5}$. **State Only:** No **Testing:** An initial source test for filterable PM, PM_{10}, and $PM_{2.5}$ emissions shall be conducted within 180 days after startup of this project and every three (3) years thereafter. An initial source test to verify no condensable PM_{10} and $PM_{2.5}$ emissions are present shall be conducted within 180 days after startup of this project. **Monitoring/Record Keeping/Reporting/Other:** See Generic Condition 5.A.7.

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PART 5.B.1.j. - EQUIPMENT FOR EXISTING MACHINING AND SHIPPING PROCESS

Equipment ID	Equipment Description	Control Device ID	Emission Point ID
E-510-01	Station No. 1 – rough bore and face ends; machining/finishing of electrodes	CD-510-01	S-510-01
E-510-02	Station No. 2 – finish turn OD and face ends; machining/finishing of electrodes	CD-510-05	S-510-05
E-510-03	Station No. 3 – threading; machining/finishing of electrodes	CD-510-01	S-510-01
E-510-06	Graphite Chip Screen; screen graphite chips to various sizes	CD-510-01	S-510-01
E-510-07	Graphite Storage Bin #1; store graphite of specific size	CD-510-01	S-510-01
E-510-08	Graphite Storage Bin #2; store graphite of specific size	CD-510-01	S-510-01
E-510-09	Graphite Storage Bin #3; store graphite of specific size	CD-510-01	S-510-01
E-520-10	Powderizer System; screen graphite chips to specific sizes	CD-510-06	S-510-06
E-520-12	Cyclone Collector; collects fines from graphite dust	CD-510-06	S-510-06
E-520-13	Bag Packer; packs fines from cyclone collector	CD-510-06	S-510-06

PART 5.B.2.j - CONTROL DEVICES FOR EXISTING MACHINING AND SHIPPING PROCESS

Control Device ID	Control Device Description	Pollutant(s) Controlled
CD-510-01	Carborundum Co. Model HP1015 Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$
CD-510-05	TONT DALDSON DFT 4-32 Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$
CD-510-06	MAC 96A VR14 Style III Baghouse	Filterable PM, PM_{10}, $PM_{2.5}$

PART 5.B.3.j - CONDITIONS FOR EXISTING MACHINING AND SHIPPING PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.j(1)	All	PM	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section VIII - Other Manufacturing, particulate matter emissions shall be limited to the rate specified by use of the following equation: for process weight rates less than or equal to 30 tons per hour ($E = 4.10P^{0.67}$) where E = the allowable emission rate in pounds per hour and P = process weight rate in tons per hour. As such, each process's allowable particulate matter emission limit is limited to the amount shown in the table below at its nominal production rating:

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PART 5.B.3.j - CONDITIONS FOR EXISTING MACHINING AND SHIPPING PROCESS

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th>Process</th><th>PM Allowable (lb/hr)</th><th>Process Weight Rate (tons/hr)</th></tr>
<tr><td>Existing Machining and Shipping</td><td>35.43</td><td>25</td></tr>
</table>

State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: See Generic Condition 5.A.7.
</td></tr>
<tr><td>5.B.3.j(2)</td><td>All</td><td>Opacity</td><td>
Limits/Standards: In accordance with SC Regulation 61-62.5, Standard No. 4 - Emissions from Process Industries, Section IX - Visible Emissions (Where Not Specified Elsewhere), where construction or modification began after December 31, 1985, emissions (including fugitive emissions) shall not exhibit an opacity greater than 20%, each.

State Only: No

Testing: None

Monitoring/Record Keeping/Reporting/Other: The permittee shall perform a visual inspection on a daily basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. No periodic monitoring for opacity will be required during periods of burning natural gas or propane only. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports.
</td></tr>
</table>

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PART 5.B.3.j - CONDITIONS FOR EXISTING MACHINING AND SHIPPING PROCESS

Condition Number	Equipment /Control Device ID	Regulated Pollutant/ Standard	Conditions
5.B.3.j(3)	All	PM PM_{10} $PM_{2.5}$	**Limits/Standards:** In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, a PSD limit of 0.005 gr/dscf has been established for filterable PM, filterable PM_{10}, and filterable $PM_{2.5}$. **State Only:** No **Testing:** An initial source test for filterable PM, PM_{10}, and $PM_{2.5}$ emissions shall be conducted within 180 days after startup of this project and every three (3) years thereafter. An initial source test to verify no condensable PM_{10} and $PM_{2.5}$ emissions are present shall be conducted within 180 days after startup of this project. **Monitoring/Record Keeping/Reporting/Other:** See Generic Condition 5.A.7.

PART 5.C. - CONDITIONS FOR FACILITY WIDE - LIMITATIONS, MONITORING AND REPORTING

Condition Number	Regulated Pollutant/ Standard	Conditions
5.C.1	PM PM_{10} $PM_{2.5}$ SO_2 CO NO_x VOC CO_2e	The 1,500 kW diesel-fired emergency generator (E-240-2-4365-01) is permitted to burn only diesel as fuel. The owner/operator shall record monthly fuel consumption, including fuel grade and supplier certification of sulfur content of the fuel. Fuel oil sulfur content shall be less than or equal to 0.0015 percent by weight. Acceptable fuel oil certification can be ensured by following Department guidance entitled "Guidance for Fuel Oil Certifications" issued on August 12, 2004 and any subsequent revisions. Fuel oil supplier certification shall be obtained for each batch of oil received and stored on site and made available to the Department upon request. The diesel-fired emergency generator is limited to a maximum operating limit of 100 hours per year (for maintenance purposes only).The owner/operator must record the actual operating hours monthly. Reports of the recorded hours of operation shall be submitted semiannually. An annual tune-up is required for the diesel-fired emergency generator.
5.C.2	PM PM_{10} $PM_{2.5}$ SO_2 CO NO_x VOC	The facility is limited to a maximum production rate of 85,000 metric tons per year of graphite electrodes. The owner/operator shall record the actual production rates on a monthly basis, and a twelve-month rolling sum shall be calculated. Reports of the production rate and the twelve-month rolling sum shall be submitted semiannually.

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PART 5.C. - CONDITIONS FOR FACILITY WIDE - LIMITATIONS, MONITORING AND REPORTING

<table>
<tr><th>Condition Number</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td></td><td>CO_2e</td><td></td></tr>
<tr><td>5.C.3</td><td>PM
PM_{10}
$PM_{2.5}$
SO_2
CO
NO_x
VOC
CO_2e</td><td>All combustion sources (except for the diesel emergency generator) are permitted to burn only natural gas or propane as fuel. All thermal oxidizers are permitted to burn only natural gas or propane as fuel, as auxiliary fuel. The use of any other substances as fuel is prohibited without prior written approval from the Department. Natural gas and propane fuel usage shall be monitored, recorded on a monthly basis and kept on site. An annual tune-up is required for all combustion sources. Annual tune-up information shall be kept on site and made available to the Department upon request.</td></tr>
<tr><td>5.C.4</td><td>PM
PM_{10}
$PM_{2.5}$
SO_2
CO
NO_x
CO_2</td><td>Simultaneous source testing of the stack exhaust and roof monitor exhaust from the new graphitizing furnaces shall be conducted under worst case conditions and relative to the averaging period specified in the permit for filterable PM, filterable PM_{10}, filterable $PM_{2.5}$, condensable PM_{10}, and condensable $PM_{2.5}$ limits.

Simultaneous source testing of the stack exhaust and roof monitor exhaust from the new graphitizing furnaces shall be conducted for an entire batch cycle relative to the averaging period specified in the permit for SO_2, CO, NO_x, and CO_2 limits.</td></tr>
<tr><td>5.C.5</td><td>SO_2</td><td>In accordance with S.C. Regulation 61-62.5, Standard 7, Prevention of Significant Deterioration (PSD) and S.C. Regulation 61-62.70.3(a)(1), the facility is defined as a major source for SO_2 emissions. The facility has netted out of PSD for SO_2. The new and existing graphitizing furnaces will have wet scrubbers in place. The facility will be able to demonstrate compliance by meeting the following conditions:

1) The following raw material sulfur contents have been established for the facility:
<table>
<tr><th>Raw Material</th><th>Maximum Sulfur Content (% by weight)</th></tr>
<tr><td>Needle Coke</td><td>0.565</td></tr>
<tr><td>Binder Pitch</td><td>0.72</td></tr>
<tr><td>Impregnation Pitch</td><td>0.72</td></tr>
<tr><td>Insulating Media</td><td>1.1</td></tr>
</table>
(i) The raw material sulfur contents (% by weight) may be increased from the values identified in the above-table up to and including a sulfur content value identified in a notification provided to the Department without amending this permit. The notification shall be provided to the Department 15 days prior to utilizing the raw material and shall include the raw material and the sulfur content (% by weight) of that batch received of needle coke, binder pitch, impregnation pitch, and insulating media. As part of the notification, the facility will submit a demonstration using air dispersion modeling or other information for any SO_2 emissions increases above what is listed in Attachment A.</td></tr>
</table>

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PART 5.C. - CONDITIONS FOR FACILITY WIDE - LIMITATIONS, MONITORING AND REPORTING

Condition Number	Regulated Pollutant/ Standard	Conditions
		Additionally, the facility shall revise the netting analysis to demonstrate PSD was not triggered. This analysis shall remain on site and changes will be reported in the semiannual report required in this condition (see below). (ii) The owner/operator shall maintain records for sulfur content (% by weight) for each batch received of needle coke, binder pitch, impregnation pitch, and insulating media. These records shall be maintained on site and made available to the Department upon request. 2) The owner/operator shall install and maintain liquid pressure indicators on each scrubber module. Each parameter shall be recorded each shift during source operation. The scrubbers shall be in place and operational whenever processes controlled by the scrubbers are running, except during periods of scrubber malfunction or mechanical failure. Prior to the first source test, the facility shall use manufacturer's recommendations for operational ranges. These operational ranges for the monitored parameters shall be derived from stack test data, which demonstrate the proper operation of the equipment in compliance. These ranges, with supporting documentation and quality assurance procedures, shall be submitted to the Bureau for approval within 180 days of startup. The operating ranges may be updated using this procedure, following Bureau approval. Each incidence of operation outside these operational ranges, including date and time, cause, and corrective action taken, shall be recorded and kept on site for five (5) years. Reports of these incidences shall be submitted semiannually. These semiannual reports shall include daily pressure drop readings. If no incidences occurred during the reporting period then a letter shall indicate such. 3) An initial source test for SO_2 emissions shall be conducted on the stack and roof monitor of the new graphitizing furnaces within 180 days after startup and every three (3) years thereafter. See Facility Wide Condition 5.C.5. 4) An initial source test for SO_2 emissions shall be conducted on the stacks of the existing graphitizing furnaces within 180 days after startup of this project and every three (3) years thereafter. See Facility Wide Condition 5.C.5. 5) The results of these initial and subsequent source tests shall be used to verify and establish emission factors, verify emissions used in air dispersion modeling, and verify emission assumptions and netting analysis calculations. Semi-annual reports shall be submitted to the Department that includes monthly SO_2 emission calculations and a 12-month rolling sum.
5.C.6	NO_x	In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, the following raw material nitrogen contents

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PART 5.C. - CONDITIONS FOR FACILITY WIDE - LIMITATIONS, MONITORING AND REPORTING

<table>
<tr><th>Condition Number</th><th>Regulated Pollutant/ Standard</th><th>Conditions</th></tr>
<tr><td></td><td></td><td>have been established for new sources (E-210-2-4271-18/32) included in this construction permit:

<table>
<tr><th>Raw Material</th><th>Maximum Nitrogen Content (% by weight)</th></tr>
<tr><td>Binder Pitch</td><td>1.10</td></tr>
<tr><td>Impregnation Pitch</td><td>1.56</td></tr>
</table>

In accordance with SC Regulation 61-62.5, Standard No. 7 – Prevention of Significant Deterioration and based on BACT analysis, the following raw material nitrogen contents have been established for new sources (E-460-4271-01/10) included in this construction permit:

<table>
<tr><th>Raw Material</th><th>Maximum Nitrogen Content (% by weight)</th></tr>
<tr><td>Needle Coke</td><td>0.40</td></tr>
<tr><td>Insulating Media</td><td>Initial sampling as specified below</td></tr>
</table>

(i) The raw material nitrogen contents (% by weight) may be increased from the values identified in the above-tables up to and including a nitrogen content value identified in a notification provided to the Department without amending this permit. The notification shall be provided to the Department 15 days prior to utilizing the raw material and the notification shall include the raw material and the nitrogen content (% by weight) of that batch received of needle coke, binder pitch, and impregnation pitch.

(ii) The owner/operator shall maintain records for nitrogen content (% by weight) for each batch received of needle coke, binder pitch, and impregnation pitch. The owner/operator shall perform an initial analysis for nitrogen content for the insulating media within 180 days of startup of this project, in order to verify emissions and assumptions utilized. These records shall be maintained on site and made available to the Department upon request. Any exceedances of the raw material nitrogen content limits shall be submitted semiannually to the Department. If no exceedances occurred during the reporting period then a letter shall be submitted to the Department indicating such.</td></tr>
<tr><td>5.C.7</td><td>Opacity</td><td>**Limits/Standards:** In accordance with S.C. Regulation 61-62.5, Standard 7, Prevention of Significant Deterioration (PSD) and S.C. Regulation 61-62.70.3(a)(1), the existing graphitizing furnaces stack shall not exhibit an opacity greater than 10%.

State Only: No

Testing: None</td></tr>
</table>

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PART 5.C. - CONDITIONS FOR FACILITY WIDE - LIMITATIONS, MONITORING AND REPORTING

Condition Number	Regulated Pollutant/ Standard	Conditions
		Monitoring/Record Keeping/Reporting/Other: The permittee shall perform a visual inspection on a daily basis during source operation. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. For all cause and corrective actions taken for any abnormal emissions and visual inspections, the owner/operator shall submit semiannual reports. If the unit did not operate during the semiannual period, the report shall state so.
5.C.8	Opacity	An initial source test of the stack exhaust from the existing graphitizing furnaces for filterable PM, PM_{10}, and $PM_{2.5}$ emissions shall be conducted within 180 days after startup. The owner/operator shall install and maintain liquid pressure indicators on each scrubber module. Each parameter shall be recorded each shift during source operation. The scrubber shall be in place and operational whenever processes controlled by the scrubber are running, except during periods of scrubber malfunction or mechanical failure. Prior to the initial source test, the facility shall use manufacturer's recommendations for operational ranges. These operational ranges for the monitored parameters shall be derived from stack test data, which demonstrate the proper operation of the equipment in compliance. These ranges, with supporting documentation and quality assurance procedures, shall be submitted to the Bureau for approval within 180 days of startup. The operating ranges may be updated using this procedure, following Bureau approval.
5.C.9	Opacity Sulfur content	The opacity limits, monitoring, recordkeeping, etc. for the existing graphitizing furnaces stack listed in this permit supersede the opacity limits, monitoring, recordkeeping for the existing graphitizing furnaces stack listed in the Title V issued July 1, 2005. The raw material sulfur contents along with associated monitoring and recordkeeping established in this permit supersede the material sulfur content limits and associated monitoring and reporting conditions set forth in the facility's Title V issued July 1, 2005.
5.C.10	N/A	All applicable requirements from construction permit 0900-0025-CZ-R5 have been included in this revised construction permit.

N/A = Not Applicable

PART 6 - ADDITIONAL CONDITIONS

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PART 6.A - OPERATIONAL FLEXIBILITY

Condition Number	Conditions
N/A	N/A

N/A = Not Applicable

PART 6.B - OTHER

Condition Number	Conditions
6.B.1	Showa Denko Carbon, Inc. will construct and maintain perimeter fencing on their property boundary. This fencing will be completed prior to start of operation of the expansion and the facility shall certify to the construction of the fence in their operating permit request. The facility shall cause to be posted on both sides of the road at both ends of the road as it crosses the Showa Denko property signage that states, a- the property is private; b- access is restricted; c- vehicles may not stop, stand or park; d- loitering is prohibited. The signs must be clearly visible and legible to any vehicle. Weathered or damaged signs shall be replaced immediately. The facility shall monitor the Showa Denko owned portion of Haven Road to ensure there is no loitering and that no authorized vehicle stops, stands, or parks. Monitoring on that portion of the road includes, a- Surveillance cameras to monitor for loitering or any prohibited or unauthorized vehicle activity; b- Staff assigned to monitoring the road and cameras and who would be trained and responsible for responding to any situation where an authorized vehicle was not traversing the road in an appropriate amount of time; c- Written procedures for responding to any loitering or unauthorized vehicle issues. Incidents will be recorded and maintained on site for a period of 5 years. Records shall include the date of the incident, action taken, and the amount of time any non-Showa Denko personnel remained on that portion of the road.

N/A = Not Applicable

PART 7 - NESHAP REQUIREMENTS

PART 7.A - NESHAP PERIODIC REPORTING SCHEDULE SUMMARY

NESHAP Part	NESHAP Subpart	Compliance Monitoring Report Submittal Frequency	Reporting Period	Report Due Date
63	ZZZZ (Emergency Generators See Notes 4 and 5)	N/A	N/A	N/A

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PART 7 - NESHAP REQUIREMENTS

PART 7.A - NESHAP PERIODIC REPORTING SCHEDULE SUMMARY

NESHAP Part	NESHAP Subpart	Compliance Monitoring Report Submittal Frequency	Reporting Period	Report Due Date
63	B	Semiannual	January 1 through June 30 and July 1 through December 31	January 30 and July 30
63	DDDDD (5D)	Five-Year	January 1 – December 31	Postmarked no later than January 31 following the end of the reporting period

Note:
1. This table summarizes only the periodic compliance reporting schedule. Additional reports may be required. See specific NESHAP Subpart for additional reporting requirements and associated schedule.
2. This reporting schedule does not supersede any other reporting requirements including but not limited to 40 CFR Part 60, 40 CFR Part 61, and/or 40 CFR Part 63.
3. Refer to condition 7.D.12 for the initial reporting frequency.
4. Facilities with emergency generators are not required to submit reports unless they meet the criteria under 63.6650(h). Only facilities with non-emergency engines are required to submit semiannual reports.
5. Facilities with emergency engines shall comply with the operations limits specified in 40 CFR 63.6640(f).

N/A = Not Applicable

PART 7.B - NESHAP - GENERAL REQUIREMENTS

Condition Number	Condition
7.B.1	All NESHAP notifications and reports shall be sent to the South Carolina Department of Health and Environmental Control - Bureau of Air Quality (SCDHEC - BAQ) at the following address: **SCDHEC - BAQ** **Air Toxics Section** **2600 Bull Street** **Columbia, SC 29201**
7.B.2	All NESHAP notifications and the cover letter to periodic reports shall be sent to the United States Environmental Protection Agency (US EPA) at the following address: **US EPA, Region 4** **Air, Pesticides and Toxics Management Division** **61 Forsyth Street SW** **Atlanta, GA 30303**

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PART 7.C - NESHAP PART 63 SUBPART ZZZZ - AFFECTED SOURCES
SUBPART ZZZZ – NESHAP for Stationary Reciprocating Internal Combustion Engines

Equipment ID	Affected Source Description	MACT Control Device	Non-MACT Control Device
E-240-2-4365-01	New Diesel Fuel-Fired 1,500 kW Emergency Generator	N/A	N/A

Part 7.C lists the affected sources as identified in the facility's Notice of Compliance Status and the permit application.
N/A = Not Applicable

PART 7.C - NESHAP PART 63 SUBPART ZZZZ - CONDITIONS
SUBPART ZZZZ – NESHAP for Stationary Reciprocating Internal Combustion Engines (RICE)

Condition Number	Equipment/ Control Device ID	Condition
7.C.1	E-240-2-4365-01	The engine has been defined as an affected source, in accordance with 40 CFR 63 Subpart ZZZZ. In accordance with 40 CFR 63.6640(f), a new or reconstructed emergency stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions that was installed on or after June 12, 2006 shall meet be the requirements of Subpart ZZZZ for an emergency stationary RICE. The requirements of this part will be met by meeting the requirements of 40 CFR 60 Subpart IIII. No further requirements apply for such engines under this part.

PART 7.D - NESHAP PART 63 SUBPART B - AFFECTED SOURCES
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

Equipment ID	Affected Source Description	MACT Control Device	Non-MACT Control Device
Mill, Mix and Extrusion (New)			
E-110-2-4253-01	Mixer No. 1	CD-110-4345-28	N/A
E-110-2-4253-02	Mixer No. 2		
E-110-2-4253-03	Mixer No. 3		
E-110-2-4253-04	Mixer No. 4		
E-110-2-4221-10	Mixer Discharge Belt		
E-110-2-4222-20	Screw Spreader		
E-110-2-4221-11	Cooling Belt position 1		
E-110-2-4221-12	Cooling Belt position 2		
E-110-2-4253-05	Homogenizer		

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PART 7.D - NESHAP PART 63 SUBPART B - AFFECTED SOURCES
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

Equipment ID	Affected Source Description	MACT Control Device	Non-MACT Control Device
E-110-2-4221-13	Homogenizer Discharge Belt		
E-110-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	N/A
E-110-25	Binder Pitch Tank	CD-110-14	N/A
Bake/Rebake Process (New)			
E-210-2-4271-18/32	Carbottom Furnaces Nos. 18-32 + Incinerator	CD-210-2-4333-01	N/A
Pitch Impregnation (New)			
E-310-2-4272-21	Preheater (6.0 million Btu/hr x 2 zones)	N/A	N/A
E-310-2-4201-01	Autoclave/spray cooler/cooling bath	CD-310-2-4333-01	
-	Fume Incinerator (Control Device)	CD-310-2-4333-01	
E-310-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	
Graphitizing Furnaces (new)			
E-460-4271-01/10	Graphitizing Furnaces (total of 10)	Utilizing metallurgical coke as the only insulating media or utilizing an alternate insulating media as approved by the Department	N/A

Part 7.D lists the affected sources as identified in the facility's Notice of Compliance Status and the permit application.
N/A = Not Applicable

PART 7.D - NESHAP PART 63 SUBPART B - CONDITIONS
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

Condition Number	Equipment /Control Device ID	Condition
General Requirements		

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PART 7.D - NESHAP PART 63 SUBPART B - CONDITIONS
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

Condition Number	Equipment /Control Device ID	Condition
7.D.1	All	The owner/operator shall comply with 40 CFR 63 *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories*, Subpart A *General Provisions* and Subpart B *Requirements for Control Technology Determinations for Major Sources* in accordance with the CAA, Section 112(g) and SC Regulation 61-62.63, Subparts A and B, as applicable.
7.D.2	All	All provisions contained in this NOMA shall be federally enforceable upon the effective date of issuance of such notice, as provided by SC Regulations 61-63.43(j) and 63.43(g)(3).
7.D.3	All	This NOMA applies to the proposed Mill, Mix and Extrusion process, fifteen (15) Carbottom Furnaces (Nos. 18-32), the proposed Autoclave/Spray Cooler/Cooling Bath and the proposed ten (10) graphitizing furnaces to be located at Showa Denko Carbon, Inc., 478 Ridge Road, Ridgeville, SC 29472.
7.D.4	All	All official correspondence, plans, permit applications, and written statements are an integral part of this NOMA.
7.D.5	All	The owner/operator shall submit written notification to the Director of the Engineering Services Division and the Regional Air Section Manager of the date construction is commenced, postmarked no later than 30 days after such date, and written notification of the actual date of initial startup of each new or altered source, postmarked within 15 days after such date.
7.D.6	All	The owner or operator shall comply with all terms, conditions, and limitations of this NOMA.
MACT Emission Limits		

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PART 7.D - NESHAP PART 63 SUBPART B - CONDITIONS
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Condition</th></tr>
<tr><td>7.D.7</td><td>CD-110-4345-28; CD-110-14; CD-210-2-4333-01; E-460-4271-01/10</td><td>Pursuant to 40 CFR 63.43(g) and SC Regulation 61-63.43(g)(1) MACT determination, the owner/operator shall not discharge or cause to be discharged into the atmosphere any emissions of POM in excess of the limits listed below:
<table>
<tr><th>New Process/Source</th><th>Work Practice Standards</th><th>Emission Limit (lb/hr)</th><th>Control Efficiency (%)</th></tr>
<tr><td>Mill, Mix and Extrusion</td><td>N/A</td><td>0.071 lb/hr (total from Dry Fume Scrubber/Baghouse)</td><td>N/A</td></tr>
<tr><td>Mill, Mix and Extrusion</td><td>Work practice standards for the vent condenser, controlling the Binder Pitch Tank</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Bake/Rebake (Carbottom Furnaces)</td><td>N/A</td><td>14.17 (total from TO)</td><td>99</td></tr>
<tr><td>Pitch Impregnation (Autoclaves/Spray Cooler/Cooling bath)</td><td>N/A</td><td>3.00 (total from TO)</td><td>99</td></tr>
<tr><td>Graphitizing Furnaces</td><td>Utilizing metallurgical coke as the only insulating media or utilizing an alternate insulating media as approved by the Department</td><td>N/A</td><td>N/A</td></tr>
</table></td></tr>
<tr><td colspan="3">General Compliance Requirements</td></tr>
<tr><td>7.D.8</td><td>All</td><td>The owner/operator must be in compliance with the emissions limitations listed in condition 7.D.7 including operating limits, at all times. Compliance is demonstrated when the emission rate of POM is equal to or less than the emission limit, when work practice standards are met for the vent condensers, and when the insulating media of the graphitizing furnaces is metallurgical coke only.</td></tr>
</table>

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PART 7.D - NESHAP PART 63 SUBPART B - CONDITIONS
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

Condition Number	Equipment /Control Device ID	Condition
7.D.9	All	The owner/operator must always operate and maintain the mill, mix and extrusion process, each carbottom furnaces, autoclave/spray cooler/cooling bath, and each graphitizing furnace including air pollution control and monitoring equipment, according to the provisions in 40 CFR 63.6(e)(1)(i).
7.D.10	All	The owner/operator must develop a written startup, shutdown, and malfunction plan, as outlined in 40 CFR 63.6(e)(3)**,** that describes, in detail, procedures for operating and maintaining the mill, mix and extrusion process, each carbottom furnace, autoclave/spray cooler/cooling bath, and each graphitizing furnace during periods of startup, shutdown, and malfunction; and a program of corrective action for malfunctioning process, air pollution control, and monitoring equipment used to comply with the emission limitations in 7.D.7. The startup, shutdown, and malfunction plan does not need to address any scenario that would not cause either equipment to exceed an emission limitation. This plan must be developed by the owner/operator by startup. During periods of startup, shutdown, and malfunction, the owner/operator must operate each carbottom furnaces and autoclave/spray cooler/cooling bath in accordance with the startup, shutdown, and malfunction plan.
7.D.11	All	The carbottom furnaces are permitted to burn only natural gas or propane (back-up) as fuel. The TO for the carbottom furnaces are allowed to burn only natural gas, propane (back-up) and the gaseous waste stream from the carbottom furnaces. The TO for the autoclave/spray cooler/cooling bath are allowed to burn only natural gas, propane (back-up) and the gaseous waste stream from the autoclave/spray cooler/cooling bath. The use of any other substances as fuel is prohibited without prior written approval from the Department.
Initial Compliance Requirements		

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PART 7.D - NESHAP PART 63 SUBPART B - CONDITIONS
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Condition</th></tr>
<tr><td>7.D.12</td><td>CD-110-4345-28</td><td>In order to demonstrate initial compliance with the MACT emissions limitations in condition 7.D.7, the owner/operator must conduct an initial performance tests for the dry fume scrubber/baghouse and conduct monitoring equipment performance evaluations within 60 days after achieving the maximum production rate at which the facility will be operated, but not later than 180 days after initial startup.

The owner/operator must conduct each performance test at representative performance (i.e., performance based on normal operating conditions) and must demonstrate initial compliance based on this test.

Notification of intent to source test, submittal of site-specific test plans, performance of source tests, and the reporting of source test results shall comply with 40 CFR 63 Sections 63.7 and 63.10 and with SC Regulation 61-62.1, Section IV Source Tests. The owner/operator shall submit a site specific test plan at least 60 calendar days before the performance test is scheduled to take place. The Department must be notified at least two weeks prior to a source test so that a representative may be present.
<table>
<tr><th>Pollutant</th><th>Emission Limit</th><th>Method</th></tr>
<tr><td>POM</td><td>0.071 lb/hr (total)</td><td>As Approved by the Bureau</td></tr>
</table></td></tr>
<tr><td>7.D.13</td><td>CD-110-14</td><td>The owner/operator is limited to the use of work practice standards for the vent condenser controlling HAP emissions from the Binder Pitch Tank.
<table>
<tr><th>Pollutant</th><th>Emission Limit</th><th>Method</th></tr>
<tr><td>HAPs</td><td>Work practice standards consisting of the inspection and cleaning of the condenser coils on a semiannual basis.</td><td>Recordkeeping</td></tr>
</table></td></tr>
</table>

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PART 7.D - NESHAP PART 63 SUBPART B - CONDITIONS
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Condition</th></tr>
<tr><td>7.D.14</td><td>CD-210-2-4333-01; and CD-310-2-4333-01</td><td>In order to demonstrate initial compliance with the MACT emissions limitations in condition 7.D.7, the owner/operator must conduct an initial performance test for the Thermal Oxidizer for the carbottom furnaces and the fume incinerator for the pitch impregnation process, establish a 3-hour block average minimum operating temperature, and conduct monitoring equipment performance evaluations within 60 days after achieving the maximum production rate at which the facility will be operated, but not later than 180 days after initial startup.

The owner/operator must conduct each performance test at representative performance (i.e., performance based on normal operating conditions) and must demonstrate initial compliance based on this test.

During the initial performance test, the facility shall continuously monitor the firebox temperature during each of the required 1-hour test runs. The minimum firebox temperature must then be established as the average of the three minimum 15-minute firebox temperatures monitored during each of the three 1-hour test runs.

When conducting the performance test for POM emissions, the owner/operator needs to use method 315.

Notification of intent to source test, submittal of site-specific test plans, performance of source tests, and the reporting of source test results shall comply with 40 CFR 63 Sections 63.7 and 63.10 and with SC Regulation 61-62.1, Section IV Source Tests. The owner/operator shall submit a site specific test plan at least 60 calendar days before the performance test is scheduled to take place. The Department must be notified at least two weeks prior to a source test so that a representative may be present.
<table>
<tr><th>Pollutant</th><th>Emission Limit</th><th>Method</th></tr>
<tr><td>POM</td><td>14.7 lb/hr (carbottom furnaces)</td><td>As Approved by the Bureau</td></tr>
<tr><td>POM</td><td>3.00 lb/hr (autoclave/cooling section)</td><td>As Approved by the Bureau</td></tr>
</table></td></tr>
</table>

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PART 7.D - NESHAP PART 63 SUBPART B - CONDITIONS
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Condition</th></tr>
<tr><td>7.D.15</td><td>E-460-4247-01/10</td><td>The owner/operator shall use the following work practice standards for the new graphitizing furnaces.
<table>
<tr><th>Pollutant</th><th>Work Practice Standards</th><th>Method</th></tr>
<tr><td>HAPs</td><td>Utilizing metallurgical coke as the only insulating media or utilizing an alternate insulating media as approved by the Department</td><td>Recordkeeping</td></tr>
</table></td></tr>
<tr><td colspan="3">Continuous Compliance Requirements</td></tr>
<tr><td>7.D.16</td><td>CD-110-4345-28</td><td>Pursuant to 40 CFR 63.43 (g)(2)(ii) and SC Regulation 61-63.43(g)(2), the owner/operator shall conduct the following monitoring to assure continuous compliance with the applicable emission limitations in condition 7.D.7.
<table>
<tr><th>Pollutant/Parameter</th><th>Monitoring</th></tr>
<tr><td>Work practice standards consisting of the inspection and cleaning of the condenser coils on a semiannual basis</td><td>Recordkeeping</td></tr>
</table>
The owner/operator is limited to the use of work practice standards, as specified above, only for the vent condenser, controlling the emissions from the Binder Pitch Tank. Records shall be kept on-site, verifying that the work practice standards are met.</td></tr>
<tr><td>7.D.17</td><td>CD-110-4345-28; CD-210-2-4333-01; and CD-310-2-4333-01</td><td>Pursuant to 40 CFR 63.43 (g)(2)(ii) and SC Regulation 61-63.43(g)(2), the owner/operator shall conduct the following monitoring to assure continuous compliance with the applicable emission limitations in condition 7.D.7.
<table>
<tr><th>Pollutant/Parameter</th><th>Monitoring</th></tr>
<tr><td>POM (thermal oxidizer, fume incinerator and dry fume scrubber/baghouse)</td><td>Source Tests as specified below</td></tr>
<tr><td>Dry Fume Scrubber/Baghouse(Mix, Mill and Extrusion)</td><td>Rotary vane rpm (coke flow) and fan amperage (air flow)</td></tr>
<tr><td>Thermal Oxidizer Temperature (Carbottom Furnaces)</td><td>Continuous temperature monitoring</td></tr>
<tr><td>Fume Incinerator Temperature (autoclave/cooling section)</td><td>Continuous temperature monitoring</td></tr>
</table></td></tr>
</table>

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PART 7.D - NESHAP PART 63 SUBPART B - CONDITIONS
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

<table>
<tr><th>Condition Number</th><th>Equipment /Control Device ID</th><th>Condition</th></tr>
<tr><td></td><td></td><td>To demonstrate continuous compliance with the POM emission limitations for the Thermal Oxidizer and the Fume Incinerator in condition 7.D.7, the owner/operator will record the 3-hour block average of all recorded firebox temperature readings, and maintain the 3-hour block average temperature above the minimum temperature established during the performance test. The firebox temperature indicator monitoring system must measure and record a temperature reading at least every fifteen minutes.

When conducting the performance test for POM emissions, the owner/operator needs to use method 315.

A source test of the Fume Incinerator, the Thermal Oxidizer and the Dry Fume Scrubber/Baghouse shall to be performed every three (3) years after the initial performance test. Less frequent source testing for POM from these sources may be conducted if at least two (2) consecutive performance tests show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source or air pollution control equipment that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test shall be conducted during the fifth year and no more than 60 months after the previous performance test.

All source tests shall be conducted in accordance with 40 CFR 63.7 and SC Regulation 61-62.1, Section IV, Source Tests and as required in the “Initial Compliance Requirements” section of this NOMA.</td></tr>
<tr><td>7.D.18</td><td>E-460-4247-01/10</td><td>Pursuant to 40 CFR 63.43 (g)(2)(ii) and SC Regulation 61-63.43(g)(2), the owner/operator shall conduct the following monitoring to assure continuous compliance with the applicable emission limitations in condition 7.D.7.
<table>
<tr><th>Pollutant/Parameter</th><th>Monitoring</th></tr>
<tr><td>Utilizing metallurgical coke only as an insulating media (graphitizing furnaces)</td><td>Recordkeeping</td></tr>
</table>
The owner/operator is limited to the use of metallurgical coke only as the insulation medium for the new graphitizing furnaces. Records shall be kept on-site, verifying that only metallurgical coke is utilized as the insulating medium. Alternate materials may be utilized as insulating media, if the HAP content of all regulated HAP pollutants in the alternate insulating media, is less than or equal to the HAP content in the metallurgical coke. The owner/operator shall submit a request to the Department, and receive approval in writing, prior to utilizing any such alternate insulating media.</td></tr>
</table>

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PART 7.D - NESHAP PART 63 SUBPART B - CONDITIONS
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

Condition Number	Equipment /Control Device ID	Condition
Monitoring Installation, Operation, And Maintenance Requirements		
7.D.19	CD-210-2-4333-01; and CD-310-2-4333-01	Each continuous parameter monitoring system (CPMS) for the Thermal Oxidizer and Fume Incinerator must be capable of completing a minimum of one cycle of operation (sampling, analyzing, and recording) for each successive 15-minute period. At all times, the owner/operator must maintain the monitoring equipment including, but not limited to, maintaining necessary parts for routine repairs of the monitoring equipment. Record the results of each inspection, calibration, and validation check. For each temperature monitoring device, the facility must meet the following requirements: (1) Locate the temperature sensor in a position that provides a representative temperature. (2) Use a temperature sensor with a minimum accuracy of 4°F or 0.75 percent of the temperature value, whichever is larger. (3) Perform an electronic calibration at least semiannually according to the procedures in the manufacturer's owners manual. Following the electronic calibration, conduct a temperature sensor validation check in which a second or redundant temperature sensor placed nearby the process temperature sensor must yield a reading within 30°F of the process temperature sensor's reading. (4) Conduct calibration and validation checks any time the sensor exceeds the manufacturer's specified maximum operating temperature range or install a new temperature sensor. (5) At least quarterly, inspect all components for integrity and all electrical connections for continuity, oxidation, and galvanic corrosion.
Notification Requirements		
7.D.20	All	a. The owner/operator must submit all of the notifications in 40 CFR 63.6(h)(4) and 63.6(h)(5), 63.7(b) and 63.7(c), 63.8(e), 63.8(f)(4) and 63.8(f)(6), and 63.9(b) through (h) that apply to the owner/operator by the dates specified. b. The owner/operator must submit a Notification of Compliance Status report according to 40 CFR 63.9(h)(2)(ii) and the requirements specified in paragraphs c and d

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PART 7.D - NESHAP PART 63 SUBPART B - CONDITIONS
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

Condition Number	Equipment /Control Device ID	Condition
		of this section. c. For each initial compliance demonstration, the owner/operator must submit the Notification of Compliance Status report, including all performance test results, before the close of business on the 60th day following the completion of the performance test and/or other initial compliance demonstrations according to 40 CFR 63.10(d)(2). d. In addition to the requirements in 63.9(h), the Notification of Compliance Status report must contain all the information specified in paragraphs (1) through (4) below, as applicable. (1) A description of the affected source(s) including identification of which subcategory the source is in, the capacity of the source, a description of the add-on controls used on the source description of the fuel(s) burned, and justification for the worst-case fuel burned during the performance test. (2) Summary of the results of all performance tests, fuel analyses, and calculations conducted to demonstrate initial compliance including all established operating limits. (3) A signed certification that the owner/operator has met all emissions limitations. (4) If had a deviation from any emission limitation, the owner/operator must also submit a description of the deviation, the duration of the deviation, and the corrective action taken in the Notification of Compliance Status report.
Recordkeeping Requirements		
7.D.21	All	a. The owner/operator shall keep records as required by 40 CFR 63 Subpart A. b. The owner/operator shall calculate and record POM emissions. To demonstrate continuous compliance with the POM emission limitations in condition 7.D.7, the owner/operator will calculate and record POM emissions on a monthly basis and a twelve-month rolling sum. Reports of the calculated values shall be submitted to the Department semiannually. c. The owner/operator must keep a copy of each notification and report that the owner/operator submitted to comply with this subpart, including all documentation supporting any Initial Notification or Notification of Compliance Status or semiannual

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PART 7.D - NESHAP PART 63 SUBPART B - CONDITIONS
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

Condition Number	Equipment /Control Device ID	Condition
		compliance report that the owner/operator submitted in accordance with the requirements in 40 CFR §63.10(b)(2)(xiv). d. In accordance with 40 CFR §63.10(b)(1), the owner or operator of an affected source subject to the provisions of this part shall maintain files of all information (including all reports and notifications) required by this part recorded in a form suitable and readily available for expeditious inspection and review. The files shall be retained for at least 5 years following the date of each occurrence, measurement, maintenance, corrective action, report, or record. At a minimum, the most recent 2 years of data shall be retained on site. The remaining 3 years of data may be retained off site. Such files may be maintained on microfilm, on a computer, on computer floppy disks, on magnetic tape disks, or on microfiche.
Reporting Requirements		
7.D.22	All	a. The owner/operator shall submit reports as required by 40 CFR 63 Subpart A. b. The facility will calculate POM emissions on a monthly basis and a twelve- month rolling sum shall be calculated for total POM emissions. Reports of the calculated values and the twelve-month rolling sum shall be submitted to the Department semiannually. These reports shall confirm that POM emissions do not exceed the permit application. c. An algorithm, including example calculations and emission factors, explaining the method used to determine emission rates shall be included in the initial report. Subsequent submittals of the algorithm and example calculations are unnecessary, unless the method of calculation is found to be unacceptable by the Department or if the facility changes the method of calculating emissions and/or changes emission factors. d. In accordance with 40 CFR §63.10(d)(1), notwithstanding the requirements in this paragraph or paragraph (e) of this section, and except as provided in §63.16, the owner or operator of an affected source subject to reporting requirements under this part shall submit reports to the Administrator in accordance with the reporting requirements in the relevant standard(s). e. The owner/operator must submit a semiannual compliance report to the Department according to the requirements below:

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PART 7.D - NESHAP PART 63 SUBPART B - CONDITIONS
SUBPART B – Requirements For Control Technology Determinations For Major Sources In Accordance With Clean Air Act Sections, Sections 112(g)

Condition Number	Equipment /Control Device ID	Condition
		(1) The first compliance report must cover the period beginning at startup and ending on June 30 or December 31, and lasting at least 6 months, but less than 12 months. (2) The first compliance report must be postmarked or delivered no later than July 30 or January 30, whichever date comes first after the first compliance report is due. (3) Each subsequent compliance report must cover the semiannual reporting period from January 1 through June 30 or the semiannual reporting period from July 1 through December 31. (4) Each subsequent compliance report must be postmarked or delivered no later than July 30 or January 30, whichever date comes first after the end of the semiannual reporting period. f. The compliance report must contain the information required below: (1) Company name and address (2) Statement by a responsible official with that official's name, title, and signature, certifying the truth, accuracy, and completeness of the content of the report (3) Date of report and beginning and ending dates of the reporting period

PART 7.E - NESHAP PART 63 SUBPART DDDDD – AFFECTED SOURCES
SUBPART DDDDD – NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters

Equipment ID	Affected Source Description	MACT Control Device	Non-MACT Control Device
E-110-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	N/A
E-310-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	N/A

Part 7.C lists the affected sources as identified in the facility's Notice of Compliance Status and the permit application.
N/A = Not Applicable

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PART 7.E - NESHAP PART 63 SUBPART DDDDD- CONDITIONS

SUBPART DDDDD – NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters

Condition Number	Equipment/ Control Device ID	Condition
7.E.1	E-110-2-4275-01 E-310-2-4275	This facility has processes subject to the provisions of S.C. Regulation 61-62.63 and 40 CFR Part 63, National Emission Standards for Hazardous Air Pollutants, Subparts A and Subpart DDDDD "National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters." Existing affected sources shall be in compliance with the requirements of these Subparts by the compliance date specified in Subpart DDDDD. Any new affected sources shall comply with the requirements of these Subparts upon initial start-up, unless otherwise noted.

PART 8 – REPORTING REQUIREMENTS

PART 8.A - PERIODIC REPORTING SCHEDULE

Compliance Monitoring Report Submittal Frequency	Reporting Period (Begins on the startup date of the source.)	Report Due Date
Quarterly	January-March April-June July-September October-December	April 30 July 30 October 30 January 30
Semiannual	January-June April-September July-December October-March	July 30 October 30 January 30 April 30
Annual	January-December April-March July-June October-September	January 30 April 30 July 30 October 30
Note: This reporting schedule does not supersede any federal reporting requirements including but not limited to 40 CFR Part 60, 40 CFR Part 61, and 40 CFR Part 63. All federal reports must meet the reporting time frames specified in the federal standard unless the Department or EPA approves a change.		

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PART 8.B - REPORTING CONDITIONS

Condition Number	Condition
8.B.1	Reporting required in this permit, shall be submitted in a timely manner as directed in Part 8.A of this permit.
8.B.2	Unless elsewhere specified within this permit, all reports required under this permit shall be submitted to the Manager of the Technical Management Section, Bureau of Air Quality, at the address listed below. **SCDHEC - BAQ** **Technical Management Section** **2600 Bull Street** **Columbia, SC 29201**

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ATTACHMENT A

Showa Denko Carbon, Inc.
0900-0025-CZ-R6

The emission rates listed herein are not considered enforceable limitations but are used to evaluate ambient air quality impact. Until the Department makes a determination that a facility is causing or contributing to an exceedance of a state or federal ambient air quality standard, increases to these emission rates are not in themselves considered violations of these ambient air quality standards (see conditions 3.2 and 3.3).

STANDARD NO. 2 - MODELED AAQS EMISSION RATES (LBS/HR)							
RUN ID	**STACK ID**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NO_x (1)**	**CO**	**Lead**
LO1	S-430-01	(3)	(3)	(2)	(3)	(3)	--
LO2	S-460-03	0.793	0.765	18.300	0.130	85.000	--
MP01R	S-110-02/03/04	3.920	3.920	--	--	--	--
MP33B	S-210-01	9.191	9.191	41.699	79.922	19.699	1.17E-04
MP52R	S-250-02/04	1.41	1.41	--	--	--	--
MP55	S-310-03	0.018	0.018	0.001	0.411	0.186	2.06E-06
MP56	S-310-04	0.018	0.018	0.001	0.414	0.188	2.06E-06
MP57	S-310-05	0.018	0.018	0.001	0.414	0.188	2.06E-06
MP58	S-310-06	0.018	0.018	0.001	0.414	0.188	2.06E-06
MP59	S-310-01	1.170	1.170	0.004	9.183	4.840	2.99E-06
MP61	S-310-02	0.007	0.007	--	0.27	0.075	1.96E-06
MP68	S-430-03	14.48(3)	14.48(3)	42.63	2.855(3)	1901.28(3)	--
MP74R	S-510-01/05	1.33	1.33	--	--	--	--
NP08	S-110-2-4349-05	0.144	0.144	--	--	--	--
NP09	S-110-2-4349-04	1.410	1.410	--	--	--	--
NP10	S-110-2-4345-22	0.086	0.086	--	--	--	--
NP11	S-110-2-4345-24	0.086	0.086	--	--	--	--
NP12	S-110-2-4349-03	2.790	2.790	--	--	--	--
NP14	S-110-2-4349-01	0.039	0.039	0.003	0.720	0.410	2.45E-06
NP49	S-210-2-4333-01	10.349	10.349	46.802	76.882	23.699	1.40E-04
NP64	S-310-2-4349-24	0.100	0.100	0.007	1.710	0.990	5.88E-06
NP65	S-310-2-4349-02	1.170	1.170	0.004	9.183	4.840	3.68E-06
NP66	S-310-2-4349-01	0.039	0.039	0.003	0.718	0.414	2.45E-06
NP70	S-460-4349-03	6.010	6.010	24.302	2.400	1606.376	--
NP72	S-460-02	0.190	0.190	--	--	--	--
NP100A	Coke Silo Bin Vent	0.000857	0.000857	--	--	--	--
NP100B	110-2-4345-04	0.001429	0.001429	--	--	--	--
NP100C	110-2-4345-06	0.000659	0.000659	--	--	--	--
NP100D	110-2-4345-08	0.000238	0.000238	--	--	--	--
NP100E	110-2-4345-05	0.00229	0.00229	--	--	--	--

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STANDARD NO. 2 - MODELED AAQS EMISSION RATES (LBS/HR)							
RUN ID	**STACK ID**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NO_x (1)**	**CO**	**Lead**
NP100F	110-2-4345-12	4.29E-05	4.29E-05	--	--	--	--
VML1_01 – VML1_21 (2)	S-430-01 (2)	**--**	**--**	81.201	**--**	**--**	**--**
XP03	EF-110-6	0.204	0.204	--	--	--	--
XP05	S-110-17	0.021	0.021	--	--	--	--
XP06	S-110-20	0.039	0.039	0.003	0.720	0.410	2.45E-06
XP50	S-220-01	0.860	0.860	--	--	--	--
XP51	S-250-01	0.043	0.043	--	--	--	--
XP53	S-250-03	0.430	0.430	--	--	--	--
XP62	S-310-10	0.035	0.035	0.003	0.650	0.370	2.21E-06
XP67	S-410-01 / S-430-02	0.750	0.750	--	--	--	--
XP69	S-430-02	0.190	0.190	--	--	--	--
XP73	S-490-01B	0.380	0.380	--	--	--	--
XP76	S-510-06	0.030	0.030	--	--	--	--

1) Rates shown are the full NOx rates, but ARM (0.8 factor) was applied to the modeling concentration results. (5/25/2012)

2) Run ID VML1_01 – VML1_21 (Stack S-430-01) is a roof vent that is represented as 21 volume sources in AERMOD for State Standard 2 and 7 modeling. Each volume source emission rate is the total emission rate for the roof vent (i.e., 81.2 lb/hr for SO2) divided by 21 (to give 3.87 lb/hr SO2 per volume source). This source is modeled as LO1 (at 81.2 lb/hr for SO2) in BLP for Full Impact Analyses. Compliance is demonstrated for the existing graphitizing total for all other pollutants using a variation of emissions through stack ID LO1 and MP68. PM10, PM2.5, NOx, and CO assume 0% control. See also note 2. (5/6/2014 and 4/9/2015)

3) Graphitizing emission (existing unit) totals are shown for MP68. Emissions are split between stack MP68 and the existing roof vent LO1. In October 2014, Showa Denko submitted additional modeling results that establish the compliant ranges of emissions from Stack ID S-430-03 (MP68) and Stack ID S-430-01 (LO1). The team designing the retrofits (related to this October 2014 submittal) will construct so that emission rates fall within the following compliant ranges: (4/9/2015)

Run ID	Stack ID	PM_{10} (lb/hr)	$PM_{2.5}$ (lb/hr)	NO_x (lb/hr)	CO (lb/hr)
MP68	S-430-03	0.00 to 14.48	6.97 to 14.48	0.00 to 2.855	0.00 to 1901.28
LO1	S-430-01	14.48 to 0.00	7.51 to 0.00	2.855 to 0.00	1901.28 to 0.00

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STANDARD NO. 7 - MODELED PSD CLASS II INCREMENT EMISSION RATES (LBS/HR)					
RUN ID	STACK ID	Minor Source Baseline Date(s)			
		6/5/1981	(2)	11/30/1977	1/25/2006
		PM_{10}	$PM_{2.5}$	SO_2	NO_X (1)
LO1	S-430-01	(4)	(4)	(3)	(4)
LO2	S-460-03	0.793	0.765	18.300	0.130
MP01R	S-110-02/03/04	3.920	3.920	--	--
MP33B	S-210-01	9.191	9.191	41.699	79.922
MP52R	S-250-02/04	1.41	1.41	--	--
MP55	S-310-03	0.018	0.018	0.001	0.411
MP56	S-310-04	0.018	0.018	0.001	0.414
MP57	S-310-05	0.018	0.018	0.001	0.414
MP58	S-310-06	0.018	0.018	0.001	0.414
MP59	S-310-01	1.170	1.170	0.004	9.183
MP61	S-310-02	0.007	0.007	--	0.270
MP68	S-430-03	14.48(4)	14.48(4)	42.63	2.855(4)
MP74R	S-510-01/05	1.33	1.33	--	--
NP08	S-110-2-4349-05	0.144	0.144	--	--
NP09	S-110-2-4349-04	1.410	1.410	--	--
NP10	S-110-2-4345-22	0.086	0.086	--	--
NP11	S-110-2-4345-24	0.086	0.086	--	--
NP12	S-110-2-4349-03	2.790	2.790	--	--
NP14	S-110-2-4349-01	0.039	0.039	0.003	0.720
NP49	S-210-2-4333-01	10.349	10.349	46.802	76.882
NP64	S-310-2-4349-24	0.100	0.100	0.007	1.710
NP65	S-310-2-4349-02	1.170	1.170	0.004	9.183
NP66	S-310-2-4349-01	0.039	0.039	0.003	0.718
NP70	S-460-4349-03	6.010	6.010	24.302	2.400
NP72	S-460-02	0.190	0.190	--	--
NP100A	Coke Silo Bin Vent	0.000857	0.000857	--	--
NP100B	110-2-4345-04	0.001429	0.001429	--	--
NP100C	110-2-4345-06	0.000659	0.000659	--	--
NP100D	110-2-4345-08	0.000238	0.000238	--	--
NP100E	110-2-4345-05	0.00229	0.00229	--	--
NP100F	110-2-4345-12	4.29E-05	4.29E-05	--	--
VML1_01 – VML1_21 (3)	S-430-01 (3)	--	--	81.201	--

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STANDARD NO. 7 - MODELED PSD CLASS II INCREMENT EMISSION RATES (LBS/HR)					
RUN ID	STACK ID	Minor Source Baseline Date(s)			
		6/5/1981	(2)	11/30/1977	1/25/2006
		PM_{10}	$PM_{2.5}$	SO_2	NO_X (1)
VXL1_01 – VXL1_21	S-430-01	--	-5.830	--	-1.170
XP01	S-110-02	--	-1.180	--	--
XP02	S-110-03	--	-1.030	--	--
XP03	EF-110-6	0.204	--	--	--
XP04	S-110-04	--	-1.710	--	--
XP05	S-110-17	0.021	--	--	--
XP06	S-110-20	0.039	--	0.003	0.72
XP33	S-210-01/02	--	-5.838	--	-75.192
XP50	S-220-01	0.860	--	--	--
XP51	S-250-01	0.043	--	--	--
XP52	S-250-02	--	-0.770	--	--
XP53	S-250-03	0.430	--	--	--
XP54	S-250-04	--	-0.640	--	--
XP59	S-310-01	--	-1.170	--	-9.183
XP62	S-310-10	0.035	--	0.003	--
XP67	S-410-01/S-430-02	0.750	--	--	--
XP68	S-430-03	--	-8.389	-101.2	-1.684
XP69	S-430-02	0.190	--	--	--
XP73	S-490-01B	0.380	--	--	--
XP74	S-510-01	--	-0.900	--	--
XP75	S-510-05	--	-0.430	--	--
XP76	S-510-06	0.030	--	--	--
1) Rates shown are the full NOx rates, but ARM (0.8 factor) was applied to the modeling concentration results. (5/25/2012)					
2) There is no minor source baseline date for PM2.5 in Dorchester County at this time. The PFC-75 project is after the Major Source Baseline date of 10/20/10, so project emission increases are increment consuming. (5/25/2012)					
3) Run ID VML1_01 – VML1_21 (Stack S-430-01) is a roof vent that is represented as 21 volume sources in AERMOD for State Standard 2 and 7 modeling. Each volume source emission rate is the total emission rate for the roof vent (i.e., 81.2 lb/hr for SO2) divided by 21 (to give 3.87 lb/hr SO2 per volume source). This source is modeled as LO1 (at 81.2 lb/hr for SO2) in BLP for Full Impact Analyses. Compliance is demonstrated for the existing graphitizing total for all other pollutants using a variation of emissions through stack ID LO1 and MP68. PM10, PM2.5, NOx, and CO assume 0% control. See also note 8. (5/6/2014 and 4/9/2015)					

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STANDARD NO. 7 - MODELED PSD CLASS II INCREMENT EMISSION RATES (LBS/HR)					
RUN ID	STACK ID	Minor Source Baseline Date(s)			
		6/5/1981	(2)	11/30/1977	1/25/2006
		PM_{10}	$PM_{2.5}$	SO_2	NO_X (1)

4) Graphitizing emission (existing unit) totals are shown for MP68. Emissions are split between stack MP68 and roof vent LO1. In October 2014, Showa Denko submitted additional modeling results that establish the compliant ranges of emissions from Stack ID S-430-03 (MP68) and Stack ID S-430-01 (LO1). The team designing the retrofits (related to this October 2014 submittal) will construct so that emission rates fall within the following compliant ranges: (4/9/2015)

Run ID	Stack ID	PM_{10} (lb/hr)	$PM_{2.5}$ (lb/hr)	NO_x (lb/hr)	CO (lb/hr)
MP68	S-430-03	0.00 to 14.48	6.97 to 14.48	0.00 to 2.855	0.00 to 1901.28
LO1	S-430-01	14.48 to 0.00	7.51 to 0.00	2.855 to 0.00	1901.28 to 0.00

STANDARD NO. 8 - MODELED AIR TOXIC EMISSION RATES (LBS/HR)					
RUN ID	STACK ID	Benzene	Carbon Disulfide	Hexane	Methyl Chloride
		71-43-2	75-15-0	110-54-3	74-87-3
L02	S-460-03	4.250E-02	1.319E-01	1.176E-02	6.250E-02
MP68	S-430-03	9.183E-01	2.850E+00	2.540E-01	1.349E+00
NP70	S-460-4349-03	8.072E-01	2.510E+00	2.234E-01	1.187E+00
VML1_01	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_02	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_03	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_04	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_05	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_06	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_07	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_08	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_09	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_10	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_11	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_12	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_13	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_14	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_15	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_16	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_17	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_18	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02

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ATTACHMENT A

Showa Denko Carbon, Inc.
0900-0025-CZ-R6

STANDARD NO. 8 - MODELED AIR TOXIC EMISSION RATES (LBS/HR)					
RUN ID	STACK ID	Benzene	Carbon Disulfide	Hexane	Methyl Chloride
		71-43-2	75-15-0	110-54-3	74-87-3
VML1_19	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_20	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02
VML1_21	S-430-01	8.326E-03	2.585E-02	2.304E-03	1.225E-02

STANDARD NO. 8 - MODELED AIR TOXIC EMISSION RATES (LBS/HR)		
RUN ID	STACK ID	Polycyclic Organic Matter
		+
MP01R	S-110-02	0.042
MP07	S-110-12/13	0.386
MP33A	S-210-01/02	16.024
MP59	S-310-01	3.54
NP12	S-110-2-4349-03	0.071
NP15	S-110-14	0.400
NP49	S-210-2-4333-01	14.10
NP65	S-310-2-4349-02	3.00

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Appendix E – Statement of Basis

Company Name	Showa Denko Carbon, Inc.	**Permit Writer:**	Sheila Watts
Permit Number:	0900-0025-CZ-R6	**Date:**	**DRAFT**

DATE APPLICATION RECEIVED: December 20, 2016

FACILITY DESCRIPTION The facility manufactures graphite electrodes for use in the steel manufacturing industry.

PROJECT DESCRIPTION The facility currently operates a graphitizing process that includes twenty-seven (27) graphitizing furnaces (will be referred to as existing graphitizing furnaces). The facility obtained a PSD permit (0900-0025-CZ), issued June 8, 2012 that included modifications to the facility to accommodate an increase in production of finished graphite electrodes from 45,000 to 85,000 metric tons per year. As part of the PSD, construction of a new graphitizing process was proposed that included ten (10) graphitizing furnaces (will be referred to as new graphitizing furnaces) along with other equipment. Also, as part of the PSD, the facility proposed to install an SO_2 scrubber on the existing graphitizing furnaces and an SO_2 scrubber on the new graphitizing furnaces. Installation of the scrubbers allowed the facility to net out of SO_2 BACT analysis. The facility conducted an initial source test in August 2016, on the SO_2 scrubber stack for the existing graphitizing furnaces, followed by an engineering source test in October 2016. Through a series of commissioning and engineering source tests, the facility discovered gaseous organic emissions at the portion of the graphitizing process cycle that precedes the furnace reaching "high-fire". The majority of the newly discovered gaseous organic emissions have been identified by the facility as one of the greenhouse gases, methane, and a portion of the gaseous organic emissions are in the form of Volatile Organic Compounds (VOCs) and Hazardous Air Pollutants (HAPs). The PSD application for the new graphitizing furnaces had proposed emissions estimated based on the existing graphitizing furnaces (past stack testing, sulfur content of raw materials, supplier information, engineering test data, CEMS, and 40 CFR Part 98 equations and factors). The PSD application did not address any potential VOC emissions or additional methane emissions (other than estimated greenhouse gas emissions) from the new graphitizing furnaces since the facility had been unaware of these emissions until the above-referenced testing was conducted. Therefore, the Preliminary Determination and Notice of MACT Approval issued April 13, 2012 did not account for these emissions, and the new graphitizing furnaces did not undergo BACT for VOC, nor did the PSD permit contain VOC PSD limits for the new graphitizing furnaces. This PSD permit revision will include revising the Preliminary Determination and Notice of MACT Approval and PSD permit in order to include and address these emissions. This PSD permit revision does not involve any changes to the existing graphitizing furnaces or any other emission units other than the new graphitizing furnaces. This PSD revision will undergo public notice. This PSD revision will also incorporate changes due to Departmental regulatory updates. These items are as follows:

1) This statement of basis will provide an update to the GHG uncontrolled potential emissions and include VOC uncontrolled potential emissions from the new graphitizing furnaces. This statement of basis will also establish an updated Table 1. Showa Denko – PSD Applicability Analysis to account for additional emissions from the new graphitizing furnaces.
2) The statement, "Also, in the Utility MACT proposal (40 CFR 63, Subpart UUUUU), the EPA established work practice standards in lieu of a limit for CO" was removed from the April 13, 2012 Preliminary Determination (located under BACT for CO). The Utility MACT has been finalized and no work practice standards have been established in lieu of a limit for CO.
3) Update the Preliminary Determination and Notice of MACT Approval (issued April 13, 2012) to include estimated VOC and HAP emissions for the new graphitizing furnaces and address VOC BACT.
4) Update the Preliminary Determination and Notice of MACT Approval (issued April 13, 2012) NO_X BACT in order to reflect that facility testing revealed no direct correlation in restricting nitrogen content in raw materials to

lowering NO_X process emissions from the carbottom and graphitizing furnaces. Accordingly, the PSD allows changes to be made to the nitrogen content based on prior Departmental approval, however the lb/hr NO_X limits for the carbottom and graphitizing furnaces will remain in place and unchanged.

5) The facility provided revised modeling to demonstrate compliance with S.C. 61-62.5, Standard No. 8 and the Preliminary Determination and PSD have been updated accordingly.
6) Establish conditions in the PSD permit to address potential VOC and HAP emission from the new graphitizing furnaces (under Part 5.B.3.h – Conditions for New Graphitizing Process and Part 7.D – NESHAP Part 63 Subpart B, Affected Sources).
7) The SO_2 limit of 3.5 lbs SO_2/million Btu heat input found in Condition 5.B.3.a(7) and Condition 5.B.3.e(6) will be changed to 2.3 lbs SO_2/million Btu heat input to reflect Departmental updates to S.C. Regulation 61-62.5, Standard No. 1 – Fuel Burning Operations.
8) Due to the repeal of S.C. Regulation 61-62.5, Standard No. 5.1, Best Available Control Technology (BACT)/Lowest Achievable Emission Rate ("LAER") Applicable to Volatile Organic Compounds, all references will be removed from the Preliminary Determination as the Standard is no longer applicable.
9) 40 CFR Part 63 Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters) is applicable and will be addressed in the revised permit and revised Preliminary Determination.

CHANGES SINCE PSD (0900-0025-CZ) ISSUANCE The PSD permit (0900-0025-CZ) was issued June 8, 2012. Below is a record of the revisions to the PSD that have taken place.

RECORD OF REVISIONS		
Date	**PSD Revision #**	**Description of Change**
10/17/2013	1	Condition 5.C.6 was clarified to list that it applied to the new carbottom and new graphitizing sources (E-210-2-4271-18/32 and E-460-4271-01/10). Also a typographical error was corrected for Condition 5.B.3.h(2).
5/8/2014	2	Condition 5.C.5 was revised (raw material sulfur contents) and Modeling Attachment was updated to reflect changes to raw material sulfur content and stack reconfiguration of the existing graphitizing furnaces. These changes resulted in more SO_2 emissions being captured and controlled (PSD Netting Analysis for SO_2 updated in Statement of Basis).
7/10/2014	3	The raw material nitrogen content limits listed in Condition 5.C.6, for proposed carbottom furnaces (E-210-2-4271-18/32) and proposed graphitizing furnaces (E-460-4271-01/10), were revised. No emission increase is associated with this change and emission limits remain unchanged.
4/23/2015	4	Update design information and air dispersion modeling results for retrofits to the existing graphitizing furnaces (E-430-01). Updates to the Modeling Attachment were from design information and air dispersion modeling that reflect no control of PM, CO, and NO_X emissions from the scrubber being proposed to control SO_2 emissions from the existing graphitizing furnaces. Condition 5.B.3.b(6) has been revised to clarify that verification of low NOX burners will be required on both sets of burners for the thermal oxidizer.

3/23/2016	5	Conditions 5.C.5 and 5.C.6 have been changed to allow increases in the sulfur and nitrogen content of the raw materials without amending the permit granted the facility provide 15-day notification to the Department prior to utilizing the raw material. No emission increase is associated with this change and the lb/hr emission limits remained unchanged. Monitoring of opacity for the existing graphitizing furnaces stack has been included and will supersede Title V monitoring of opacity for the existing graphitizing furnaces stack. These changes are associated with the addition of a wet scrubber at the facility to control emissions from the existing graphitizing furnaces. This revision includes the addition of an initial source test for filterable PM, PM_{10} and $PM_{2.5}$ emissions from the existing graphitizing furnaces stack. Also, updates to Part 7.A - NESHAP Periodic Reporting Schedule Summary for Subpart ZZZZ occurred during this revision. There is no reporting for Subpart ZZZZ for the new emergency generator, therefore N/A (Not Applicable) was put in the Reporting Schedule Summary and notes 3 and 4 were added that pertain to emergency generators.

SOURCE TEST REQUIREMENTS Source test requirements for VOC emissions from the new graphitizing furnaces has been added during this revision. Other source test requirements have remained the same as previous revision and are specified in the permit. VOC source testing for the new graphitizing furnaces will involve an initial source test conducted within 180 days after startup and every three (3) years thereafter (option for less frequent subsequent testing is outlined in permit). Testing of VOC emissions for 96 hours shall take place at the roof monitor and graphitizing stack scrubber, in accordance with a Department approved site-specific test plan. Testing of VOC emissions for the existing graphitizing furnaces will be incorporated during TV renewal for the facility. Testing for the existing graphitizing furnaces will take place over 120 hours at the existing graphitizing stack scrubber, in accordance with a Department approved site-specific test plan. The difference in hours of testing is attributed to the differences in time of batch cycles for the existing and new graphitizing furnaces.
Source test requirements for CO_2 emissions from the new graphitizing furnaces now include CH_4 as well.

SPECIAL CONDITIONS, MONITORING, LIMITS Special conditions, monitoring, and limits are listed in the revised preliminary determination and the permit. Changes with this permit revision are additional monitoring requirements and VOC BACT limits for the new graphitizing furnaces.

EMISSIONS Emissions in the facility's modified PSD application, received December 20, 2016, have been reviewed for accuracy. The tables below only address changes from this sixth PSD revision. Refer to Statement of Basis dated June 8, 2012 and Statement of Basis dated May 8, 2014 for remaining emissions from the new graphitizing furnaces and from other equipment involved in the PSD, which are not the subject of this permit revision.

UNCONTROLLED POTENTIAL EMISSIONS (Project Only) (H designates a hazardous air pollutant, T designates a toxic air pollutant, and V designates a volatile organic compound)				
Equipment ID	**Pollutant**	**lb/hr**	**TPY**	**Method for Estimating Emissions**
E-460-4271-01/10 (new graphitizing furnaces)	VOC	47.3 (maximum)	14.4	Based on engineering source test (10/2016) on existing graphitizing

		3.3 (average)		furnaces, using 36 hours of test data. Variability factors were applied to existing graphitizing furnace values in order to estimate new graphitizing furnace emissions. TPY estimate is based on the average lb/hr value and 8760 hours of operation. See example calculations below.
	Methane	141.4 (maximum) 23.9 (average)	104.5	
	GHG (CO_2e) from recently discovered methane	-------	2,612	Converting to CO_2e by using a methane global warming potential of 25.
	Methyl Chloride (V,H,T)	1.25	5.48	Based on engineering source test (10/2016) on existing graphitizing furnaces, using 36 hours of test data. The nine regulated speciated non-methane gaseous organic emissions that resulted in 0.01 lb/hr or greater emissions were quantified in the application. Variability factors were applied to existing graphitizing furnace highest maximum peak lb/hr values for each of the nine pollutants in order to estimate new graphitizing furnace worst case of emissions. TPY values reflected are based on 8760 hours of operation at peak emission rates. See example calculations below. The graphitizing furnaces are batch operations. Inherent operational limitations prevent the furnaces from operating 8760 hours per year or from operating at peak values for extended periods. Thus, emission values reflected are higher than what the new graphitizing furnaces can emit. Total HAP emissions from these units are expected to be less
	Carbon Disulfide (V,H,T)	2.64	11.55	
	Hexane (V,H,T)	0.235	1.03	
	Benzene (V,H,T)	0.85	3.72	
	1,4- Dioxane (V,H,T)	0.01	0.045	
	Toluene (V,H,T)	0.068	0.30	
	Xylenes, total (V,H,T)	0.04	0.18	
	Methylene Chloride (H,T)	0.027	0.12	
	Vinyl Acetate (V,H,T)	0.012	0.05	

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				than 10 tpy for any single HAP and less than 25 tpy for any combination of HAPs.
Total VOCs for New Graphitizing Furnaces	14.4 TPY			
Total GHG (CO_2e) for New Graphitizing Furnaces	32,852 TPY (previously established) + 2,612 TPY (from recently discovered methane) = 35,464 TPY			
Total HAPs for New Graphitizing Furnaces	1.69×10^{-4} TPY (previous emissions from chromium and mercury) + 22.48 TPY (from recently discovered non-methane gaseous organic emissions) = 22.48 TPY			

New graphitizing furnace emissions above estimate the potential worst case of uncontrolled emissions (scrubber stack + roof vent). The average lb/hr values for VOC and methane are the average taken over 36 hours of engineering test data. The facility stated that previous engineering testing has shown that the new SO_2 scrubbers (one for the existing graphitizing furnaces and one for the new graphitizing furnaces) have nominal or no control efficiency for gaseous organics, therefore uncontrolled = controlled emissions for the pollutants listed above. As indicated, the new graphitizing furnaces are batch operations and could not operate at peak conditions for 8760 hours per year. For this reason, any emission estimates based upon such assumptions would overestimate emissions.

Example Calculations:

Engineering source test (10/2016) on the existing graphitizing furnaces report results "as methane" because the Method 25A analyzer was calibrated with methane calibration gas. The facility acquired 36 hours of test data over 4 days.
Total hydrocarbons lb/hr (as methane) minus Methane lb/hr (as methane) = VOC lb/hr (as methane)
For the existing graphitizing furnaces stack the source testing resulted in a maximum of 122.2 lb/hr Methane (as methane) and a maximum of 176.7 lb/hr Total hydrocarbons (as methane); therefore VOC lb/hr (as methane) = 176.7 lb/hr Total hydrocarbons (as methane) minus 122.2 lb/hr Methane (as methane) = 54.5 lb/hr VOC (as methane) from the scrubber stack. The same methods were used to calculate a 3.2 lb/hr VOC (as methane) average from the scrubber stack except the data was averaged over 36 hours. VOC lb/hr (as methane) from the existing graphitizing furnaces roof vent was estimated based on a 84% captured emissions going through the scrubber and the remaining 16 % assumed to exhaust through the roof vent. Calculations take into account the 84/16 (scrubber stack/roof vent) split for the existing graphitizing furnaces in order to estimate roof vent emissions (all testing took place at the scrubber stack). VOC lb/hr (as methane) total from stack + roof vent = 54.5 lb/hr VOC (as methane) x (100/84) = 64.9 lb/hr VOC (as methane). 64.9 lb/hr VOC (as methane) converted to VOC (as carbon) = 64.9 lb/hr VOC (as methane) x 12/16 (molecular wt. of carbon/molecular wt. of methane) = 48.7 lb/hr VOC (as carbon).
Using the above methodologies and stack test data the facility provided the following:
Total (stack + roof vent) for existing graphitizing furnaces = 141.75 lb/hr Methane (as methane), maximum
Total for existing graphitizing furnaces = 27.9 lb/hr Methane (as methane), average
Total for existing graphitizing furnaces = 122.1 tpy Methane (as methane), based on average lb/hr value and 8760 hours of operation.
Total for existing graphitizing furnaces = 48.7 lb/hr VOC (as carbon), maximum
Total for existing graphitizing furnaces = 3.9 lb/hr VOC (as carbon), average
Total for existing graphitizing furnaces = 16.87 tpy VOC (as carbon), based on average lb/hr value and 8760 hours of operation.

To estimate VOC lb/hr (as carbon) emissions from the new graphitizing furnaces several factors were taken into account: 1) the existing graphitizing furnaces can produce 45,000 metric tons per year of finished electrodes while the new graphitizing furnaces are estimated to a produce 35,000 metric tons of finished electrodes, 2) new graphitizing furnaces are larger than the existing graphitizing furnaces (process longer, larger diameter electrodes), 3) still working on understanding the formation mechanism for gaseous organics emissions during the graphitizing process and the uncertainty of applying gaseous organic test results from a single engineering source test. Along with the production scaling factor (35,000/45,000), a variability factor of 1.1 has been applied to calculations of average hourly and annual emissions from the new graphitizing furnaces and a variability factor of 1.25 applied to the calculations for maximum hourly emissions. Therefore maximum VOC lb/hr (as carbon) for the new graphitizing furnaces = 47.415 lb/hr VOC (as carbon) x (35,000/45,000) x 1.25 = 46.10 lb/hr VOC (as carbon), maximum for new graphitizing furnaces.
Emissions from the new graphitizing furnaces have a 95/5 (scrubber stack/roof vent) split; however the scrubber does not control the gaseous organic emissions, therefore the split is not taken into account when estimating emissions from the new graphitizing furnaces.
Total (stack + roof vent) for new graphitizing furnaces = 145.48 lb/hr Methane (as methane), maximum for existing graphitizing furnaces x (35,000/45,000) x 1.25 = <u>141.4 lb/hr Methane (as methane), maximum</u>
Total for new graphitizing furnaces = 27.9 lb/hr Methane (as methane), average x (35,000/45,000) x 1.1 = <u>23.9 lb/hr Methane (as methane), average</u>
Total for new graphitizing furnaces = 122.1 tpy Methane (as methane) x (35,000/45,000) x 1.1 = <u>104.5 tpy Methane (as methane)</u>
Total for new graphitizing furnaces = 48.7 lb/hr VOC (as carbon), maximum x (35,000/45,000) x 1.25 = <u>47.3 lb/hr VOC (as carbon), maximum</u>
Total for new graphitizing furnaces = 3.9 lb/hr VOC (as carbon), average x (35,000/45,000) x 1.1 = <u>3.3 lb/hr VOC (as carbon), average</u>
Total for new graphitizing furnaces = 16.87 tpy VOC (as carbon) x (35,000/45,000) x 1.1 = <u>14.4 tpy VOC (as carbon)</u>

Testing of the existing graphitizing furnaces provided data for the nine regulated speciated non-methane gaseous organic emissions that resulted in 0.01 lb/hr or greater emissions. The data was obtained by using Method 0030/0040 testing that consisted of taking sorbent tube samples and Tedlar bag samples during peak gaseous organic emissions. The highest maximum peak lb/hr value (comparing maximum peak lb/hr and average peak lb/hr) for each of the nine regulated speciated non-methane gaseous organic emissions was used to calculate potential emissions for the new graphitizing furnaces. Calculations take into account the 84/16 (scrubber stack/roof vent) split for the existing graphitizing furnaces in order to estimate roof vent emissions (all testing took place at the scrubber stack). For example: Carbon disulfide lb/hr total from stack + roof vent = 2.85 lb/hr Carbon disulfide (highest max. peak) x (100/84) = 3.39 lb/hr Carbon disulfide.
Using the above methodologies and stack test data the facility provided the following:
Total (stack + roof vent) for existing graphitizing furnaces = 3.39 lb/hr Carbon disulfide
Total for existing graphitizing furnaces = 14.85 tpy Carbon disulfide, based on highest max. peak lb/hr value and 8760 hours of operation. Once again, this over estimates these emissions. The batch nature of the graphitizing furnaces would prevent them from operating 8760 hours per year at a highest maximum peak lb/hr value. Given the average value for carbon disulfide, it is expected that emissions would not be greater than 10 tpy.
For purposes of this exercise, emissions from the new graphitizing furnaces were estimated using a (35,000/45,000) production factor. Emissions from the new graphitizing furnaces have a 95/5 (scrubber stack/roof vent) split; however

the scrubber does not control the gaseous organic emissions, therefore the split is not taken into account when estimating emissions from the new graphitizing furnaces.
Total (stack + roof vent) for new graphitizing furnaces = 3.39 lb/hr Carbon disulfide x (35,000/45,000) = 2.64 lb/hr Carbon disulfide
Total for new graphitizing furnaces = 14.85 tpy Carbon disulfide x (35,000/45,000) = 11.55 tpy Carbon disulfide (again, on account of the batch nature of the graphitizing furnaces and inherent limitations on nature of operation, the units cannot be operated 8760 hours per year at peak emission rates. Carbon disulfide emissions are expected to be below 10 tpy).
Calculations for the remaining 8 regulated speciated non-methane gaseous organic emissions that resulted in 0.01 lb/hr or greater emissions were estimated the same way.

OPERATING PERMIT STATUS
This facility currently operates under a Title V operating permit that was issued July 1, 2005 and expired September 20, 2010. A Title V renewal application for the facility was received May 2010.

REGULATORY APPLICABILITY REVIEW (Project Only)	
Regulations	**Comments/Periodic Monitoring Requirements**
Section II.E – Synthetic Minor	Not Applicable. No synthetic minor limits are being established with this PSD revision.
Standard No. 1	Applicable. The PSD permit has two (2), 5 million Btu/hr hot oil heaters that will be indirect fired fuel burning sources. Due to Departmental changes to Standard 1 since the issuance of the original PSD, the maximum allowable SO_2 emission rate will be 2.3 lbs SO_2/million Btu heat input instead of 3.5 lbs SO_2/million Btu heat input for each hot oil heater. This PSD revision will reflect these changes.
Standard No. 3 (state only)	Applicable. No change with this PSD revision.
Standard No. 4	Applicable. No change with this PSD revision.
Standard No. 5	Not Applicable. The facility was not in existence in 1979 or 1980; it was constructed in 1983 after issuance of a construction permit on 01/11/1982.
Standard No. 5.1	Not Applicable. Due to the repeal of Standard No. 5.1, this regulation is no longer applicable and the revised Preliminary Determination for this project will reflect this change.
Standard No. 5.2	Not Applicable. No change with this PSD revision.
Standard No. 7	Applicable. Previously the project exceeded the significant threshold as defined under PSD for PM, PM_{10}, $PM_{2.5}$, NO_X, CO, VOC, and GHG emissions. A BACT analysis was performed and proposed BACT limits were outlined in the Preliminary Determination. The facility netted out of SO_2 due to installation of a control device on the existing graphitizing furnaces. This is still the case, however the facility did not account for VOC or additional methane emissions from the new graphitizing furnaces (discovered on the basis of recent testing of existing graphitizing furnaces). For this PSD revision the facility, for the new graphitizing furnaces, went through VOC BACT analysis, established VOC PSD limits, and re-evaluated the GHG PSD limit (additional methane emissions). See Table 1 below (updated to included additional VOC and methane emissions).
61-62.6	Applicable. No change with this PSD revision.

DRAFT

Company Name	Showa Denko Carbon, Inc.	**Permit Writer:**	Sheila Watts
Permit Number:	0900-0025-CZ-R6	**Date:**	**DRAFT**

REGULATORY APPLICABILITY REVIEW (Project Only)	
Regulations	**Comments/Periodic Monitoring Requirements**
40 CFR 60 and 61-62.60	Applicable. There is no change to the emergency diesel-fired generator being subject to comply with 40 CFR Subpart IIII during this PSD revision.
40 CFR 61 and 61-62.61	Not Applicable. No change with this PSD revision.
40 CFR 63 and 61-62.63	Applicable. The facility is major for HAP emissions (PTE is greater than 10 TPY single HAP or 25 TPY combination HAPs). The PSD issued June 8, 2012 was subjected to a case-by-case MACT determination (112g). The Notice of MACT Approval (NOMA) was included within the Preliminary Determination/NOMA document. For this PSD revision, the case-by-case MACT determination (112g) was evaluated to determine if changes needed to be made. Previous conditions will remain in place and no changes to the 112g are required at this time. There are no changes to the emergency diesel-fired generator being subject to 40 CFR 63 Subpart ZZZZ and the requirements of 40 CFR 63 Subpart ZZZZ being met by complying with 40 CFR 60 Subpart IIII which is more stringent. A change with this PSD revision is that 40 CFR Part 63 Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters), applies to the new, two 5 million Btu/hr hot oil heaters.
61-62.68	Not Applicable. No change with this PSD revision.
40 CFR 64 (CAM)	Not Applicable. No change with this PSD revision.

AMBIENT AIR STANDARDS REVIEW	
Regulations	**Comments/Periodic Monitoring Requirements**
Standard No. 2	Applicable. No change with this PSD revision.
Standard No. 7.c	Applicable. No change with this PSD revision.
Standard No. 8 (state only)	Applicable. The facility has demonstrated compliance through modeling for all TAPs as of January 24, 2017.

Table 1. Showa Denko – PSD Applicability Analysis

Pollutant	Controlled Emissions Increase	PSD Significant Threshold	Significant Increase?
	TPY	TPY	
PM	93.4	25	Yes
PM_{10}	93.08	15	Yes
$PM_{2.5}$	92.8	10	Yes
SO_2	**-342.7**	40	No
NO_X	324.6	40	Yes
CO	4,757.0	100	Yes
VOC	**129.9**	40	Yes

Table 1. Showa Denko – PSD Applicability Analysis			
Pollutant	**Controlled Emissions Increase**	**PSD Significant Threshold**	**Significant Increase?**
	TPY	**TPY**	
Lead	0.0001	0.6	No
CO_{2e} (GHG)	**258,176**	75,000	Yes

The bold font in Table 1 represents changes. The increased reduction in SO_2 emissions was part of PSD Revision 2 (0900-0025-CZ-R2). Controlled emissions increase of SO_2 reflect installing a wet scrubber on the existing graphitizing furnaces and proposed graphitizing furnaces. Therefore the PSD project does not contribute to a PSD significant increase for SO_2 emissions. See table below.

PSD Netting Analysis for SO_2			
Equipment ID	Source Description	Stack ID	SO_2 (TPY)
Project Emissions			
E-110-2-4275-01	Hot Oil Heater (New Mill, Mix, and Extrusion)	S-110-2-4349-01	0.01
E-210-2-4271-18/32	Carbottom Furnaces Nos. 18-32 equipped with Thermal Oxidizer (New Bake/Rebake Process)	S-210-2-4333-01	105.6
E-310-2-4272-21	Preheater (New Pitch Impregnation Process)	S-310-2-4349-24	0.03
E-310-2-4275-01	Hot Oil Heater (New Pitch Impregnation Process)	S-310-2-4349-02	0.02
E-310-2-4201-01/ CD-310-2-4333-01	Autoclave/Spray Cooler/Cooling Bath equipped with Thermal Oxidizer (New Pitch Impregnation Process)	S-310-02-4349-01	0.01
E-460-4271-01/10	Graphitizing Furnaces/Stack Emissions (New Graphitizing Process)	S-460-4349-03	53.2
E-460-4271-01/10	Graphitizing Furnaces/Roof Monitor Emissions (New Graphitizing Process)	Roof Monitor	40.0
		Total for New Source Emissions	**198.87**
Average Past Actual Emissions (2007-2008)			
E-210-01	Carbottom Furnaces Nos. 1-17 equipped with Thermal Oxidizer (Existing Bake/Rebake Process)	S-210-01/S-210-02	128.83
E-430-01	Graphitizing Furnaces/Stack Emissions (Existing Graphitizing Process)	S-430-03	443.3

DRAFT

PSD Netting Analysis for SO_2			
E-430-01	Graphitizing Furnaces/Roof Monitor Emissions (Existing Graphitizing Process)	S-430-01 (Roof Monitor)	308.03
		Total Past Actual Emissions	**880.2**
Creditable Emissions Increase – Sources that were new/modified within the last 5 years			
E-310-01	(2) Preheaters (installed burners with increased Btu rating; original 2.1 million Btu/hr; new 4.2 million Btu/hr each) (2010)	S-310-03/ S-310-04/ S-310-05/ S-310-06	0.02
E-310-11	Hot Oil Heater (4.5 million Btu/hr) (2010)	S-310-10	0.01
		Total Creditable Emissions Increase – New/Modified Sources	**0.03**
New Allowable Emissions – Existing Sources			
E-210-01	Carbottom Furnaces Nos. 1-17 equipped with Thermal Oxidizer (Existing Bake/Rebake Process)	S-210-01/S-210-02	118.8
E-430-01	Graphitizing Furnaces/Stack Emissions (Existing Graphitizing Process)	S-430-03	75.7
E-430-01	Graphitizing Furnaces/Roof Monitor Emissions (Existing Graphitizing Process)	S-430-01 (Roof Monitor)	144.1
		Total New Allowable Emissions – Existing Sources	**338.6**
		Creditable Decrease (Total New Allowable + Total Creditable Increase minus Total Past Actual)	**(541.6)**
		SO_2 Net Increase/Decrease	**(342.7)**

PUBLIC NOTICE
This construction permit will undergo a 30-day public notice period to establish a new VOC BACT limit for the new graphitizing furnaces and modifying the existing GHG BACT limit for the new graphitizing furnaces in accordance with SC Regulation 61-62.1, Section II.N. This permit(s) was placed in *The Journal Scene* newspaper on Wednesday, January 25, 2017. The comment period was open from January 25, 2017 to February 23, 2017 and was placed on the BAQ website during that time period.

ADDITIONAL PUBLIC PARTICIPATION The facility held a public meeting (the Department was not present) at the facility on December 14, 2016 where an update on the status of the PFC-75 project (0900-0025-CZ) was provided.

SUMMARY AND CONCLUSIONS
It has been determined that this source, if operated in accordance with the submitted application, will meet all applicable requirements and emission standards.

DRAFT

Appendix F – Public Notice of Draft PSD Construction Permit

PUBLIC NOTICE

State of South Carolina (SC)
Department of Health and Environmental Control (DHEC)
Bureau of Air Quality (BAQ)
2600 Bull Street
Columbia, SC 29201
(803) 898-4123

Notice of a Draft Air Prevention of Significant Deterioration (PSD) Revised Construction Permit
PUBLIC NOTICE #17-003-PSD-R-TVAA

COMMENT PERIOD: Public Notice will begin on January 25, 2017 and will end at close of business, which is 5:00 p.m. on February 23, 2017

Showa Denko Carbon, Inc. (Showa Denko)
478 Ridge Road
Ridgeville, South Carolina
(Dorchester)
AIR PERMIT #0900-0025-CZ-R6

Showa Denko has applied to the SC DHEC, BAQ, for a Prevention of Significant Deterioration (PSD) revised air construction permit to establish new Best Available Control Technology (BACT) limit for Volatile Organic Compounds (VOCs) and revise the existing BACT limit for Greenhouse Gases (GHGs) for the new graphitizing furnaces. A revised Preliminary Determination, draft revised construction permit, and Statement of Basis have been written by the BAQ outlining this revised proposed project and applicable regulations. In addition to other state and federal air quality regulations, the draft revised permit is subject to review under SC DHEC Regulation 61-62.5, Standard No. 7 "Prevention of Significant Deterioration (PSD)." This regulation is equivalent to Title 40 of the Code of Federal Regulations, Part 52.21 "Prevention of Significant Deterioration of Air Quality." Under these regulations, a facility must demonstrate that it will not significantly deteriorate the air quality in its region prior to constructing or modifying sources of air pollutants. The draft revised permit has not yet been approved and is open to comment from the public, the United States Environmental Protection Agency (EPA), the Federal Land Managers, the chief executives of Dorchester County, the Town of Ridgeville, and Berkeley-Charleston-Dorchester Council of Governments.

Showa Denko operates a graphite electrode manufacturing facility. This PSD permit revision will include revising the Preliminary Determination and Notice of MACT Approval, and PSD permit in order to include and address BACT limits for VOCs and GHGs for the new graphitizing furnaces only. This PSD permit revision does not involve any changes to the existing graphitizing furnaces or any other emission units. Emissions generated by this facility as a result of the proposed revised PSD project will include VOC and GHGs. Air dispersion modeling has indicated that the release of emissions from this facility will not cause or contribute to an exceedance of the National Ambient Air Quality Standards (NAAQS). There will be no Class I Areas impacted and no degree of increment consumption resulting from this proposed project.

This revised construction permit will be incorporated as an administrative amendment into the existing Title V permit with no additional public comment period, provided all public participation and EPA requirements were fulfilled with notice of the construction permit action. The status regarding EPA's review of the proposed permit and the deadline for a citizen petition is available on EPA's website at: http://www.epa.gov/caa-permitting/south-carolina-proposed-title-v-permits. All emissions limitations and conditions in the draft PSD construction permit have been written in accordance with the SC Title V Operating Permit Program.

Interested persons may review the materials drafted and maintained by DHEC for this facility and submit written comments on the draft permit by the end of the public notice period listed above, to Ruthie Hall at the above DHEC address or by e-mail at hallmr@dhec.sc.gov. All comments received by the end of the notice period, will be considered when making a decision to approve, disapprove, or modify the draft permit. Where there is a significant amount of public interest, DHEC may hold a public hearing to receive additional comments. Public hearing requests should be

made in writing to Ruthie Hall at the above DHEC address or by e-mail. If a public hearing is requested and scheduled, notice will be given thirty (30) days in advance. If you have questions concerning the draft permit, please contact Sheila Watts at the phone number listed above. A final review request may be filed after a permit decision has been made. Information regarding final review procedures is available from DHEC's legal office at the above address or by calling (803) 898-3350. Information relative to the draft permit will be made available for review through the end of the notice period listed above, at the DHEC Columbia Office listed above and at the following location:

SC DHEC, Low Country, Charleston BEHS Office, 1362 McMillian Ave. Suite 300, Charleston SC 29405.

Information on permit decisions and hearing procedures is available by contacting DHEC at either address listed above. Copies of a draft permit or other related documents may be requested in writing to the Freedom of Information Office; fees may apply. Please bring this notice to the attention of persons you know will be interested in this matter.

This public notice, along with the draft permit and statement of basis, may be viewed through the end of the notice period on DHEC's website at: http://www.scdhec.gov/PublicNotices/.

Appendix G – Correspondence

Modeling Correspondence

Reply
Delete
Junk
RE: Draft documents

BH

Bernie Hawkins <bernie.hawkins@nelsonmullins.com>

Reply
Sun 1/22, 12:39 PM
Barringer, Veronica;
Watts, Sheila G.;
Pascazio, Daniel <DPascazio@SDKC.com>;
jwm@gel.com;
Thompson, Rhonda;
Gorman, Veronica;
Glass, John
Inbox

Veronica,

Thank you again for all the work the Department has put in on these documents. Special thanks to all those copied on this email.

SDKC's additional comments/responses are as follows:

- Statement of Basis, Table 1, we believe the correct CO2e value is 258,057 (vs. 258,167).

- With respect to your question number 2 below, SDKC confirms that the 14.4 TPY value does include the average nine regulated speciated non-methane gaseous organic emissions were included in this number.

- SDKC has no comments on the modeling update.

Thank you again for the opportunity to review these draft documents. Let us know if you have any other questions.

Bernie

Bernard F. Hawkins
Nelson Mullins Riley & Scarborough LLP
1320 Main Street/Columbia SC 29201
Tel: 803.255.9581 Mobile: 803.331.5410
bernie.hawkins@nelsonmullins.com
From: Barringer, Veronica [mailto:barrinv@dhec.sc.gov]
Sent: Friday, January 20, 2017 7:05 PM

To: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>; Watts, Sheila G. <wattssg@dhec.sc.gov>
Cc: Pascazio, Daniel <DPascazio@SDKC.com>; jwm@gel.com; Thompson, Rhonda <thompsrb@dhec.sc.gov>; Gorman, Veronica <gormanvm@dhec.sc.gov>; Glass, John <glassjp@dhec.sc.gov>
Subject: RE: Draft documents

Bernie,

Attached, is the updated modeling section for your review.

Thanks,

Veronica

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality – Engineering Services Division
S.C. Dept. of Health & Environmental Control
Office: (803) 898-4127
Connect: www.scdhec.gov Facebook Twitter

From: Bernie Hawkins [mailto:bernie.hawkins@nelsonmullins.com]
Sent: Friday, January 20, 2017 4:20 PM
To: Barringer, Veronica <barrinv@dhec.sc.gov>; Watts, Sheila G. <wattssg@dhec.sc.gov>
Cc: Pascazio, Daniel <DPascazio@SDKC.com>; jwm@gel.com; Thompson, Rhonda <thompsrb@dhec.sc.gov>
Subject: RE: Draft documents

Veronica,

We will review and get back to you. Can you send us a copy of the updated PD when it is available?

Thanks,

Bernie

Bernard F. Hawkins
Nelson Mullins Riley & Scarborough LLP
1320 Main Street/Columbia SC 29201
Tel: 803.255.9581 Mobile: 803.331.5410
bernie.hawkins@nelsonmullins.com
From: Barringer, Veronica [mailto:barrinv@dhec.sc.gov]
Sent: Friday, January 20, 2017 3:38 PM
To: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>; Watts, Sheila G. <wattssg@dhec.sc.gov>

Cc: Pascazio, Daniel <DPascazio@SDKC.com>; jwm@gel.com; Thompson, Rhonda <thompsrb@dhec.sc.gov>
Subject: Draft documents

Bernie,

Attached, are the updated draft documents. The changes left that needs to be reviewed are highlighted in yellow. Below is a list of some of them:

1. On the PD we added the nitrogen and sulfur % back in. These were left in the permit as part of revision 5 and it would be better if the permit and PD matched up.
2. On the SOB a comment on the 14.4 TPY number has been added. Please can you confirm that the thought process is correct. We tried calling GEL for confirmation but were unable to reach anybody.
3. On the permit we added methane as being included in the initial test as the limit now reflects CO2 and methane and source testing only had CO2.
4. The modeling section on the PD has been converted over from the original PD. The modeling section is in the process of updating it, to include the other revisions and Std 8 modeling for this revision. Updating the PD just ensure that we are moving forward with one complete and accurate PD for the facility. As these revisions have already been included in the permit, the only change to the permit will be to include the Std 8 modeling.

Please let me know asap, but no later than 8am Monday morning (January 23rd), if you have any issues with moving forward.

Thanks,

Veronica

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality – Engineering Services Division
S.C. Dept. of Health & Environmental Control
Office (803) 898-4127
Connect www.scdhec.gov Facebook Twitter

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RE: Show 0900-0025

IL

Irene Lee <ilee@exponent.com>

Reply

Tue 1/17, 4:28 PM
Gorman, Veronica
You replied on 1/18/2017 8:45 AM.

Action Items

Hi Veronica,

I just wanted to check that you received the email below with attached BPIP files?

Please let me know whenever you get the chance. Thank you.

-Irene

From: Irene Lee
Sent: Tuesday, January 17, 2017 3:34 PM
To: Gorman, Veronica
Cc: 'John McLure'; Watts, Sheila G.; Barringer, Veronica; Matthew Wike
Subject: RE: Show Denko 0900-0025

Veronica,

Attached are the BPIP files for the recently submitted Showa Denko modeling. Please let me know that you successfully received this email with attachments.

And if you need anything further or have any other questions, please don't hesitate to contact me. Thank you.

Best regards,
Irene

Irene Lee, Managing Scientist
E^x^ponent®
1 Mill and Main Place, Suite 150, Maynard, MA 01754
Tel: 978-461-4621 Fax: 978-461-4699
ilee@exponent.com

From: John McLure [mailto:jwm@gel.com]
Sent: Tuesday, January 17, 2017 2:04 PM

To: Irene Lee
Cc: Watts, Sheila G.; Barringer, Veronica; Gorman, Veronica; Matthew Wike
Subject: RE: Show Denko 0900-0025
Importance: High

Irene

See the questions below from DHEC. Can you call Veronica @ 803-898-3847 and resolve?

Thanks John

From: Gorman, Veronica [mailto:gormanvm@dhec.sc.gov]
Sent: Tuesday, January 17, 2017 2:01 PM
To: John McLure <jwm@gel.com>
Cc: Watts, Sheila G. <wattssg@dhec.sc.gov>; Barringer, Veronica <barrinv@dhec.sc.gov>
Subject: Show Denko 0900-0025

I am currently reviewing the modeling portion of the Showa Denko PSD permit application for the Gaseous Organic Emissions From Graphitizing. I do not see that a BPIP file has been included with the modeling files. Please send a BPIP file so that it can be used during the model runs. In regard to the Receptor file, it looks like the file may not be set up correctly as I cannot get the receptors to show up in AERMOD after I import it. Thanks.

Veronica Gorman
Modeling Section
Bureau of Air Quality
2600 Bull Street
Columbia, South Carolina 29201-1708
Phone: 803-898-3847 Fax: 803-898-4487

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RE: Show Denko 0900-0025

IL

Irene Lee <ilee@exponent.com>

Reply

Wed 1/18, 12:37 PM
Gorman, Veronica

Great! And if you have any questions, please just let me know.

-Irene

Irene Lee, Managing Scientist
E^ponent^®
1 Mill and Main Place, Suite 150, Maynard, MA 01754
Tel: 978-461-4621 Fax: 978-461-4699
ilee@exponent.com

From: Gorman, Veronica [mailto:gormanvm@dhec.sc.gov]
Sent: Wednesday, January 18, 2017 8:45 AM
To: Irene Lee
Subject: Re: Show Denko 0900-0025

I did receive the information. Thanks!

Veronica Gorman
Modeling Section
Bureau of Air Quality
2600 Bull Street
Columbia, South Carolina 29201-1708
Phone: 803-898-3847 Fax: 803-898-4487

From: Irene Lee <ilee@exponent.com>
Sent: Tuesday, January 17, 2017 4:28 PM
To: Gorman, Veronica
Subject: RE: Show Denko 0900-0025

Hi Veronica,

I just wanted to check that you received the email below with attached BPIP files?

Please let me know whenever you get the chance. Thank you.

-Irene

From: Irene Lee
Sent: Tuesday, January 17, 2017 3:34 PM
To: Gorman, Veronica
Cc: 'John McLure'; Watts, Sheila G.; Barringer, Veronica; Matthew Wike
Subject: RE: Show Denko 0900-0025

Veronica,

Attached are the BPIP files for the recently submitted Showa Denko modeling. Please let me know that you successfully received this email with attachments.

And if you need anything further or have any other questions, please don't hesitate to contact me. Thank you.

Best regards,
Irene

Irene Lee, Managing Scientist
E^xponent^®
1 Mill and Main Place, Suite 150, Maynard, MA 01754
Tel: 978-461-4621 Fax: 978-461-4699
ilee@exponent.com

From: John McLure [mailto:jwm@gel.com]
Sent: Tuesday, January 17, 2017 2:04 PM
To: Irene Lee
Cc: Watts, Sheila G.; Barringer, Veronica; Gorman, Veronica; Matthew Wike
Subject: RE: Show Denko 0900-0025
Importance: High

Irene

See the questions below from DHEC. Can you call Veronica @ 803-898-3847 and resolve?

Thanks John

From: Gorman, Veronica [mailto:gormanvm@dhec.sc.gov]
Sent: Tuesday, January 17, 2017 2:01 PM
To: John McLure <jwm@gel.com>
Cc: Watts, Sheila G. <wattssg@dhec.sc.gov>; Barringer, Veronica <barrinv@dhec.sc.gov>
Subject: Show Denko 0900-0025

I am currently reviewing the modeling portion of the Showa Denko PSD permit application for the Gaseous Organic Emissions From Graphitizing. I do not see that a BPIP file has been included with the modeling files. Please send a BPIP file so that it can be used during the model runs. In regard to the Receptor file, it looks like the file may not be set up correctly as I cannot get the receptors to show up in AERMOD after I import it. Thanks.

Veronica Gorman
Modeling Section
Bureau of Air Quality
2600 Bull Street
Columbia, South Carolina 29201-1708
Phone: 803-898-3847 Fax: 803-898-4487

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Re: Showa Denko

JM

John McLure <jwm@gel.com>

Reply

Thu 1/19, 12:44 PM
Gorman, Veronica;
Irene Lee <ilee@exponent.com>;
Matthew Wike <matthew.wike@gel.com>

Veronica

The actual de minimis analysis is in Appendix II if the December permit Applucation. Irene is correct the graphitizing scrubber stacks and roof vents are the only facility sources for these gaseous TAPs. Thanks John

John W. McLure, P.E.
Principal
GEL Engineering, LLC
Cell: 843.906.3636 Office: 843.769.7378

> On Jan 19, 2017, at 11:37 AM, Irene Lee <ilee@exponent.com> wrote:
>
> Hi Veronica,
>
> For your reference, I have attached the report that was submitted to DHEC on January 6.
>
> Yes, you are correct that the only benzene, carbon disulfide, hexane, and methyl chloride emissions at the Showa Denko facility are from the two scrubber stacks (MP68 and NP70) and the two roof monitors (L02 and the volume sources representing L01) as part of the graphitizing process that is described in Section 1 of the attached report.
>
> The modeled emission rates and source parameters are listed in Tables 1, 2, and 3 of Section 4 of the attached report.
>
> Please let me know if this helps answer your questions and if you have any others.
>
> Thanks,
> Irene
> _____
> Irene Lee, Managing Scientist
> Exponent®
> 1 Mill and Main Place, Suite 150, Maynard, MA 01754
> Tel: 978-461-4621 Fax: 978-461-4699
> ilee@exponent.com <mailto:ilee@exponent.com>
>

> From: Gorman, Veronica [mailto:gormanvm@dhec.sc.gov]
> Sent: Thursday, January 19, 2017 12:08 PM
> To: Irene Lee
> Subject: Showa Denko
>
>
> How are the Standard No. 8 de minimis analysis emission rates in Section II of the application allocated? Are all of the de minimis emission rates from MP68 or NP70 or L02 or the volume souces. If I have overlooked the designated emission points that are explained it the application, please direct me to it. Thanks!
>
>
> Veronica Gorman
> Modeling Section
> Bureau of Air Quality
> 2600 Bull Street
> Columbia, South Carolina 29201-1708
> Phone: 803-898-3847 Fax: 803-898-4487
>
>
>
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> <Showa Denko (S01) - Std No. 8 Report (20170105).pdf>
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RE: Show 0900-0025

JM

John McLure <jwm@gel.com>

Reply

Tue 1/17, 2:03 PM
Irene Lee (ilee@exponent.com);
Watts, Sheila G.;
Barringer, Veronica;
Gorman, Veronica;
Matthew Wike <matthew.wike@gel.com>
This message was sent with high importance.

Irene

See the questions below from DHEC. Can you call Veronica @ 803-898-3847 and resolve?

Thanks John

From: Gorman, Veronica [mailto:gormanvm@dhec.sc.gov]
Sent: Tuesday, January 17, 2017 2:01 PM
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Ozone Designations

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Ozone Designations Guidance and Data

The information on this page is intended to support the area designation process for the 2015 ozone National Ambient Air Quality Standards (NAAQS) by providing states and tribes with current data and tools that may be useful in evaluating each area on a case-by-case basis and in making boundary recommendations. The data and tools that could be of use for these evaluations are not limited to the data and tools provided here.

On this page:

A. EPA Guidance on the Area Designations for the 2015 Ozone National Ambient Air Quality Standards
B. Five-Factor Analysis
   - Factor 1: Air Quality Data
   - Factor 2: Emissions and Emissions-Related Data
   - Factor 3: Meteorology
   - Factor 4: Geography/Topography
   - Factor 5: Jurisdictional Boundaries
C. Ozone Designations Mapping Tool

Datasets Provided by EPA to Support the Five-factor Analysis:

Dataset	Availability Date
2015 Ozone Design Values (excel spreadsheet) (309 K)	November 2016

Dataset	Availability Date
2011 v2 NEI emissions summaries (excel spreadsheet) (5 MB)	April 28, 2016
Vehicle Miles Traveled (excel spreadsheet) (649 K)	April 28, 2016
County Population (excel spreadsheet) (189 K, July 14, 2016)	July 14, 2016

A. EPA Guidance on the Area Designations for the 2015 Ozone NAAQS

States and Tribes should refer to the following guidance documents for area designations for the 2015 Ozone NAAQS when preparing their recommendations on area designations.

- Guidance for states and tribes

B. Summary of Five-Factor Analysis

The five factors identified in the Guidance for Area Designations for the 2015 Ozone NAAQS are listed below, along with data and data sources that may be useful in evaluating each area on a case-by-case and in making boundary recommendations. The following is not an exclusive list of factors, data, or sources of data that could be considered in assessing an area. EPA is providing this list as a useful tool for the designations process, and it should not be construed as representing a decision by EPA to rely solely on this list for final designation determinations. EPA intends, at a minimum, to evaluate these factors, data and/or data sources in making final determinations regarding area designations for the 2015 Ozone NAAQS. States and tribes should refer to the designations guidance for more complete information about these factors and the factor analysis. The EPA recognizes that consideration of the 5 factors for an assessment can be resource intensive. In addition to providing the relevant data to facilitate the analyses, the EPA is providing an Ozone Designations Mapping Tool to assist air agencies in developing their area designation and nonattainment boundary recommendations. The Ozone Designations Mapping Tool is available below.

Factor 1: Air Quality Data - The air quality analysis is an examination of available ambient ozone air quality monitoring data, including the annual design value calculated for each area based on air quality data for a 3-year period.

Factor 2: Emissions and Emissions-Related Data –The emissions analysis examines emissions of precursors (NOx and VOCs) that form ozone in the county with the violating monitor and in nearby counties. Emissions data are derived

from the 2011 National Emissions Inventory (NEI) version 2, and are given in tons per year. The 2011 NEI version 2 data will be the most recent NEI information available at the beginning of the designations process. When the 2014 NEI becomes available, then it will be provided in lieu of the 2011 NEI version 2. Emissions data indicate the potential for a source to contribute to observed violations, making it useful in assessing boundaries of nonattainment areas.

Factor 3: Meteorology - The evaluation of meteorological data helps to determine the effect on the fate and transport of emissions contributing to ozone concentrations and to identify areas potentially contributing to the monitored violations. One basic meteorological analysis involves assessing potential source-receptor relationships in the area using summaries of emissions, wind speed, and wind direction data. A more sophisticated assessment involves modeling air parcel trajectories to help understand complex transport situations. The HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) modeling system may be useful for some areas to produce trajectories that illustrate the 3-dimensional paths traveled by air parcels to a violating monitor. The EPA is providing back trajectories in the Ozone Mapping Tool for violating monitors, for each day of high ozone concentration (i.e., daily maximum 8 hour values that exceed the NAAQS) at those monitors. States or tribes can choose to do additional HYSPLIT modeling and guidance is provided in the ozone designations guidance document.

Factor 4: Geography/Topography - The geography/topography analysis includes an examination of physical features of the land that might define the airshed and, therefore, affect the formation and distribution of ozone over an area. Mountains or other physical features may influence the fate and transport of emissions and ozone concentrations. Additional analyses may consider topographical features that cause local stagnation episodes via inversions. Valley-type topographical features can cause local stagnation episodes where vertical temperature inversions effectively "trap" air pollution. Under these conditions emissions can accumulate leading to periods of elevated ozone concentrations. These inversions may be limited in extent and, therefore, the areas with inversions may need to be separated from areas at altitudes above the top of the inversion layer in locations where exceedances are associated with this type of event.

Factor 5: Jurisdictional Boundaries - Existing jurisdictional boundaries may be considered for the purposes of providing a clearly defined legal boundary and carrying out the air quality planning and enforcement functions for nonattainment areas. Examples of jurisdictional boundaries include, but are not limited to: counties, air districts, areas of Indian country, metropolitan planning organizations, and existing nonattainment areas. If an existing jurisdictional boundary is used to help define the nonattainment area, it must encompass all of the area that has been identified as meeting the nonattainment definition. Where existing jurisdictional boundaries are not adequate to describe the nonattainment area, other clearly defined and permanent landmarks or geographic coordinates should be used.

C. Ozone Designations Mapping Tool

The ozone designations mapping tool gives you access to air quality data, emissions data, and jurisdictional boundaries to assist in designations for the 2015 Ozone NAAQS

- Ozone Designations Mapping Tool

- Ozone Designations Mapping Tool Demonstration - Webinar March 23, 2016

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Jan. 6, 2017

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2015
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State: South Carolina

Site ID	Poc	STREET ADDRESS	2015 Valid Days	2015 Percent Complete	2015 4th Max	2015 Cert& Eval	2014 Valid Days	2014 Percent Complete	2014 4th Max	2014 Cert& Eval	2013 Valid Days	2013 Percent Complete	2013 4th Max	2013 Cert& Eval	3 - Year Percent Complete	3 - Year Design Value	D. V. Validity
45-001-0001		59 JIM SCOTT LANE [Due West]	193	90	.055	N	179	84	.059	Y	204	95	.056	Y	90	.056	Y
45-003-0003		8217 ATOMIC ROAD (INDIAN DRIVE) [Jackson]	209	98	.057	Y	206	96	.062	Y	209	98	.061	Y	97	.060	Y
45-007-0005		215 McAlister Road [Big Creek]	205	96	.063	Y	211	99	.060	Y	212	99	.057	Y	98	.060	Y
45-015-0002		River Oak Drive (Goose Creek) [Bushy Park]	198	93	.054	Y	207	97	.060	Y	210	98	.058	Y	96	.057	Y
45-019-0046		390 BULLS ISLAND ROAD (AWENDAW) [Cape Romain]	212	99	.054	Y	196	92	.059	Y	195	91	.059	Y	94	.057	Y
45-021-0002		McGinnis Road [Cowpens]	213	100	.065	Y	210	98	.066	Y	209	98	.060	Y	99	.063	Y
45-025-0001		RT 2 BOX 100 MCBEE (SC145) [Chesterfield]	206	96	.059	Y	211	99	.059	Y	211	99	.058	Y	98	.058	Y
45-029-0002		Ashton Road [Ashton]	175	82	.054	Y	193	90	.059	Y	202	94	.050	Y	89	.054	N
45-031-0003		2200 POCKET ROAD [Pee Dee]	206	96	.061	Y	210	98	.063	Y	208	97	.059	Y	97	.061	Y
45-037-0001		660 WOODYARD ROAD [Trenton]	199	93	.061	Y	201	94	.055	Y	196	92	.048	Y	93	.054	Y
45-045-0016		510 Garrison Road [Hillcrest]	206	96	.067	Y	209	98	.062	Y	210	98	.063	Y	97	.064	Y
45-045-1003		7401 Mountain View Road [Famoda Farm]	213	100	.064	Y	210	98	.062	Y	211	99	.060	M	99	.062	Y
45-073-0001		ROUND MOUNTAIN TOWER ROAD [Long Creek]	210	98	.060	Y	206	96	.064	Y	187	87	.053	Y	94	.059	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Showa Denko VOC PSD

	Source ID	Stack Relea	FLAT (Non-	Source Des	Easting (X)	Northing (Y	Base Elevat	Stack Heigh
					(m)	(m)	(m)	(ft)
1	MP68	DEFAULT			561325.9	3661532	19.34	165.748
2	NP70	DEFAULT			561149.4	3661212	20.75	165.748

	Source ID	FLAT (Non-	Source Des	Start Eastir	Start North	Base Elevat	Release He	End Easting
				(m)	(m)	(m)	(ft)	(ft)
24	L02			561197.2	3661222	20.92	95.01312	1841366

	Source ID	FLAT (Non-	Source Des	Easting (X)	Northing (Y	Base Elevat	Release He	Init. Horizo
				(m)	(m)	(ft)	(ft)	(ft)
3	VML1_01			561257	3661474	63.58268	179.0026	32.87402
4	VML1_02			561261.7	3661483	63.54987	179.0026	32.87402
5	VML1_03			561266.4	3661492	63.48425	179.0026	32.87402
6	VML1_04			561271.1	3661501	63.41864	179.0026	32.87402
7	VML1_05			561275.8	3661509	63.35302	179.0026	32.87402
8	VML1_06			561280.5	3661518	63.2874	179.0026	32.87402
9	VML1_07			561285.2	3661527	63.22178	179.0026	32.87402
10	VML1_08			561305.5	3661559	63.02493	179.0026	32.87402
11	VML1_09			561294.6	3661545	63.09055	179.0026	32.87402
12	VML1_10			561299.3	3661554	63.02493	179.0026	32.87402
13	VML1_11			561304	3661562	62.95932	179.0026	32.87402
14	VML1_12			561308.7	3661571	62.8937	179.0026	32.87402
15	VML1_13			561313.4	3661580	62.82808	179.0026	32.87402
16	VML1_14			561318.1	3661589	62.76247	179.0026	32.87402
17	VML1_15			561322.8	3661598	62.69685	179.0026	32.87402
18	VML1_16			561327.5	3661607	62.63123	179.0026	32.87402
19	VML1_17			561332.2	3661616	62.56562	179.0026	32.87402
20	VML1_18			561336.9	3661624	62.5	179.0026	32.87402
21	VML1_19			561341.6	3661633	62.40157	179.0026	32.87402
22	VML1_20			561346.3	3661642	62.33596	179.0026	32.87402
23	VML1_21			561351.1	3661651	62.27034	179.0026	32.87402

Temperatu (°F)	Exit Velocit (fps)	Stack Diam (ft)	BENZENE (lb/hr)	CARBONDI (lb/hr)	HEXANE (lb/hr)	METHYLCH (lb/hr)
99.95	60	8.300525	0.918269	2.850048	0.253973	1.349229
101.93	70.86614	8.300525	0.807156	2.850048	0.223416	1.187322

End Northi (ft)	BENZENE (lb/hr)	CARBONDI lbhr	HEXANE (lb/hr)	METHYLCH (lb/hr)
12012198	0.042501	0.1319	0.011762	0.062501

Initial Vert. (ft)	BENZENE (lb/hr)	CARBONDI (lb/hr)	HEXANE (lb/hr)	METHYLCH (lb/hr)
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
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32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246

Showa Denko Modeling Results PSD Revision (Air Toxics Results) 1/18/2017

Model	File	Pollutant	Average	Group	Rank	Conc/Dep	East (X)	North (Y)
AERMOD	1 Showa Den	BENZENE	24-HR	ALL	1ST	0.49617	561745	3661471
AERMOD	1 Showa Den	CARBONDI	24-HR	ALL	1ST	1.54661	561745	3661471
AERMOD	1 Showa Den	HEXANE	24-HR	ALL	1ST	0.13724	561745	3661471
AERMOD	1 Showa Den	METHYLCH	24-HR	ALL	1ST	0.72911	561745	3661471
AERMOD	1 Showa Den	BENZENE	24-HR	ALL	1ST	0.5644	561085.1	3662106
AERMOD	1 Showa Den	CARBONDI	24-HR	ALL	1ST	1.76583	561085.1	3662106
AERMOD	1 Showa Den	HEXANE	24-HR	ALL	1ST	0.15611	561085.1	3662106
AERMOD	1 Showa Den	METHYLCH	24-HR	ALL	1ST	0.8294	561085.1	3662106
AERMOD	1 Showa Den	BENZENE	24-HR	ALL	1ST	0.47723	561505.3	3661090
AERMOD	1 Showa Den	CARBONDI	24-HR	ALL	1ST	1.4842	561505.3	3661090
AERMOD	1 Showa Den	HEXANE	24-HR	ALL	1ST	0.132	561505.3	3661090
AERMOD	1 Showa Den	METHYLCH	24-HR	ALL	1ST	0.70126	561505.3	3661090
AERMOD	1 Showa Den	BENZENE	24-HR	ALL	1ST	0.51252	561949.9	3661565
AERMOD	1 Showa Den	CARBONDI	24-HR	ALL	1ST	1.67422	561060.8	3660781
AERMOD	1 Showa Den	HEXANE	24-HR	ALL	1ST	0.14179	561949.9	3661565
AERMOD	1 Showa Den	METHYLCH	24-HR	ALL	1ST	0.75338	561949.9	3661565
AERMOD	1 Showa Den	BENZENE	24-HR	ALL	1ST	0.50816	561540.2	3661106
AERMOD	1 Showa Den	CARBONDI	24-HR	ALL	1ST	1.57981	561540.2	3661106
AERMOD	1 Showa Den	HEXANE	24-HR	ALL	1ST	0.14055	561540.2	3661106
AERMOD	1 Showa Den	METHYLCH	24-HR	ALL	1ST	0.74673	561540.2	3661106

Elev	Hill	Flag	Time	Met File	Sources	Groups	Receptors
23.07	23.07	0	2111724	CHS_02_v1	24	1	4633
23.07	23.07	0	2111724	CHS_02_v1	24	1	4633
23.07	23.07	0	2111724	CHS_02_v1	24	1	4633
23.07	23.07	0	2111724	CHS_02_v1	24	1	4633
17.99	17.99	0	3110524	CHS_03_v1	24	1	4633
17.99	17.99	0	3110524	CHS_03_v1	24	1	4633
17.99	17.99	0	3110524	CHS_03_v1	24	1	4633
17.99	17.99	0	3110524	CHS_03_v1	24	1	4633
23.62	23.62	0	4121424	CHS_04_v1	24	1	4633
23.62	23.62	0	4121424	CHS_04_v1	24	1	4633
23.62	23.62	0	4121424	CHS_04_v1	24	1	4633
23.62	23.62	0	4121424	CHS_04_v1	24	1	4633
22.77	22.77	0	5121124	CHS_05_v1	24	1	4633
24.17	24.17	0	5091124	CHS_05_v1	24	1	4633
22.77	22.77	0	5121124	CHS_05_v1	24	1	4633
22.77	22.77	0	5121124	CHS_05_v1	24	1	4633
23.51	23.51	0	6091524	CHS_06_v1	24	1	4633
23.51	23.51	0	6091524	CHS_06_v1	24	1	4633
23.51	23.51	0	6091524	CHS_06_v1	24	1	4633
23.51	23.51	0	6091524	CHS_06_v1	24	1	4633

Showa Denko VOC PSD

	Source ID	Stack Relea	FLAT (Non-	Source Des	Easting (X) (m)	Northing (Y (m)	Base Elevat (m)	Stack Heigh (ft)
1	MP68	DEFAULT			561325.9	3661532	19.34	165.748
2	NP70	DEFAULT			561149.4	3661212	20.75	165.748

	Source ID	FLAT (Non-	Source Des	Start Eastir (m)	Start North (m)	Base Elevat (m)	Release He (ft)	End Easting (ft)
24	L02			561197.2	3661222	20.92	95.01312	1841366

	Source ID	FLAT (Non-	Source Des	Easting (X) (m)	Northing (Y (m)	Base Elevat (ft)	Release He (ft)	Init. Horizo (ft)
3	VML1_01			561257	3661474	63.58268	179.0026	32.87402
4	VML1_02			561261.7	3661483	63.54987	179.0026	32.87402
5	VML1_03			561266.4	3661492	63.48425	179.0026	32.87402
6	VML1_04			561271.1	3661501	63.41864	179.0026	32.87402
7	VML1_05			561275.8	3661509	63.35302	179.0026	32.87402
8	VML1_06			561280.5	3661518	63.2874	179.0026	32.87402
9	VML1_07			561285.2	3661527	63.22178	179.0026	32.87402
10	VML1_08			561305.5	3661559	63.02493	179.0026	32.87402
11	VML1_09			561294.6	3661545	63.09055	179.0026	32.87402
12	VML1_10			561299.3	3661554	63.02493	179.0026	32.87402
13	VML1_11			561304	3661562	62.95932	179.0026	32.87402
14	VML1_12			561308.7	3661571	62.8937	179.0026	32.87402
15	VML1_13			561313.4	3661580	62.82808	179.0026	32.87402
16	VML1_14			561318.1	3661589	62.76247	179.0026	32.87402
17	VML1_15			561322.8	3661598	62.69685	179.0026	32.87402
18	VML1_16			561327.5	3661607	62.63123	179.0026	32.87402
19	VML1_17			561332.2	3661616	62.56562	179.0026	32.87402
20	VML1_18			561336.9	3661624	62.5	179.0026	32.87402
21	VML1_19			561341.6	3661633	62.40157	179.0026	32.87402
22	VML1_20			561346.3	3661642	62.33596	179.0026	32.87402
23	VML1_21			561351.1	3661651	62.27034	179.0026	32.87402

Temperatu	Exit Velocit	Stack Diam	BENZENE	CARBONDI	HEXANE	METHYLCH
(°F)	(fps)	(ft)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
99.95	60	8.300525	0.918269	2.850048	0.253973	1.349229
101.93	70.86614	8.300525	0.807156	2.850048	0.223416	1.187322

End Northi	BENZENE	CARBONDI	HEXANE	METHYLCH
(ft)	(lb/hr)	(g/s)	(lb/hr)	(lb/hr)
12012198	0.042501	0.01662	0.011762	0.062501

Initial Vert.	BENZENE	CARBONDI	HEXANE	METHYLCH
(ft)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
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32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246
32.87402	0.008326	0.02585	0.002304	0.012246

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Atmospheric Sciences

South Carolina Department of Health and Environmental Control Standard No. 8 Modeling Report for Showa Denko Carbon, Inc.

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Acronyms and Abbreviations

AERMET	AERMOD Meteorological Preprocessor
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
BAQ	Bureau of Air Quality
BLP	Buoyant Line and Point Source Model
BPIP	Building Profile Input Program
BPIPPRIME	EPA Building Profile Input Program for PRIME
C_6H_6	benzene
C_6H_{14}	hexane
CH_3Cl	methyl chloride
CS_2	carbon disulfide
DC	direct current
DHEC	South Carolina Department of Health and Environmental Control
EPA	United States Environmental Protection Agency
g/s	grams per second
K	Kelvin
KCHS	Charleston International Airport
km	kilometer
m	meter
µg	microgram
$\mu g/m^3$	micrograms per cubic meter
LLC	limited liability company
NAD	North American Datum
PRIME	Plume Rise Model Enhancements
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTM	Universal Transverse Mercator

Limitations

This report summarizes work performed to date and presents the findings resulting from that work. The findings presented herein are made to a reasonable degree of scientific certainty. Exponent reserves the right to supplement this report and to expand or modify opinions based on review of additional material as it becomes available through any additional work or review of additional work performed by others.

1 Project Description

1.1 Purpose

This modeling report describes the procedures used for refined air quality dispersion modeling analyses for the Showa Denko Carbon, Inc. (Showa Denko) graphite manufacturing plant in Ridgeville, South Carolina. The modeling analyses evaluate the air quality impacts associated with emissions of benzene, carbon disulfide, hexane, and methyl chloride. Predicted pollutant concentrations are assessed relative to the South Carolina Department of Health and Environmental Control (DHEC) Bureau of Air Quality (BAQ) Standard No. 8 Toxic Air Pollutant limits. This report discusses the methodology and results of the modeling analyses.

The modeling procedures are designed to be consistent with applicable guidance, including information in the United States Environmental Protection Agency (EPA) "*Guideline on Air Quality Models*" (codified as Appendix W of 40 CFR Part 51) and recent guidance and clarification memoranda issued by the EPA. In addition, the report also accounts for guidance in the July 2001 DHEC BAQ "*Air Quality Modeling Guidelines*" and modeling procedures that DHEC has accepted for regulatory purposes in other analyses in recent years.

1.2 Facility Description

After placing PFC-75 sources in operation, Showa Denko will be able to manufacture up to 80,000 metric tons per year of graphite electrodes for use in the steel manufacturing industry at their Ridgeville, South Carolina facility. The emission sources at Showa Denko can be identified as follows:

- I - Mill, Mix, and Extrusion
- II - Bake/Rebake Process
- III - Rebake Load and Unload/Graphitizing Preparation
- IV - Bake Load and Unload and Baked Electrode Cleaning
- V - Pitch Impregnation
- VI – Insulating Media Receiving

- VII - Graphitizing
- VIII - Cleaning and Inspection
- IX - Machining and Shipping

Based upon recent testing, emissions from the graphitizing process included the following toxic air pollutants above DHEC BAQ Standard No. 8 de minimis criteria: benzene (C_6H_6), carbon disulfide (CS_2), hexane (C_6H_{14}), and methyl chloride (CH_3Cl).

A brief description of the graphitizing process area is provided in the following paragraphs.

1.2.1 Graphitizing

The Existing Graphitizing process is located in Building 430 and includes 27 furnaces. The New Graphitizing process is located in Building 460 and includes eight furnaces installed as part of the PFC-75 project. The Graphitizing process changes the crystalline structure of electrodes. Electrodes are placed in the Graphitizing furnaces horizontally and end-to-end on a bed of packing/insulating material (metallurgical coke), making two parallel columns. The two columns are then connected into a direct current (DC) circuit. The electrodes are covered with additional insulating material for thermal insulation and electricity is applied to the electrodes.

After the above action, the insulating material is allowed to cool to a temperature at which it can be removed from the furnace. The graphite electrodes are then transferred for cleaning and inspection. The insulating material is sorted to remove fines which are unusable in the furnaces. Coarse materials are reused in the furnaces.

1.3 Location

The Showa Denko facility in Ridgeville, South Carolina is located about 52 kilometers (km) northwest of Charleston in Dorchester County and about 35 km northwest of Charleston Air Force Base/International Airport.

An aerial photograph showing the location of the plant and the surrounding area is presented below in Figure 1. Figure 2 shows the terrain in the area surrounding the facility. Figure 3 shows the land use in the area.

Figure 1 Google Earth photograph of the Showa Denko facility

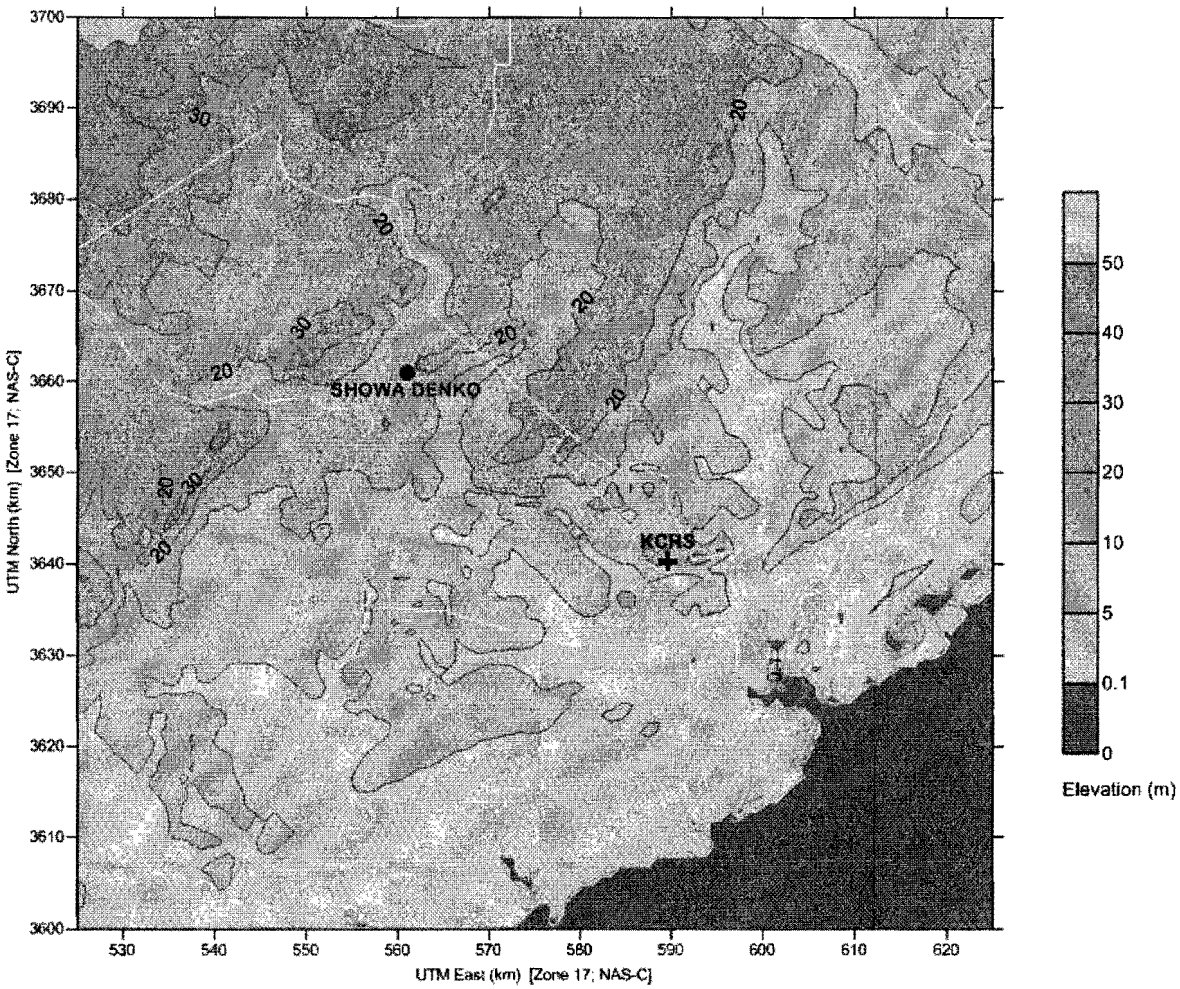

Figure 2 Plot showing Charleston International Airport (KCHS) and the Showa Denko plant and surrounding terrain elevations

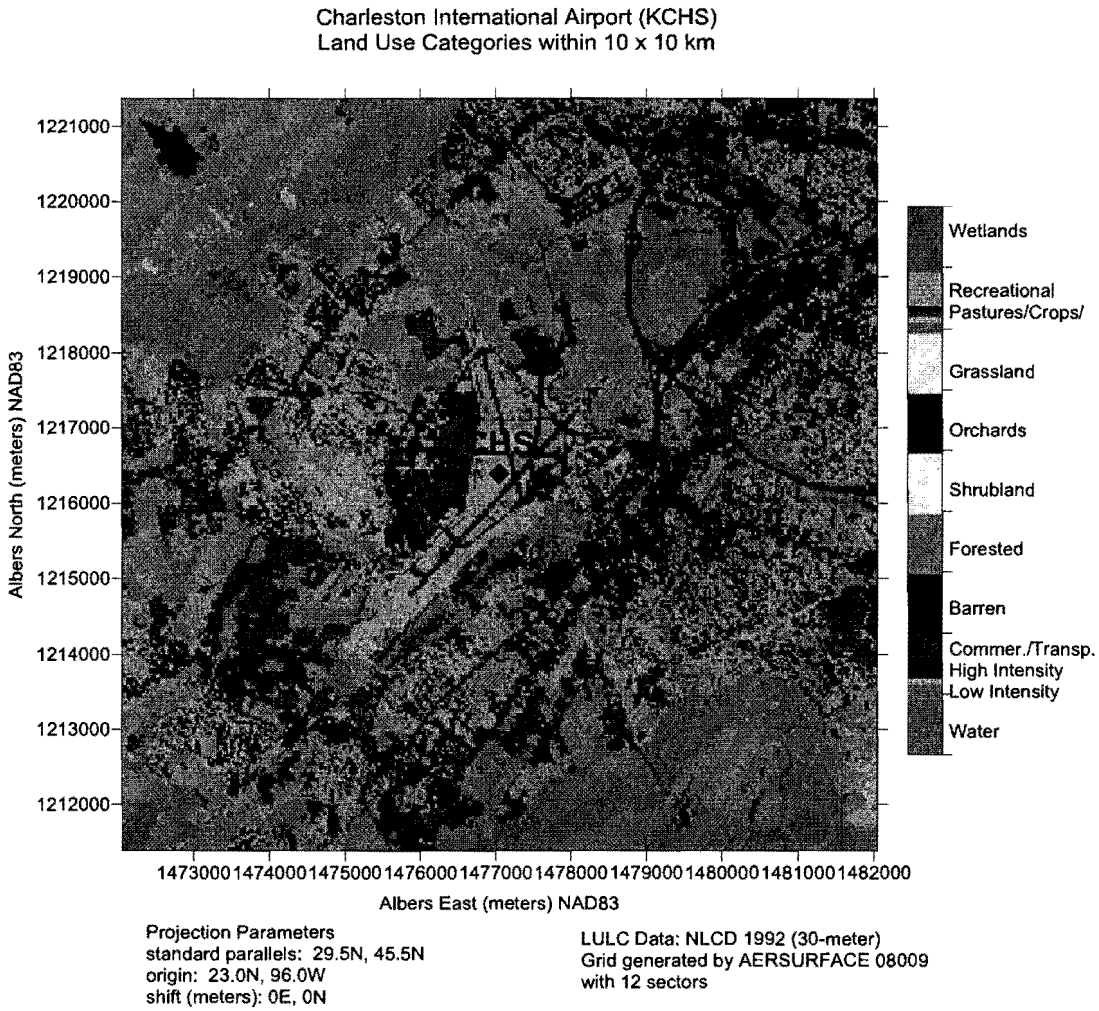

Figure 3 Plot of the USGS land use within an area of 10-km x 10-km centered on the KCHS/CHS surface station

2 Model Selection

The most recent version of the EPA AERMOD model (16216) was used for the refined air quality dispersion analyses. AERMOD is recommended in the EPA *"Guideline on Air Quality Models"* for a wide range of near-field applications in all types of terrain. In addition, AERMOD contains the Plume Rise Model Enhancements (PRIME) building downwash algorithm, which accounts for aerodynamic building downwash effects. AERMOD was used to model all sources with current regulatory default options.

The New Graphitizing roof monitor (NEW-L02/S-460-03) was modeled using the source type BUOYLINE in AERMOD. AERMOD now incorporates the Buoyant Line and Point Source (BLP) model in order to account for buoyant plume rise from line sources. The BLP option within AERMOD allows buoyant line sources to be modeled using the input meteorological data provided by the AERMET meteorological processor and also allows for predicted impacts from buoyant line sources to be handled in a manner consistent with other modeled sources. AERMOD is not currently capable of modeling two separate line sources in the configuration that exists at Showa Denko. Therefore, and in keeping with modeling previously submitted to DHEC BAQ, the modified roof monitor (Existing Graphitizing) at Showa Denko (VML1_01-21/S-430-01) was modeled as a series of non-buoyant volume sources.

The air quality dispersion modeling analyses accounted for potential aerodynamic building downwash effects for all modeled stacks at Showa Denko. Building parameters needed by AERMOD to model potential building downwash effects were obtained using the latest version (04274) of the EPA Building Profile Input Program for PRIME (BPIPPRIME).

3 Modeling Domain

3.1 Receptor Grid

Modeling for compliance with state ambient air requirements was conducted using a total of 4,633 receptors. This included 206 receptors placed along the Showa Denko facility property line at a spacing of no greater than 50m. The property line was defined in a manner consistent with prior modeling analyses that have been submitted to DHEC BAQ and represents the facility fence line. A grid of 4,427 receptors with a spacing of 100m was placed extending outward from the facility boundary to a distance of approximately 1 km and covering an area of approximately 7 km x 7 km. Gridded receptors falling within the Showa Denko facility property boundary were excluded. A plot of the modeled receptor grid is shown in Figure 4.

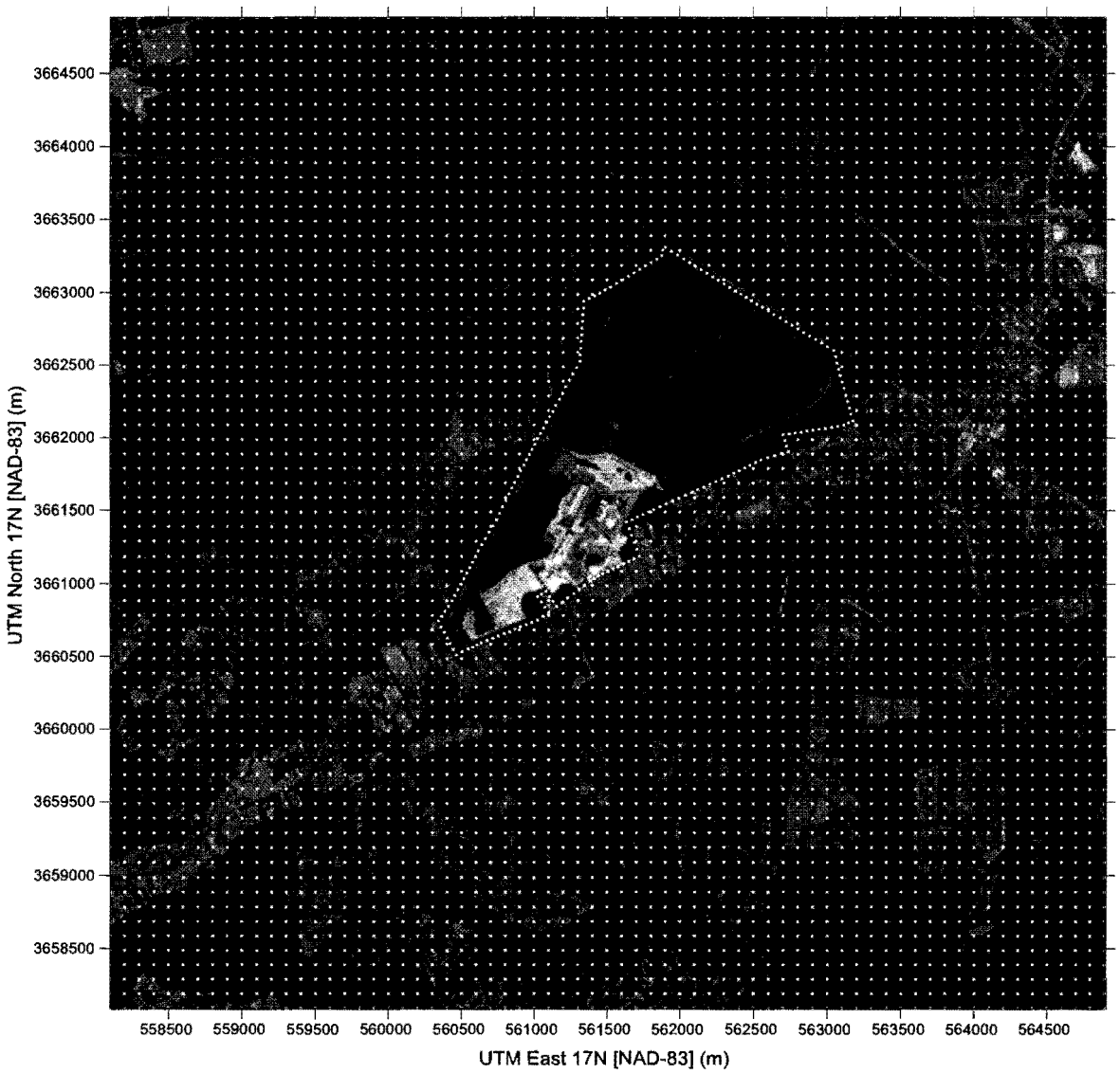

Figure 4 Plot of Cartesian and property line receptors

4 Emission Rates and Source Characterization

Figure 5 provides a schematic plot of the modeled buildings and individual point, line, and volume sources at the Showa Denko facility.

The two graphitizing scrubbers (MP68/S-430-03 and NP70/S-460-4349-03) at the Showa Denko facility were modeled as point sources. The New Graphitizing roof monitor (NEW-L02/S-460-03) was treated as a buoyant line source in AERMOD using source type BUOYLINE while the Existing Graphitizing modified roof monitor (VML1_01-21/S-430-01) was modeled using an exact representation of volume sources in AERMOD.

Table 1 provides source coordinates, stack parameters, and emission rates for the two graphitizing scrubbers (MP68/S-430-03 and NP70/S-460-4349-03). Table 2 provides source coordinates, effective release height, initial sigma-y, initial sigma-z, and emission rates for the volume sources representing the Existing Graphitizing modified roof monitor (VML1_01-21/S-430-01). Table 3 provides source coordinates, parameters, and emission rates for the New Graphitizing roof monitor (NEW-L02/S-460-03). Source locations are provided in Universal Transverse Mercator (UTM) coordinates in the North American Datum (NAD) 1983 for Zone 17.

The peak impacts from the modified existing Graphitizing Building roof monitor (VML1_01-21/S-430-01) occur during stable, light wind speed meteorological conditions. Using the BLP line source plume rise equations (Schulman and Scire, 1980), the average plume rise for a representative set of 145 hours with these conditions was computed as 33.02 meters above the release height of 21.54 meters, for a plume height of 54.56 meters. The final plume rise under these conditions nearly always occurred within the fence line. In this analysis, the Existing Graphitizing Building was modeled with AERMOD as a series of non-buoyant volume sources. The final computed plume height of 54.56 meters was used as the effective release height for the volume sources used to represent the modified roof monitor (VML1_01-21/S-430-01). The volume sources' initial σ_y and initial σ_z were computed in accordance with the User's Guide for the AMS/EPA Regulatory Model – AERMOD (EPA, 2004, EPA-454/B-03-001).

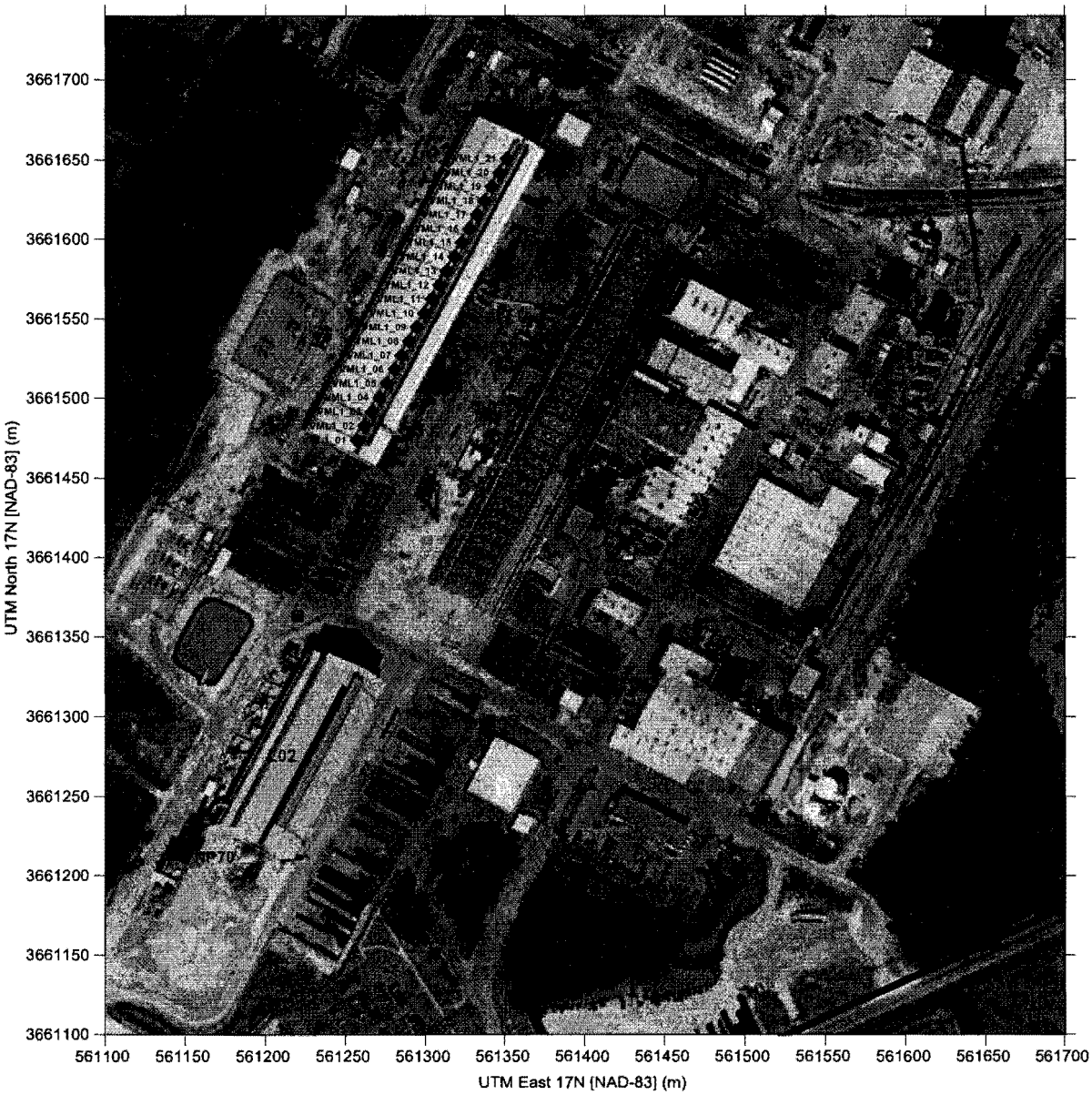

Figure 5 Showa Denko modeled sources and buildings

Table 1 Showa Denko Point Source Parameters and Emission Rates

RUN ID	Stack ID	UTM East (m)	UTM North (m)	Base Elev. (m)	Stack Height (m)	Stack Temp. (K)	Exit Velocity (m/s)	Stack Diameter (m)	Benzene (g/s)	Carbon Disulfide (g/s)	Hexane (g/s)	Methyl Chloride (g/s)
MP68	S-430-03	561325.9	3661531.8	20.0	50.52	310.9	18.288	2.53	1.157E-01	3.591E-01	3.200E-02	1.701E-01
NP70	S-460-4349-03	561149.4	3661211.5	20.0	50.52	312.0	21.600	2.53	1.017E-01	3.159E-01	2.815E-02	1.496E-01

Table 2 Showa Denko Line Source Parameters and Emission Rates

RUN ID	Stack ID	Line Length (m)	Line Width (m)	Release Height (m)	Base Elev. (m)	UTM East 1 (m)	UTM North 1 (m)	UTM East 2 (m)	UTM North 2 (m)	F' (m^4/s^3)	Benzene (g/s)	Carbon Disulfide (g/s)	Hexane (g/s)	Methyl Chloride (g/s)
NEW-L02	S-460-03	109.33	3.05	28.96	20.0	561197.2	3661221.5	561248.5	3661318.0	196.14	5.355E-03	1.662E-02	1.482E-03	7.875E-03

g =	9.81	m/s^2
L =	109.33	m
W_m =	3.05	m
w =	1.24	m/s
T_s-T_a =	14.40	K
T_s =	297.59	K
F' =	196.14	m^4/s^3

$$F' = \frac{gLWw\ (T_s - T_a)}{T_s}$$

Table 3 Showa Denko Volume Source Parameters and Emission Rates

Run ID	Stack ID	UTM East (m)	UTM North (m)	Base Elev. (m)	Effective Release Height (m)	Initial σ_y (m)	Initial σ_z (m)	Benzene (g/s)	Carbon Disulfide (g/s)	Hexane (g/s)	Methyl Chloride (g/s)
VML1_01	S-430-01	561257.0	3661473.9	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_02	S-430-01	561261.7	3661482.8	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_03	S-430-01	561266.4	3661491.6	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_04	S-430-01	561271.1	3661500.5	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_05	S-430-01	561275.8	3661509.3	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_06	S-430-01	561280.5	3661518.2	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_07	S-430-01	561285.2	3661527.0	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_08	S-430-01	561289.9	3661535.9	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_09	S-430-01	561294.6	3661544.7	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_10	S-430-01	561299.3	3661553.5	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_11	S-430-01	561304.0	3661562.4	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_12	S-430-01	561308.7	3661571.2	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_13	S-430-01	561313.4	3661580.1	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_14	S-430-01	561318.1	3661588.9	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_15	S-430-01	561322.8	3661597.8	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_16	S-430-01	561327.5	3661606.6	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_17	S-430-01	561332.2	3661615.5	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_18	S-430-01	561336.9	3661624.3	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_19	S-430-01	561341.6	3661633.2	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_20	S-430-01	561346.3	3661642.0	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03
VML1_21	S-430-01	561351.1	3661650.9	20.0	54.56	10.02	10.02	1.049E-03	3.257E-03	2.903E-04	1.543E-03

5 Meteorological Data

5.1 Overview

The modeling was performed utilizing five years (2002-2006) of AERMOD-ready meteorological data for Charleston International Airport (KCHS) provided by DHEC BAQ[1]. DHEC BAQ processed the data using AERMET 15181.

5.2 DHEC BAQ Recommendations and Guidance

Showa Denko is located in Dorchester County, for which DHEC BAQ guidance[2] recommends surface meteorological data from KCHS along with concurrent upper air observations also from KCHS.

5.3 Selection of Meteorological Data Set

DHEC BAQ clearly prefers and recommends the use of meteorological data from KCHS for modeling for sources in this part of South Carolina. Consideration of other factors most often suggested that data from KCHS would generally be most representative of conditions at Showa Denko.

For these reasons, meteorological data from KCHS was used in the modeling.

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[1] http://www.scdhec.gov/Environment/AirQuality/ComplianceandReporting/AirDispersionModeling/ModelingData/

[2] http://www.scdhec.gov/Environment/AirQuality/ComplianceandReporting/AirDispersionModeling/ModelingData/

6 Modeling Results

6.1 Overview

The results of the refined air quality dispersion modeling analyses for Showa Denko demonstrate that the predicted air quality impacts associated with benzene, carbon disulfide, hexane, and methyl chloride emissions from the graphitizing process are in compliance with all applicable state standards.

6.2 DHEC BAQ Standard No. 8 Toxic Air Pollutant Limits

Table 4 compares the impact of Showa Denko to the corresponding DHEC BAQ Standard No. 8 Toxic Air Pollutant maximum allowable 24-hour concentrations for benzene, carbon disulfide, hexane, and methyl chloride. The results demonstrate compliance for the facility with all applicable DHEC BAQ Standard No. 8 Toxic Air Pollutant limits.

Table 4 DHEC BAQ Standard No. 8 Toxic Air Pollutant Limits Analysis Results

Pollutant	Averaging Period	Predicted Showa Denko Impacts ($\mu g/m^3$)	Concentration Limit ($\mu g/m^3$)
Benzene	24-hour	0.6	*150*
Carbon Disulfide	24-hour	1.8	*150*
Hexane	24-hour	0.2	*900*
Methyl Chloride	24-hour	0.8	*515*

* The predicted impacts are the maximum values over five years.

7 References

U.S. EPA. 2010. Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard. Available at: http://www.epa.gov/ttn/scram/guidance/clarification/ClarificationMemo_AppendixW_Hourly-SO2-NAAQS_FINAL_08-23-2010.pdf. U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

U.S. EPA. 2011. Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard. Available at: http://www.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf. U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

U.S. EPA, 2015: *AERMOD Implementation Guide (Revised)*. U.S. Environmental Protection Agency, Research Triangle Park, North Carolina. August 3, 2015.

U.S. EPA, 2014. Guideline on Air Quality Models, Title 40, Part 51, Appendix W.

1.0 Air Quality Impact Analysis

For a major facility, PSD regulations require an applicant to analyze the impact from the construction of a proposed new source(s) on the following areas:

1. Compliance with the National Ambient Air Quality Standards (NAAQS);
2. Compliance with the PSD Increments;
3. Significant impact on PSD Class I Areas, including Class I PSD increments;
4. Impairments to visibility, soil, and vegetation; and
5. Air Quality impact of general growth associated with the source.

All minor and major sources proposing new construction or construction modifications in South Carolina (SC) are also required to demonstrate that their facility will remain in compliance with South Carolina Regulation 61-62.5 Standards 2 (AAQS), 7 (Class II PSD Increments), and Standard 8 (air toxics).

General results of this compliance demonstration indicate that there will be no exceedances of Full Impact or South Carolina ambient air quality standards or PSD increments. It is also predicted that this project will not cause any adverse effects on visibility, vegetation, or soils nor will there be any adverse effects caused by growth associated with this project. It is predicted that there will also be no adverse effects on visibility, vegetation, or soils in any of the Class I areas within 300 km of the facility/source nor will there be any significant impact on the Class I increments at any Class I area.

1.1 PSD Class II Modeling Analysis

The PSD Review requires pollutants, which are determined to be "major", be evaluated by an Air Quality Impact Analysis and Additional Impacts Analysis. The Air Quality Impact Analysis consists of (1) a Preliminary Modeling Analysis to determine which pollutants from the proposed project at the facility only**,** exceed their Class II Significant Impact Levels (SIL); and (2) a more comprehensive Full Impact Analysis based on concentrations of pollutants that exceed the SIL for the facility and additional 'facility-wide' impacts from other facilities that may impact the Significant Impact Area (SIA). The Additional Impacts Analysis evaluates the impacts on soils, vegetation, and visibility effects.

For this project, all emissions for NO_2 were modeled as NO_X. Then, the ambient ratio method value of 0.80 was applied to all of the modeled concentrations to obtain the final concentrations for NO_2. This ratio method is allowed under *40 CFR 51 Appendix W* and the

Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard, 3/1/2012 memo from EPA.

1.1.1 PSD Class II Preliminary Modeling Analysis

Potential emission rates or net emission rate increases for each pollutant determined to be significant (Table IV-1) at the facility were modeled to determine (a) the Significant Impact Level (SIL); (b) the impact area within which a Full Impact Analysis must be performed; and (c) whether or not the facility may be exempted from the ambient monitoring data requirements. Each of these three preliminary Class II analyses is discussed below.

1.1.1.1 Significant Impact Level (SIL) Analysis

If an impact is less than the SIL, then no further PSD analysis is required. Table VI-1 provides the results of the SIL modeling analysis for this project for the major pollutants. This analysis shows SILs were exceeded for PM10 24-hour, PM2.5 24-hour, NO2 1-hour and annual, and CO 1-hour and 8-hour. Therefore, a Full Impact analysis is required for these pollutants. No further PSD analysis is required for PM10 Annual and PM2.5 Annual. However, they are included along with SO2 (which was not significant for PSD), in the facility-only South Carolina Standards 2/7 modeling. The Full Impact analysis assessed the combined impacts of the significant impact pollutants from the facility sources along with those from other sources in the SIA and the Screening Area as appropriate.

Maximum concentrations are used for the SIL analysis (i.e. Highest-First-High), except for PM2.5 and NO2-1hr. For these newer standards, the following apply.

- 24-hour PM2.5: the highest 5-year average of the maximum 24-hour averages over 5 years of meteorological data modeled
- Annual PM2.5: the highest 5-year average of the annual averages over 5 years of meteorological data modeled
- 1-hour NO2: the highest 5-year average of the daily maximum 1-hour averages over 5 years of meteorological data modeled

Table 17 – Class II PSD (PSD) Significant Impact Level

Pollutant	Averaging Time	Model Used	Maximum Impact (µg/m^3)	Note	SIL (µg/m^3)	Exceeds SIL (Yes/No)	Significant Impact Area (km)

Table 17 – Class II PSD (PSD) Significant Impact Level							
Pollutant	**Averaging Time**	**Model Used**	**Maximum Impact (μg/m³)**	**Note**	**SIL (μg/m³)**	**Exceeds SIL (Yes/No)**	**Significant Impact Area (km)**
PM_{10}	24 Hour	AERMOD	5.7	B	5	Yes	0.77
	Annual	AERMOD	0.16	B	1	No	0
$PM_{2.5}$	24 Hour	AERMOD	4.6	C	1.2	Yes	1.96
	Annual	AERMOD	0.12	D	0.3	No	0
NO_2	1 Hour	AERMOD	48.0	A	7.5(1)	Yes	6.27
	Annual	AERMOD	1.3	B	1	Yes	0.92
CO	1 Hour	AERMOD	3061	B	2000	Yes	2.83
	8 Hour	AERMOD	2047	B	500	Yes	4.93
Ozone is not modeled, but a general impact assessment is to be made if the source is major for ozone as determined in Table #.							
There is no SIL for fluorides, lead, H_2S, and H_2SO_4. These pollutants will be modeled in Section E – SC State modeling as applicable. The toxic air pollutants are subject to 40 CFR 63 Case by Case MACT.							
TSP is not considered a criteria pollutant for this analysis.							
(1) The South Carolina interim SIL for 1-hr NO_2 modeling is 8 but the facility used 7.5, which is conservative.							
Notes: A) Highest 5-year average of the daily maximum predicted 1-hour average at any receptor. B) Maximum predicted average at any receptor. C) Highest 5-year average of the maximum predicted 24-hr averages at any receptor. D) Highest 5-year average of the predicted annual average at any receptor.							

The Southeastern United States, including South Carolina, is NO_X limited with regards to ozone formation. This means that there is an excess of VOC in the atmosphere with regards to ozone formation and increases in VOC do not lead to increases in ozone production. The excess VOC is in part due to natural sources in the environment. Due to the excess VOC, only increases in NO_X in this region are a concern with regards to ozone formation. Ambient impacts from NO_X are addressed in NO_2 modeling.

Due to the highly complex reactions involving formation of ozone in the atmosphere, there is no preferred EPA guideline ozone model for individual NO_X source emissions and, hence, ambient air quality demonstrations are not required to be included for NO_X (precursor for ozone). In order to estimate impacts on ozone, increases in NO_X from the project were compared with the total NO_X emissions from the surrounding area of South Carolina. The project NO_X emissions increase is 369.53 tons/year. The proposed project emissions of NO_X represent approximately 0.5% of the stationary point source emissions of NO_X in South Carolina in 2008 and less than 0.2% of the sum of non-point and mobile source emissions of NO_X in South Carolina in 2008. The representative ozone monitoring

station for this area, located approximately 28 km from the project location, is the Cape Romain monitor located in Charleston County. The most recent design value of 0.067 ppm for this station shows that the area is currently in attainment with the 8-hour ozone standard of 0.075 ppm. Based on this small increase in NO_X, it is estimated that this project will have minimal impact on overall ozone formation within the surrounding area and should not exceed the current 8-hr ozone standard.

1.1.1.2 Significant Impact Area (SIA) Analysis

The impact area is a circular area with a radius extending from the source to (1) the most distant point where approved dispersion modeling predicts a significant ambient impact will occur (greater than or equal to the SIL), or (2) a modeling receptor distance of 50 km, whichever is less. An impact area is initially established for each pollutant for every averaging time. Sources within the SIA will be used for this analysis. Table VI-1 indicates the maximum distances to significant impacts. All sources within the pollutant respective radius were included for each pollutant accordingly.

In order to insure that the significant impact area was not underestimated, the distance to the most distant significant impact from the Showa Denko facility was increased by a buffer equal to the next more distant receptor beyond the receptor that was equal to or greater than the SIL.

1.1.1.3 Significant Monitoring Concentration Analysis

Modeling significance results for PM_{10}, SO_2, NO_2, and CO are shown below along with significant monitoring concentrations for these pollutants. The significant monitoring concentrations are from SC Regulation 61-62.5, Standard No. 7. Impacts are the maximum modeled concentrations for each pollutant (i.e. Highest First High) except for $PM_{2.5}$ and NO_2-1hr. For these newer standards, the following apply.

- 24-hour $PM_{2.5}$: the highest 5-year average of the maximum 24-hour averages over 5 years of meteorological data modeled

- Annual $PM_{2.5}$: the highest 5-year average of the annual averages over 5 years of meteorological data modeled

- 1-hour NO_2: the highest 5-year average of the daily maximum 1-hour averages over 5 years of meteorological data modeled

Table 11~~18~~ – Significant Monitoring Concentrations				
Pollutant	**Averaging Period**	**Max. Impact (μg/m³)**	**Significant Monitoring Concentration (μg/m³)**	**Exceeds (Yes or No)**
PM_{10}	24 Hour	5.7	10	No
$PM_{2.5}$	24 Hour	4.6	4	Yes
NO_2	Annual	1.3	14	No
CO	8 Hour	2047	575	Yes

The maximum impacts for NO_2 Annual and PM_{10} 24-hour are below the significant monitoring concentration (SMC) levels, therefore, no pre-construction monitoring is required for these pollutants. The $PM_{2.5}$ and CO concentrations exceed the SMC. Since SO_2 is not considered significant for this project as previously determined, pre-construction monitoring for SO_2 is not required. Also, since this site is significant for VOCs, ozone monitoring data also needs to be reviewed. Section 2.4 of U.S. EPA's *Ambient Monitoring Guidelines for Prevention of Significant Deterioration* (EPA-450/4-87-007) permits the use of existing representative air quality data in place of preconstruction monitoring data, provided monitor location, quality of data, and currentness of data are acceptable. According to the EPA document listed above, monitoring data from a regional site may be used as representative data in these cases.

The facility location is in an area that is generally free from the impact of other point sources and area sources associated with human activities. Additionally, the site is located in an area with no complex terrain. According to the EPA document listed above, monitoring data from a regional site may be used as representative data in these cases.

The nearest regional monitor for $PM_{2.5}$ is the Charleston FFA Beacon monitor. The monitoring site and the facility have similar base elevations and there are no significant land features between the facility and monitoring site. The Showa Denko facility is located in a rural area while the FAA site is in a suburban area that would be expected to experience somewhat higher $PM_{2.5}$ concentrations due to local particulate contributions.

The closest CO monitor is located at the Cape Romain station. Since the Cape Romain CO monitor is located in a Class I area on the coast of South Carolina and may not be entirely representative of a more inland, rural area, an alternative monitoring location was sought. The only other candidate site for CO background data in South Carolina is the Greenville County Health Department monitoring station. While this monitoring station is located over 270 km from the project

facility, it is in a major urban area with significant CO emissions and is a very conservative alternative that easily satisfies the background monitoring requirements.

Although there is no 1-hr SMC for NO_2, since the significant impact results were above the interim SIL for this averaging period, background monitoring data was needed for the 1-hr NO_2 for the full impact analysis. The Jenkins NO_2 monitor in North Charleston is the closest NO_2 monitoring station to the project location. The Jenkins station is located in an urban area with commercial land use and significant NO_X emissions. The Jenkins Avenue monitor would be expected to provide a very conservative background for the Showa Denko modeling.

Background PM_{10} monitoring data is also needed since cumulative modeling is required for this pollutant. The Jenkins PM_{10} monitor is the closest PM_{10} monitoring station to the project location. The Jenkins station is located in an urban area with commercial land use and significant PM_{10} emissions. Again, the Jenkins Avenue monitor would be expected to provide a very conservative background for the Showa Denko modeling.

The nearest ozone monitoring data is available from the Bushy Part site in Berkley County and the Cape Romain monitor in Charleston County. The 2008-2010 data is 0.062 and 0.067 for these monitors respectively, both of which are well below the 0.075 ppm threshold. These monitors are operated by the SC DHEC in support of National Ambient Air Quality Standards attainment activities and meet the quality assurance requirements for this work. These activities require the data to be quality assured, and the level of quality assurance for these monitors meets the requirements for PSD modeling.

It has been determined that the data the BAQ has obtained for background concentrations are representative (or conservative) of the ambient pollutant concentrations in the area of the proposed facility. In accordance with Chapter C, Section III of the New Source Review Manual (Draft document, dated October 1990), the BAQ approves the use of ambient data collected at DHEC monitoring stations for pre-construction monitoring requirements.

1.1.2 PSD Class II Full Impact Modeling Analysis

A Full Impact Analysis is required for any pollutant for which the proposed source's estimated ambient pollutant concentrations meet or exceed the SIL's (determined in Table VI-1). Separate analyses are performed for determining compliance with the NAAQS and PSD increments. The Full Impact Analysis consists of modeling all

facilities within the SIA, those in the SA that are not excluded by the screening protocol, and background pollutant concentrations (for the NAAQS analysis). The SA used is an area extending 50 km beyond the SIA for each pollutant and averaging period.

The "Screening Threshold Method for PSD Modeling" or "20D Rule" was used to determine which sources within the Screening Area to include. In order to exclude a source, the annual emissions of a pollutant must be less than 20 times the distance (km) from the SIA to the source in the Screening Area. Sources within 1 km of each other were summed prior to applying the 20D Rule. Each calculated 20D distance was compared to the annual emission of each pollutant. Those sources with annual emissions greater than or equal to 20D were retained and considered in the Full Impact modeling analysis for the Class II NAAQS. For the Class II PSD Increment analysis, all the increment consuming sources in the Screening Area were included (no screening was performed).

In addition, Showa Denko performed a significant concentration gradient analysis for the 1-hr NO_2 modeling as an additional screen for sources to exclude in the Screening Area. In that analysis, modeling was performed for those sources that did not screen out using the 20D rule to determine the lateral and longitudinal concentration gradient between the source and the Showa Denko facility. In agreement with the requirements of the EPA "Guideline on Air Quality Models," those sources whose emissions do not cause a significant concentration gradient in the vicinity of the Showa Denko facility were screened out of the full impact modeling.

1.1.2.1 PSD Class II Full Impact - National Ambient Air Quality Standards (NAAQS) Analysis

Table 19 shows a list of facilities that are included in the full impact analysis for NAAQS modeling.

Table 1229 – Class II Full Impact Analysis – NAAQS Sources

PM_{10} 24-Hour	$PM_{2.5}$ 24-Hour	SO_2	NO_2 1-Hour	NO_2 Annual	CO 1-Hour	CO 8-Hour
Showa Denko	Showa Denko	--	Showa Denko	Showa Denko	Showa Denko	Showa Denko
Santee Cooper - Jefferies	Santee Cooper - Jefferies	--	Santee Cooper Jefferies	Santee Cooper - Jefferies	Roseburg Forest Products	Roseburg Forest Products
SCE&G Williams	SCE&G Williams	--	SCE&G Williams	SCE&G Williams	Georgia-Pacific Corp -	Georgia-Pacific Corp -

Table 122~~9~~ – Class II Full Impact Analysis – NAAQS Sources						
PM_{10} 24-Hour	**$PM_{2.5}$ 24-Hour**	**SO_2**	**NO_2 1-Hour**	**NO_2 Annual**	**CO 1-Hour**	**CO 8-Hour**
					Resins	Resins
C. R. BARD	C. R. BARD	--	E.I.Dupont	E.I.Dupont	SCE&G Williams	SCE&G Williams
Santee Cooper - Cross	Santee Cooper - Cross	--	American-LaFrance	C. R. BARD	Georgia-Pacific Russellville Resin	Georgia-Pacific Russellville Resin
MeadWestvaco	MeadWestvaco	--	C. R. BARD	BP-Amoco Cooper River	Alcoa - Mt. Holly	Alcoa - Mt. Holly
MeadWestvaco Chemical Division	MeadWestvaco Chemical Division	--	BP-Amoco Cooper River	Santee Cooper - Cross	American-LaFrance	American-LaFrance
Cogen South LLC	Cogen South LLC	--	Santee Cooper - Cross	Nucor Steel	BP-Amoco Cooper River	BP-Amoco Cooper River
Charleston Technical Center	Charleston Technical Center	--	Nucor Steel	Air Liquide Large	Santee Cooper - Cross	Santee Cooper - Cross
SCE&G Canadys	SCE&G Canadys	--	Air Liquide Large	Corning Inc.	Nucor Steel	Nucor Steel
Georgia Pacific Sawmill	Georgia Pacific Sawmill	--	Corning Inc.	DAK Americas LLC	Air Liquide Large	Air Liquide Large
Holcim Inc.	Holcim Inc.	--	DAK Americas LLC	MeadWestvaco	MeadWestvaco	MeadWestvaco
Georgia Pacific - MDF	Georgia Pacific - MDF	--	MeadWestvaco	Rhodia	Rhodia	Rhodia
--	--	--	Rhodia	Charleston AFB	SCE&G - Hagood	SCE&G - Hagood
--	--	--	Charleston AFB	SCE&G - Hagood	Kinder Morgan Bulk Terminals	Kinder Morgan Bulk Terminals
--	--	--	SCE&G - Hagood	Kinder Morgan Bulk Terminals	MeadWestvaco Chemical Division	MeadWestvaco Chemical Division
--	--	--	Kinder Morgan Bulk Terminals	MeadWestvaco Chemical Division	BASF North Charleston	BASF North Charleston
--	--	--	MeadWestvaco Chemical Division	Cogen South LLC	Cogen South LLC	Cogen South LLC
--	--	--	Cogen South LLC	Charleston Technical	Charleston Technical	Charleston Technical

Table 1229 – Class II Full Impact Analysis – NAAQS Sources						
PM_{10} 24-Hour	**$PM_{2.5}$ 24-Hour**	**SO_2**	**NO_2 1-Hour**	**NO_2 Annual**	**CO 1-Hour**	**CO 8-Hour**
				Center	Center	Center
--	--	--	Charleston Technical Center	SCE&G Canadys	Tri County Paving Inc.	Tri County Paving Inc.
--	--	--	SCE&G Canadys	Giant Cement	SCE&G Canadys	SCE&G Canadys
--	--	--	Giant Cement	Blue Circle Cement	Giant Cement	Giant Cement
--	--	--	Blue Circle Cement	Chamber Oakridge Landfill	Blue Circle Cement	Blue Circle Cement
--	--	--	Chamber Oakridge Landfill	Holcim Inc.	Chamber Oakridge Landfill	Chamber Oakridge Landfill
--	--	--	Holcim Inc.	Georgia Pacific - MDF	Holcim Inc.	Holcim Inc.
--	--	--	Georgia Pacific - MDF	--	Georgia Pacific - MDF	Georgia Pacific - MDF
--	--	--	--	--	Tri County Paving Inc.	Tri County Paving Inc.
SO_2 is not significant for PSD and is not included in any further PSD analysis.						

Table VI-4 shows that when proposed facility emissions are modeled with other sources in the SIA and SA, and background values are added, the National Ambient Air Quality Standards are not exceeded and compliance has been demonstrated.

Table 3320 – National Ambient Air Quality Standards Class II Full Impact Analysis							
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration ($\mu g/m^3$)**	**Background Concentration ($\mu g/m^3$)**	**Total ($\mu g/m^3$)**	**Standard ($\mu g/m^3$)**	**% of Standard**
PM_{10}	24 Hour	AERMOD/ BLP	27.3	49	76	150	51
$PM_{2.5}$	24 Hour	AERMOD/ BLP	14.9	19.9	35	35	100
NO_2	1 Hour	AERMOD/ BLP	83.2	72.1	155.3	188	82
	Annual	AERMOD/ BLP	6.6	12.4	19	100	19
CO	1 Hour	AERMOD/ BLP	15010.0	1450.3	16460.3	40,000	41

Table 33~~20~~ – National Ambient Air Quality Standards Class II Full Impact Analysis							
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration (µg/m³)**	**Background Concentration (µg/m³)**	**Total (µg/m³)**	**Standard (µg/m³)**	**% of Standard**
	8 Hour	AERMOD/ BLP	4488.2	916	5404.2	10,000	54
1) The highest-first-high modeled concentrations for the 5 years of Meteorological data are listed for annual averaging periods and the highest second-high for short-term averaging periods.							
2) Worst-case scenario considers maximized emission rate released from the existing roof vent LO1.							
3) Backgrounds are summarized in Section E.							
4) Controlling concentration is based on the 8th high averaged over the 5-years of modeling.							
5) The ambient ratio method value of 0.80 was applied to all of the modeled concentrations of NOx to obtain the final concentrations for NO_2.							

The dispersion parameters of each off-site source, as well as each respective modeled emission rate included in the Class II NAAQS Full Impact Analysis, is included in the facility's application (dated June 2011 and subsequent revisions and/or additions) and the corresponding electronic modeling files. Those tables were not re-produced for this summary.

Secondary particulate matter (PM) can form as a result of chemical reactions in the atmosphere of primary precursor emissions of SO2 and NOx to form ammonium sulfate and ammonium nitrate, respectively. The project will result in a net reduction of 342.7 tpy and a net increase of 324.6 tpy of NOx emissions. In South Carolina, nitrate is a small contributor to PM2.5 (less than 8%) according to IMPROVE measurements. Due to the relatively high average temperatures in South Carolina, nitrate formation is inhibited resulting in generally low nitrate formation rates. Sulfate is the largest contributor to PM2.5 (41-46%) and organic carbon is second (35-41%). The project will reduce SO2 emissions significantly (342.7 TPY), resulting in the benefit of decreased regional secondary sulfate formation and mitigating any project-related increase of nitrate. Because of the higher molecular weight of sulfate and the general unfavorable conditions for forming nitrate in the state, the net effects of the SO2 reductions should completely offset any nitrate formation and produce a net benefit of reduced PM2.5 as a result of the project.

A detailed listing of dispersion parameters of each source, as well as each respective modeled emission rate included in the Class II NAAQS Full Impact Analysis, is included in the facility's application (Dated June 2011 and subsequent revisions and/or additions) and the corresponding electronic modeling files. Those tables were not re-produced for this summary.

1.1.2.2 PSD Class II – PSD Increment Analysis

The full impact analysis for PSD increment consuming sources is performed in the same manner as the full impact analysis for the NAAQS shown above. The sources included are all increment consuming sources from the facility and those previously identified within the SIA and SA.

Table ~~44~~21 – PSD Class II Increment Analysis SIA and 20D PSD Increment Consuming Sources			
PM_{10} 24-Hour	**$PM_{2.5}$ 24-Hour[(a)]**	**SO_2[(b)]**	**NO_X Annual**
Allied Terminal	--	--	Medical University of South Carolina
Kinder Morgan Bulk Terminals	--	--	City of Chas. Plum Island Sludge Inciner
Macalloy Corporation	--	--	GS Roofing Products
Charleston AFB	--	--	SCE&G - Hagood
Medical University of South Carolina	--	--	Siebe North Inc.
GS Roofing Products	--	--	Charleston Steel & Metal Co.
SCE&G - Hagood	--	--	Kinder Morgan Bulk Terminals
Siebe North Inc.	--	--	Lockheed Martin Aeronautical
Charleston Steel & Metal Co.	--	--	Roper Hospital
Kinder Morgan Bulk Terminals	--	--	R.H. Johnson VA Medical Center
Lockheed Martin Aeronautical	--	--	Moore Drums
Roper Hospital	--	--	South Carolina Farm Bureau
R.H. Johnson VA Medical Center	--	--	Trident Medical Center
Moore Drums	--	--	Broyhill Furniture
South Carolina Farm Bureau	--	--	MeadWestvaco Chemical Division
Trident Medical Center	--	--	North Charleston Sewer Dist.
Chem-Marine Terminal	--	--	Foster Wheeler
Broyhill Furniture	--	--	The Scotts Company
MeadWestvaco Chemical Division	--	--	BASF North Charleston
Siebe North Inc.-Butyl 2	--	--	ExxonMobil
North Charleston Sewer	--	--	Deytens Shipyards

Table ~~4421~~ – PSD Class II Increment Analysis SIA and 20D PSD Increment Consuming Sources			
PM_{10} 24-Hour	**$PM_{2.5}$ 24-Hour[(a)]**	**SO_2[(b)]**	**NO_X Annual**
Dist.			
Foster Wheeler	--	--	Carolina Starches
The Scotts Company	--	--	Bon Secours St. Francis Xavier
BASF North Charleston	--	--	Cogen South LLC
ExxonMobil	--	--	Palmetto Lime LLC
Deytens Shipyards	--	--	Charleston Technical Center
Metal Trades Inc.	--	--	Green Oasis Environmental
Bon Secours St. Francis Xavier	--	--	National Starch LLC
Cogen South LLC	--	--	SCE&G Faber Place
Charleston Marine Container	--	--	American Tank Fabrication Co.
Palmetto Lime LLC	--	--	Heritage Synfuel Binders
Charleston Technical Center	--	--	Vought Aircraft Industries Inc.
Green Oasis Environmental	--	--	Charleston County Detention Center
Vickers Inc.	--	--	Holset Engineering
Charleston Cement Company	--	--	Tri County Paving Inc.
National Starch LLC	--	--	Chamber Oakridge Landfill
SCE&G Faber Place	--	--	DBW Inc (formerly Lauscha Fiber International)
American Tank Fabrication Co.	--	--	SRE Dorchester
Heritage Synfuel Binders	--	--	Holcim Inc.
Cummins MerCruiser Diesel LLC	--	--	Carolina Pole Inc
Vought Aircraft Industries Inc.	--	--	V.P. Kiser Lumber Co. Inc.
Charleston County Detention Center	--	--	Orangeburg County Biomass
Holset Engineering	--	--	Tri County Paving Inc.
Tri County Paving Inc.	--	--	Banks Construction Co.
Giant Cement	--	--	--

Table ~~44~~21 – PSD Class II Increment Analysis SIA and 20D PSD Increment Consuming Sources			
PM_{10} 24-Hour	**$PM_{2.5}$ 24-Hour[(a)]**	**SO_2[(b)]**	**NO_X Annual**
Blue Circle Cement	--	--	--
Westvaco Lumber Mill	--	--	--
Robert Bosch Corporation	--	--	--
Summerville Medical Center	--	--	--
Lauscha Fiber International-Summerville	--	--	--
Geocycle	--	--	--
Chamber Oakridge Landfill	--	--	--
Dausey	--	--	--
Raisio Staest US Inc	--	--	--
Cemplank Inc.	--	--	--
DBW Inc (formerly Lauscha Fiber International)	--	--	--
SRE Dorchester	--	--	--
Banks Construction Co.	--	--	--
Holcim Inc.	--	--	--
Georgia Pacific – MDF	--	--	--
Carolina Pole Inc	--	--	--
V.P. Kiser Lumber Co. Inc.	--	--	--
Lumber Components	--	--	--
Pennington Crossarm Co.	--	--	--
Orangeburg County Biomass	--	--	--
Tri County Paving Inc.	--	--	--
Sanders Brothers	--	--	--
Banks Construction Co.	--	--	--
(a) There are no increment consuming $PM_{2.5}$ sources other than those at the Showa Denko facility.			
(b) SO_2 is not significant for PSD and is not included in any further PSD analysis.			

The emissions from the Showa Denko facility project were combined with those from additional non-facility sources identified in Table VI-5 and included in the PSD Class II Full Impact Increment modeling analysis. Table VI-6 indicates that the

maximum impact for each averaging period and each pollutant was determined to be less than the PSD increment standard for each averaging period.

Table 22 – Prevention of Significant Deterioration Class II Increment Analysis					
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration (μg/m³)**	**Standard (μg/m³)**	**% of Standard**
PM_{10}	24 Hour	AERMOD/BLP	9.3	30	31
$PM_{2.5}$	24 Hour	AERMOD/BLP	5.1	9	57
NO_2	Annual	AERMOD/BLP	2.0	25	8
The highest-first-high modeled concentrations for the 5 years of Meteorological data are listed for annual averaging periods and the highest second-high for other averaging periods.					

1.2 Additional Impacts Analysis – Growth, Soils and Vegetation, and Visibility Impairment

PSD review requires an analysis of any potential impairment to visibility, soils, and vegetation that may occur as a result of the proposed or modified facility/sources. The review also requires an analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial, and other growth associated with the expansion.

1.2.1 Growth

The SC PSD rules require the applicant to provide information relating to the nature and extent of air quality impacts from all commercial, residential, industrial and other growth, which has occurred since August 7, 1977, in the area the facility, or modification, would affect. For the purposes of this report, the area the facility would affect is defined as the area of significant impact. The greatest significant impact distance was determined to be 6.27 km. The facility will hire approximately 140 new employees, and it is anticipated that the workforce will come from existing local population. The facility modifications will be completed by local contractors. Therefore, there will be little or no commercial or industrial growth associated with the construction and modification of the facility and any workforce growth associated residential and commercial growth is not expected to cause or contribute a quantifiable adverse impact on local ambient air quality.

1.2.2 Soils and Vegetation

Maximum predicted offsite impacts (highest first high) were compared to EPA secondary NAAQS or screening levels. Modeling of all the proposed emissions for

the soils and vegetation analysis indicates that there will be no adverse impacts expected on soils or vegetation caused by the proposed facility emissions.

Table 5~~23~~ – Soils and Vegetation Analysis

Pollutant	Averaging Time	Model Used	Facility / Regional Impact (µg/m³)(2)	EPA Screening Concentration (µg/m³)	AAQS Standard (µg/m³)	Exceeds
PM_{10}	24 Hour	AERMOD/BLP	59.6	N/A	150	No
	Annual(1)	AERMOD/BLP	19.9	N/A	50	No
$PM_{2.5}$	24 Hour	AERMOD/BLP	29.9	N/A	35	No
	Annual	AERMOD/BLP	11.7	N/A	15.0	No
SO_2(1)	1 Hour	AERMOD/BLP	136.2	917	N/A	No
	3 Hour	AERMOD/BLP	157.5	786	1300	No
	Annual	AERMOD/BLP	9.9	18	80	No
NO_2	4 Hour (4)	AERMOD/BLP	92.5	3760	N/A	No
	8 Hour (4)	AERMOD/BLP	80.5	3760	N/A	No
	1 Month (4)	AERMOD/BLP	32.6	564	N/A	No
	Annual	AERMOD/BLP	21.8	94	100	No
CO	1 Week (4)	AERMOD/BLP	1947	1,800,000	N/A	No
Lead	3 Month (1,3)	AERMOD/BLP	0.006	0.15	--	No

1) Concentrations include only the facility impacts since they either did not exceed the Significant Impact Levels or none were available. All other values include full impact sources.

2) Results include background values when available.

3) Lead is the maximum 3-month rolling average over the modeling period.

4) Power law relationship used to obtain these concentrations – see details below.

The facility used the power law relationship to obtain concentrations for averaging periods which were not modeled and there were EPA screening values. This was taken from Chapter 5 of the EPA "Workbook of Atmospheric Dispersion Estimates", revised 1970.

$$X(t2) = X(t1)(t1/t2)^{0.2}$$

X = concentrations
t2 = needed averaging period
t1 = other averaging period

1.2.3 Visibility

This visibility impairment analysis is distinct from the Class I visibility impact analysis. The procedure consists of a screening process done through several

levels. Visibility analyses for Class II areas are not necessary for this project, as there are no visibility sensitive areas located within any of the project's Significant Impact Areas (SIAs).

1.3 PSD Class I Impact Analysis

A facility within 100 km of a Class I area must perform a Class I modeling analysis to determine the impact on the Class I area. For the visibility and deposition analyses, the recommendations in the; 1) *Interagency Workgroup on Air Quality Modeling Phase II Summary Report and Recommendations for Modeling Long Range Transport Impacts (IWAQM)* (EPA-454/R-98-019, December 1998); 2) *Federal Land Managers' Air Quality Related Values Workgroup Phase I Report (FLAG 2010)* (U.S. Forest Service- Air Quality Program, the National Park Service – Air Resources Division, and the U.S. Fish & Wildlife Service – Air Quality Branch, December 2000); 3) *Regional Haze Regulations and Guidelines for Best Available Retrofit Technology* (U.S. EPA, June 15, 2005); and 4) U.S. EPA's *Guidelines on Air Quality Models (Guideline)*, are to be followed.

The 2010 version of the FLAG document allows the screening of sources based on total emissions of certain pollutants and distance from the source to the Class I area. When a source is screened out with Q/D ≤ 10 (where D = distance from the source to the Class I area in kilometers; Q = TPY of SO2 + NOx + PM10 + H2SO4), the facility is not required to do an AQRV analysis. For modified sources, applicants should only consider the emissions increases associated with the proposed project modification when calculating Q/D.

For this project, the source was below the screening level and no AQRV analysis was required. [Q/D = 8.9 ≤ 10 where D = 67 kilometers (Cape Romain) and Q = 599 TPY].

1.3.1 Class I Significant Impact Level Analysis

Table VI-10 shows the maximum impacts on Cape Romain for NO_2, PM_{10}, and $PM_{2.5}$. The air quality impacts are less than the Class I SILs for all pollutants. No further air modeling analyses are required to demonstrate compliance with the PSD increments.

Table 24 – Class I PSD Significant Impact Level Analysis

Pollutant	Averaging Time	Model Used	Maximum Modeled Concentration (μg/m³)	SIL (μg/m³)	Significant Impact?
PM_{10}	24 Hour	CALPUFF	0.05	0.32	No
	Annual	CALPUFF	0.002	0.16	No
$PM_{2.5}$	24 Hour	CALPUFF	0.05	0.07	No

Table 24 – Class I PSD Significant Impact Level Analysis					
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration (μg/m³)**	**SIL (μg/m³)**	**Significant Impact?**
	Annual	CALPUFF	0.002	0.06	No
NO_2	Annual	CALPUFF	0.005	0.1	No
Highest First-high values are shown for all pollutants and averaging periods.					
All PM_{10} was assumed to be $PM_{2.5}$ for this analysis.					

1.3.2 Class I Increment Consumption Impact Analysis

Table VI-11 shows the maximum impacts on Cape Romain for NO_2, PM_{10}, and $PM_{2.5}$ from the facility project emissions. The air quality impacts are less than the Class I SILs for all pollutants. No further air concentration analyses are required to demonstrate compliance with the PSD increments.

Table 25 – Class I PSD Increment Impacts Cape Romain National Wildlife Refuge						
Pollutant	**Averaging Time**	**Model Used**	**Year**	**Maximum Modeled Concentration (μg/m³)**	**Standard (μg/m³)**	**Exceeds Standard?**
PM_{10}	24 Hour	CALPUFF	2001	0.05	8.0	No
			2002	0.04	8.0	No
			2003	0.05	8.0	No
	Annual	CALPUFF	2001	0.002	4.0	No
			2002	0.002	4.0	No
			2003	0.002	4.0	No
$PM_{2.5}$	24 Hour	CALPUFF	2001	0.05	2.0	No
			2002	0.04	2.0	No
			2003	0.05	2.0	No
	Annual	CALPUFF	2001	0.002	1.0	No
			2002	0.002	1.0	No
			2003	0.002	1.0	No
NO_2	Annual	CALPUFF	2001	0.005	2.5	No
			2002	0.005	2.5	No
			2003	0.005	2.5	No
Highest First-high values are shown for all pollutants and averaging periods.						
Standards are from SC Regulation 61-62.5 Standard 7, Class I Area limits.						

1.4 South Carolina Facility-Wide Compliance Demonstration

All minor and major sources proposing new construction or construction modifications in South Carolina are required to demonstrate compliance with South Carolina Regulation No. 62.5 Standards Nos. 2 (NAAQS), 7 (Class II PSD

Increment), and 8 (Air Toxics). Standard No. 7 (PSD) Part k - "Source Impact Analysis" and Part p - "Sources Impacting Federal Class I Areas - Additional Requirements" require Class II modeling. Facility-wide emissions from the Showa Denko facility only were modeled to demonstrate compliance with Standards 2, 7, and 8.

Table 26 – Standard No. 2 – Ambient Air Quality Standards Modeling Analysis

Pollutant	Averaging Time	Model Used	Maximum Modeled Concentration ($\mu g/m^3$) (1)	Background Concentration ($\mu g/m^3$)	Total ($\mu g/m^3$)	Standard ($\mu g/m^3$)	% of Standard
PM_{10}	24 Hour	AERMOD	11.8	47	59	150	39
	Annual	AERMOD	2.7	17.2	20	50	40
$PM_{2.5}$	24 Hour	AERMOD	9.2(2)	20	29	35	83
	Annual	AERMOD	2.3(3)	9.4	12	15	80
SO_2	3 Hour	AERMOD	91.8	65.7	158	1300	12
	24 Hour	AERMOD	48.7	23.2	72	365	20
	Annual	AERMOD	6.8	3.1	10	80	13
NO_2	Annual	AERMOD	4.5	15.2	20	100	20
CO	1 Hour	AERMOD	3402.2	2022.8	5425	40,000	14
	8 Hour	AERMOD	1909.3	1412.8	3322	10,000	33
Lead	3 Month (4)	AERMOD	0.000023	0.006	0.01	0.15	7

1) The highest-first-high modeled concentration was used for annual averaging periods and the highest-second-high was used for all other averaging periods, except Lead and unless otherwise noted.

2) The 8th high averaged over the five years of modeling was used.

3) The average of the maximum annual concentration over five years was used.

4) Lead is the maximum 3-month rolling average over the modeling period.

Table 27 – Background Monitoring Data ($\mu g/m^3$)

Pollutant	Site Name	County	Year	1-Hr	3-Hr	8-Hr	24-Hr	3-Mo	Annual
PM_{10}	Jenkins Ave	Charleston	08-10				47		17.2
$PM_{2.5}$	Charleston FAA	Berkeley	08-10				20		9.4
SO_2	Jenkins Ave	Charleston	08-10	Level 2b Or 79.4	65.7		23.2		3.1
NO_2	Jenkins Ave	Charleston	08-10	Level 2b Or 76.5					15.2
CO	Greenville CHD	Greenville	08-10	2022.8		1412.8			
Pb	Jenkins Ave	Charleston	08-10					0.006	

Table 27 – Background Monitoring Data (μg/m³)									
Pollutant	**Site Name**	**County**	**Year**	**1-Hr**	**3-Hr**	**8-Hr**	**24-Hr**	**3-Mo**	**Annual**
Lead is the maximum 3-month rolling average over the three-year period. $PM_{2.5}$ is the three year design value. PM_{10} 24-hr is the fourth-high over three-year period. Annual for pollutants other than $PM_{2.5}$ is the average of the annual averages over the three-year period. All other averaging periods are the average of the three year second-high values.									

Table 28 – Standard No. 7 – Class II PSD Modeling Analysis					
Pollutant	Averaging Time	Model Used	Maximum Modeled Concentration (μg/m³) (1)	Standard (μg/m³)	% of Standard
PM_{10}	24 Hour	AERMOD/BLP	5	30	17
	Annual	AERMOD/BLP	0	17	0
$PM_{2.5}$	24 Hour	AERMOD/BLP	5	9	56
	Annual	AERMOD/BLP	0	4	0
SO_2	3 Hour	AERMOD/BLP	86	512	17
	24 Hour	AERMOD/BLP	34	91	37
	Annual	AERMOD/BLP	2	20	10
NO_2	Annual	AERMOD/BLP	1	25	4
1) The highest-first-high modeled concentration was used for annual averaging periods and the highest-second-high was used for all other averaging periods.					

Table E.4 STANDARD NO. 8 - TOXIC AIR POLLUTANTS ANALYSIS					
Pollutant	**CAS Number**	**Basis**	**Maximum Concentration (μg/m³)(1)**	**Standard (μg/m³)**	**% Of Standard**
Benzene	**71-43-2**	**AERMOD**	**0.56**	**150.00**	**0**
Carbon Disulfide	**75-15-0**	**AERMOD**	**1.77**	**150.00**	**1**
Hexane	**110-54-3**	**AERMOD**	**0.16**	**900.00**	**0**
Methyl Chloride	**74-87-3**	**AERMOD**	**0.83**	**515.00**	**0**
Polycylic Organic Matter	+	AERMOD	29.89	160.00	19
1) Concentrations are rounded to two decimal places to compare to the standards.					

Table E.4 STANDARD NO. 8 - TOXIC AIR POLLUTANTS ANALYSIS					
Pollutant	**CAS Number**	**Basis**	**Maximum Concentration ($\mu g/m^3$)(1)**	**Standard ($\mu g/m^3$)**	**% Of Standard**
(+) There is no CAS number for this pollutant.					

Table E.5 STANDARD NO. 8 – TOXIC AIR POLLUTANTS LEVEL I DE MINIMIS ANALYSIS			
Pollutant	**CAS Number**	**Emission Rate (LBS/DAY)(1,2)**	**De Minimis (LBS/DAY)**
1,4-Dioxane	**123-91-1**	**0.570**	**5.400**
Methylene Chloride	**75-09-02**	**1.470**	**105.000**
Toluene	**108-88-3**	**3.720**	**24.000**
Vinyl Acetate	**108-05-4**	**0.650**	**2.112**
Xylene	**1330-20-7**	**2.210**	**52.200**
1) Emission rates are rounded to three decimal places to compare to the de minimis threshold.			
2) There is a small discrepancy between the lb/hr and the lb/day emission rates due to rounding.			

E-Mail Correspondence

Watts, Sheila G.

From: Watts, Sheila G.
Sent: Monday, January 23, 2017 11:13 AM
To: 'John McLure'
Cc: Barringer, Veronica; bernie.hawkins@nelsonmullins.com; Matthew Wike
Subject: RE: Revised Modeling Attachment for PSD revision.....

John,

We will correct the typo.

Thank You,

Sheila

From: John McLure [mailto:jwm@gel.com]
Sent: Monday, January 23, 2017 10:25 AM
To: Watts, Sheila G. <wattssg@dhec.sc.gov>
Cc: Barringer, Veronica <barrinv@dhec.sc.gov>; bernie.hawkins@nelsonmullins.com; Matthew Wike <matthew.wike@gel.com>
Subject: RE: Revised Modeling Attachment for PSD revision.....
Importance: High

Sheila

Please see attached – there is only one typo. The carbon disulfide emission rate from the New Graphitizing Scrubber (Run ID NP70) is 2.51 lbs/hr, not 2.85 lbs/hr. 2.85 lbs/hr is the carbon disulfide emission rate from the Existing Graphitizing Scrubber (Run ID MP68), so this is just a "cut and paste" typo.

Thanks John

From: Watts, Sheila G. [mailto:wattssg@dhec.sc.gov]
Sent: Monday, January 23, 2017 9:38 AM
To: bernie.hawkins@nelsonmullins.com; John McLure <jwm@gel.com>
Cc: Barringer, Veronica <barrinv@dhec.sc.gov>
Subject: Revised Modeling Attachment for PSD revision.....

Please see attached. Let me know of any concerns with the highlighted portion regarding Std. 8 for this revision. This is what will be in the revised Attachment A for the PSD permit.

Thank You,

Sheila

Sheila Watts, P.E.
Environmental Engineer
Engineering Services Division/Bureau of Air Quality
S.C. Dept. of Health & Environmental Control
2600 Bull Street, Columbia, SC 29201-1708
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Watts, Sheila G.

From: Watts, Sheila G.
Sent: Monday, January 23, 2017 11:48 AM
To: 'John McLure'
Cc: Barringer, Veronica; Matthew Wike; bernie.hawkins@nelsonmullins.com
Subject: RE: GHG (CO2e) emissions total....

Okay, thanks John.

Thank You,

Sheila

From: John McLure [mailto:jwm@gel.com]
Sent: Monday, January 23, 2017 11:40 AM
To: Watts, Sheila G. <wattssg@dhec.sc.gov>
Cc: Barringer, Veronica <barrinv@dhec.sc.gov>; Matthew Wike <matthew.wike@gel.com>; bernie.hawkins@nelsonmullins.com
Subject: RE: GHG (CO2e) emissions total....

Yes that's correct thanks John

From: Watts, Sheila G. [mailto:wattssg@dhec.sc.gov]
Sent: Monday, January 23, 2017 10:38 AM
To: John McLure <jwm@gel.com>
Cc: Barringer, Veronica <barrinv@dhec.sc.gov>; Matthew Wike <matthew.wike@gel.com>; bernie.hawkins@nelsonmullins.com
Subject: RE: GHG (CO2e) emissions total....

Okay, so with this breakdown will the overall CO2e value for Table 1 be 258,176 tpy?

From: John McLure [mailto:jwm@gel.com]
Sent: Monday, January 23, 2017 10:34 AM
To: Watts, Sheila G. <wattssg@dhec.sc.gov>
Cc: Barringer, Veronica <barrinv@dhec.sc.gov>; Matthew Wike <matthew.wike@gel.com>; bernie.hawkins@nelsonmullins.com
Subject: RE: GHG (CO2e) emissions total....

Sheila

This is GEL's breakdown

CO2 (tpy) = 118.22
CH4 (tpy) = 0.0645 tpy
N20 (tpy) = 0.000948 tpy

GHG-Mass (tpy) = 118.3 tpy
GHG-CO2e (tpy) = 120.12 tpy

So the slight discrepancy may be taking the 118.3 tpy mass and converting to CO2e (taking into account the GWP for CH4 (25) and N2O (298).

118.22 + 0.0645(25) + 0.000948(298) = 120.12

Thanks John

From: Watts, Sheila G. [mailto:wattssg@dhec.sc.gov]
Sent: Monday, January 23, 2017 10:13 AM
To: John McLure <jwm@gel.com>; bernie.hawkins@nelsonmullins.com
Cc: Barringer, Veronica <barrinv@dhec.sc.gov>; Matthew Wike <matthew.wike@gel.com>
Subject: RE: GHG (CO2e) emissions total....

Okay, sounds good. What about the breakdown for generator emissions that we will have under the BACT Carbon Dioxide Equivalent, Table 14 values?

Thank You,

Sheila

From: John McLure [mailto:jwm@gel.com]
Sent: Monday, January 23, 2017 10:00 AM
To: Watts, Sheila G. <wattssg@dhec.sc.gov>; bernie.hawkins@nelsonmullins.com
Cc: Barringer, Veronica <barrinv@dhec.sc.gov>; Matthew Wike <matthew.wike@gel.com>
Subject: RE: GHG (CO2e) emissions total....

Sheila

Matt reviewed the numbers below and they match ours very closely (taking into account rounding). We were not counting the New Emergency Generator in our CO2e project total, and we looked at our calcs for the generator operating 100 hours per year and get 118.3 tpy CO2e (again with slight differences due to rounding). So our total matches DHEC's when the New Emergency Generator is included.

Thanks John

From: Watts, Sheila G. [mailto:wattssg@dhec.sc.gov]
Sent: Monday, January 23, 2017 8:43 AM
To: John McLure <jwm@gel.com>; bernie.hawkins@nelsonmullins.com
Cc: Barringer, Veronica <barrinv@dhec.sc.gov>
Subject: GHG (CO2e) emissions total....

Hi John,

Please confirm that we are estimating the total GHGs correctly…….

For Table 1 (in SOB and Preliminary Determination) we will have a total for CO2e emissions from the project equal to 258,174 tpy, this comes from the following CO2e emissions:

New Carbottom furnaces = 23,065 (process) + 167,045 (combustion) + 9,899 (16 MMBtu/hr TO) = 200,009 tpy
New Graphitizing furnaces = 32,852 (previous estimate) + 2,612 (from recently discovered methane) = 35,464 tpy
New Mill, Mix 5 MMBtu/hr hot oil heater = 3,093 tpy
New Pitch Impregnation 12 MMBtu/hr preheater = 7,424 tpy
New Pitch Impregnation 5 MMBtu/hr hot oil heater = 3,093 tpy
New Pitch Impregnation 7.5 MMBtu/hr TO = 8,973 tpy
New Diesel Emergency Generator (operating 100 hrs) = 118.3 tpy

Also, for the Preliminary Determination, under BACT for Carbon Dioxide Equivalent, Table 14 – Estimated Annual CO2e Emissions, it looks like there may be a slight discrepancy for the breakdown of emissions for the new 1,500 kW Diesel Emergency Generator. Please provide the estimated maximum annual CO2, estimated max. annual CH4, estimated max. annual N2O, and estimated max. annual CO2e all in tpy for the emergency generator. We will then fill this table in with the values accordingly.

Thank You,

Sheila

Sheila Watts, P.E.
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Engineering Services Division/Bureau of Air Quality
S.C. Dept. of Health & Environmental Control
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Watts, Sheila G.

From: Barringer, Veronica
Sent: Monday, January 23, 2017 10:06 AM
To: Watts, Sheila G.
Subject: FW: Your phone call

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality – Engineering Services Division
S.C. Dept. of Health & Environmental Control
Office: (803) 898-4127
Connect: www.scdhec.gov Facebook Twitter

From: Bernie Hawkins [mailto:bernie.hawkins@nelsonmullins.com]
Sent: Thursday, January 19, 2017 8:40 PM
To: Barringer, Veronica <barrinv@dhec.sc.gov>
Subject: RE: Your phone call

Great. Thanks

Bernard F. Hawkins
Nelson Mullins Riley & Scarborough LLP
1320 Main Street/Columbia SC 29201
Tel: 803.255.9581 Mobile: 803.331.5410
bernie.hawkins@nelsonmullins.com

From: Barringer, Veronica [mailto:barrinv@dhec.sc.gov]
Sent: Thursday, January 19, 2017 8:40 PM
To: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Subject: Re: Your phone call

sure. talk to you then.

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality - Engineering Services Division
S.C. Dept. of Health & Environmental Control
Office: (803) 898-4127
Connect: www.scdhec.gov Facebook Twitter

From: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Sent: Thursday, January 19, 2017 8:38:54 PM
To: Barringer, Veronica
Subject: RE: Your phone call

Would 9:30 AM be okay?

Bernard F. Hawkins
Nelson Mullins Riley & Scarborough LLP
1320 Main Street/Columbia SC 29201
Tel: 803.255.9581 Mobile: 803.331.5410
bernie.hawkins@nelsonmullins.com

From: Barringer, Veronica [mailto:barrinv@dhec.sc.gov]
Sent: Thursday, January 19, 2017 8:32 PM
To: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Subject: Re: Your phone call

How about 9am?

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality - Engineering Services Division
S.C. Dept. of Health & Environmental Control
Office: (803) 898-4127
Connect: www.scdhec.gov Facebook Twitter

From: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Sent: Thursday, January 19, 2017 8:27:10 PM
To: Barringer, Veronica
Subject: RE: Your phone call

Yes. I have a call from 11 am-noon and a meeting from 1 PM-4 PM. I have comments to send you but it might help if we talk first. We could talk before 11 AM. Let me know what time works best for you.

Thanks,

Bernie

Bernard F. Hawkins
Nelson Mullins Riley & Scarborough LLP
1320 Main Street/Columbia SC 29201

Tel: 803.255.9581 Mobile: 803.331.5410
bernie.hawkins@nelsonmullins.com

From: Barringer, Veronica [mailto:barrinv@dhec.sc.gov]
Sent: Thursday, January 19, 2017 8:22 PM
To: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Subject: Re: Your phone call

Sorry, we haven't been able to touch base yet. Would you be free to talk tomorrow at some point?
Thanks,

Veronica

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality - Engineering Services Division
S.C. Dept. of Health & Environmental Control
Office: (803) 898-4127
Connect: www.scdhec.gov Facebook Twitter

From: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Sent: Wednesday, January 18, 2017 7:52:37 PM
To: Barringer, Veronica
Subject: RE: Your phone call

Veronica.

Sorry I could not follow up today. Will call you tomorrow. Thanks.

Sent from my Verizon, Samsung Galaxy smartphone

-------- Original message --------
From: "Barringer, Veronica" <barrinv@dhec.sc.gov>
Date: 1/18/17 7:49 AM (GMT-05:00)
To: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Cc: "Thompson, Rhonda" <thompsrb@dhec.sc.gov>
Subject: Your phone call

Bernie,

1. The modeling section in the PD is what I was referring to in my e-mail. This section hasn't been updated yet, so please ignore it. Sheila is working on it and once it's finished we will send it to you.
2. Understand your concerns on the second call. What I am struggling with is that by not addressing the other revisions we would end up with an incorrect document or two valid PD documents. Let me re-group with some co-workers my end and we can discuss later today.

Thanks,

Veronica

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality – Engineering Services Division
S.C. Dept. of Health & Environmental Control
Office: (803) 898-4127
Connect: www.scdhec.gov Facebook Twitter

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S.C. Department of Health and Environmental Control

Bureau of Air Quality
Preliminary Determination
AND NOTICE OF MACT APPROVAL

Showa Denko Carbon, Inc.
478 Ridge Road
Ridgeville, South Carolina 29472
Dorchester County

Permit No. 0900-0025-CZ
April 13, 2012 (original), Revised DATE

This review was performed by the Bureau of Air Quality of the South Carolina Department of Health and Environmental Control in accordance with South Carolina Regulations for the Prevention of Significant Air Quality Deterioration.

Modeling Analysis Reviewed by:

MODELER
TITLE
Bureau of Air Quality

Modeling Analysis Approved by:

John Glass, Manager
Modeling Section
Bureau of Air Quality

Reviewed by:

Sheila Watts, P.E.
Environmental Engineer
Bureau of Air Quality

Approved by:

[name of acting director], Director
Engineering Services Division
Bureau of Air Quality

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1.0 Time Line (Permitting Action History)

June 14, 2011	The South Carolina Department of Health and Environmental Control (SC DHEC), Bureau of Air Quality (BAQ), received a Prevention of Significant Deterioration (PSD) Construction Permit application from Showa Denko Carbon, Inc. under the Expedited Review Program, requesting permission to increase its production capacity from 45,000 tons per year to 85,000 tons per year.
June 15, 2011	BAQ Engineering Services Division (ESD) advised Mr. Jeff Felker (Showa Denko Carbon, Inc.) of receipt of the application via e-mail and phone message. BAQ ESD sent a Completeness Determination letter to Mr. Jeff Felker (Showa Denko Carbon, Inc.) stating the application was deemed incomplete and could not be accepted into the Expedited Program at this time. Air dispersion modeling was not included in the application. BAQ ESD also sent Completeness Determination letters to Ms. Catherine Collins (USPHS) and Ms. Heather Ceron (EPA) that included a copy of the PSD application.
June 22, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD) participated in a conference call with representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering to go over preliminary findings of the PSD application.
June 30, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD) participated in a conference call with representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering to go over preliminary findings of Greenhouse Gas BACT analysis for the PSD application. BAQ ESD mailed out a review letter to Showa Denko Carbon, Inc. requesting additional information.

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July 19, 2011	Ms. Veronica Barringer (BAQ ESD), representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
July 20, 2011	BAQ ESD mailed out a review letter to Jeff Felker (Showa Denko Carbon, Inc.) requesting additional information.
July 26, 2011	Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
August 2, 2011	Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), Mr. John Glass (BAQ Modeling) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application. Showa Denko Carbon, Inc. sent an electronic version of all responses to BAQ ESD review letters dated June 30, 2011 and July 19, 2011 as one document. BAQ ESD mailed out a review letter to Mr. Jeff Felker (Showa Denko Carbon, Inc.) requesting additional information regarding calculations in the application. Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD) held a conference call with Mr. Andrew Parks (EPA) to discuss his initial comments on the application.
August 8, 2011	Copies of the air dispersion modeling and an expedited review request were hand delivered to BAQ ESD. BAQ ESD delivered the copies of the air dispersion modeling to BAQ Modeling. BAQ ESD mailed a copy of the facility responses to the June 30 and July 19, 2011 review letters to Ms. Heather Ceron (EPA) (Heather Ceron).

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August 9, 2011	Ms. Rhonda Banks Thompson, Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), Mr. John Glass (BAQ Modeling) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
August 10, 2011	Responses from Showa Denko Carbon, Inc. to the BAQ ESD, August 2, 2011 review letter were received.
August 11, 2011	BAQ ESD mailed the Completeness Determination and Acceptance into the Expedited Review Program letter to Mr. Jeff Felker (Showa Denko Carbon, Inc.) and carbon copied Ms. Catherine Collins (USPHS) and Ms. Heather Ceron (EPA). BAQ ESD also e-mailed and left a phone message for Mr. Jeff Felker (Showa Denko Carbon, Inc.) regarding completeness determination and acceptance into the expedited review program.
August 15, 2011	BAQ ESD mailed out a review letter to Mr. Jeff Felker (Showa Denko Carbon, Inc.) requesting additional information which included items needed for modeling review.
August 16, 2011	Ms. Sheila Watts (BAQ ESD) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application. BAQ ESD received comments from Mr. Gregg Worley (EPA) and these comments were sent electronically to Showa Denko Carbon, Inc.
August 17, 2011	Mr. John Glass (BAQ Modeling) received comments from Mr. Stanley Krivo (EPA) and these comments were sent electronically to Mr. John McLure (GEL Engineering).

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August 22, 2011	Representatives from BAQ ESD and Modeling, EPA Region IV, Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a meeting to discuss details of Showa's overall process, modeling issues, and questions/comments on the PSD application.
August 26, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD) Mr. John Glass, Ms. Veronica Gorman (BAQ Modeling) held a conference call with representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering to go over updates and issues needing further clarification.
August 28, 2011	BAQ ESD mailed out a review letter to Mr. Jeff Felker (Showa Denko Carbon, Inc.) requesting additional information.
August 30, 2011	Ms. Sheila Watts (BAQ ESD) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
September 2, 2011	Mr. John Glass, Mr. Tracy Price, Ms. Veronica Gorman, Mr. Paul Martin (BAQ Modeling), and representatives from GEL and Exponent participated in a conference call to discuss items needed for the facility modeling analysis.
September 6, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
September 9, 2011	Mr. John Glass participated in a conference call with Showa Denko to discuss options for receptor grids and locations.

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September 13, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
September 15, 2011	Mr. John Glass, Mr. Tracy Price, Ms. Veronica Gorman (BAQ Modeling), Mr. Joe Scire, and Mr. John Patella participated in a conference call to discuss emission rates, receptor fields, and application of SILs for short term and long term SO_2 and NO_2 modeling.
September 20, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
September 26, 2011	Conference call with EPA , Showa Denko, consultant, and Ms. Myra Reece; meeting on fence lines and 'through' road issues and modeling items pertaining to 1-hr standards.
September 27, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
September 30, 2011	Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss proposed BACT limits.
October 4, 2011	Conference call with Mr. John Glass, Mr. Tracy Price, Ms. Ruthie Hall (BAQ Modeling), Showa Denko, Mr. Joe Scire (Exponent), and GEL to discuss modeling issues.

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October 11, 2011	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
October 18, 2011	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates and any concerns with the application.
October 24, 2011	BAQ ESD e-mailed the draft preliminary determination, draft permit, and draft statement of basis to Mr. Jeff Felker (Showa Denko Carbon, Inc.) for review and comment.
October 25, 2011	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and draft statement of basis and updates.
November 1, 2011	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and draft statement of basis and updates.
November 8, 2011	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and draft statement of basis and updates.

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November 15, 2011	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and draft statement of basis and updates.
November 18, 2011	Representatives from BAQ Management, ESD and Modeling, EPA Region IV, Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a meeting at the Showa Denko facility to discuss details of Showa's overall process, modeling issues, and questions/comments on the PSD application.
November 23, 2011	Mr. Jeff Felker (Showa Denko Carbon, Inc.) e-mailed comments on the draft preliminary determination and draft permit to BAQ.
November 28, 2011	Mr. Jeff Felker (Showa Denko Carbon, Inc.) e-mailed the summary of stack engineering testing results to BAQ.
November 29, 2011	Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and updates.
December 6, 2011	Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and updates.
December 8, 2011	Conference call was held with GEL, Showa Denko, EPA, and DHEC to discuss modeling issues.

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December 13, 2011	Ms. Rhonda Banks Thompson, Ms. Elizabeth Basil, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any questions pertaining to the draft preliminary determination, draft permit, and updates.
January 11, 2012	Representatives from BAQ ESD and Modeling, Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a meeting to discuss updates on permitting/modeling, specifically Showa Denko's efforts towards the feasibility of installing emissions abatement equipment on existing sources.
January 17, 2012	Ms. Veronica Barringer, Ms. Sheila Watts, and Mr. Jake Frick (BAQ), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
January 24, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
January 31, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
February 7, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
February 14, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.

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February 17, 2012	Showa Denko e-mailed a revised PSD application, excluding modeling, to the BAQ.
February 21, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
February 28, 2012	Ms. Elizabeth Basil and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
March 6, 2012	Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
March 13, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
March 20, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates.
March 21, 2012	BAQ ESD e-mailed the revised draft preliminary determination and draft permit to Mr. Jeff Felker (Showa Denko Carbon, Inc.) for review and comment.

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March 27, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates along with any comments on the revised draft preliminary determination and draft permit.
March 28, 2012	Mr. Keith McCullock (GEL Engineering) e-mailed comments on the revised draft preliminary determination and draft permit to BAQ. BAQ ESD e-mailed an updated draft statement of basis to Jeff Felker (Showa Denko Carbon, Inc.) for review and comment.
March 29-30, 2012	Mr. Joe Scire and Ms. Irene Lee of Exponent met with Mr. John Glass, Mr. Tracy Price, Mr. Greg Quina, Mr. Paul Martin, and Ms. Ruthie Hall (BAQ Modeling) to discuss modeling issues and provided additional files not previously received.
March 30, 2012	Ms. Elizabeth Basil and Ms. Veronica Barringer (BAQ ESD) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any comments and to discuss timeframes.
April 2, 2012	Ms. Veronica Barringer and Mr. Jeff Felker (Showa Denko Carbon, Inc.) held a phone conversation to discuss the monitoring of the baghouses.
April 4, 2012	Mr. Matthew Wike (GEL Engineering) e-mailed comments on the updated draft statement of basis to BAQ.
April 10, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any permitting/modeling updates and timeframes.

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April 13, 2012	The BAQ placed the PSD Preliminary Determination and PSD Construction Permit No. 0900-0025-CZ on public notice by publication in The Journal Scene newspaper in Summerville, South Carolina. All appropriate Federal and State Officials were notified.
April 17, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any updates.
April 24, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any updates.
April 27, 2012	A conference call was held with Mr. Joe Scire, representatives from Showa Denko Carbon, Inc., representatives from GEL Engineering, and representatives from BAQ Modeling (Mr. John Glass, Mr. Tracy Price, Mr. Greg Quina, Mr. Paul Martin, and Ms. Ruthie Hall) to discuss modeling issues.
May 1, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any updates.
May 8, 2012	Ms. Veronica Barringer and Ms. Sheila Watts (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any updates.
May 14, 2012	A public hearing regarding the draft PSD Construction Permit was held at the Ridgeville Town Hall Auditorium, 105 School Street, Ridgeville, South Carolina.
May 18, 2012	DHEC extended the original public comment period for the proposed project through close of business on May 31, 2012.

Commented [A1]: After April 13, 2012 the remaining permit action history comes from the final determination and recent meetings dealing with PSD revision 6.

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May 22, 2012	Ms. Elizabeth Basil and Ms. Sheila Watts (BAQ ESD) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss comments received during the public hearing.
May 29, 2012	Ms. Veronica Barringer (BAQ ESD), and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss any updates or comments received during the public comment period.
June 1, 2012	Ms. Myra Reece, Ms. Elizabeth Basil, Mr. Henry Porter, and Mr. John Glass (BAQ) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Exponent Consulting held a conference call to discuss comments received during the public notice period.
June 5, 2012	Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), Mr. John Glass (BAQ Modeling) and representatives from Showa Denko Carbon, Inc., GEL Engineering, and Fluor Engineering held a conference call to discuss updates on responses to comments received during the public comment period.
June 8, 2012	Issuance of PSD and NESHAP (40 CFR 63) Construction Permit (0900-0025-CZ).
November 18, 2016	Mr. Henry Porter, Ms. Veronica Barringer, Ms. Sheila Watts (BAQ ESD), Mr. John Glass (BAQ Modeling), Mr. Bryan Nichols (BAQ Source Evaluation) and representatives from Showa Denko Carbon, Inc. and GEL Engineering held a conference to discuss VOC and methane emissions, found during facility engineering testing, from the existing graphitizing furnaces and how this may impact emissions from the new graphitizing furnaces.

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December 20, 2016	BAQ received a Prevention of Significant Deterioration (PSD) Construction Permit Revision application from Showa Denko Carbon, Inc. to address potential additional VOC, methane, and HAP emissions from the new graphitizing furnaces.
DATE	The BAQ placed the revised PSD Preliminary Determination and PSD Construction Permit No. 0900-0025-CZ-R6 on public notice by publication in The Journal Scene newspaper in Summerville, South Carolina. All appropriate Federal and State Officials were notified .

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2.0 Introduction and Preliminary Determination

2.1 Project Overview

Showa Denko Carbon, Inc. (Showa Denko) submitted a PSD Construction Permit application and a Case-by-Case MACT Determination, also known as 112(g), application to the SC DHEC BAQ (Department) to increase production capacity of graphite electrodes from 45,000 to 85,000 metric tons per year (TPY) at the facility's Dorchester County location. This facility, which is located at 478 Ridge Road in Ridgeville, South Carolina, currently holds a Title V Operating Permit. Draft Construction Permit Number 0900-0025-CZ was prepared by the Department for this proposed project.

The application addressed the following modifications to the facility that will involve the use of existing processes and/or new processes:

- New Mill, Mix, and Extrusion Process (new equipment)
- New Bake/Rebake Process (new equipment)
- Existing Rebake Load and Unload/Graphitizing Preparation Process (relocating existing process, increased throughput)
- Existing Bake Load and Unload and Baked Electrode Cleaning Process (use of existing process, increased throughput)
- Existing Pitch Impregnation Process (use of existing process, increased throughput)
- New Pitch Impregnation Process (new equipment)
- Existing Insulating media Receiving Process (use of existing process, increased throughput)
- New Graphitizing Process (new equipment)
- Existing Graphitizing Process (modification of existing equipment)
- Existing Cleaning and Inspection Process (relocating existing process, increased throughput)

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- Existing Machining and Shipping Process (use of existing process, increased throughput)
- New Emergency Generator (new equipment)

After completion of the proposed expansion, Showa Denko will have two (2) processes for the Mill, Mix, and Extrusion, the Bake/Rebake, the Pitch Impregnation, and the Graphitizing and remain with only one (1) process for the Rebake Load and Unload/Graphitizing Preparation, the Bake Load and Unload and Baked Electrode Cleaning, the Insulating media Receiving, the Cleaning and Inspection, and the Machining and Shipping.

The facility is currently a major source for PSD. The facility does anticipate that a creditable emission decrease will occur as a result of modification to the existing graphitizing process, as part of the PSD, therefore a netting analysis was performed. The proposed modification resulted in increases that exceeded the PSD significant thresholds for the following pollutants; particulate matter (PM), particulate matter with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}), particulate matter with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$), nitrogen oxides (NO_X), carbon monoxide (CO), volatile organic compounds (VOC), and carbon dioxide equivalent (CO_2e). Therefore, the project is subject to review under SC Regulation 61-62.5, Standard No. 7 Prevention of Significant Deterioration. SC Regulation 61-62.5, Standard No. 7 is equivalent to the Federal Prevention of Significant Deterioration of Air Quality regulations in Title 40 CFR Section 52.21. Pursuant to these regulations, new major stationary sources and modifications to major stationary sources of air pollution must demonstrate that they will not significantly deteriorate the air quality in their region. Dorchester County, SC is currently in attainment for all criteria pollutants.

A PSD review for PM, PM_{10}, $PM_{2.5}$, NO_X, CO, VOC, and CO_2e emissions and a BACT determination and Air Quality Impact Analysis was completed. A 112(g) review for HAP emissions that includes a Case-by-Case MACT determination was also completed.

The facility has submitted a revision to the PSD in order to account for recently discovered VOC, Methane, and HAP emissions found from their existing graphitizing furnaces. Emissions from existing graphitizing furnaces were used to estimate emissions from the proposed new graphitizing furnaces. This Preliminary Determination has been revised to include previously unaccounted for potential emissions from the proposed new graphitizing furnaces. This revised Preliminary

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Determination will include all applicable requirements from the Preliminary Determination issued April 13, 2012. The additional VOC, methane, and HAP emissions required updates to the VOC BACT Analysis and GHG BACT Analysis (increase in CO_2e limit for new graphitizing furnaces).

Also, due to previously issued PSD revision #2, the SO_2 controlled emissions has decreased further and the value is reflected in Table 1. Showa Denko – PSD Applicability Analysis.

2.2 Regulatory Applicability

The increased production capacity results in potential emissions that exceed the PSD significant thresholds. By virtue of the proposed increase, this project is subject to review under the following standards in S.C. Regulation 61-62 and Federal standards:

- S.C. Regulation 61-62.5, Standard No. 1, *Emissions from Fuel Burning Operations*
- S.C. Regulation 61-62.5, Standard No. 2, *Ambient Air Quality Standards*
- S.C. Regulation 61-62.5, Standard No. 3, *Waste Combustion and Reduction*
- S.C. Regulation 61-62.5, Standard No. 4, *Emissions from Process Industries*
- S.C. Regulation 61-62.5, Standard No. 7, *Prevention of Significant Deterioration*
- S.C. Regulation 61-62.5, Standard No. 8, *Toxic Air Pollutants*
- S.C. Regulation 61-62.6, *Control of Fugitive Particulate Matter*
- S.C. Regulation 61-62.7, *Good Engineering Practice Stack Height*
- S.C. Regulation 61-62.60, *South Carolina Designated Facility Plan and New Source Performance Standards*
- 40 CFR 60, *Standards of Performance of New Stationary Sources*, Subpart A, *General Provisions*
- 40 CFR 60, *Standards of Performance of New Stationary Sources*, Subpart IIII, *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines*
- S.C. Regulation 61-62.63 and 40 CFR 63, *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories*, Subpart A, *General Provisions*
- S.C. Regulation 61-62.63 and 40 CFR 63, *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories*, Subpart B, *Requirements for Control Technology Determinations for Major Sources in Accordance With Clean Air Act Sections, Sections 112(g) and 112(j)*

Commented [A2]: Removed Standard 5.1, since it has been repealed.

Commented [A3]: Added specific Subparts (4I, 5D, and 4Z) that are applicable.

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- 40 CFR 63, *National Emission Standards For Hazardous Air Pollutants For Source Categories*, Subpart ZZZZ, *National Emission Standards For Hazardous Air Pollutants For Stationary Reciprocating Internal Combustion Engines*
- 40 CFR 63, *National Emission Standards For Hazardous Air Pollutants For Source Categories*, Subpart DDDDD, *National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters*
- S.C. Regulation 61-62.70, *Title V Operating Permit Program*
- 40 CFR 52, *Approval And Promulgation Of Implementation Plans*, Section 52.21, *Prevention Of Significant Deterioration Of Air Quality*

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3.0 Detailed Process Description

Showa Denko is a graphite electrode manufacturing facility located in Ridgeville, South Carolina, which has been operating since 1983. The manufactured graphite electrodes are primarily used by the steelmaking industry as a means of transporting electrical energy into the electric arc steelmaking furnace. The facility currently includes the following nine processes – Mill, Mix, and Extrusion; Bake/Rebake Process; Rebake Load and Unload/Graphitizing Preparation; Bake Load and Unload and Baked Electrode Cleaning; Pitch Impregnation; Insulating media Receiving; Graphitizing; Cleaning and Inspection; and Machining and Shipping.

Mill, Mix, and Extrusion Process

During the Mill, Mix, and Extrusion process, needle coke and binder pitch (pitch) are mixed and formed into green electrodes. Needle coke is delivered to the facility, stored in various silos according to particle size and transferred from the silos and further sorted by size or crushed to specific-sized particles. Needle coke with various size specifications is mixed to achieve the required particle size distribution. Iron oxide is added to the needle coke and this dry mix is then combined with binder pitch and a lubricant, stearic acid, in heated mixers. The mix is fed to a cooling system and then charged to the extrusion press to form green electrodes of a desired diameter and length. The extruded green electrodes are cooled in a water trough and then transferred for further cooling. The iron oxide is stored at the facility in bags. The binder pitch and stearic acid are stored in electrically-heated tanks. Heat is supplied to the mixers and extruder by a hot oil heater.

Bake/Rebake Process

During the Bake Process, the green electrode is converted to a hard, rigid structure (brittle, abrasive and difficult to machine). The bake cycle for the green electrodes takes several days and occurs in a rich, non-oxidizing atmosphere. After reaching final temperature, the furnace is cooled with water sprays and the carbottom platforms returned to a building for off-loading. The furnace is generally reloaded within one day. The Rebake Process also involves the use of the carbottom furnaces but is for electrodes that are impregnated with pitch. The Rebake Process is used to transform the added impregnating pitch into carbon. The rebake cycle is shorter than the bake cycle. Exhaust gases from the proposed carbottom furnaces will exit to the atmosphere in two ways: through a common stack that receives exhaust gases continuously from the furnaces and from Clean Air stacks that are attached to each furnace and that open for a short time at the end of a charging cycle for an individual furnace.

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Rebake Load and Unload/Graphitizing Preparation

After the pitch impregnated electrodes are rebaked in the carbottom furnaces, the electrodes are "end faced" to prepare them for graphitizing. The baskets are cleaned to recover the residual pitch coke which accumulated in the basket during rebake. Larger pieces of residual pitch coke are transferred to a storage bin where they are loaded onto trucks, as product, at the carbon chips loading station. Smaller residual pitch coke particles are crushed and stored in a pitch coke storage silo. The pitch coke fines are bagged and sold as product.

Bake Load and Unload and Baked Electrode Cleaning

Before baking, green electrodes are loaded upright into stainless steel cylinders (saggers) and the void space is packed with sand to support the electrodes. The saggers are loaded on carbottom platforms and then rolled into carbottom furnaces for baking (Bake Process). After baking, the baked electrodes are unloaded from the saggers and the sand is recycled back to the feed process. The baked electrode is then cleaned to remove residual sand and surface debris.

Pitch Impregnation

The baked and cleaned electrodes are fed to preheaters to prepare the electrodes for pitch impregnation. Pitch impregnation increases the density, strength, and electrical end-product conductivity of the electrodes by exposing them to pitch under elevated pressure and temperature in autoclaves. The duration of this exposure varies based on electrode diameter. Following impregnation, the electrodes are cooled in water spray coolers and a water trough; placed in non-supporting baskets; and loaded on carbottom platforms for the rebake process. Both solid and liquid pitch are used. A hot oil heater supplies heat for the oil jackets on the new storage tanks. Pitch is transferred from the two storage tanks into an existing storage tank and fed to the autoclaves from dosing tanks. Heat for the autoclaves is supplied by a hot oil heater.

Insulating media Receiving

The insulating media used is metallurgical coke and will be referred to as insulating media throughout this document. The insulating media is delivered by truck and transferred to a storage silo. The insulating media is then transferred from the storage silo to the graphitizing building in hoppers and is then transferred to the graphitizing furnaces by a crane mounted vacuum system (gulper system).

Graphitizing

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The crystalline structure of the amorphous carbon is converted to graphitic carbon, which results in increased conductivity and machinability. This conversion takes place by intense heating of the rebaked electrodes (up to 3,000 degrees Centigrade) in electrically powered graphitizing furnaces. The rebaked electrodes are placed horizontally, end to end on a bed of insulating media (used for thermal insulation), making two parallel columns. The two columns are then connected into a direct current circuit. The electrodes are covered with additional insulating media and power is supplied to the electrodes from one of four rectifiers. The total firing time ranges from five to 24 hours. After completion of the graphitizing furnace cycle, several days are required for the met coke to cool to a temperature at which it can be removed from the furnace. Once the insulating media has reached a temperature where it can be removed, it is transferred pneumatically by the gulper system. The graphite electrodes are then transferred for cleaning and inspection. The insulating media is sorted to remove fines which are unusable in the furnaces. Coarse materials are stored in the gulper system and replaced into the furnaces for reuse. Sorted fines are stored in an outside silo.

Cleaning and Inspection

During this process, the graphitized electrodes are cleaned to remove residual insulating media.

Machining and Shipping

The cleaned graphitized electrodes are transferred to machining and finishing. As part of the machining process, the electrodes are turned to final diameter and threaded sockets are machined into the ends. Matching threaded graphite connecting pins are then inserted into one end of the electrode. In addition, stripes and other identifying marks may be painted on the electrodes. Graphite tailings and chips generated by the machining process are screened and stored in various bins as part of the granular graphite area. This material is bagged and otherwise packaged for delivery to customers.

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4.0 Significant Emission Rates

As shown in Table 1, this project exceeds the significant threshold as defined under PSD for PM, PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO, VOC, and CO_2e emissions. HAP emissions are also shown in this table.

Table 1. Showa Denko – PSD Applicability Analysis

Pollutant	Controlled Emissions Increase	PSD Significant Threshold	Significant Increase?
	TPY	TPY	
PM	93.4	25	Yes
PM_{10}	93.08	15	Yes
$PM_{2.5}$	92.8	10	Yes
SO_2	-342.7	40	No
NO_X	324.6	40	Yes
CO	4,757	100	Yes
VOC	152.3	40	Yes
Lead	0.0001	0.6	No
CO_2e	255,445	75,000	Yes
HAP (single greatest)	75.4	10	Yes
HAP (total)	75.4	25	Yes

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5.0 Best Available Control Technology (BACT) Determination

5.1 BACT Requirement

BACT is defined as "an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant, taking into account energy, environmental, and economic impacts." As per S.C. Regulation 61-62.5, Standard No. 7, the BACT requirement applies to each individual new or modified affected emissions unit and pollutant emitting activity at which a net emissions increase would occur. In no case can the application of BACT result in emissions of any pollutant which would exceed emissions allowed under any applicable standard under 40 CFR 60, *New Source Performance Standard (NSPS)*, 61, *NESHAP,* or 63, *NESHAP for Source Categories*.

Chapter B of the draft *New Source Review Workshop Manual* (October 1990) defines the BACT determination process as a 5-step process.

Step 1 – Identify All Control Technologies
Step 2 – Eliminate Technically Infeasible Options
Step 3 – Rank Remaining Control Technologies by Control Effectiveness
Step 4 – Evaluate Most Effective Controls and Document Results
Step 5 – Select BACT

Opacity is not considered to be a PSD pollutant and therefore, opacity itself does not require a BACT evaluation and establishment of a BACT limit. However, BACT can include the use of visible emission limitations or work practice standards for regulated PSD pollutants. Opacity limits have been included in the draft permit as required by State and Federal regulations. BACT cannot be less stringent than an applicable NSPS or NESHAP as outlined in 40 CFR 60, 61, and 63.

The primary resource for establishing BACT is the RACT/BACT/LAER Clearinghouse (RBLC) on the Technology Transfer Network (TTN) maintained by the EPA. To establish BACT for a PSD source, state regulatory agencies query the RBLC. This database contains information about available control technologies for specific industry sources and lists the limits that other pollution control agencies have established for similar source types.

BAQ queried the RBLC for all process types and NSR applicable pollutants. An RBLC advanced search was queried using a standard industrial classification (SIC) code of 3624. In addition to the RBLC, operating permits for existing facilities with similar

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processes and the various control options used by those facilities were reviewed along with 40 CFR 63, Subpart LL – *National Emission Standards for Hazardous Air Pollutants for Primary Aluminum Reduction Plants*. Information provided by Showa Denko included queries of the RBLC using numerous variables such as SIC code, process type, facility name and pollutant. The facility also reviewed the California EPA Air Resources Board and the South Coast Air Quality Management District database, operating permits for existing facilities with similar processes and their control devices. BAQ compared information gathered to the information provided in the application to identify BACT sources.

Commented [A4]: Removed paragraph about the project being subject to SC Reg. Standard No. 5.1.

Showa Denko has stated that there will be no emissions of NSR regulated pollutants from the Clean Air stacks on the carbottom furnaces. Therefore, BACT evaluations of the carbottom furnaces do not consider this stack. The permit requires stack testing to verify these assumptions.

5.2 BACT for Filterable Particulate Matter (PM, PM_{10}, $PM_{2.5}$) and Condensable Particulate Matter (PM_{10}, $PM_{2.5}$)

The proposed project includes nine (9) process areas that are subject to PSD review and that will have PM, PM_{10}, and $PM_{2.5}$ emissions increases requiring a BACT evaluation. Table 2 below presents these process areas and the estimated maximum annual PM, PM_{10}, $PM_{2.5}$, filterable and PM_{10}, $PM_{2.5}$ condensable emissions from these areas without add-on control devices. The types of PM, PM_{10}, $PM_{2.5}$ emissions are labeled as "process" or "combustion." Condensable PM_{10} and $PM_{2.5}$ emissions are from combustion sources and the graphitizing furnaces.

Table 2 – Estimated Annual Uncontrolled Filterable Particulate Matter (PM, PM10, PM2.5) and Condensable Particulate Matter (PM10, PM2.5) Emissions

Process Area/Equipment Description	Equipment ID No.	Estimated Maximum Annual Particulate Matter Emissions Without Add-On Control Devices (ton/yr)
New Mill, Mix and Extrusion Process: ● Green Scrap Service Bins and Weigh Scale (process) ● Service Bins, Bucket Elevators, Crusher Bins, Crushers, Screens and Weigh Scales (process) ● Conveyors, Scale Retractable Spouts, Pre-heaters, Hoppers (process) ● Mill Feed Bin (process)	See Permit # 0900-0025-CZ-R6	PM (filterable) = 896.5 PM10 (filterable) = 425.97 PM2.5 (filterable)= 64.3 PM10 (condensable) = 0.1 PM2.5 (condensable)= 0.1

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Table 2 – Estimated Annual Uncontrolled Filterable Particulate Matter (PM, PM10, PM2.5) and Condensable Particulate Matter (PM10, PM2.5) Emissions

Process Area/Equipment Description	Equipment ID No.	Estimated Maximum Annual Particulate Matter Emissions Without Add-On Control Devices (ton/yr)
● Iron Oxide Bin and Scale (process) ● Mixers, Mixer Discharge Belt (process) ● Screw Spreader (process) ● Cooling Belts (process) ● Homogenizer (process) ● Homogenizer Discharge Belt (process) ● Coke Silos and Conveyor Belts (process) ● Hot Oil Heater (combustion)		
New Bake/Rebake Process: ● Carbottom Furnaces (process and combustion)	E-210-2-4271-18/32	PM (filterable) = 1780 PM10 (filterable) = 1780 PM2.5 (filterable)= 1780 PM10 (condensable) = 1210 PM2.5 (condensable)= 1210
Existing Rebake Load and Unload/Graphitizing Preparation: ● End Facing Machine (process) ● Basket Cleaner (process) ● Pitch Coke Crusher (process) ● Pitch Coke Storage Silo (process) ● Pitch Coke Loading Station (process) ● Storage Bin (process)	E-220-01 E-220-02 E-220-03 E-220-04 E-220-05 E-220-06	PM = 0.21 PM10 = 0.10 PM2.5 = 0.02
Existing Bake Load and Unload and Baked Electrode Cleaning: ● Sand Storage Bin (process) ● Sagger Loading System (process) ● Sagger Unloading System (process) ● Sagger Cleaning (process) ● Electrode Cleaner (process)	E-250-02 E-250-03 E-250-04 E-250-06 E-250-07	PM = 0.45 PM10 = 0.35 PM2.5 = 0.27
New Pitch Impregnation Process: ● Preheater (combustion) ● Hot Oil Heater (combustion)	E-310-2-4272-21 E-310-2-4275-01	PM (filterable) = 0.17 PM10 (filterable) = 0.17 PM2.5 (filterable)= 0.17 PM10 (condensable) = 0.41 PM2.5 (condensable)= 0.41
Existing Insulating media Receiving: ● Insulating media Unloading Station (process) ● Insulating media Silo (process) ● Transport Hopper Loading (process)	E-410-01 E-410-02 E-420-03	PM = 3.28 PM10 = 3.28 PM2.5 = 3.28
New Graphitizing Process: ● Graphitizing Furnaces (process)	E-460-4271-01/10	PM (filterable) = 40.4 PM10 (filterable) = 36.6

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Table 2 – Estimated Annual Uncontrolled Filterable Particulate Matter (PM, PM10, PM2.5) and Condensable Particulate Matter (PM10, PM2.5) Emissions		
Process Area/Equipment Description	**Equipment ID No.**	**Estimated Maximum Annual Particulate Matter Emissions Without Add-On Control Devices (ton/yr)**
• Sodium Carbonate Storage Bin (process) • Gulper System (process) • Insulating media Dust Bins (process) • Insulating media Recycle (process)	E-460-4349-02 E-460-4225-01 E-460-4202-01 and E-460-4202-06 E-460-4202-02	PM2.5 (filterable)= 33.8 PM10 (condensable) = 22.1 PM2.5 (condensable)= 22.1
Existing Cleaning and Inspection: • Electrode Cleaning Machine (process)	E-490-01	PM = 0.06 PM10 = 0.06 PM2.5 = 0.06
Existing Machining and Shipping: • Station No. 1 – Rough Bore and Face Ends (process) • Station No. 2 – Finish Turn OD and Face Ends (process) • Station No. 3 - Threading (process) • Graphite Chip Screen (process) • Graphite Storage Bins (process)	E-510-01 E-510-02 E-510-03 E-510-06 E-510-07, E-510-08, E-510-09	PM = 0.23 PM10 = 0.11 PM2.5 = 0.02
New 1,500 kW Diesel Fuel-Fired Emergency Generator (combustion)	E-240-2-4365-01	Infrequent operation; minimal emissions

*Emissions for existing equipment reflect the net increase in TPY resulting from the proposed expansion. The net increase for existing equipment was calculated by subtracting actual potential controlled emissions from future potential controlled emissions.

Another source of filterable PM, PM10, and PM2.5 emissions and condensable PM10 and PM2.5 emissions is the installation of a 1,500 kW emergency generator. The filterable and condensable particulate emissions from this source will be limited by the size of the generator and an operating restriction of no more than 100 hours per year for maintenance. Therefore, a full BACT analysis was not performed for the emergency generator.

5.2.1 Step 1: Identify All Available Control Technologies

The BACT analysis identifies the following control technologies that could reduce PM, PM10, and PM2.5 emissions:

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Baghouse (Fabric Filters)

A baghouse (also known as a fabric filter) involves the use of fabric bags, in different shaped tubes or cartridges, where particulate-laden gas is drawn through the bags (or outside the bags) and forms a layer of dust on the filter media. The fabric used may be made of cotton, nylon, polyester, fiberglass, or other materials. Gas stream characteristics (moisture content and temperature) will affect which material is chosen. When a certain pressure drop occurs across the filter media (fabric), the cleaning process begins. Baghouses are highly efficient in particulate matter removal, commonly designed with a 99.9% collection efficiency.

Electrostatic Precipitator (ESP) (Wet/Dry)

An ESP involves use of the force created by an induced electrostatic charge to remove particulate matter from a gas stream. The charged particles are collected on plates and loosened from the plates during the cleaning process. Removal of the charged particles from the plates may involve mechanical hammers called rappers or water. When using water for removing particles from the plates, the control device is referred to as a Wet ESP. ESPs are considered highly efficient in particulate matter collection because energy is applied directly to the particulate-laden gas stream. An ESP has a typical collection efficiency of 97% to over 99%.

Wet Scrubbers

Wet Scrubbers use a liquid spray to remove particles and acid gases from a waste gas stream. The primary function of wet scrubbers is to remove gaseous emissions, with a secondary function of particulate removal. Removal of pollutants is primarily achieved through impaction, diffusion, interception, and/or absorption of the pollutant onto droplets of liquid. The liquid effluent is then collected and disposed. The control efficiencies for wet scrubbers are typically 99.9%.

Spray Dryer Absorber (SDA) with Baghouse (Fabric Filters)

A waste gas stream is sent through a spray dryer absorber tower that has been injected with an alkaline slurry, usually lime mixed with water. The alkaline slurry is atomized and acid gases in the waste gas stream are absorbed by the alkaline mist to form particulate and products of the reaction. These particulates and products of reaction are discharged to a baghouse (fabric filters) located downstream of the spray dryer tower. The baghouse (fabric filters) is used to capture the formed particulates.

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Condensers

Condensation is the process of converting a gas or vapor to a liquid. The conversion takes place by decreasing the temperature and/or increasing the pressure.

Good Combustion Practices

Good combustion practices imply that the combustion sources (preheater, hot oil heaters and carbottom furnaces) will be operated within parameters promoting efficient and complete fuel combustion, thereby reducing combustion emissions. Showa Denko will be using good combustion practices, low NO_X burners and will utilize natural gas/propane exclusively as fuel for the two hot oil heaters, preheater and 15 new carbottom furnaces.

Showa Denko has listed the following as good combustion practices:

1. Good air/fuel mixing in the combustion zone;
2. Sufficient residence time to complete combustion;
3. Proper fuel gas supply system design and operation in order to minimize the effect of contaminants and fluctuations in pressure and flow on the fuel gas quality delivered to combustions units;
4. Operator and maintenance practices including good burner maintenance and operation;
5. High temperatures and low oxygen levels in the primary combustion zone;
6. Overall excess oxygen levels high enough to complete combustion while maximizing thermal efficiency.

Good combustion practices #1 through #6 listed above will apply to the hot oil heaters. Good combustion practices #1 through #5 listed above will apply to the preheater and carbottom furnaces.

Combinations of Control Methods

For combustion units, good combustion practices can be used in combination with other control methods.

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5.2.2 Step 2: Technical Feasibility of Options

The control options were analyzed for their technical feasibility as applied to all process/point sources resulting in PM, PM10 and PM2.5 emissions at the facility. A summary is presented below.

Baghouse (Fabric Filters)
Several different types of material may be used to manufacture baghouses, including a polytetrafluoroethylene (PTFE) membrane bag to control PM2.5 emissions. Showa Denko attempted to use the PTFE membrane bags on some of their existing sources but the coating degraded quickly; therefore, the use of a PTFE membrane bags is not technically feasible. Other common materials used for baghouses, such polyester, Nomex, and fiberglass are deemed technically feasible for all sources excluding the combustion units. Exhaust gas temperatures from the combustion units would result in higher than maximum inlet temperatures for baghouses. Baghouses are considered technically feasible for the proposed Mill, Mix and Extrusion Process mixers. But the mixers will also need to have VOC control; therefore, a baghouse equipped with a dry fume scrubber is being considered. Baghouses are deemed technically feasible for the remaining new process sources and all of the existing sources with increased hours of operation or annual throughput that have particulate matter emissions. All the existing sources that are subject to the PM BACT analysis currently have baghouses as control devices.

Electrostatic Precipitator (ESP) Wet/Dry
The inlet gas flow for ESPs can range from 1,000 to 1,000,000 standard cubic feet per minute (scfm). Dry ESPs are able to handle inlet gas temperatures of up to 1300 ºF. Wet ESPs are able to handle inlet gas temperatures of up to 190 ºF. ESPs can be very sensitive to gas stream fluctuations. Although the carbottom furnaces have a high exhaust gas temperature (1,562 ºF), a cooling technology could be utilized to lower the high exhaust temperature, therefore a wet or dry ESP is deemed technically feasible for the carbottom furnaces. Dry and wet ESPs are deemed technically feasible for all remaining proposed sources contributing to PM emissions except for the hot oil heaters and sodium carbonate storage bin. Dry and wet ESPs are deemed not technically feasible for the hot oil heaters and sodium carbonate storage bin due to relatively low exhaust gas flows. Dry and wet ESPs are deemed technically infeasible for existing sources with increased hours of operation or annual throughput due to variable and low exhaust flow.

Wet Scrubbers

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The inlet gas flow for wet scrubbers normally range from 1,000 to 100,000 scfm. Wet scrubbers can typically handle inlet gas flow temperatures in a range from 40 to 750 ºF. Wet scrubbers are deemed technically feasible to all proposed sources contributing to PM emissions except for the hot oil heaters and sodium carbonate storage bin. The hot oil heaters and sodium carbonate storage bin have relatively low exhaust gas flows and are therefore deemed technically infeasible. Although the carbottom furnaces have a high exhaust gas temperature (1,562 ºF), a cooling technology could be utilized to lower the high exhaust temperature, therefore a wet scrubber is deemed technically feasible for the carbottom furnaces. Although the exhaust gas flow from the graphitizing furnaces exceeds the normal range for wet scrubbers, units can be designed to handle the higher gas flow and therefore the wet scrubber is deemed technically feasible for the graphitizing furnaces. Wet scrubbers are also deemed technically feasible for all of the existing sources with increased hours of operation or annual throughput that have particulate matter emissions.

Spray Dryer Absorber (SDA) with Baghouse (Fabric Filters)

A SDA with baghouse (fabric filters) could be used to control any condensable or filterable particulate matter being emitted. Sources emitting condensable particulate matter include the hot oil heaters, preheater, carbottom furnaces, and graphitizing furnaces. Exhaust gas temperatures from the hot oil heaters, preheater, and carbottom furnaces would result in higher than maximum inlet temperatures for baghouses, therefore a SDA with baghouse (fabric filters) is not technically feasible for these units. The SDA with baghouse (fabric filters) is considered technically feasible for the proposed Mill, Mix and Extrusion Process mixers. But the mixers will also need to have VOC control; therefore, a baghouse equipped with a dry fume scrubber is being considered. The SDA with baghouse (fabric filters) is deemed technically feasible for the remaining new sources and existing sources with increased hours of operation or annual throughput that emit particulate matter. All the existing sources that are subject to the PM BACT analysis currently have baghouses as control devices.

Condensers

Condensers can be used in the removal of condensable particulate matter, however all sources that contribute to condensable particulate matter also emit filterable particulate matter. It is not technically feasible to use condensers for any of these sources due to the “sticky” nature of collected solids that would cause a build up and render the condensers ineffective.

Good Combustion Practices

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Based on data included in the RBLC database, BACT/LAER determinations for control of PM emissions from miscellaneous boilers, furnaces, and heaters (process type code 19.600) have included good combustion practices. Good combustion practices are deemed technically feasible for the combustion units. Showa Denko will use good combustion practices and natural gas as the primary fuel with propane as back-up fuel for the hot oil heaters, preheater, and carbottom furnaces.

5.2.3 Step 3: Ranking of Control Technologies

The available control technologies deemed technically feasible for PM/PM10/PM2.5 control are ranked in Table 3 from the most to least effective based on emission reduction potential (% control efficiency).

Table 3 – Ranking of Technically Feasible PM Control Technologies

Technology	PM, PM10, PM2.5 Control Efficiency (%)
SDA with Baghouse	99.9 (Filterable only)
Wet Scrubber	99.9 (Filterable only)
Baghouse (Fabric Filters)	99.9 (Filterable only)
Electrostatic Precipitator (Wet/Dry)	97 (Filterable only)
Good Combustion Practices	N/A

5.2.4 Step 4: Evaluation of Most Effective Controls

This step requires a case-by-case analysis of energy, environmental, and economic impacts. The SDA with baghouse (fabric filters), wet scrubber, and baghouse (fabric filters) result in the highest PM control efficiencies and are therefore considered. The SDA with baghouse (fabric filters) will contribute to higher costs with the capability of removing the same amount of filterable particulate matter as a baghouse (fabric filter), therefore it is considered not cost effective. Although the wet scrubber was deemed technically feasible for the preheater, it would not be cost effective. Annual operating costs for the preheater would be approximately $75,884 to control 0.41 tons per year of filterable and condensable particulate matter with a wet scrubber. Use of a wet scrubber is cost prohibitive for the carbottom furnaces, due to the need of adding methods to lower the exhaust gas of the carbottom furnaces prior to entering the wet scrubber. Good combustion practices are also considered for the proposed equipment in which baghouses and wet scrubbers were deemed not technically feasible or not cost effective. No additional costs, energy impacts, or

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environmental impacts are associated with good combustion practices for the new combustion units. As stated previously, the existing units are already equipped with baghouses. The addition of a baghouse or wet scrubber to further control the pollutant stream would be cost prohibitive, therefore existing controls are deemed BACT.

The baghouse and wet scrubber are agreed by Showa Denko as being cost effective in controlling new sources emitting particulate matter. Increased energy consumption by use of the baghouse or wet scrubber is not considered great enough to disqualify either control methods. Use of the baghouse or wet scrubber could result in some degree of adverse environmental impacts. Operation of baghouses will result in solids that require offsite disposal at the local landfill. Operation of the wet scrubber will result in increased amounts of wastewater requiring treatment. Potential environmental impacts are not sufficient in and of themselves to eliminate any of the control methods.

5.2.5 Step 5: Select BACT

The evaluation of the most effective control (Step 4) did not reach a conclusion between the wet scrubber and baghouse. The baghouse is selected as the preferred control method since the facility has proposed this control as part of the design for the expansion. The control method for filterable and condensable PM, PM10, and PM2.5 control along with proposed BACT limits are listed in Table 4 below:

Table 4 – Selection of Filterable Particulate Matter (PM, PM10, PM2.5) and Condensable Particulate Matter (PM10, PM2.5) BACT Limits

Process/Equipment	Control Method	Proposed BACT Limit
New Mill, Mix and Extrusion Process (all equip. excluding Mixers, Mixer Discharge Belt, Screw Spreader, Cooling Belts, Homogenizer, Homogenizer Belt and Hot Oil Heater)	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
New Mill, Mix and Extrusion Process/ Mixers, Mixer Discharge Belt, Screw Spreader, Cooling Belts, Homogenizer and Homogenizer Belt	Baghouse/Dry Fume Scrubber, see footnote (1)	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
New Mill, Mix and Extrusion Process/	Good Combustion Practices; Annual Tune	0.0022 lb/million Btu (Filterable PM)

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Table 4 – Selection of Filterable Particulate Matter (PM, PM10, PM2.5) and Condensable Particulate Matter (PM10, PM2.5) BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
Hot Oil Heater	Up; natural gas as primary/propane as back-up fuel source	0.0022 lb/million Btu (Filterable PM10) 0.0022 lb/million Btu (Filterable PM2.5) 0.0056 lb/million Btu (Condensable PM10) 0.0056 lb/million Btu (Condensable PM2.5) Good Combustion Practices #1-6
New Bake/Rebake Process/ 15 Carbottom Furnaces	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as back-up fuel source; Thermal Oxidizer; Low NO_X Burners, see footnote (2)	4.14 lb/hr (Filterable PM) 4.14 lb/hr (Filterable PM10) 4.14 lb/hr (Filterable PM2.5) 2.85 lb/hr (Condensable PM10) 2.85 lb/hr (Condensable PM2.5) Good Combustion Practices #1-5
Existing Rebake Load and Unload/Graphitizing Preparation Process	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Sand Storage Bin	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Sagger Unloading and Loading System	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Electric Shot Blaster	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Sagger Cleaning and Electrode Cleaner	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
New Pitch Impregnation Process/ Preheater	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as	0.0023 lb/million Btu (Filterable PM) 0.0023 lb/million Btu (Filterable PM10)

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Table 4 – Selection of Filterable Particulate Matter (PM, PM10, PM2.5) and Condensable Particulate Matter (PM10, PM2.5) BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
	back-up fuel source	0.0023 lb/million Btu (Filterable PM2.5) 0.0056 lb/million Btu (Condensable PM10) 0.0056 lb/million Btu (Condensable PM2.5) Good Combustion Practices #1-5
New Pitch Impregnation Process/ Hot Oil Heater	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as back-up fuel source	0.0022 lb/million Btu (Filterable PM) 0.0022 lb/million Btu (Filterable PM10) 0.0022 lb/million Btu (Filterable PM2.5) 0.0056 lb/million Btu (Condensable PM10) 0.0056 lb/million Btu (Condensable PM2.5) Good Combustion Practices #1-6
Existing Insulating media Receiving Process	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
New Graphitizing Process/ 10 Graphitizing Furnaces	Wet Scrubber, see footnote (3)	4.19 lb/hr (Filterable PM) 4.15 lb/hr (Filterable PM10) 4.12 lb/hr (Filterable PM2.5) 2.65 lb/hr (Condensable PM10) 2.65 lb/hr (Condensable PM2.5)
New Graphitizing Process/ Gulper System and Insulating media Dust Bins	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
New Graphitizing Process/ Insulating media Recycle (Gulper System)	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
Existing Cleaning and Inspection Process/ Electrode Cleaning Machine	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
Existing Machining and Shipping Process/Station No. 1, Station No. 3, Graphite Chip Screen, and Graphite Storage Bins	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
Existing Machining and	Baghouse	0.005 gr/dscf (Filterable PM)

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Table 4 – Selection of Filterable Particulate Matter (PM, PM10, PM2.5) and Condensable Particulate Matter (PM10, PM2.5) BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
Shipping Process/Station No. 2		0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
Existing Machining and Shipping/ Powderizer System, Cyclone Collector, and Bag Packer	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
New Emergency Generator	Annual Tune Up	Operational limit of 100 hours for maintenance

(1) Mixers will also require VOC control. Therefore a baghouse equipped with a dry fume scrubber was selected as the control option.
(2) For the carbottom furnaces there is a need to control several pollutants other than PM, therefore a thermal oxidizer and low NO_X burners were selected. Filterable and condensable particulate emissions from the carbottom furnaces will be controlled by the thermal oxidizer (99% control efficiency for PM). The proposed BACT limit takes into account combustion filterable and condensable particulate emissions from the thermal oxidizer.
(3) The wet scrubber was selected for PM control because it will also provide SO_2 control. Since primary control is for SO_2, Showa Denko has estimated a 50% control efficiency would be achieved for filterable and condensable particulate based on vendor data obtained. The wet scrubber controls 95% of the graphitizing furnaces emissions, the remaining uncontrolled 5% exhaust through the roof. The proposed BACT limit represents the total of the controlled stack plus uncontrolled roof monitor emissions.

Baghouses have been selected to achieve BACT for proposed process units where PM is the primary pollutant of concern. Baghouses in-place on existing units subject to PSD review are deemed appropriate to achieve BACT emissions limits. The PM BACT analysis did not conclude that any other control option, deemed technically feasible, would be any more effective for process PM emissions than baghouses, except in cases where the sources emitted other criteria pollutants in higher levels (carbottom furnaces and graphitizing furnaces).

A BACT limit of 0.005 grains/dscf has been proposed for the new units that will be controlled by baghouses. This limit has been chosen due to research indicating that a BACT limit of 0.005 grains/dscf is in place for similar sources and is a widely used industry standard for baghouses. The existing units at Showa Denko, Ridgeville that have baghouses in-place currently have a 0.005 grains/dscf limit and this has been deemed an appropriate BACT limit.

<u>Testing/Monitoring/Record Keeping/Reporting:</u>

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All proposed baghouses will be subject to an initial source test for filterable PM, PM10, and PM2.5 emissions shall be conducted within 180 days after startup and every three (3) years thereafter. An initial source test to verify no condensable PM10 and PM2.5 emissions are present shall be conducted within 180 days after startup. All existing baghouses will be subject to an initial source test for filterable PM, PM10, and PM2.5 emissions shall be conducted within 180 days after startup of this project and every three (3) years thereafter. An initial source test to verify no condensable PM10 and PM2.5 emissions are present shall be conducted within 180 days after startup of this project. The owner/operator shall install and maintain a bag leak detection system (BLDS) on each module of the baghouses.

The thermal oxidizer that will be installed on the carbottom furnaces will be subject to an initial source test for filterable PM, PM10, and PM2.5 emissions and condensable PM10 and PM2.5 emission that will be conducted 180 days after startup and every three (3) years thereafter. Depending upon stack test results, a less frequent stack testing schedule may be granted, as per permit conditions. Combustion zone and/or afterburner temperature indicators will be installed and maintained on the thermal oxidizer. Temperature readings shall be recorded at least every fifteen (15) minutes and maintained on site. The thermal oxidizer will be in place and operational whenever the carbottom furnaces are running, except during periods of thermal oxidizer malfunction or mechanical failure.

The wet scrubber that will be installed on the graphitizing furnaces will be subject to an initial source test for filterable PM, PM10, and PM2.5 emissions and condensable PM10 and PM2.5 emissions that will be conducted within 180 days after startup and every three (3) years thereafter. The owner/operator shall install and maintain liquid pressure indicators on each scrubber module. Each parameter shall be recorded each shift during source operation. The scrubber shall be in place and operational whenever processes controlled by the scrubber are running, except during periods of scrubber malfunction or mechanical failure. Prior to the first source test, the facility shall use manufacturer's recommendations for operational ranges. These operational ranges for the monitored parameters shall be derived from stack test data, which demonstrate the proper operation of the equipment in compliance. These ranges, with supporting documentation and quality assurance procedures, shall be submitted to the Bureau for approval within 180 days of startup. The operating ranges may be updated using this procedure, following Bureau approval.

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5.3 BACT for CO

The proposed project includes process areas that are subject to PSD review and that will have CO emissions increases requiring a BACT evaluation. The table below presents these process areas and the estimated maximum annual CO emissions from these areas without add-on control devices. The types of CO emissions are labeled as "process" or "combustion."

Table 5 – Estimated Annual Uncontrolled CO Emissions

Process Area/Equipment Description	Equipment ID No.	Estimated Maximum Annual CO Emissions Without Add-On Control Devices (ton/yr)
New Mill, Mix and Extrusion Process: ● Hot Oil Heater (combustion)	E-110-2-4275-01	1.81
New Bake/Rebake Process: ● Carbottom Furnaces (process and combustion)	E-210-2-4271-18/32	98.01
New Pitch Impregnation Process: ● Preheater (combustion) ● Hot Oil Heater (combustion)	 E-310-2-4272-21 E-310-2-4275-01	 4.36 1.81
New Graphitizing Process: ● Graphitizing Furnaces (process)	E-460-4271-01/10	4,572
New 1,500 kW Diesel Fuel-Fired Emergency Generator (combustion)	E-240-2-4365-01	Infrequent operation; minimal emissions

No existing sources that are part of this project emit CO so the CO BACT was performed for only new sources emitting CO. The combustion CO emissions are generated from natural gas combustion emissions with propane used as the backup fuel. Exhaust gases from the proposed carbottom furnaces will exit to the atmosphere in two ways: through a common stack (TO) that receives exhaust gases continuously from the furnaces and from clean air stacks that are attached to each furnace and that open for a short time at the end of a charging cycle for an individual furnace. Showa Denko has stated that there will be no emissions of NSR regulated pollutants (including CO) from the clean air stacks. Therefore, this CO BACT evaluation considers only those emissions from the common stack (TO). Exhaust gases from the proposed graphitizing furnaces will exit the atmosphere in two ways: through a common stack (TO) that receives exhaust gases from each individual furnace and from the roof monitor. The CO emissions are generated during the actual graphitizing process, where the electrodes, along with the packing media

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(metallurgical coke) undergo degradation, i.e. a small amount of metallurgical coke is actually being combusted.

Another source of CO emissions is the installation of a 1,500 kW emergency generator. The CO emissions from this source will be limited by the size of the generator and an operating restriction of no more than 100 hours per year for maintenance. Therefore, a full BACT analysis was not performed for the emergency generator.

5.3.1 Step 1: Identify All Available Control Technologies

Afterburners

There are several types of afterburners, such as thermal oxidation systems, direct flame (flares), thermal recuperative oxidizer (TRO), regenerative thermal oxidizer (RTO) and thermal oxidizers (TO). These systems all operated on the concept of oxidizing combustible materials at a temperature high enough and a time frame long enough (typically 0.5-2 seconds) to convert the pollutants to CO2, water vapors and heat. All of these types of systems have been used to control CO emissions. BAQ reviewed source test data for a facility using an RTO for CO control, which showed a control efficiency around 80-90%. Vendor data provided by Showa Denko has an estimated control efficiency of 97% for CO. A TO is currently utilized by Showa Denko to control VOC emissions from the existing carbottom furnaces.

Regenerative Catalytic Oxidizer (RCO)

The typical oxidation catalyst for CO-containing exhaust gases is rhodium or platinum (noble metal) catalyst on an alumina support material. This catalyst is installed in an enlarged duct or reactor with flue gas inlet and outlet distribution plates. Acceptable catalyst operating temperatures range from 400 to 1250 °F, with the optimal range being 850 to 1,100 °F. Installation of oxidation catalyst in flue gas containing more than trace levels of SO_2 will result in poisoning and deactivation of the catalyst by sulfur-containing compounds.

Good Combustion Practices

Good combustion practices imply that the combustion sources (preheater, hot oil heaters and carbottom furnaces) will be operated within parameters promoting efficient and complete fuel combustion, thereby reducing combustion emissions. Showa Denko will be using good combustion practices, low NO_X burners and will

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utilize natural gas/propane exclusively as fuel for the two hot oil heaters, preheater, and 15 new carbottom furnaces.

Commented [A5]: Removed reference to 5U and work practice standards in lieu of a limit for CO. This is not the case per Air Toxics Section.

Showa Denko has listed the following as good combustion practices:

1. Good air/fuel mixing in the combustion zone;
2. Sufficient residence time to complete combustion;
3. Proper fuel gas supply system design and operation in order to minimize the effect of contaminants and fluctuations in pressure and flow on the fuel gas quality delivered to combustions units;
4. Operator and maintenance practices including good burner maintenance and operation;
5. High temperatures and low oxygen levels in the primary combustion zone;
6. Overall excess oxygen levels high enough to complete combustion while maximizing thermal efficiency.

Good combustion practices #1 through #6 listed above will apply to the hot oil heaters. Good combustion practices #1 through #5 listed above will apply to the preheater and carbottom furnaces.

5.3.2 Step 2: Technical Feasibility of Options

The available control options were analyzed for their technical feasibility as applied to the hot oil heaters, preheater, carbottom furnaces and graphitizing furnaces.

<u>Afterburner</u>

Afterburners are currently being used to control CO from other graphitizing facilities. Showa Denko has recently performed engineering tests on the existing TO, however no inlet and outlet testing was conducted, so a control efficiency could not be established. Afterburners generally require an exhaust flow rate greater than 5,000 scfm for proper operation. As per information provided by equipment suppliers, the exhaust flow rate from the hot oil heaters is 967 acfm and the exhaust flow rate from the preheater is 4,600 acfm, hence the flow rate would be considered too low for an afterburner to be technically feasible. Afterburners are deemed technically feasible for the carbottom furnaces and the graphitizing furnaces, which have exhaust flow

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rates of 95,426 and 200,000 acfm respectively.

Regenerative Catalytic Oxidizer (RCO)

Because of the required exhaust gas temperatures and potential of catalyst poisoning, oxidation catalyst is not deemed technically feasible for the hot oil heaters, preheater and carbottom furnaces.

Good Combustion Practices

Good combustion practices are deemed technically feasible for all the natural gas and propane fired sources. Showa Denko will use good combustion practices and natural gas as the primary fuel and propane as a backup fuel for the two (2) hot oil heaters, preheater and fifteen (15) carbottom furnaces. Good combustion practices are deemed technically feasible for the diesel-fired emergency generator.
Baghouse (Fabric Filters)

5.3.3 Step 3: Ranking of Control Technologies

The available control technologies deemed technically feasible for CO control are ranked below from most to least effective based on their CO emission reduction potential (% control efficiency).

Table 6 – Ranking of Technically Feasible CO Control Technologies

Technology	Control Efficiency (%)
Afterburner (TO)	97 (based on vendor data)
Good Combustion Practices	N/A

5.3.4 Step 4: Evaluation of Most Effective Controls

This step requires a case-by-case analysis of energy, environmental, and economic impacts. The afterburner (TO) and good combustion practices will be considered.
Carbottom Furnaces

Since Showa Denko is installing a TO for the purpose of VOC control (see the BACT evaluation for VOC emissions in this preliminary determination), there will be no adverse energy and environmental impacts, from using this TO to also control CO emissions, from the new carbottom furnaces.

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Graphitizing Furnaces (stack and roof emissions)

A cost analysis was submitted for the installation and operation of a 7.5 million Btu/hr natural gas fired afterburner. The cost analysis was based on a 97% CO control efficiency and 4,435 tons of CO being removed, for a total cost of $289 per ton CO removed. Based on this data, this would make the installation of an afterburner cost effective. Although the addition of an afterburner is economically feasible, it would result in adverse energy and environmental impacts. An afterburner increases natural gas utilization which would result in an increase in criteria pollutants, especially NO_X. As a state, SC has an ample margin of compliance with the CO NAAQS. Even though SC is currently in attainment with the ozone standard, we are a NO_X limited area (see ozone discussion in the air impact analysis section). The CO monitor at Cape Romain is less than 4% of the 1-hr and 8-hr standard compared to Bushy Park and Cape Romain monitors for ozone being at less than 80%. Additionally, Showa Denko's NAAQS Class II full impact analysis shows 1-hr NO2 at 85% of the standard while the 1-hr CO is 14% of the standard. Based on this information, an afterburner has been eliminated from the BACT review and no CO control is required for the new graphitizing furnaces.

5.3.5 Step 5: Select BACT

Table 5 – Selection of CO BACT Limits

Process/Equipment	Control Method	Proposed BACT Limit
New Mill, Mix and Extrusion Process/Hot Oil Heater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	0.082 lb/million Btu Good Combustion Practices #1-6
New Bake/Rebake Process/ 15 Carbottom Furnaces	TO; Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	2.0 lb/hr Good Combustion Practices #1-5
New Pitch Impregnation Process/ Preheater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune up	0.083 lb/million Btu Good Combustion Practices #1-5
New Pitch Impregnation	Good Combustion	0.082 lb/million Btu

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Table 5 – Selection of CO BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
Process/ Hot Oil Heater	Practices; Natural gas and propane as sole fuels; Annual Tune Up	Good Combustion Practices #1-6
New Graphitizing Process/ 10 Graphitizing Furnaces	None	1,690 lb/hr (total for stack and roof emissions)
New Emergency Generator	Annual Tune Up	Operational limit of 100 hours for maintenance

5.4 BACT for Nitrogen Oxides (NO_X)

The proposed project includes process areas that are subject to PSD review and that will have NO_X emissions increases requiring a BACT evaluation. The table below presents these process areas and the estimated maximum annual NO_X emissions from these areas without add-on control devices except for low NO_X burners on proposed sources that are sold equipped with low NO_X burners. The types of NO_X emissions are labeled as "process" or "combustion."

Table 6 – Estimated Annual Uncontrolled NO_X Emissions		
Process Area/Equipment Description	**Equipment ID No.**	**Estimated Maximum Annual NO_X Emissions Without Add-On Control Devices (ton/yr)**
New Mill, Mix and Extrusion Process: ● Hot Oil Heater (combustion)	E-110-2-4275-01	2.20
New Bake/Rebake Process: ● Carbottom Furnaces (process and combustion)	E-210-2-4271-18/32	233.38
New Pitch Impregnation Process: ● Preheater (combustion) ● Hot Oil Heater (combustion)	 E-310-2-4272-21 E-310-2-4275-01	 5.29 2.20
New Graphitizing Process: ● Graphitizing Furnaces (process)	E-460-4271-01/10	11.1
New 1,500 kW Diesel Fuel-Fired Emergency Generator (combustion)	E-240-2-4365-01	Infrequent operation; minimal emissions

No existing sources that are part of this project emit NO_X so the NO_X BACT was performed for only new sources emitting NO_X. The combustion NO_X emissions are generated from natural gas combustion emissions with propane used as the backup

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fuel and the process NO_X emissions are generated from the carbottom furnaces and the graphitizing furnaces. Exhaust gases from the proposed carbottom furnaces will exit to the atmosphere in two ways: through a common stack (TO) that receives exhaust gases continuously from the furnaces and from clean air stacks that are attached to each furnace and that open for a short time at the end of a charging cycle for an individual furnace. Showa Denko has stated that there will be no emissions of NSR regulated pollutants (including NO_X) from the clean air stacks. Showa Denko will be required to perform an initial screening to verify no NO_X emissions are present in the clean air stacks. Therefore, this NO_X BACT evaluation considers only those emissions from the common stack (TO).

Another source of NO_X emissions is the installation of a 1,500 kW emergency generator. The NO_X emissions from this source will be limited by the size of the generator and an operating restriction of no more than 100 hours per year for maintenance. Therefore, a full BACT analysis was not performed for the emergency generator. Another source of filterable PM, PM10, and PM2.5 emissions and condensable PM10 and PM2.5 emissions is the installation of a 1,500 kW emergency generator. The filterable and condensable particulate emissions from this source will be limited by the size of the generator and an operating restriction of no more than 100 hours per year for maintenance. Therefore, a full BACT analysis was not performed for the emergency generator.

5.4.1 Step 1: Identify All Available Control Technologies

The BACT analysis identifies the following control technologies that could be used to reduce NO_X emissions:

Selective Catalytic Reduction

Selective Catalytic Reduction (SCR) works by injecting a reagent (ammonia or urea) into the ductwork, downstream of a combustion source. The reagent combines with NO_X in the gas stream and the combined gas stream comes into contact with a catalyst. The result of the NO_X reduction chemical reaction is the formation of nitrogen and water. Depending on the type of catalyst and the gas stream composition, an optimum operating range for a SCR can vary from 480 ºF to 800 ºF. The unreacted ammonia (also known as ammonia slip) can be emitted from the SCR system at 5 to 10 parts per million. Depending on the type of application, SCR systems can result in a range of 70 to 95% NO_X control efficiency.

Selective Noncatalytic Reduction

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Selective Noncatalytic Reduction (SNCR) works similar to an SCR system but without the catalyst. In a SNCR system a reagent (ammonia or urea) is injected into the post combustion exhaust gas, usually within the source's radiant and convective regions. The combustion unit will act as a reactor chamber for the reagent and nitrogen oxides. The result of this NO_X reduction reaction is the formation of nitrogen and water. This reaction normally occurs at temperatures ranging from 1600 ºF to 2100 ºF. Depending on the type of application, SNCR systems can result in a range of 30 to >60% NO_X control efficiency.

Low NOx Burners

Low NO_X burners are used in industry to reduce the amount of NO_X formation from combustion sources. Design parameters for low NO_X burners, which aid in lowering NO_X emissions, include limiting excess air and reducing peak flame temperature.

Flue Gas Recirculation with Low NOx Burners

Flue gas recirculation is a process that involves recirculating a portion source flue gas (up to 20%) into the source combustion chamber. Recirculating the flue gas reduces the peak combustion temperature and lowers the percentage of oxygen in the combustion air/flue gas mixture. This process results in a decrease of thermal NO_X emissions (formation of NO_X through high flame temperatures).

Restrict Nitrogen Content in Raw Materials

Restricting the nitrogen content in raw materials provided by suppliers can correlate to low NO_X process emissions. Showa Denko uses needle coke, binder pitch, and impregnation pitch provided by suppliers as their raw materials for the graphite electrode production process.

Good Combustion Practices

Good combustion practices imply that the combustion sources (preheater, hot oil heaters and carbottom furnaces) will be operated within parameters promoting efficient and complete fuel combustion, thereby reducing combustion emissions. Showa Denko will be using good combustion practices, low NO_X burners and will utilize natural gas/propane exclusively as fuel for the two hot oil heaters, preheater and 15 new carbottom furnaces.

Showa Denko has listed the following as good combustion practices:

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1. Good air/fuel mixing in the combustion zone;

2. Sufficient residence time to complete combustion;

3. Proper fuel gas supply system design and operation in order to minimize the effect of contaminants and fluctuations in pressure and flow on the fuel gas quality delivered to combustions units;

4. Operator and maintenance practices including good burner maintenance and operation;

5. High temperatures and low oxygen levels in the primary combustion zone;

6. Overall excess oxygen levels high enough to complete combustion while maximizing thermal efficiency.

Good combustion practices #1 through #6 listed above will apply to the hot oil heaters. Good combustion practices #1 through #5 listed above will apply to the preheater and carbottom furnaces.

Combinations of Control Methods

Low NO_X materials can be used in combination with other control methods, and low NO_X burners and good combustion practices can be used together and in combination with other control methods for combustion units.

5.4.2 Step 2: Technical Feasibility of Options

The control options were analyzed for their technical feasibility as applied to all process/point sources resulting in NO_X emissions at the facility. A summary is presented below.

Selective Catalytic Reduction (SCR)

SCR has been applied to a variety of industrial applications to reduce NO_X emissions. SCR has been used to control NO_X emissions from utility/industrial/solid waste boilers, process heaters, gas turbines, and reciprocating internal combustion engines. Although the optimum operating range for an SCR can vary from 480 ºF to 800 ºF and the exhaust gas temperature of the carbottom furnaces is 1,562 ºF, an air cooler could be used to bring down the exhaust gas temperature of the carbottom furnaces to be within the optimum operating temperature range of the SCR. SCR is

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deemed technically feasible for the hot oil heaters, preheater, carbottom furnaces, and graphitizing furnaces.

Selective Noncatalytic Reduction (SNCR)

SNCR has been used on sources that utilize coal, oil, gas, biomass, and waste as fuel to reduce NO_X emissions. The NO_X emission reduction reaction normally occurs at temperatures between 1600 ºF and 2100 ºF. The exhaust gas from the hot oil heaters, preheater, and graphitizing furnaces are below 1600 ºF; therefore the SNCR is deemed not technically feasible for these sources. SNCR is deemed technically feasible for the carbottom furnaces.

Low NOx Burners

The use of low NO_X burners has been widely applied to fuel burning sources to reduce NO_X emissions. Low NO_X burners are deemed technically feasible for the hot oil heaters, preheater, and carbottom furnaces as these are the only fuel burning sources contributing to NO_X emissions.

Flue Gas Recirculation with Low NOx Burners

Flue gas recirculation with low NO_X burners has been shown to significantly reduce NO_X emissions from industrial boilers. The preheaters and carbottom furnaces are direct fired sources, therefore flue gas recirculation with low NO_X burners is deemed not technically feasible. Flue gas recirculation with low NO_X burners is deemed technically feasible for the hot oil heaters.

Restrict Nitrogen Content in Raw Materials

In addition to the generation of NO_X emissions from fuel combustion, nitrogen present in raw materials also contributes to NO_X emissions. The use of low nitrogen content materials is deemed not technically feasible for the hot oil heaters and preheater, since NO_X emissions from these units are related to fuel combustion not process emissions (nitrogen in raw materials). The carbottom furnaces and graphitizing furnaces generate process NO_X emissions. Showa Denko uses needle coke binder pitch, and impregnation pitch as the raw materials for their graphite electrode production process. Any lower nitrogen content materials that may be used to produce graphite electrodes would not meet Showa Denko's product requirements. Therefore, limiting nitrogen content in raw materials that will still

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allow Showa Denko to meet product requirements is deemed technically feasible for the carbottom furnaces and graphitizing furnaces.

Good Combustion Practices

Based on data included in the RBLC database, the BACT/LAER determinations for NO_X emissions from combustion sources firing natural-gas or propane have primarily been good combustion practices combined with the use of low NO_X burners. Good combustion practices are deemed technically feasible for the hot oil heaters, preheater, and carbottom furnaces.

Combinations of Control Methods

The combination of low NO_X burners and good combustion practices along with other technically feasible control methods is deemed to be technically feasible.

5.4.3 Step 3: Ranking of Control Technologies

The available control technologies deemed technically feasible for NO_X control are ranked in Table 14 from most to least effective based on their NO_X emission reduction potential (% control efficiency).

Table 7 – Ranking of Technically Feasible NO_X Control Technologies

Technology	NO_X Control Efficiency (%)
Selective Catalytic Reduction (SCR)	95, 90*
Selective Noncatalytic Reduction (SNCR)	65*
Low NOx Burners	N/A
Flue Gas Recirculation with Low NOx Burners	N/A
Restrict Nitrogen Content in Raw Materials	N/A
Good Combustion Practices	N/A
Combinations of Control Methods	N/A

*The NO_X control efficiency is for the carbottom furnaces.

5.4.4 Step 4: Evaluation of Most Effective Controls

This step requires a case-by-case analysis of energy, environmental, and economic impacts. The SCR, SNCR, low NO_X burners, flue gas recirculation w/low NO_X burners,

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restrict nitrogen content in raw materials, good combustion practices, and combinations of control methods will be considered. Based on vendor information, flue gas recirculation is typically not found on hot oil heaters with combustion blower size of 100 Hp. The proposed 5 million Btu/hr hot oil heaters will each have a 15 Hp combustion blower. Therefore, flue gas recirculation for the hot oil heaters is deemed not cost effective.

Engineering testing at Showa Denko has revealed that restricting the nitrogen content in raw materials provided by suppliers does not result in a direct correlation to lowering NO_X process emissions. Testing information provided by the facility demonstrated that lb/hr NO_X emissions from the carbottom or graphitizing furnaces did not increase when higher nitrogen content in the raw materials was utilized. The lb/hr NO_X BACT limits for the carbottom and graphitizing furnaces remain in place. However, the PSD construction permit has a condition listing the maximum nitrogen content (% by weight) for binder pitch, impregnation pitch, needle coke and insulating media (sampling) for the furnaces, and the limits may be increased provided the Department is given prior notification. These limits will not be listed in the Selection of NO_X BACT limits table below, since they are subject to change.

No additional costs, energy impacts, or environmental impacts are associated with good combustion practices for the new combustion sources. A cost analysis of the energy, environmental, and economical impacts for the SCR on the hot oil heaters and preheaters was evaluated. Also, a cost analysis of the energy, environmental, and economical impacts for the SCR and SNCR on the carbottom furnaces has been evaluated. All evaluations represent controls for the highest amount of uncontrolled NO_X emissions (using propane as the fuel source).

<u>Economic Impacts Analysis</u>

Each hot oil heater had a cost of $36,014 /ton of NO_X removed. The preheaters had a cost of $15,026/ton of NO_X removed. For the carbottom furnaces an SCR resulted in a cost of $28,091/ton of NO_X removed and a SNCR resulted in a cost of $33, 666/ton of NO_X removed. The Department considers SCR and SNCR not to be cost effective in controlling NO_X emissions for the hot oil heaters, preheaters, or carbottom furnaces. This conclusion is based on typical cost effectiveness values for types of emissions units where SCR and SNCR have been used for NO_X emissions control.

<u>Energy Impacts Analysis</u>

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Operation of the SCR or SNCR would not require a substantial amount of increased energy usage (in the form of electricity consumption).

Environmental Impacts Analysis

Operation of the SCR and SNCR could result in some degree of adverse environmental impacts. Ammonia slip could result from the operation of either the SCR or SNCR. In addition, spent catalyst resulting from SCR use might be deemed a hazardous waste depending on the constituents of the material. These adverse environmental impacts are not considered sufficient in and of themselves to eliminate the SCR or SNCR as control methods.

5.4.5 Step 5: Select BACT

The control options for NO_X emissions are low NO_X burners, restrict nitrogen content in raw materials, and good combustion practices. The low NO_X burners, restrict nitrogen content in raw materials, and good combustion practices will result in a lower formation of NO_X emissions without added environmental impacts and high costs to the facility. Showa Denko will use good combustion practices and will utilize natural gas (primary) and propane (back-up) as fuel for the hot oil heaters, preheater, and carbottom furnaces. Additionally, the hot oil heaters, preheater, and carbottom furnaces will be equipped with low NO_X burners. There will be a limit on nitrogen content in raw materials used in carbottom furnaces and graphitizing furnaces. The control options along with proposed limits are listed in Table 15 below:

Table 8 – Selection of NO_X BACT Limits

Process/Equipment	Control Method	Proposed BACT Limit
New Mill, Mix and Extrusion Process/Hot Oil Heater	Low NOx Burners; Good Combustion Practices; Natural gas or propane as fuel; Annual Tune Up	0.10 lb/million Btu Good Combustion Practices #1-6
New Bake/Rebake Process/ 15 Carbottom Furnaces	Low NOx Burners; Good Combustion Practices; Natural gas or propane as fuel; Annual Tune Up	75.22 lb/hr Maximum Nitrogen Content (% by weight), subject to change based on prior Departmental notification Good Combustion Practices #1-5
New Pitch Impregnation	Low NOx Burners and	0.10 lb/million Btu

Commented [A6]: Removed nitrogen content limit values. Same comment for graphitizing furnaces.

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Table 8 – Selection of NO_X BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
Process/ Preheater	Good Combustion Practices	Good Combustion Practices #1-5
New Pitch Impregnation Process/ Hot Oil Heater	Low NOx Burners; Good Combustion Practices; Natural gas or propane as fuel; Annual Tune Up	0.10 lb/million Btu Good Combustion Practices #1-6
New Graphitizing Process/ 10 Graphitizing Furnaces	None	2.5 lb/hr (total for stack and roof emissions) Maximum Nitrogen Content (% by weight), subject to change based on prior Departmental notification Perform initial analysis for nitrogen content on insulating media
New Emergency Generator	Annual Tune Up	Operational limit of 100 hours for maintenance

*Proposed BACT limits are based on propane usage with a low NOx emission factor of 9.1 lbs/1000gal derived from AP-42, Vol.I, 5th Ed., Chapter 1, Section 1.5, Table 1.5-1, Liquefied Petroleum Gas Combustion emission factor of 13 lbs/1000 gal and applying a 30% reduction.

Testing/Monitoring/Record Keeping/Reporting:

An initial source test for the carbottom furnaces and the graphitizing furnaces will be conducted within 180 days after startup. Source tests will need to be conducted every three (3) years after an initial source test for the carbottom furnaces and graphitizing furnaces. Initially, vendor information for the natural gas and propane burners for the preheater, carbottom furnaces and hot oil heaters, verifying that low NO_X burners was installed on the combustion sources shall be submitted to the Department within 180 days after startup and then kept on-site. Fuel use is limited to natural gas or propane for all equipment listed in Table 15 except for the emergency generator. Fuel usage must be monitored, recorded and kept on site. Good combustion practices apply.

5.5 BACT for Volatile Organic Compounds (VOC)

The proposed project includes process areas that are subject to PSD review and that will have VOC emissions increases requiring a BACT evaluation. The table below

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presents these process areas and the estimated maximum annual VOC emissions from these areas without add-on control devices. The types of VOC emissions are labeled as "process" or "combustion."

Table 9 – Estimated Annual Uncontrolled VOC Emissions

Process Area/Equipment Description	Equipment ID No.	Estimated Maximum Annual Particulate Matter Emissions Without Add-On Control Devices (ton/yr)
New Mill, Mix and Extrusion Process: ● Mixers (process) ● Mixer Discharge Belt (process) ● Screw Spreader (process) ● Cooling Belts (process) ● Homogenizer (process) ● Homogenizer Discharge Belt (process) ● Binder Pitch Tank (process) ● Hot Oil Heater (combustion)	E-110-2-4253-01, 02, 03, 04 E-110-2-4221-10 E-110-2-4221-20 E-110-2-4221-11, 12 E-110-2-4253-05 E-110-2-4221-13 E-110-25 E-110-2-4275-01	3.12 0.30 0.24
New Bake/Rebake Process: ● Carbottom Furnaces (process and combustion)	E-210-2-4271-18/32	6,204.07
New Pitch Impregnation Process: ● Autoclave/spray cooler/cooling bath (process) ● Preheater (combustion) ● Hot Oil Heater (combustion)	E-310-2-4201-01 E-310-2-4272-21 E-310-2-4275-01	1,313 0.58 0.24
New Graphitizing Process: ● Graphitizing Furnaces (process)	E-460-4271-01/10	14.4
Existing Pitch Impregnation Process: ● Impregnation Pitch Storage Tanks (existing, process)	E-310-04, E-310-09, E-310-10	0.032*
New 1,500 kW Diesel Fuel-Fired Emergency Generator (combustion)	E-240-2-4365-01	Infrequent operation; minimal emissions

*VOC emissions for existing equipment reflect the net increase in TPY resulting from the proposed expansion. The net increase for existing equipment was calculated by subtracting actual potential controlled emissions from future potential controlled emissions.

The combustion VOC emissions are generated from natural gas combustion emissions with propane used as the backup fuel. Exhaust gases from the proposed carbottom furnaces will exit to the atmosphere in two ways: through a common stack (TO) that receives exhaust gases continuously from the furnaces and from clean air stacks that are attached to each furnace and that open for a short time at the end

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of a charging cycle for an individual furnace. Showa Denko has stated that there will be no emissions of NSR regulated pollutants (including VOC) from the clean air stacks. Showa Denko will be required to perform an initial screening to verify no VOC emissions are present in the clean air stacks. Therefore, this VOC BACT evaluation considers only those emissions from the common stack (TO).

Currently Showa Denko utilizes a thermal oxidizer to control VOC emissions from the existing carbottom furnaces and also utilizes a backup thermal oxidizer. The existing backup thermal oxidizer will also be used as a backup for the proposed carbottom furnaces as well.

Another source of VOC emissions is the installation of a 1,500 kW emergency generator. The VOC emissions from this source will be limited by the size of the generator and an operating restriction of no more than 100 hours per year for maintenance. Therefore, a full BACT analysis was not performed for the emergency generator.

5.5.1 Step 1: Identify All Available Control Technologies

The BACT analysis identifies the following control technologies that could be used to reduce VOC emissions:

Carbon Adsorption

Carbon adsorption has been used to remove VOCs from a low to medium concentration gas stream. The process of carbon adsorption involves gas molecules passing through a bed of solid particles (carbon). Physical attractive forces, not chemical bonds, allow the gas molecules to hold onto the bed of solid particles. After the VOCs have been adsorbed, the carbon can be either regenerated on site (released by heat or vacuum) or transported off site for disposal or regeneration.

Catalytic Oxidizer

Catalytic oxidizers are used to control VOCs and volatile hazardous air pollutant (HAP) emissions. A catalyst is used to promote the oxidation of VOCs and allows this to occur at lower temperatures when compared to thermal oxidizers. The efficiency of catalytic oxidizers depends on several design factors such as temperature, residence time, the inlet gas VOC concentration and species, mixing of combustion air with the waste gas, catalyst characteristics, and any masking agents present in the waste gas.

Regenerative Thermal Oxidizer (RTO)

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A regenerative thermal oxidizer (RTO) has been used to control VOC emissions by destruction of VOCs through thermal oxidation. Destruction of VOC emissions by utilizing an RTO depend on several factors such as temperature, residence time, inlet VOC concentration, type of compound, level of mixing, etc.

Thermal Oxidizer

Thermal oxidizers have been used in industrial applications to reduce VOC emissions. Thermal oxidation takes place in a controlled combustion chamber. The exhaust gas passes through the combustion chamber and the VOCs in the exhaust gas are destroyed due to the high operating temperature. Residence time, temperature, mixing, and oxygen availability are design efficiency parameters that need to be considered for a thermal oxidizer.

Thermal Oxidizer with Concentrator

A concentrator in conjunction with a thermal oxidizer is used when there is a low temperature, high-volume exhaust air stream with a low concentration of VOC. The rotary concentrator is an adsorption technology (similar to carbon adsorption) that is used to concentrate emissions into smaller air-streams with much high concentrations that can be handled by a thermal oxidizer. Purified air is exhausted to the atmosphere while the adsorbed VOCs go through a desorption process for removal with higher temperatures and a low volume airstream. The high concentration desorption air is then sent through a thermal oxidizer for VOC destruction.

Biofiltration Technology

Biofiltration can be used to remove VOCs . The use of biofiltration involves a supported media for microbial growth that aids in the removal of VOCs from air streams. The filter is a closed chamber where exhaust air flows through a packed bed and the VOCs transfer into a thin biofilm on the surface of the packing material (compost-based materials, earth, plastic, or wood-product based material). Microbial growth that occurs in the biofilm aids in degrading the pollutant (VOCs). Trickling filters and bioscrubbers rely on a biofilm and the bacterial action in their recirculating waters.

Wet Scrubber

Wet scrubbers use a liquid spray to remove VOCs from a waste gas stream. The primary function of wet scrubbers is to remove gaseous emissions, with a secondary

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function of particulate removal. Removal of pollutants is primarily achieved through impaction, diffusion, interception, and/or absorption of the pollutant onto droplets of liquid. The liquid effluent is then collected and disposed.

Condenser

Condensation is the process of converting a gas or vapor to a liquid. The conversion takes place by decreasing the temperature and/or increasing the pressure. A vent condenser allows for condensable vapors to accumulate within the liquid seal of the unit. The seal consists of fluid and acts to isolate the stored materials from contact with the atmosphere.

Low VOC Materials

Using low VOC materials as part of the production process can correlate to low VOC process emissions. Showa Denko uses needle coke and binder pitch as the two main raw materials for their graphite electrode production process. A baghouse (also known as a fabric filter) involves the use of fabric bags, in different shaped tubes or cartridges, where particulate-laden gas is drawn through the bags (or outside the bags) and forms a layer of dust on the filter media. The fabric used may be made of cotton, nylon, polyester, fiberglass, or other materials. Gas stream characteristics (moisture content and temperature) will affect which material is chosen. When a certain pressure drop occurs across the filter media (fabric), the cleaning process begins. Baghouses are highly efficient in particulate matter removal, commonly designed with a 99.9% collection efficiency.

Good Combustion Practices

Good combustion practices imply that the combustion sources (preheater, hot oil heaters and carbottom furnaces) will be operated within parameters promoting efficient and complete fuel combustion, thereby reducing combustion emissions.

Showa Denko has listed the following as good combustion practices:

1. Good air/fuel mixing in the combustion zone;

2. Sufficient residence time to complete combustion;

3. Proper fuel gas supply system design and operation in order to minimize the effect of contaminants and fluctuations in pressure and flow on the fuel gas quality delivered to combustions units;

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4. Operator and maintenance practices including good burner maintenance and operation;

5. High temperatures and low oxygen levels in the primary combustion zone;

6. Overall excess oxygen levels high enough to complete combustion while maximizing thermal efficiency.

Good combustion practices #1 through #6 listed above will apply to the hot oil heaters. Good combustion practices #1 through #5 listed above will apply to the preheater and carbottom furnaces.

Combinations of Control Methods

Low VOC materials can be used in combination with other control methods, and good combustion practices can be used in combination with other control methods for combustion units.

5.5.2 Step 2: Technical Feasibility of Options

The control options were analyzed for their technical feasibility as applied to all process/point sources resulting in VOC emissions at the facility. A summary is presented below.

Carbon Adsorption

Carbon adsorption has been applied by industries for the removal and recovery of VOCs. Optimal VOC removal, for the carbon adsorption process, normally occurs when temperatures of the exhaust gas are at or lower than 150 ºF. Also, carbon adsorption design requires a maximum gas loading rate (cfm) per square foot of bed surface be maintained. The exhaust temperatures of the hot oil heaters, preheaters, carbottom furnaces, and autoclaves are higher than 150 ºF. Although these exhaust temperatures do not result in ideal operating conditions, carbon adsorption is deemed to be technically feasible for the hot oil heaters, preheater, carbottom furnaces, autoclave, and equipment in the mill, mix, and extrusion process (excluding the binder pitch tank). Carbon adsorption is deemed not technically feasible for the binder pitch tank and existing impregnation pitch storage tanks due to the low exhaust flow rate. Carbon adsorption is deemed not technically feasible for the graphitizing furnaces due to the molecular weight of the VOCs being too low for adsorption on carbon. Carbon adsorbers (dry scrubbers) are currently being

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utilized at Showa Denko. VOC emissions from the existing mixers, coal tar pitch weigh scale, stearic acid storage tank and weigh scale, cooling system, and extruder are controlled by a dry fume scrubber.

Catalytic Oxidizer

Typical gas flow rates for catalytic oxidizers start at or above 700 scfm. Catalytic oxidizers generally have a temperature operating range between 650 ºF and 1000 ºF, depending on the type of catalyst used. The typical oxidation catalyst for VOC-containing exhaust gases is a rhodium or platinum (noble metal) catalyst on an alumina support material. This catalyst is installed in an enlarged duct or reactor with flue gas inlet and outlet distribution plates. Acceptable catalyst operating temperatures range from 400 ºF to 1250 °F, with the optimal range being 850 ºF to 1,100 °F. Installation of an oxidation catalyst in flue gas containing more than trace levels of SO_2 will result in poisoning and deactivation of the catalyst by sulfur-containing compounds. Because of the required exhaust gas temperatures and potential of catalyst poisoning, a catalytic oxidizer is not deemed technically feasible for the hot oil heaters, preheater, autoclave, carbottom furnaces, equipment in the mill, mix and extrusion process (excluding the binder pitch tank). A catalytic oxidizer is not deemed technically feasible for the graphitizing furnaces due to the potential of catalyst poisoning. Due to the low exhaust flow rate of the binder pitch tank and existing impregnation pitch tanks, a catalytic oxidizer is deemed not technically feasible.

Regenerative Thermal Oxidizer (RTO)

A regenerative thermal oxidizer (RTO) is normally used to control VOC emissions on exhaust gases that have a low average VOC concentration. The typical gas flow rates for RTOs are from 5,000 to 500,000 scfm. The RTO uses natural gas to heat the waste exhaust gas to approximately 1400 ºF to 1500 ºF, but is capable of operating at a temperature of up to 2000 ºF. Due to the low exhaust flow rate of the binder pitch tank, hot oil heaters, preheater, and existing impregnation pitch tanks, a RTO is deemed not technically feasible. The RTO is deemed technically feasible for the remaining equipment in the mill, mix, and extrusion process, carbottom furnaces, autoclave, and graphitizing furnaces.

Thermal Oxidizer

The use of thermal oxidizers is applied to a wide variety of industrial processes for

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VOC removal. Typical gas flow rates for thermal oxidizers start at or above 5,000 scfm. Thermal destruction of most VOCs occurs between 1100 ºF and 1200 ºF. Due to the low exhaust flow rate, a thermal oxidizer is deemed not technically feasible for the binder pitch tank, existing impregnation pitch tanks, hot oil heaters, and preheater. A thermal oxidizer is deemed technically feasible for control of for the autoclave, carbottom furnaces, graphitizing furnaces, and remaining equipment in the mill, mix and extrusion process. Showa Denko currently controls VOC emissions from their existing carbottom furnaces with a thermal oxidizer and controls VOC emissions from their existing autoclaves, spray coolers, and dosing tanks with a thermal oxidizer.

Thermal Oxidizer with Concentrator

A concentrator is used on exhaust gases that have a high volume, low temperature, and low VOC concentration. Based on discussions with equipment vendors and review of reference material, use of a thermal oxidizer with concentrator on the carbottom furnaces is deemed not technically feasible, due to relatively low VOC concentration and high exhaust temperature. Exhaust gases from the autoclave have high VOC concentrations, therefore a concentrator is deemed not technically feasible. Typical gas flow rates for thermal oxidizers start at or above 5,000 scfm. Due to the low exhaust flow rate, a thermal oxidizer is deemed not technically feasible for the binder pitch tank, existing impregnation pitch tanks, hot oil heaters, and preheater. Due to the particulate loading, a thermal oxidizer with concentrator is deemed not technically feasible for the remaining equipment in the mill, mix and extrusion process. A thermal oxidizer with concentrator is deemed not technically feasible for the graphitizing furnaces due to the molecular weight of the VOCs being too low for adsorption on carbon.

Biofiltration Technology

Exhaust gas stream characteristics that work best with biofiltration are very low (< 2000 ppm) VOC concentrations and temperatures between 50 ºF and 105 ºF. Stack gas temperature exceed 105 ºF for the hot oil heaters, carbottom furnaces, preheater and autoclave. Biofiltration is deemed not technically feasible for the graphitizing furnaces due to methane not being sufficiently soluble in water. Although biofiltration is not ideal for these sources, it is deemed technically feasible for the hot oil heaters, carbottom furnaces, preheater, and autoclave. Biofiltration is deemed technically feasible for the binder pitch tank, existing impregnation pitch tanks, and remaining equipment in the mill, mix and extrusion process.

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Wet Scrubber

The inlet gas flow rate for wet scrubbers ranges from 1,000 to 100,000 scfm. Wet scrubbers can typically handle inlet gas flow temperatures in a range from 40 to 750 ºF. Wet scrubbers are deemed not technically feasible for the binder pitch tank and existing impregnation pitch tanks due to low exhaust flow rate. Wet scrubbers are deemed not technically feasible for the carbottom furnaces due to a high exhaust gas temperature (1,562 ºF). Based on vendor information, a wet scrubber is deemed not technically feasible for the autoclave and remaining equipment in the mill, mix and extrusion process (excluding the hot oil heater) due to relatively low VOC concentration to high volumetric exhaust flow rate ratio. A wet scrubber is deemed not technically feasible for the graphitizing furnaces due to methane not being sufficiently soluble in water. Wet scrubbers are deemed technically feasible for the hot oil heaters and preheater.

Condenser

Condensers are used on storage tanks when reclaim or removal of VOCs is necessary. Condensers are deemed not technically feasible for the hot oil heaters, preheater, carbottom furnaces, autoclave, graphitizing furnaces, and equipment in the mill, mix and extrusion process (excluding the binder pitch tank). Condensers are deemed technically feasible for the binder pitch tank and the existing pitch storage tanks. Showa Denko currently controls VOC emissions from the existing pitch storage tanks with vent condensers.

Low VOC Materials

In addition to the generation of VOC emissions from fuel combustion, volatiles present in raw materials also contribute to VOC emissions. The use of low VOC materials is deemed not technically feasible for the hot oil heaters and preheater, since VOC emissions from these units are related to fuel combustion not process emissions (volatiles in raw materials). The carbottom furnaces generate combustion and process VOC emissions. Process VOC emissions are generated from the carbottom furnaces by the liberation of pitch during baking. Process VOC emissions are generated from the graphitizing furnaces. Showa Denko uses needle coke and binder pitch as the two main raw materials for their graphite electrode production process. Any lower VOC materials that may be used to produce graphite electrodes would not meet Showa Denko's product requirements. Therefore, use of low VOC

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materials is deemed not technically feasible for the carbottom furnaces, graphitizing furnaces, autoclaves, binder pitch tank, and remaining equipment in the mill, mix and extrusion process. Several different types of material may be used to manufacture baghouses, including a polytetrafluoroethylene (PTFE) membrane bag to control PM2.5 emissions. Showa Denko attempted to use the PTFE membrane bags on some of their existing sources but the coating degraded quickly; therefore, the use of a PTFE membrane bags is not technically feasible. Other common materials used for baghouses, such polyester, Nomex, and fiberglass are deemed technically feasible for all sources excluding the combustion units. Exhaust gas temperatures from the combustion units would result in higher than maximum inlet temperatures for baghouses. Baghouses are considered technically feasible for the proposed Mill, Mix and Extrusion Process mixers. But the mixers will also need to have VOC control; therefore, a baghouse equipped with a dry fume scrubber is being considered. Baghouses are deemed technically feasible for the remaining new process sources and all of the existing sources with increased hours of operation or annual throughput that have particulate matter emissions. All the existing sources that are subject to the PM BACT analysis currently have baghouses as control devices.

Good Combustion Practices

Based on data included in the RBLC database, the BACT/LAER determinations for VOC emissions from combustion of natural gas or propane in miscellaneous boilers, furnaces, and heaters have been good combustion practices. Good combustion practices are deemed not technically feasible for the graphitizing furnaces due to the furnaces being electrically heated (no combustion emissions). Showa Denko will use good combustion practices and natural gas as the primary fuel with propane as back-up fuel for the hot oil heaters, preheater, and carbottom furnaces. Good combustion practices are deemed technically feasible for the hot oil heaters, preheater, and carbottom furnaces.

Combinations of Control Methods

For combustion units, good combustion practices can be used in combination with other technically feasible control methods. For the remainder of this VOC BACT evaluation, BAQ bases the assessment of various combustion unit VOC control methods on the presumption that good combustion practices will also be employed. This presumption will be made enforceable through permit conditions.

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5.5.3 Step 3: Ranking of Control Technologies

The available control technologies deemed technically feasible for VOC control are ranked in Table 17 from most to least effective based on their VOC emission reduction potential (% control efficiency).

Table 10 – Ranking of Technically Feasible VOC Control Technologies

Technology	VOC Control Efficiency (%)
Thermal Oxidizer	99
Wet Scrubber	70-99
Regenerative Thermal Oxidizer	95-99
Carbon Adsorption	90
Biofiltration Technology	90
Condenser	90
Good Combustion Practices	N/A
Combinations of Control Methods	N/A

5.5.4 Step 4: Evaluation of Most Effective Controls

This step requires a case-by-case analysis of energy, environmental, and economical impacts. The wet scrubber, thermal oxidizer, regenerative thermal oxidizer, carbon adsorption, biofiltration technology, and good combustion practices will be considered. A wet scrubber used to reduce VOC emissions from the hot oil heaters and preheater is not cost effective due to the low VOC concentration. Showa Denko has a cyclical operation that is not conducive to utilizing a regenerative thermal oxidizer. The use of a regenerative thermal oxidizer on the equipment in the mill, mix, and extrusion process (excluding binder pitch tank and hot oil heater), carbottom furnaces, and autoclave when compared to that of a thermal oxidizer is not as cost effective with relatively the same VOC control efficiency. Due to the high flow rate of the graphitizing furnaces, two (2) regenerative thermal oxidizers (RTO) would be required (each 6.5 million Btu/hr). Showa Denko has documented a vendor guarantee of 98% control of VOCs from the graphitizing furnaces, however the cost to reduce VOCs would be approximately $93,210 per ton removed (based on 14.4 uncontrolled tpy of VOC) and is therefore not cost effective. Also, the use of a regenerative thermal oxidizer to control VOC emission from the graphitizing furnaces would result in an increase of 5.58 tpy of NO_X emissions and would therefore contribute to adverse environmental impacts. Using this same methodology, the use of thermal oxidizers is also deemed not cost effective or environmentally beneficial.

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The exhaust temperatures of the hot oil heaters, preheater, carbottom furnaces, and autoclaves are higher than ideal operating conditions for carbon adsorption or biofiltration technology. The exhaust temperatures would need to be cooled prior to carbon adsorption or biofiltration treatment and therefore is not considered to be cost effective. Due to the low exhaust flow rate and low amount of VOC emissions from the binder pitch tank, existing impregnation pitch tanks, and remaining equipment in the mill, mix and extrusion process, biofiltration is deemed not cost effective.

The existing pitch impregnation storage tanks are equipped with vent condensers, therefore there are no additional costs associated with the condensers as a control device. Use of a condenser for the binder pitch is a cost effective method of controlling VOC emissions.

No additional costs, energy impacts, or environmental impacts are associated with good combustion practices for the new combustion sources.

A thermal oxidizer in combination with good combustion practices is determined to be the most effective control for the carbottom furnaces. A thermal oxidizer is deemed the most effective control for the autoclave. A vent condenser is determined to be the most effective control for the new binder pitch tank and existing impregnation pitch tanks (currently equipped with vent condensers). Good combustion practices are the most effective control for the hot oil heaters and preheater.

5.5.5 Step 5: Select BACT

The emissions limits deemed BACT for VOC emissions are those associated with the use of condensers, thermal oxidizers, and good combustion practices. The new emergency generator will have a VOC emission rate resulting from diesel fuel combustion of less than 1 lb/hr. The proposed BACT limit for the emergency generator will be an operational restriction of no more than 100 hours per year for maintenance. The control options along with proposed limits are listed in Table 18 below:

Table 11 – Selection of VOC BACT Limits

Process/Equipment	Control Method	Proposed BACT Limit
New Mill, Mix and Extrusion	Dry Fume Scrubber/Baghouse	0.07 lb/hr

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Table 11 – Selection of VOC BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
Process – Mixers, Mixer Discharge Belt, Screw Spreader, Cooling Belts, Homogenizer, and Homogenizer Discharge Belt		
New Mill, Mix and Extrusion Process - Binder Pitch Tank	Vent Condenser	0.40 lb/hr
New Mill, Mix and Extrusion Process - Hot Oil Heater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	0.012 lb/million Btu Good Combustion Practices #1-6
New Bake/Rebake Process – 15 Carbottom Furnaces	Thermal Oxidizer; Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	17.3 lb/hr Good Combustion Practices #1-5
New Pitch Impregnation Process - Hot Oil Heater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	0.012 lb/million Btu Good Combustion Practices #1-6
New Pitch Impregnation Process - Preheater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	0.011 lb/million Btu Good Combustion Practices #1-5
New Pitch Impregnation Process -Autoclave/spray cooler/cooling bath	Thermal Oxidizer	3.083 lb/hr
New Graphitizing Process/ 10 Graphitizing Furnaces	None	3.3 lb/hr, total for stack and roof emissions (based on 96 hour block average)
Existing Pitch Impregnation Process – Impregnation Pitch	Vent Condenser	0.055 TPY (total)
New 1,500 kW Diesel Fuel-Fired Emergency Generator (combustion)	Annual Tune Up	Operational limit of 100 hours for maintenance

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Testing/Monitoring/Record Keeping/Reporting:

An initial source test for VOC emissions from the carbottom furnaces will be conducted within 180 days after startup. Source tests will need to be conducted every three (3) years after an initial source test for the thermal oxidizers. Combustion zone and/or afterburner temperature indicators will be installed and maintained on

the thermal oxidizers. Temperature readings will be recorded at least every fifteen (15) minutes and maintained on site. The thermal oxidizers will be in place and operational whenever the autoclave and carbottom furnaces are running, except during periods of thermal oxidizer malfunction or mechanical failure. For the new and existing vent condensers, the owner/operator shall utilize work practice standards consisting of the inspection and cleaning of the condenser coils on a semiannual basis. The vent condenser shall be in place and operational whenever processes controlled by the vent condenser are running, except during periods of condenser malfunction or mechanical failure. Records shall be kept on-site, verifying that the work practice standards are met and made available to the Department upon request.

An initial source test for VOC as VOC emissions shall be conducted within 180 days after startup and every three (3) years thereafter. During the initial performance test and any subsequent testing, the facility shall test for VOC emissions from the roof monitor and graphitizing scrubber stack for 96 continuous hours. Less frequent source testing for VOC emissions from the source may be conducted if at least two (2) consecutive performance tests show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test shall be conducted during the fifth year and no more than 60 months after the previous performance test. To demonstrate continuous compliance with the VOC emission limitations, the owner/operator is limited to the use of metallurgical coke only as the insulation medium for the new graphitizing furnaces. Records shall be kept on-site, verifying that only metallurgical coke is utilized as the insulating medium. Alternate materials may be utilized as insulating media, if the VOC content in the alternate insulating media, is less than or equal to the VOC content in the metallurgical coke. The owner/operator shall submit a request to the Department, and receive approval in writing, prior to utilizing any such alternate insulating media.

Good combustion practices will be used for all equipment resulting in VOC combustion emissions except for the diesel emergency generator. Fuel use for hot oil heaters, carbottom furnaces, and preheater is limited to natural gas or propane. Fuel usage will be monitored, recorded and kept on site. Annual tune-ups are required for the hot oil heaters, carbottom furnaces, preheater, and diesel emergency generator.

5.6 BACT for Carbon Dioxide Equivalent (CO_2e)

Beginning on January 2, 2011, greenhouse gases (GHGs) became subject to regulation under the PSD major source permitting program and a regulated NSR pollutant when emitted in amounts greater than certain applicability thresholds. South Carolina has adopted the Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule through a South Carolina General Assembly joint resolution (H4888) issued on June 11, 2010. GHGs are a single air pollutant defined in 40 CFR 52.21(b)(49)(i) as the aggregate group of the following six gases:

Carbon dioxide (CO2);

Nitrous oxide (N2O);

Methane (CH4);

Hydrofluorocarbons (HFCs);

Perfluorocarbons (PFCs); and

Sulfur hexafluoride (SF6).

Due to the nature of GHGs and their incorporation into the definition of subject to regulation, the process for determining whether a source is emitting GHGs in an amount that would make the GHGs a regulated NSR pollutant includes a calculation of, and applicability threshold for, the source based on CO2 equivalent (CO_2e) emissions as well as its GHG mass emissions. Consequently, when determining the applicability of PSD to GHGs, there is a two-part applicability process that evaluates both: the sum of the CO_2e emissions in TPY of the six GHGs, in order to determine whether the source's emissions are a regulated NSR pollutant; and, if so; the sum of the mass emissions in TPY of the six GHGs, in order to determine if there is a major source or major modification of such emissions.

For PSD permits issued on or after July 1, 2011, PSD applies to the GHG emissions from a proposed major modification if the source is subject to PSD for another pollutant and the potential to emit GHGs is greater than or equal to 75,000 TPY on a CO_2e basis and greater than zero TPY on a mass basis. Mass based emissions from the Showa Denko expansion are greater than zero TPY and CO_2e emissions are over 75,000 TPY; therefore, this expansion project triggers BACT for CO_2e.

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The proposed project includes process areas that are subject to PSD review and that will have CO_2e emissions increases requiring a BACT evaluation. The table below presents these process areas and the estimated maximum annual CO_2e emissions from these areas, including emissions generated from the formation of CO_2 from the thermal oxidizers. The CO_2e emissions generated are labeled as "process" or "combustion." No existing sources that are being utilized as part of this project emit CO_2e so CO_2e BACT was performed for only new sources emitting CO_2e. The combustion CO_2e emissions are generated from natural gas combustion with propane used as the backup fuel and the GHG pollutants emitted are CO_2, N_2O and CH_4. CO_2 is emitted from hot oil heaters, carbottom furnaces and preheater because it is a combustion product of any carbon-containing fuel. In the combustion of a fossil fuel, the fuel carbon is oxidized into CO and CO_2. N_2O will be emitted due to partial oxidation of nitrogen in the air used as the oxygen source for the combustion process. CH_4 is emitted as a result of incomplete combustion. Process CO_2 emissions are generated from the combustion of binder pitch volatiles in the bake process and combustion of impregnation pitch volatiles in the rebake process and for the graphitizing furnaces, combustion of insulating media.

Table 12 – Estimated Annual CO_2e Emissions

Process Area/Equipment Description	Equipment ID No.	Estimated Maximum Annual CO_2 Emissions (ton/yr)	Estimated Maximum Annual CH_4 Emissions (ton/yr)	Estimated Maximum Annual N_2O Emissions (ton/yr)	Estimated Maximum Annual CO_2e Emissions (ton/yr)
New Mill, Mix and Extrusion Process: • Hot Oil Heater (combustion)	E-110-2-4275-01	3,025	0.05	0.22	3,093
New Bake/Rebake Process: • 15 Carbottom Furnaces (process and combustion) - 18 million BTU/hr, each furnace and 16 million Btu/hr thermal oxidizer (process and combustion)	E-210-2-4271-18/32	196,087	2.82	12.46	200,009
New Pitch Impregnation Process: • 12 million BTU/hr Preheater (combustion)	E-310-2-4272-21	7,260	0.12	0.52	7,424
New Pitch Impregnation Process:	E-310-2-4275-01	3,025	0.05	0.22	3,093

Commented [A7]: This inadvertently got left off of original table but was included in original total CO2e and BACT analysis.

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Table 12 – Estimated Annual CO_2e Emissions					
Process Area/Equipment Description	**Equipment ID No.**	**Estimated Maximum Annual CO_2 Emissions (ton/yr)**	**Estimated Maximum Annual CH_4 Emissions (ton/yr)**	**Estimated Maximum Annual N_2O Emissions (ton/yr)**	**Estimated Maximum Annual CO_2e Emissions (ton/yr)**
• Hot Oil Heater (combustion)					
New Pitch Impregnation Process: • 7.5 million BTU/hr Incinerator, VOC control equipment for autoclave (combustion)	CD-310-2-4333-01	8,870	0.07	0.33	8,973
New Graphitizing Process: • 10 Graphitizing Furnaces (process)	E-460-4271-01/10	32,852	104.5	N/A	35,464
New 1,500 kW Diesel Fuel-Fired Emergency Generator (combustion)	E-240-2-4365-01	118.22	0.064	0.00095	119.87
Total		251,237	107.67	13.75	258,176

At the time of permit application submittal, there was no available CO_2e process data for the graphite electrode process that is currently utilized by the Show Denko facility. GHG emission factors in 40 CFR 98 Mandatory Greenhouse Gas Reporting, Subpart F - Aluminum Production were used to estimate the process CO_2e emissions from the graphitizing furnaces and carbottom furnaces. The green anode baking furnaces in the aluminum industry are similar to the anode baking furnaces (carbottom) at Show Denko; therefore, the pitch volatiles combustion factors were used. There is no graphitizing process in the primary aluminum industry, but the packing media in the bake furnace (fluid coke- a needle coke product) is similar to the media used in graphitizing furnaces (insulating media); therefore, the bake furnace packing material emissions factors were used. Carbonization does not begin until temperatures reach over 900 °F. Because the low temperature of the autoclave/pitch impregnation (500 °F) indicates no baking/carbonization occurs, CO_2e is emitted only through the thermal oxidizer combusting the process volatiles. The facility has since performed CO2 engineering tests on the following three existing sources to confirm the presence of CO2 emissions and to verify the appropriateness of the Subpart F emission factor use: carbottom furnaces thermal oxidizer, pitch impregnation thermal oxidizer and the graphitizing stack and roof vent. Further testing on the

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existing graphitizing stack has revealed methane emissions that contribute to CO_2e emissions.

Process design

The Showa Denko process uses specific temperature, cycle times and raw material to manufacture the size and quality of graphite electrode required by their customers. The use of the carbottom furnaces as well as the process operation is critical to the expansion of the existing facility and the use of any other type of furnace would be considered redesigning the source and therefore, not considered in the BACT analysis. However, the discussion below has been added for informational purposes only to demonstrate the carbottom furnaces are the most efficient furnace design. Showa Denko's processes operate 24 hours per day, 7 days a week. The process is designed so that the individual carbottom furnaces are in different stages of cycling so the overall bake and rebake process is always operating. The carbottom furnace's firing process takes approximately 14-17 days to complete and the furnaces are used for both the bake and rebake process. Showa Denko's plant in Japan is older and the design requires two separate furnaces for the bake and rebake process: ring furnaces for the bake and tunnel furnaces for the rebake. Ring furnaces can take up to 28 days to complete a bake. Another older furnace design is a pit furnace. The firing process for a pit furnace takes approximately 30-40 days to complete. The carbottom furnace is used almost exclusively in the United States for new or expanding facilities. Based on the amount of time to cycle the bake and rebake process, the use of carbottom furnaces in the bake and rebake process are the most efficient design.

Carbon capture and storage (CCS)

The expanded process at Showa Denko is expected to emit 258,176 tons per year of CO_2e, 251,237 (97%) being CO2 emissions. In the March, 2011 EPA document titled, "PSD and Title V Permitting Guidance for Greenhouse Gases," EPA states they classify CCS as being available control technology for large emitters (power plants), including industrial facilities with "high purity CO2 streams…" CO_2e emissions from large power plants burning fossil fuels are at the very least an order of magnitude greater than those in the Showa Denko expansion. For example, a recently permitted power plant's (Wolverine-Michigan) allowable emission rate is over 6 million tons per year CO_2e. The pollutant streams from this facility are not highly pure CO2. Engineering tests indicate that CO2 is less than 1 % of the stream from the existing graphitizing furnaces and less than 10% of the stream for the carbottom furnaces. Therefore, CCS is not considered an available control technology for this permit. However, the

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discussion below has been added to further clarify the difficulties/hurdles of CCS for this permit action.

- Carbon capture and sequestration

Based on Showa Denko's review of available technologies, sorbents and solvents, cryogenic separation, and/or membrane separation are potential means for separating CO2 from exhaust gases. Separating CO2 from exhaust gases like those at Showa Denko is challenging in that trace impurities (particulate matter, sulfur oxides, NO_X, etc.) can degrade the CO2 capture materials. Captured CO2 gases must then be compressed so that they can be transported to a storage/sequestration site. Compressing captured CO2from near atmospheric pressure to pipeline pressure (about 2,000 pounds per square inch absolute) is an extremely energy intensive process. Producing the energy needed to compress the captured CO2 will result in increased CO2 emissions and increases in traditional criteria pollutants. It is cost prohibitive given the additional equipment and energy necessary to compress the captured CO2. Therefore, capture and compression is currently impractical for both economic and environmental reasons.

- Carbon transport

The transportation of captured and then compressed CO2 is a vital component of the CCS process. There is no CO2 pipeline in the region to transport CO2 from Showa Denko to a storage site. The cost of building a CO2 pipeline (planning, engineering, extensive permitting, right-of-way acquisition, construction, and operation) to an as yet undetermined storage site is not economically feasible for a single facility such as Showa Denko. Transportation via tanker truck would require the liquefaction of the CO2 and is not cost effective based on the energy costs to liquefy the CO2 (which would generate additional CO2in itself) and the transport costs. Therefore, transportation of compressed or liquefied CO2 is not a technically or economically viable option.

- Carbon storage

Storage of CO2 is possible by underground injection and enhanced oil and/or gas recovery and geologic sequestration. Appropriate storage sites for geological sequestration would need to be assessed where the geology could hold the CO2 and prevent it from leaking back up to the surface where it could have the potential to impact human health and ecosystems or potentially contaminate drinking water sources. A few potential CO2 storage locations have been identified (for example,

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off shore underneath the Atlantic Ocean, Tuscaloosa (AL), Mt. Simon (KY) and Knox (KY)) as meeting the minimum sustainability criteria for geologic storage sites; however, each site has barriers to permanent and safe CO2 storage, such as inadequate seals or lack of depth to prevent CO2 leakage or potential fresh water contamination. Additionally, the University of South Carolina is conducting research on the viability of permanent and safe CO2 storage in the South Georgia Rift Basin. The project is still in the first phase of research and the viability of this area for safe and permanent carbon dioxide storage is unknown. Additionally, no suitable depleted natural gas reserves, depleted oil reserves, or deep unmineable coal seams are as yet identified in the vicinity of the Showa Denko facility. Therefore, the storage option is not technically or economically feasible at this time.

5.6.1 Step 1: Identify All Available Control Technologies

The RBLC database was reviewed as well as other PSD permits, such as Nucor Steel-Louisiana, Hyperion Energy Center-South Dakota, PacifiCorp Energy – Utah, Russell City Energy Company, LLC - California and WE Energies – Biomass Fueled Cogeneration-Wisconsin. There were no similar sources to the Showa Denko facility. The BACT analysis identifies the following control technologies that could reduce CO_2e emissions:

<u>Restrict fuel use to fossil fuels with inherently lower carbon content</u>

Restriction of fuel use to lower carbon emitting fuels is technically feasible if it does not redefine the source.

<u>Good Combustion Practices</u>

Good combustion practices imply that the combustion sources (preheater, hot oil heaters and carbottom furnaces) will be operated within parameters promoting efficient and complete fuel combustion, thereby reducing the combustion CO_2e emissions of CO2, N2O and CH4.

<u>Energy efficient design</u>

An efficient combustion unit requires less fuel. Elements affecting energy efficiency for the combustion sources include combustion air preheat and excess air monitoring/control. Air preheat recovers heat from the flue gas by heat exchange with the combustion air before it enters the combustion chamber or furnace. Preheating the combustion air reduces the amount of fuel required in the furnace because the combustion air does not have to be heated all the way from ambient

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temperature to the fuel combustion temperature by combusting fuel. Furnace air/fuel control, which is the installation of oxygen monitors in the combustion unit stack and damper controls on the combustion air dampers, control the air and fuel ratio on a continuous basis. Hot process gases may also be re-circulated to pre-heat the furnaces to reduce the amount of fuel used.

Raw material, insulator usage

Another option is specification of restrictions on the content of raw material needle coke, binder pitch, and impregnation pitch and restrictions on the content of the insulating media as the insulator material provided by suppliers.

Thermal Oxidation of Methane

Methane (CH4) emissions are emitted from combustion of natural gas (propane as back up) and in the process. When incinerated, methane is converted to CO2 and water. This provides a benefit for GHG control because CO2 has a much lower global warming potential than methane.

Oxidation Catalyst

Oxidation catalyst has been widely applied as a control technology for CO and volatile organic compound (VOC) emissions for numerous types of natural gas-fired sources and would provide reduction in CH4 emissions. This technology utilizes excess air present in the combustion exhaust, and the activation energy required for the reaction to proceed is lowered in the presence of a catalyst. Reactants are introduced into a catalytic bed, with the optimum temperature range for these systems being approximately 850 °F to 1,100 °F. No chemical reagent addition is required.

5.6.2 Step 2: Technical Feasibility of Options

The control options were analyzed for their technical feasibility as applied to all process/point sources resulting in CO_2e emissions at the facility.

Lower carbon emitting fuels

In the combustion of a fossil fuel, the fuel carbon is oxidized into CO and CO2. Full oxidation of fuel carbon to CO2 (complete combustion) is desirable because it reduces overall pollutant emissions. Natural gas and propane contain less carbon than coal, residual oil or diesel fuel. Showa Denko has proposed, and BAQ will require, that the proposed combustion sources combustion be restricted to use of

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fossil fuels that emit lower emitting carbon gaseous fuels, specifically natural gas or propane.

Good Combustion Practices

Good combustion practices imply that the combustion sources (preheater, hot oil heaters and carbottom furnaces) will be operated within parameters promoting efficient and complete fuel combustion, thereby reducing combustion emissions. Although CH4 emissions can be reduced by operating the combustion devices at higher flame temperatures, higher excess oxygen levels, and longer furnace residence time, these techniques for reducing CH4 emissions can increase NO_X emissions, which is not desirable. Showa Denko will be using good combustion practices and low NO_X burners and will utilize natural gas (and propane as backup) exclusively as fuel for the two hot oil heaters, preheater and 15 new carbottom furnaces.

Showa Denko has listed the following as good combustion practices:

1. Good air/fuel mixing in the combustion zone;
2. Sufficient residence time to complete combustion;
3. Proper fuel gas supply system design and operation in order to minimize the effect of contaminants and fluctuations in pressure and flow on the fuel gas quality delivered to combustions units;
4. Operator and maintenance practices including good burner maintenance and operation;
5. High temperatures and low oxygen levels in the primary combustion zone;
6. Overall excess oxygen levels high enough to complete combustion while maximizing thermal efficiency.

Good combustion practices #1 through #6 listed above will apply to the hot oil heaters. Good combustion practices #1 through #5 listed above will apply to the preheater and carbottom furnaces. This option is technically feasible. Good combustion practices are deemed not technically feasible for the graphitizing furnaces due to the furnaces being electrically heated (no combustion emissions).

Energy efficient design

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Preheater and furnace air/fuel control: Due to the low exhaust temperature for the preheater, air preheat is not technically feasible based on information from the equipment suppliers. The proposed hot oil heaters have air preheat as an integral part of the design. Continuous excess air monitoring/control is technically feasible for the hot oil heaters. The carbottom furnaces and preheater are direct fired units. Multiple low NO_X burners are installed in the furnaces. While the low NO_X burners will ensure good combustion in the burner itself, the atmosphere in the furnaces requires very low oxygen levels to prevent oxidation and ensure a quality product. Air preheat and furnace air/fuel control is determined to be technically infeasible for the carbottom furnaces.

Furnace waste heat recovery: No combustion sources are used in the graphitizing furnaces. The question is whether hot carbottom furnaces gases collected in the central thermal oxidizer system can be re-circulated to the carbottom furnaces to reduce the amount of fuel needed to pre-heat the furnaces or reduce the amount of fuel used in the bake and rebake process. The furnaces operate under positive pressure and volatile gases from the process are vented to a central thermal oxidizer. In the bake and rebake operation, the carbottom furnaces are cycled such that they are all in use and in a different stage of the process to ensure continuous production. Some furnaces will be in the pre-heat stage, others are in full volatile stage (fuming cycle), and others are in cool down stage. Waste heat could be vented from the central oxidizer system to preheat furnaces, thus reducing the fuel required to heat the furnaces. Or, waste heat from the carbottom furnaces themselves in the volatile stage could be used, in part, to heat the furnaces in the preheat stage.

The carbottom furnaces require a low oxygen environment to prevent oxidation to create the desired product. The oxygen level is maintained at 1-2% in the furnaces. The volatile gases from the furnaces are continually vented to the central thermal oxidizer system. To ensure complete combustion of the volatiles in the central thermal oxidizer system, excess air is introduced into the central thermal oxidizer system prior to combustion and oxygen levels are maintained at 3%. Re-circulating air with oxygen levels at 3% on a bare electrode during any cycle (stage) of the rebake process is technically infeasible. In the bake process, the electrode is protected by sand, so degradation of the electrode by oxidation is not as much of a concern as it is in the rebake process. However, there is a safety issue with re-circulating the volatile rich air from the central thermal oxidizer system to the furnaces in both the bake and rebake cycles. Oxygen must be prevented from entering the furnaces while in the volatile stage (fuming cycle) to avoid explosions. This would require shut off valves at that furnace to avoid any air from the central thermal oxidation system from

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entering into that furnace. The vendor could not guarantee no-leak valves; vendor representatives stated that they have found no valves that did not have some leakage. Therefore, re-circulating the gases during the bake cycle is technically infeasible. Even if there were no leaks from the valves and re-circulated gases were prevented from entering the bake furnaces during the volatile stage, the pre-volatile bake stage is the only stage in which re-circulation of the gases would be useful to pre-heat the furnace.

Raw material, insulator usage

Showa Denko's process requires specific grades of needle coke and pitch as raw materials to meet the specified electrode standards. Showa Denko has stated that few suppliers of required raw materials are available; therefore raw material choices are limited. Furthermore, there are no raw material replacements that could be used to lower CO_2e emissions, and therefore raw material replacement is technically infeasible.

The graphitizing furnaces do not utilize fuel in the process. Rather, electrical resistivity is used to convert the carbon to graphite. Process GHGs are created from the degradation of the insulating media (metallurgical coke) used as an insulator for the electrodes. The insulating media, here, metallurgical coke, is the product of a purification process where unstable components of bituminous coal are released. These unstable components include volatile organic compounds and ammonia. Electrode graphitizing operations in North Carolina and Arkansas, as well as the primary aluminum production industry, use needle coke (petroleum coke-oil derived) as an insulator rather than metallurgical coke. Other insulating alternatives are anthracite. Data provided by the facility indicates the carbon content of metallurgical coke (85-90%) is less than that of needle coke (99%) but similar to anthracite (86.3%). Restricting the carbon content of the insulating media of the graphitizing process is technically feasible. Additionally, the metallurgical coke has desirable qualities for HAP reduction (see case-by-case MACT discussion).

Thermal oxidation of methane

When incinerated, CH4 is converted to CO2 and water. Thermal oxidation of the CH4 in the carbottom furnaces is technically feasible. The facility has proposed, and the draft permit requires the installation of a thermal oxidizer for the carbottom furnaces. Therefore, thermal oxidation of methane is considered technically feasible for the carbottom furnace. Small combustion units are identified the New Mix Mill and Extrusion hot oil heater, Pitch Impregnation preheater and the Pitch

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Impregnation hot oil heater. The exhaust flow rate of each hot oil heater is 967 acfm and the exhaust flow rate of the preheater is 4,600 acfm. Afterburners generally require an exhaust flow rate greater than 5,000 scfm for proper operation; therefore, a thermal oxidizer is not technically feasible for the hot oil heaters and preheater. A thermal oxidizer is considered technically feasible for control of methane from the graphitizing furnaces.

Oxidation Catalyst

The typical oxidation catalyst for CO-containing exhaust gases is rhodium or platinum (noble metal) catalyst on an alumina support material. This catalyst is installed in an enlarged duct or reactor with flue gas inlet and outlet distribution plates. Acceptable catalyst operating temperatures range from 400 to 1250 °F, with the optimal range being 850 to 1,100 °F. Installation of oxidation catalyst in flue gas containing more than trace levels of SO_2 will result in poisoning and deactivation of the catalyst by sulfur-containing compounds. Because of the required exhaust gas temperatures and potential of catalyst poisoning, oxidation catalyst is deemed technically infeasible for the hot oil heaters, preheater and carbottom furnaces. An oxidation catalyst is not deemed technically feasible for the graphitizing furnaces due to the potential of catalyst poisoning.

5.6.3 Step 3: Ranking of Control Technologies and Step 4: Evaluation of Most Effective Controls (Energy, Environmental and Economic Impacts)

Small Combustion Sources

New Mix Mill and Extrusion hot oil heater, Pitch Impregnation preheater and the Pitch Impregnation hot oil heater: The only available control option not eliminated as technically infeasible is the use of natural gas/propane as fuel and good combustion practices. Therefore, there is no need for a ranking of the remaining control technologies or for an evaluation of energy, environmental and economic impacts. CO_2e emission limits have been assigned to these sources based on the fuel emission factor.

Carbottom Furnaces

The facility has proposed, and the draft permit requires, the installation of a thermal for the carbottom furnaces to control volatiles, CO and PM. This control device will, ipso facto, control methane emissions. Uncontrolled methane emissions from the carbottom furnaces are estimated to be 2.82 tons per year, including methane

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generated from natural gas combustion in the incinerator. There is documentation that an incinerator will have a 95% control efficiency with an inlet concentration of 20 ppm; however, the vendor could not provide a control efficiency for a 2.5 ppm inlet concentration. Due to the difficulty of estimating methane destruction efficiency and the small amount of methane emissions, BACT will require a thermal incinerator for the methane, but the emission rate will reflect the uncontrolled methane emissions.

Because GHG BACT is efficiency based, an output based emission limit was explored as well as critical parameter limitations. GHG emissions are generated from three sources: binder pitch volatile combustion, impregnation pitch volatile combustion and natural gas fuel consumption. Non fuel consumption emissions were calculated using Equation F-7 of 40 CFR Part 98 Subpart F, Greenhouse Gas Reporting for Aluminum Production. Review of the variables included in the Equation F-7 reflects the green electrode weight, baked weight, hydrogen loss and waste binder pitch/impregnation pitch.

Equation F-7 is as follows:
ECO2PV = (GA – Hw – BA – WT) x (44/12)
where:
ECO2PV = annual CO2 emissions from pitch volatile combustion (metric tons)
GA = initial weight of green anodes (metric tons)
Hw = annual hydrogen content in green anodes (metric tons)
BA = annual baked anode production (metric tons)
WT = annual waste tar collected (metric tons) = zero for carbottom operation
44/12 = ratio of molecular weights (CO2 to carbon)

Simply manipulating the equation to output based function does not promote efficiency. The purpose of the bake process is to coke the binder pitch in the green electrodes, locking the needle coke particles in place to yield one strong carbon structure. Efficient operation of the bake/rebake process relies on efficient operation of each of the carbottom furnaces for the process they are being used for (bake or rebake) and optimum flue draft and incineration. The carbottom furnace efficiency is driven by control to bake or rebake schedule (temperature ramp rate), which is predicated by carbon yield. The facility has stated that poor control of the schedule is typically a result of equipment malfunction, which can result in overuse of gas, loss of product, and loss of oxygen/pressure control in the furnace. Furnaces in draft to the collector flue are operated to maintain very low levels of oxygen concentration not only to minimize product loss through oxidation and improve carbon yield and

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to avoid safety hazards. The oxygen is controlled to very low levels by tightly sealing each furnace prior to operation and allowing the heat and volatiles evolved from the coking of the pitch to increase and develop a positive pressure within the furnace during the heating cycle. The efficiency of the carbottom complex operation can be tracked in three ways: oxidizer control (temperature and O2 concentration), process optimization and gas consumption. The oxidizer temperature and oxygen are continuously monitored, the input and output weight of each electrode is measured, and fuel consumption is continuously measured.

BACT is determined to be a CO_2e limit of 200,009 TPY (12- month rolling sum), the operation of the thermal oxidizer, process optimization, good combustion practices and the use of natural gas/propane as fuel. Process Optimization implies the carbottom furnaces will be operated within parameters promoting efficiency, thereby reducing CO2 emissions. Showa Denko has listed the following as process optimization:

1. Proper furnace scheduling for control to temperature ramp rate
2. Monitoring of thermal oxidizer temperature and oxygen levels
3. Operator and maintenance practices, including training in the proper sealing of each furnace prior to operation
4. Optimum product yield

<u>Graphitizing Furnaces</u>

Because GHG BACT is efficiency based, an output based emission limit was explored as well as critical parameter limitations. GHG emissions were calculated using Equation F-8 of 40 CFR Part 98 Subpart F, Greenhouse Gas Reporting for Aluminum Production.

ECO2PC = PCC x BA x ([100-Spc-Ashpc]/100) x (44/12)
where:
ECO2PC = annual CO2 emissions from furnace packing material (metric tons)
PCC = annual packing coke consumption (metric tons/metric ton baked)
BA = annual baked anode production (metric tons)
Spc = sulfur content in packing coke (weight percent)
Ashpc = ash content in packing coke (weight percent)
44/12 = ratio of molecular weights (CO2 to carbon)

Simply manipulating the equation to output based function does not promote

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efficiency. The packing coke consumption rate, packing coke sulfur content, and packing coke ash content are the main variables affecting CO2 emissions. Increasing the sulfur and ash contents of the packing coke will reduce the CO2 emissions. However, increased sulfur and ash contents will increase sulfur dioxide and particulate matter emissions which have established ambient air quality standards. Therefore, there will be no requirement to maximize sulfur and ash content. BACT for SO_2 and PM have been established in this permit.

The purpose of the Graphitization process is to convert the amorphous carbon structure of needle coke and coked pitch that comprise the electrode into a tighter, more conductive graphitic structure. In preparation, rebaked electrodes are placed horizontally, end to end in a furnace to create a conductive circuit. Electrodes are packed within the furnace using an insulating media. The goal of the insulating media is to minimize the potential for oxidation of the electrodes, isolate current flow, and provide a controlled dissipation of heat during the furnace's operation. Once a furnace is prepared, electric current is charged through the electrode circuit via a rectiformer, resistively heating the electrodes to 2900°C in order to graphitize them. A graphitization building is comprised of a number of electrically fired furnaces which are lined up within one building. Furnaces are tied together to a common duct and stack when hooded, and emissions draft to a common roof vent when not hooded. The building is divided into groups of furnaces, which share a common rectiformer. Each rectiformer is only used to heat one furnace at a time. Due to plant power supply and related costs, the power consumption of each rectiformer is generally staggered so as to minimize peak power demand. Since peak power consumption is in-line with the peak in the graphitization cycle, this impacts the cycling and emissions of the furnaces.

Efficient operation of the graphitization line relies on furnace scheduling that synchronizes product flow with rectiformer power demand. The graphitizing furnace efficiency is driven by control to firing schedule, which is predicated carbon yield and effectiveness of the furnace packing. Poor control to the schedule is typically a result of equipment malfunction or poor furnace loading practices, and can result in overuse of power, loss of product, or excessive loss of packing media. Reducing insulating media will reduce CO2 emissions. Effective packing will minimize media consumption, and dissipate heat at a rate in keeping with the furnaces heating and cooling cycles. A packing media that is too high in ash will break down into fine particles that can lead to too dense of a furnace pack, extending cooling times, and may also increase particulate emissions. The carbon content of the packing media is the contributor to CO2 emissions, and increasing ash or even sulfur content of the

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packing media would result in a lower carbon content of the packing media. However, similarly to increased ash, a packing media that is too high in sulfur will lead to increases in other emissions, in this case SO_2. The efficiency of the graphitization building is measured by: maximizing graphite production yield, minimizing electrical cost; and minimizing packing media consumption.

Due to the high flow rate of the graphitizing furnaces, two (2) regenerative thermal oxidizers (RTOs) would be required (each 6.5 million Btu/hr). Showa Denko has documented a vendor guarantee of 98% control of methane from the graphitizing furnaces, however the cost to reduce methane would be approximately $12,844 per ton removed (based on 104.5 uncontrolled tpy of methane) and is therefore not cost effective. Also, the use of RTOs to control methane emissions from the graphitizing furnaces would result in an increase of 5.58 tpy of NO_X emissions and 6,739 tpy of CO_2e and would therefore contribute to adverse environmental impacts. The RTOs would contribute to more CO_2e than it would control (2,612 tpy CO_2e from methane). Using this same methodology, the use of thermal oxidizers is also deemed not cost effective or environmentally beneficial.

BACT is determined to be a CO_2e limit of 32,852 TPY (12- month rolling sum), insulating media carbon content 90 % or less and process optimization. Process Optimization implies the graphitizing furnaces will be operated within parameters promoting efficiency, thereby reducing CO2 emissions. Showa Denko has listed the following as process optimization:

1. Proper furnace scheduling to minimize power demand
2. Operator and maintenance practices, including training in effective furnace packing
3. Optimum product yield available control technologies deemed technically feasible for PM/PM10/PM2.5 control are ranked in Table 3 from the most to least effective based on emission reduction potential (% control efficiency).

5.6.4 Step 5: Select BACT

The evaluation of the most effective control (Step 4) did not reach a conclusion between the wet scrubber and baghouse. The baghouse is selected as the preferred control method since the facility has proposed this control as part of the design for the expansion. The control method for filterable and condensable PM, PM10, and PM2.5 control along with proposed BACT limits are listed in Table 4 below:

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Table 13 – Selection of CO_2e BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
New Mill, Mix and Extrusion Process/ Hot Oil Heater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	3,093 TPY CO_2e
New Bake/Rebake Process/ 15 Carbottom Furnaces	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up Thermal Oxidizer Process optimization	200,009 TPY CO_2e
New Pitch Impregnation Process/ Preheater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	7,424 TPY CO_2e
New Pitch Impregnation Process/ Hot Oil Heater	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	3,093 TPY CO_2e
New Pitch Impregnation Process/ Fume Incinerator	Good Combustion Practices; Natural gas and propane as sole fuels; Annual Tune Up	8,973 TPY CO_2e
New Graphitizing Process/ 10 Graphitizing Furnaces	Insulating media carbon content Process optimization	32,852 TPY CO_2e insulating media carbon content 90%
New Emergency Generator	Good Combustion Practices	Operational limit of 100 hours for maintenance

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6.0 Summary of BACT Limits

Table # - Summary of BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
New Mill, Mix and Extrusion Process (all equip. excluding Mixers, Mixer Discharge Belt, Screw Spreader, Cooling Belts, Homogenizer, Homogenizer Belt and Hot Oil Heater)	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5)
New Mill, Mix and Extrusion Process/ Mixers, Mixer Discharge Belt, Screw Spreader, Cooling Belts, Homogenizer and Homogenizer Belt	Baghouse/Dry Fume Scrubber	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM10) 0.005 gr/dscf (Filterable PM2.5) 0.07 lb VOC/hr
New Mill, Mix and Extrusion Process/ Hot Oil Heater	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as back-up fuel source; Low NO_X burners	0.0022 lb/million Btu (Filterable PM) 0.0022 lb/million Btu (Filterable PM10) 0.0022 lb/million Btu (Filterable PM2.5) 0.0056 lb/million Btu (Condensable PM10) 0.0056 lb/million Btu (Condensable PM2.5) 0.082 lb CO/million Btu 0.10 lb NO_X/million Btu 0.012 lb VOC/million Btu 3,093 TPY CO_2e Good Combustion Practices #1-6
New Mill, Mix and Extrusion Process/Binder Pitch Tank	Vent Condenser	0.40 lb VOC/hr
New Bake/Rebake Process/ 15 Carbottom Furnaces	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as back-up fuel source; Thermal Oxidizer; Low NO_X Burners, Process	4.14 lb/hr (Filterable PM) 4.14 lb/hr (Filterable PM10) 4.14 lb/hr (Filterable PM2.5) 2.85 lb/hr (Condensable PM10) 2.85 lb/hr (Condensable PM2.5) 2.0 lb CO/hr 75.22 lb NO_X/hr Maximum Nitrogen Content (% by

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Table # - Summary of BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
	Optimization	weight), subject to change based on prior Departmental notification 17.3 lb VOC/hr 200,0009 TPY CO_2e Good Combustion Practices #1-5
Existing Rebake Load and Unload/Graphitizing Preparation Process	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Sand Storage Bin	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Sagger Unloading and Loading System	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Bake Load and Unload and Baked Electrode Cleaning Process	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Bake Load and Unload and Baked Electrode Cleaning Process/Sagger Cleaning and Electrode Cleaner	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Pitch Impregnation Process/ Preheater	Good Combustion Practices; Annual Tune Up; natural gas as primary/propane as back-up fuel source; Low NO_X burners	0.0023 lb/million Btu (Filterable PM) 0.0023 lb/million Btu (Filterable PM10) 0.0023 lb/million Btu (Filterable PM2.5) 0.0056 lb/million Btu (Condensable PM10) 0.0056 lb/million Btu (Condensable PM2.5) 0.083 lb CO/million Btu 0.10 lb NO_X/million Btu 0.011 lb VOC/million Btu 7,424 TPY CO_2e Good Combustion Practices #1-5
New Pitch Impregnation Process/ Hot Oil Heater	Good Combustion	0.0022 lb/million Btu (Filterable PM) 0.0022 lb/million Btu (Filterable PM10)

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Table # - Summary of BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
	Practices; Annual Tune Up; natural gas as primary/propane as back-up fuel source; Low NO_X burners	0.0022 lb/million Btu (Filterable PM2.5) 0.0056 lb/million Btu (Condensable PM10) 0.0056 lb/million Btu (Condensable PM2.5) 0.082 lb CO/million Btu 0.10 lb NO_X/ million Btu 0.012 lb VOC/million Btu 3,093 TPY CO_2e Good Combustion Practices #1-6
New Pitch Impregnation Process -Autoclave/spray cooler/cooling bath	Thermal Oxidizer	3.083 lb VOC/hr 8,973 TPY CO_2e
Existing Pitch Impregnation Process/Impregnation Pitch Storage Tanks	Vent Condenser	0.055 TPY (total)
Existing Insulating media Receiving Process	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Graphitizing Process/ 10 Graphitizing Furnaces	Wet Scrubber; Process Optimization	4.19 lb/hr (Filterable PM) 4.15 lb/hr (Filterable PM10) 4.12 lb/hr (Filterable PM2.5) 2.65 lb/hr (Condensable PM10) 2.65 lb/hr (Condensable PM2.5) 1,690 lb CO/hr (total for stack and roof emissions) 2.5 lb NO_X/hr (total for stack and roof emissions) Maximum Nitrogen Content (% by weight), subject to change based on prior Departmental notification Perform initial analysis for nitrogen content on insulating media 3.3 lb/hr VOC, total for stack and roof

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Table # - Summary of BACT Limits		
Process/Equipment	**Control Method**	**Proposed BACT Limit**
		emissions (based on 96 hour block average) 32,852 TPY CO_2e insulating media 90% carbon
New Graphitizing Process/ Gulper System and Insulating media Dust Bins	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Graphitizing Process/ Insulating media Recycle (Gulper System)	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Cleaning and Inspection Process/ Electrode Cleaning Machine	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Machining and Shipping Process/Station No. 1, Station No. 3, Graphite Chip Screen, and Graphite Storage Bins	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Machining and Shipping Process/Station No. 2	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
Existing Machining and Shipping/ Powderizer System, Cyclone Collector, and Bag Packer	Baghouse	0.005 gr/dscf (Filterable PM) 0.005 gr/dscf (Filterable PM_{10}) 0.005 gr/dscf (Filterable $PM_{2.5}$)
New Emergency Generator	Annual Tune Up	Operational Limit of 100 hours for maintenance

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7.0 Air Quality Impact Analysis

For a major facility, PSD regulations require an applicant to analyze the impact from the construction of a proposed new source(s) on the following areas:

1. Compliance with the National Ambient Air Quality Standards (NAAQS);
2. Compliance with the PSD Increments;
3. Significant impact on PSD Class I Areas, including Class I PSD increments;
4. Impairments to visibility, soil, and vegetation; and
5. Air Quality impact of general growth associated with the source.

All minor and major sources proposing new construction or construction modifications in South Carolina (SC) are also required to demonstrate that their facility will remain in compliance with South Carolina Regulation 61-62.5 Standards 2 (AAQS), and 7 (Class II PSD Increments).

General results of this compliance demonstration indicate that there will be no exceedances of Full Impact or South Carolina ambient air quality standards or PSD increments. Refined Class I modeling indicated that there will also be no adverse effects on visibility, vegetation, or soils in any of the Class I areas within 200 km of the facility/source.

OR

[possible discussion of exceedance] The results of the Full Impact compliance demonstration predict exceedances of the 1-hr SO_2, 1-hr NO_2, and 24-hr $PM_{2.5}$ NAAQS on or in the vicinity of the (facility B) facility. However, all of the exceedances are caused by emissions from the (facility B) facility, and, with one exception, emissions from the (project facility) facility do not contribute to the exceedances. In the one exception where (project facility) contributions are above the SIL for an exceeding receptor, the receptor is on the (facility B) facility property and there is no exceedance predicted without the contributions from the (facility B) sources. Modeling predicts compliance for all other ambient air quality standards and increments. It is also predicted that this project will not cause any adverse effects on visibility, vegetation, or soils nor will there be any adverse effects caused by growth associated with this project.

All minor and major sources proposing new construction are also required to demonstrate compliance with South Carolina Regulation 61-62.5 Standard No. 8 (toxics) unless otherwise exempt. [possible discussion of air toxics] All emissions of

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toxic air pollutants from the proposed facility will be emitted from sources which will be in compliance with a Maximum Achievable Control Technology (MACT) standard at startup and/or are the product of the burning of virgin fuel. As such, the proposed facility is exempt from the requirements of Standard 8 and no modeling is required for this standard.

7.1 PSD Class II Modeling Analysis

The PSD Review requires pollutants, which are determined to be "major", be evaluated by an Air Quality Impact Analysis and Additional Impacts Analysis. The Air Quality Impact Analysis consists of (1) a Preliminary Modeling Analysis to determine which pollutants from the proposed project at the facility only, exceed their Class II Significant Impact Levels (SIL); and (2) a more comprehensive Full Impact Analysis based on concentrations of pollutants that exceed the SIL for the facility and additional 'facility-wide' impacts from other facilities that may impact the Significant Impact Area (SIA). The Additional Impacts Analysis evaluates the impacts on soils, vegetation, and visibility effects.

7.1.1 PSD Class II Preliminary Modeling Analysis

Potential emission rates or net emission rate increases for each pollutant determined to be significant (Table #) at the facility were modeled to determine (a) the Significant Impact Level (SIL); (b) the impact area within which a Full Impact Analysis must be performed; and (c) whether or not the facility may be exempted from the ambient monitoring data requirements. Each of these three preliminary Class II analyses is discussed below.

7.1.1.1 Significant Impact Level (SIL) Analysis

If an impact is less than the SIL, then no further PSD analysis is required. Table # provides the results of the SIL modeling analysis for this project for the "major" pollutants as defined above. Maximum concentrations are used for the Significant Impact Level analysis (i.e. Highest-First-High). This analysis, which shows SILs were exceeded for PM_{10}, $PM_{2.5}$, SO_2, and NO_2 for the averaging periods indicated. Therefore, a Full Impact analysis was required for these pollutants. No further PSD analysis is required for CO; however, CO must be included in the facility-only South Carolina Standard 2 modeling. The Full Impact analysis assessed the combined impacts of the significant impact pollutants from the facility sources along with those from other sources in the Significant Impact Area (SIA) and the Screening Area as appropriate.

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Table 14 – Class II PSD (PSD) Significant Impact Level						
Pollutant	**Averaging Time**	**Model Used**	**Maximum Impact (µg/m³)**	**SIL (µg/m³)**	**Exceeds SIL (Yes/No)**	**Significant Impact Area (km)**
PM_{10}	24 Hour	AERMOD		5		
	Annual	AERMOD		1		
$PM_{2.5}$	24 Hour	AERMOD		1.2		
	Annual	AERMOD		0.3		
SO_2	1 Hour	AERMOD		8		
	3 Hour	AERMOD		25		
	24 Hour	AERMOD		5		
	Annual	AERMOD		1		
NO_2	1 Hour	AERMOD		8		
	Annual	AERMOD		1		
CO	1 Hour	AERMOD		2000		
	8 Hour	AERMOD		500		
Ozone is not modeled, but a general impact assessment is to be made if the source is major for ozone as determined in Table #.						
There is no SIL for fluorides, lead, H_2S, and H_2SO_4. These pollutants will be modeled in Section E – SC State modeling as applicable.						
TSP is not considered a criteria pollutant for this analysis.						

The Southeastern United States, including South Carolina, is NO_X limited with regards to ozone formation. This means that there is an excess of VOC in the atmosphere with regards to ozone formation and increases in VOC do not lead to increases in ozone production. The excess VOC is in part due to natural sources in the environment. Due to the excess VOC, only increases in NO_X in this region are a concern with regards to ozone formation. Ambient impacts from NO_X are addressed in NO_2 modeling.

Due to the highly complex reactions involving formation of ozone in the atmosphere, there is no "preferred" EPA guideline model for individual NO_X source emissions and, hence, ambient air quality demonstrations are not required to be included for NO_X (precursor for ozone). In order to estimate impacts on ozone, increases in NO_X from the project were compared with the total NO_X emissions from facilities in the surrounding SIA and SA. The total of the NO_X emissions for these facilities is _____ tons/year. The project NO_X emissions increase is _____tons/year. This represents a NO_X emissions increase of just _____% for the region. The representative ozone monitoring station for this area, located approximately _____ km from the project

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location, is the _____ monitor located in _____ County. The most recent design value of _____ ppm for this station shows that the area is currently in attainment with the 8-hour ozone standard. In fact, all South Carolina ozone monitoring data shows that the entire state is meeting this standard. Based on this small increase in NO_X, it is estimated that this project will have minimal impact on overall ozone formation within the surrounding area and should not exceed the current 8-hr ozone standard.

7.1.1.2 Significant Impact Area (SIA) Analysis

The impact area is a circular area with a radius extending from the source to (1) the most distant point where approved dispersion modeling predicts a significant ambient impact will occur (greater than or equal to the SIL), or (2) a modeling receptor distance of 50 km, whichever is less. An impact area is initially established for each pollutant for every averaging time. Sources within the SIA will be used for this analysis. Table VI-1 indicates the maximum distances to significant impacts. All sources within _____ radius were included for each pollutant accordingly.

7.1.1.3 Significant Monitoring Concentration Analysis

Modeling significance results for PM_{10}, SO_2, NO_2, and CO are shown below along with significant monitoring concentrations for these pollutants. The significant monitoring concentrations are from SC Regulation 61-62.5, Standard No. 7. Impacts are the maximum modeled concentrations for each pollutant (i.e. Highest First High).

Table # shows…

Table 15 – Significant Monitoring Concentrations

Pollutant	Averaging Period	Max. Impact (µg/m³)	Significant Monitoring Concentration (µg/m³)	Exceeds (Y or N)
PM_{10}	24 Hour		10	
$PM_{2.5}$	24 Hour		4	
SO_2	24 Hour		13	
NO_2	Annual		14	
CO	8 Hour		575	

The maximum impacts for (e.g. SO_2, NO_2, and CO) are below the significant monitoring concentration (SMC) levels, therefore, no pre-construction monitoring is required for these pollutants. The (PM_{10} and $PM_{2.5}$) concentrations exceed the SMC. Section 2.4 of U.S. EPA's *Ambient Monitoring Guidelines for Prevention of Significant*

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Deterioration (EPA-450/4-87-007) permits the use of existing representative air quality data in place of preconstruction monitoring data, provided monitor location, quality of data, and currentness of data are acceptable. According to the EPA document listed above, monitoring data from a regional site may be used as representative data in these cases. SC DHEC approves the use of data from the _____station in _____ County, SC for PM_{10} background data and from the _____ , station in _____ County, SC for $PM_{2.5}$ background for this project. Both of these stations meet PSD modeling requirements.

SC DHEC also approves the use of the Jenkins Avenue SO_2 data as a conservative background for the project's full impact modeling. There are no non-urban NO_2 monitoring stations other than the Cape Romain station located in the Cape Romain Class I area on the coast of South Carolina. Since the Cape Romain location is not considered representative for the proposed facility location and the other available SC locations are overly conservative for the rural location of the proposed facility, the use of the data from the Paulding County site in Georgia was considered. The Paulding County station is located in a rural area about 45 km west of the Atlanta metropolitan area and is operated as part of the ambient monitoring network by the state of Georgia. The NO_2 data from this site meets the PSD modeling requirements for use as background data. SC DHEC approves the use of the Paulding County NO_2 data as a representative background for the projects full impact modeling.

7.1.2 PSD Class II Full Impact Modeling Analysis

A Full Impact Analysis is required for any pollutant for which the proposed source's estimated ambient pollutant concentrations meet or exceed the SIL's (determined in Table #). Separate analyses are performed for determining compliance with the NAAQS and PSD increments. The NAAQS analysis must also include background pollutant concentrations. The Full Impact Analysis consists of modeling all facilities within the SIA, and those in the SA, which are not excluded by the screening protocol. The SA used is an area extending 50 km beyond the SIA for each pollutant and averaging period. The "Screening Threshold Method for PSD Modeling" or "20D Rule" was used to determine which sources within the Screening Area to include.

In order to exclude a source, the annual emissions of a pollutant must be less than 20 times the distance (km) from the SIA to the source in the screening area. Sources within 2 km of each other were summed prior to applying the 20D Rule. Each calculated 20D distance was compared to the annual emission of each pollutant. Those sources with annual emissions greater than or equal to 20D were retained and

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considered in both the Full Impact modeling analysis for the Class II NAAQS analysis and the Class II PSD Increment analysis.

7.1.2.1 PSD Class II Full Impact - National Ambient Air Quality Standards (NAAQS) Analysis

Table # shows a list of facilities that are included in the full impact analysis for NAAQS modeling.

Table 16 – Class II Full Impact Analysis – NAAQS SIA and 20D Sources				
PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO
____ was eliminated in the Significant Impact Level analysis.				

Table # shows that when proposed facility emissions are modeled with other sources in the SIA and SA, and background values are added, the National Ambient Air Quality Standards are not exceeded and compliance has been demonstrated.

OR

[possible discussion of exceedance] The results shown in Table VI-4 of the Full Impact compliance demonstration predict exceedances of the 1-hr SO_2, 1-hr NO_2, and 24-hr $PM_{2.5}$ NAAQS on or in the vicinity of the _(facility B)___facility. However, all of the exceedances are caused by emissions from the _ (facility B)____facility, and, with one exception, emissions from the _(project facility)__ facility do not contribute to the exceedances. In the one exception where _ (project facility) _ contributions are above the SIL for an exceeding receptor, the receptor is on the __(facility B)____facility property and there is no exceedance predicted without the contributions from the ___(facility B)___sources. Modeling predicts compliance for all other ambient air quality standards and increments and it has been determined that emissions from

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the proposed (project facility) will not cause or contribute to any violation of a NAAQS.

Table 17 – NAAQS Class II Full Impact Analysis

Pollutant	Averaging Time	Model Used	Maximum Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Total (µg/m³)	Standard (µg/m³)	% of Standard
PM_{10}	24 Hour	AERMOD				150	
	Annual	AERMOD				50	
$PM_{2.5}$	24 Hour	AERMOD				35	
	Annual	AERMOD				15	
SO_2	1 Hour	AERMOD				196	
	3 Hour	AERMOD				1300	
	24 Hour	AERMOD				365	
	Annual	AERMOD				80	
NO_2	1 Hour	AERMOD				188	
	Annual	AERMOD				100	
CO	1 Hour	AERMOD				40,000	
	8 Hour	AERMOD				10,000	

Backgrounds are summarized in Section E.

The highest-first-high modeled concentrations for the 5 years of Meteorological data are listed for annual averaging periods and the highest second-high for short-term averaging periods.

A detailed listing of dispersion parameters of each off-site source, as well as each respective modeled emission rate included in the Class II NAAQS Full Impact Analysis, is included in the facility's application (Dated _____, and subsequent revisions and/or additions) and the corresponding electronic modeling files. Those tables were not re-produced for this summary.

7.1.2.2 PSD Class II – PSD Increment Analysis

The full impact analysis for PSD increment consuming sources is performed in the same manner as the full impact analysis for the NAAQS shown above. The sources included are all increment consuming sources from the facility and those previously identified within the SIA and SA.

Table # shows…

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Table 18 – SIA and 20D PSD Increment Consuming Sources			
PM_{10}	**$PM_{2.5}$**	**SO_2**	**NO_X**

The emissions from the proposed _____ facility were combined with those from additional non-facility sources identified in Table VI-5 and included in the PSD Class II Full Impact Increment modeling analysis. Table # indicates that the maximum impact for each averaging period and each pollutant was determined to be less than the PSD increment standard for each averaging period. Highest-first-high values were used for annual averaging periods and highest-second-high for all short-term averaging periods.

Table 19 – PSD Class II Increment Analysis					
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration (µg/m³)**	**Standard (µg/m³)**	**% of Standard**
PM_{10}	24 Hour	AERMOD		30	
	Annual	AERMOD		17	
$PM_{2.5}$	24 Hour	AERMOD		9	
	Annual	AERMOD		4	
SO_2	3 Hour	AERMOD		512	
	24 Hour	AERMOD		91	
	Annual	AERMOD		20	
NO_2	Annual	AERMOD		25	
The highest-first-high modeled concentrations for the 5 years of Meteorological data are listed for annual averaging periods and the highest second-high for other averaging periods.					
* The SIL was not exceeded for this averaging period so a full impact increment analysis was not required.					

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7.2 Additional Impacts Analysis

PSD review requires an analysis of any potential impairment to visibility, soils, and vegetation that may occur as a result of the proposed or modified facility/sources. The review also requires an analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial, and other growth associated with the expansion.

7.2.1 Growth

The SC PSD rules require the applicant to provide information relating to the nature and extent of air quality impacts from all commercial, residential, industrial and other growth, which has occurred since August 7, 1977, in the area the facility, or modification, would affect. For the purposes of this report, the area the facility would affect is defined as the area of significant impact. The greatest significant impact distance was determined to be _____ km. The facility will have approximately __ employees. It is anticipated that the workforce will come from already existing local population in an area where unemployment is high.??????????????????????????????. There will be increased truck traffic between the ????? site and the proposed facility location but the increase (compared to growth without the facility) will be minimal. The closest ????? site supplying materials to the site would be expected to be outside the SIA for all pollutant averaging periods. Therefore, the construction and modification of the facility and any workforce growth associated residential and commercial growth is not expected to cause or contribute a quantifiable adverse impact on local ambient air quality.

7.2.2 Soils and Vegetation

Maximum predicted offsite impacts (highest first high) were compared to EPA secondary NAAQS or screening levels. The only predicted impacts exceeding these concentrations were for the full impact List Pollutants modeling. However, as previously mentioned, emissions from the proposed facility do not cause or contribute to any predicted violations. Thus, modeling of all the proposed emissions for the soils and vegetation analysis indicates that there will be no adverse impacts expected on soils or vegetation caused by the proposed facility emissions.

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Table 20 – Soils and Vegetation Analysis

Pollutant	Averaging Time	Model Used	MAX. Impact (µg/m³)	Back-ground (µg/m³)	Facility / Regional Impact (µg/m³)(2)	EPA Screening Concentration (µg/m³)	AAQS Standard (µg/m³)	Exceeds ?
PM_{10}	24 Hour	AERMOD				N/A	150	
	Annual	AERMOD				N/A	50	
SO_2	1 Hour	AERMOD				917	N/A	
	3 Hour	AERMOD				786	1300	
	Annual	AERMOD				18	80	
NO_2	4 Hour (3)	AERMOD	(1)			3760	N/A	
	8 Hour (3)	AERMOD	(1)			3760	N/A	
	1 Month (3)	AERMOD	(1)			564	N/A	
	Annual	AERMOD	(1)			94	100	
CO	1 Week (4)	AERMOD	(1)			1,800,000	N/A	
Fluoride	10 Day (4)	AERMOD	(1)			0.5	--	
Lead	3 Month (6)	AERMOD	(1, 7)	0.004		0.15	--	
Sulfuric Acid Mist	24 Hour	AERMOD	(1, 3)	N/A		--	10 (5)	

1) Concentrations include only the facility impacts since they either did not exceed the Significant Impact Levels or none were available. All other values include full impact sources.
2) Results include background values when available.
3) Averaging period concentrations were determined directly using selected periods in modeling software, and not by applying conversion factors to a 1-hour concentration.
4) Non-Standard Averaging period was conservatively estimated as follows:
1 Week CO = 8-hour concentration compared to weekly standard. Background is also 8-hr value.
10 Day Fluoride = 24-hour concentration was compared to 10-day standard
5) Standard 8 concentration was used since there was no EPA level available.
6) Lead is the maximum 3-month rolling average over the modeling period.
7) The highest monthly concentration was compared to the standard as a conservative approach.

7.2.3 Visibility

Visibility analyses for Class II areas are not necessary for this project, as there are no visibility sensitive located within the project's Significant Impact Area (SIA) for non 1-hr NAAQS pollutants.

OR

This visibility impairment analysis is distinct from the Class I visibility impact analysis. VISCREEN was used following the guidelines published in the *Workbook for Plume Visual Impact Screening and Analysis* (EPA-450/4-88-015, 1988). The procedure consists

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of a screening process done through several levels. A nearby sensitive receptor, such as a state park or local airport, is analyzed to determine if an impact is expected. The _____ airport located _____ km southwest of the facility was used for this analysis. Calculations were performed for two assumed plume-viewing backgrounds: the horizon sky and a dark terrain object. As shown in the table below, the screening values are below the thresholds for the _____ airport.

Table # shows… Table # shows…

Table 21 – Visibility Impairment Analysis

Background	Theta	Azi	Distance (km)	Alpha	ΔE Critical	ΔE Plume	Contrast Critical	Contrast Plume
Sky					2.0		0.05	
Terrain					2.0		0.05	
Sky					2.0		0.05	
Terrain					2.0		0.05	

Input values for the Level I screen were: PM = XX lb/hr; NO_2 = XX lb/hr; Primary Sulfate = XX lb/hr; background ozone = XX ppm; observer angle = 11.25 degrees; and background visual range = 25 km.

Table 22 – Visibility Impairment Analysis Inputs

Parameter	Value	Units
Particulate Matter		lb/hr
Nitrogen Dioxide		lb/hr
Primary Sulfur		lb/hr
Background Ozone		ppm
Plume-source-observer angle		degrees
Background visual range		km
Wind Speed		meters/sec
Stability Class		-

7.3 PSD Class I Impact Analysis

A facility within 100 km of a Class I area must perform Class I modeling to determine the impact on the Class I area. For the visibility and deposition analyses, the recommendations in the; 1) *Interagency Workgroup on Air Quality Modeling Phase II Summary Report and Recommendations for Modeling Long Range Transport Impacts (IWAQM)* (EPA-454/R-98-019, December 1998); 2) *Federal Land Managers' Air Quality Related Values Workgroup Phase I Report (FLAG 2010)* (U.S. Forest Service- Air Quality Program, the National Park Service – Air Resources Division, and the U.S. Fish &

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Wildlife Service – Air Quality Branch, December 2000); 3) *Regional Haze Regulations and Guidelines for Best Available Retrofit Technology* (U.S. EPA, June 15, 2005); and 4) U.S. EPA's *Guidelines on Air Quality Models (Guideline)*, are to be followed.

Dispersion modeling was performed to evaluate the potential impacts to the _____, located approximately ____ km to the _____south of the proposed facility. Given the complex nature of the meteorology in a shoreline environment and the recommendations of the various regulatory agencies, the CALPUFF model was used for performing all of the air dispersion modeling for this project. MM5 (mesoscale meteorological forecast model) data for 2001, 2002, and 2003 was used in CALMET (version 5.8) to provide input into CALPUFF (version 5.8). CALPOST (version 5.6394) was used as the postprocessor to generate the ambient concentrations of PM_{10}, SO_2, and NO_X at the Class I areas for comparison to; 1) the PSD Class I increment modeling significance level; 2) the total deposition of sulfur and nitrogen for assessment against the deposition assessment threshold values for sulfate and nitrate set by the FLM (DAT); and 3) the 24-hour average visibility impairment.

CALPUFF modeling was not performed by SCDHEC for this project, but was accepted by South Carolina upon approval of the Federal Land Manager. A summary of Class I impact results, as provided in the July 2006 submittal, are provided below.

All modeling was performed using a refined grid modeling approach in the CALPUFF modeling system. Based on this dispersion, deposition, and visibility modeling, the ambient air impacts of the project were estimated to be less than all threshold levels specified by all applicable regulatory requirements except for the short-term SO_2 impacts on the Cape Romain NWR. Air impacts of increased SO_2 emissions were greater than the applicable SILs for the 3-hr and 24-hr averaging periods, which required an additional cumulative impact analysis to be performed. Other sources of SO_2 emissions within the modeling domain, which consume PSD increment (or expand the increment if no longer in service), were obtained from DHEC. Cumulative air quality modeling for the Cape Romain Class I receptors was performed for these sources combined with the facility sources. The cumulative PSD increment impacts were less than the Class I area allowable PSD increments.

[This paragraph may be used if the facility screens out of Class I]
The 2010 FLAG document allows the screening of sources based on total emissions of certain pollutants and distance from the source to the Class I area. When a source is screened out with Q/D ≤ 10 (where D = distance from the source to the Class I area in kilometers; Q = TPY of $SO_2 + NO_x + PM_{10} + H_2SO_4$), the facility is not required to do an AQRV analysis.

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For this project, the source was below the screening level for all Class I areas within 300 km and no AQRV analysis was required. Max Q/D = 6.08 ≤ 10 where D = 203 kilometers (Shining Rock) and Q = 1232 TPY (SO_2 = 205, NO_x = 700, PM_{10} = 327, and H_2SO_4 = 0).

7.3.1 Class I Significant Impact Level Analysis

(If SILs were not screened out, need a discussion of results)
Table D.1 shows the maximum impacts on Cape Romain for SO_2, NO_2, and PM_{10}. The air quality impacts are less than the Class I SILs for PM_{10}, NO_2, and the SO_2 annual averaging period. The impacts of the facility emissions are greater than the applicable Class I SIL for SO_2, for the 3-hour and 24-hour averaging periods. Therefore, for the SO_2 3-hour and 24-hour averaging periods, a cumulative impact analysis is required. No further air concentration analyses are required to demonstrate compliance with the PSD increments for PM_{10}, NO_2, and the SO_2 annual averaging period.

OR

(If the facility performed a screening since no SIL analysis was required)
For the Class I SIL analysis, COMPANY modeled receptors located at 50 km from the facility in a pattern surrounding the facility. Since the closest Class I area is _____ km from the facility, this modeling is a conservative screening of the significant impact at the Class I areas. Table VI-8 shows the maximum impacts at these receptors compared to the prospective SILs. The air quality impacts are less than the Class I SILs for PM_{10}, NO_2, and SO_2 for all averaging periods and for $PM_{2.5}$ for the annual averaging period.

Table 23 – Class I PSD Significant Impact Level Analysis

Pollutant	Averaging Time	Model Used	Maximum Modeled Concentration (µg/m³)	SIL (µg/m³)	Significant Impact?
PM_{10}	24 Hour	AERMOD		0.32	
	Annual	AERMOD		0.16	
$PM_{2.5}$	24 Hour	AERMOD		0.07	
	Annual	AERMOD		0.06	
SO_2	3 Hour	AERMOD		1.0	
	24 Hour	AERMOD		0.2	
	Annual	AERMOD		0.1	
NO_2	Annual	AERMOD		0.1	
Highest First-high values are shown for all pollutants and averaging periods.					

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[model for this could also be CALPUFF]

7.3.2 Class I Increment Consumption Impact Analysis

PSD increment consuming and increment expanding sources for (PM10, SO2, etc) in the modeling domain were considered in this analysis. The modeling domain was determined by; 1) developing a list of all sources within 100 km of the facility; 2) including all increment sources less than 100 km from Cape Romain; 3) for sources between 100 and 200 km from Cape Romain, including sources if the facility total increment potential emissions were greater than 100 TPY of any PSD pollutant; and 4) for sources greater than 200 km from Cape Romain, including sources if the facility total increment potential emissions were greater than 250 TPY of any PSD pollutant.

CALPUFF modeling for these increment-affecting sources was performed over the whole modeling domain for impacts on the Cape Romain NWR. The results of these cumulative effects are shown in the following table. As shown, these impacts do not exceed the allowable PSD increments for a Class I area.

Table # shows...

Table 24 – Class I PSD Increment Impacts Cape Romain NWR

Pollutant	Averaging Time	Model Used	Year	Maximum Modeled Concentration (µg/m³)	Standard (µg/m³)	Exceeds Standard?
PM_{10}	24 Hour	CALPUFF	2001		8.0	
			2002		8.0	
			2003		8.0	
	Annual	CALPUFF	2001		4.0	
			2002		4.0	
			2003		4.0	
SO_2	3 Hour	CALPUFF	2001		25.0	
			2002		25.0	
			2003		25.0	
	24 Hour	CALPUFF	2001		5.0	
			2002		5.0	
			2003		5.0	
	Annual	CALPUFF	2001		2.0	
			2002		2.0	
			2003		2.0	
NO_2	Annual	CALPUFF	2001		2.5	
			2002		2.5	
			2003		2.5	

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Table 24 – Class I PSD Increment Impacts Cape Romain NWR						
Pollutant	**Averaging Time**	**Model Used**	**Year**	**Maximum Modeled Concentration (µg/m³)**	**Standard (µg/m³)**	**Exceeds Standard?**
Highest First-high values are shown for all pollutants and averaging periods.						
Standards are from SC Regulation 61-62.5 Standard 7, Class I Area limits.						

After Table D.1, take out any pollutants that do not have a significant impact.

OR

[example of a facility specific situation]
The maximum predicted concentration is greater than the applicable Class I SIL for the $PM2_{2.5}$ 24-hour averaging period. Since the $PM_{2.5}$ 24-hour impact exceeds the Class I SIL using the screening approach, COMPANY had to assess PSD Class I Increment at the Class I area (Cape Romain), including other increment consuming sources in the domain. The only other increment-consuming source in the area, to date, is the _____facility in _____, SC, which is located between COMPANY and Cape Romain at roughly ____ km from the Class I area. COMPANY reviewed the Class II modeling analysis conducted as part of the other facility's PSD application and determined that the $PM_{2.5}$ SIA for the Class II analysis was 13 km. As such, the impact from _the other facility_would be less than 1.2 ug/m3 (the Class II SIL for PM2.5) at the Cape Romain Class I area, since it is more than 13 km distant. This concentration was added to the COMPANY facility's impact from the Class I Significance run from AERMOD. This approach is very conservative as it assumes the maximum impact from COMPANY sources and Showa Denko sources would occur at the same, more distant Class I receptor, and at the same time. Using this conservative approach, the $PM_{2.5}$ Class I increment results are within the allowable increments.

Table # shows…

Table 25 – Class I PSD Increment Impacts Cape Romain NWR					
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration (µg/m³)**	**Standard (µg/m³)**	**Exceeds Standard?**
$PM_{2.5}$	24 Hour	AERMOD		2.00	
	Annual	AERMOD		1.00	
Highest First-high values used for all pollutants and averaging periods.					
Standards are from SC Regulation 61-62.5 Standard 7, Class I Area limits.					

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7.3.3 Class I Visibility Analysis

The visibility analysis evaluates the potential change in light extinction relative to the natural background as a result of the proposed project. Visibility is described through two methods, Plume Impairment (less than 50 km) and Regional Haze (greater than 50 km). Regional haze occurs at distances where the plume has become evenly dispersed into the atmosphere such that there is no definable plume. The EPA guidance (IWAQM, 1998 Revised) and the FLM guidance (FLAG, 2008 Revised) recommend the use of non-steady state dispersion modeling for both screening and refined dispersion modeling.

Plume impairment was not evaluated for this project since the distance from the facility to the Cape Romain NWR was greater than 50 km. Only regional haze was evaluated.

OR

Plume impairment was evaluated for this project since the distance from the facility to the Cape Romain NWR was less than 50 km. Likewise, since the distance was less than 50 km, regional haze was not evaluated.

CALPUFF visibility section

The peak 24-hour visibility impairment as predicted by the air quality model is typically used to attribute visibility affects to a single source. However, the recently promulgated Regional Haze Regulations and *Guidelines for Best Available Retrofit Technology* establish a different method for assessing whether a single facility causes or contributes to visibility impairment. This guidance establishes a 0.5 deciview (dv) (roughly equivalent to 5% extinction change) threshold for contribution and 1.0 dv (approximately 10% extinction change) threshold for causation of visibility impairment. These thresholds are essentially equivalent to the FLAG guidance, except that they are to be applied to the 98th percentile model result for an analysis that considers multiple years of met data. Visibility modeling results are presented at both peak and 98th percentile levels to demonstrate two interpretations of the model results. This analysis utilizes the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) version of the CALPOST processor to assess impacts from the proposed project on regional haze.

The IWAQM recommended "Method 2", which uses hourly relative humidity adjustment applied to background and modeled sulfate and nitrate with the relative humidity factor capped at 95%, was used to compute visibility impairment in terms of Δb_{ext} from modeled pollutant concentrations. This post-processing option uses

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observed relative humidity values and pollutant concentrations at each receptor to compute the percent change in visibility due to the facility's emissions compared against the natural background visibility under the prevailing atmospheric conditions. Method 2 is considered the default approach under FLAG and the results are shown in the following table.

Table # shows…

Table 26 – Class I Area Visibility Analysis at Cape Romain NWR Using Method 2				
Year	**Method 2**			
	Maximum Impact	**98th Percentile**	**Number Days >5%**	**Number Days >10%**
2001				
2002				
2003				
Method 2 with IMPROVE Tool				
2001				
2002				
2003				

The "Method 6" approach, computes Δb_{ext} using a monthly average relative humidity adjustment particular to each Class I area applied to background and modeled sulfate and nitrate. Because a monthly average is used, no cap on *f*(RH) is necessary since the function is not used in Method 6. The results tend to be smoothed out since peak short-term humidity events are not considered. Method 6 is not typically considered a default approach for PSD AQRV analyses, but is used to assess visibility impairment under the U.S. EPA's G*uidance for Best Achievable Retrofit Technology*, in particular in the VISTAS regional planning organization. When using this methodology, the light extinction change above background extinction that is compared to the 5% threshold is set at the 98th percentile value from the modeling. This translates into the 8th highest visibility impact or light extinction change above background in a given year being compared to the 5% threshold change.

Table D.4 provides the visibility impacts for each year of meteorological data and shows the 8th highest value for each year of analysis.

Table # shows…

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Table 27 – Class I Area Visibility Analysis at Cape Romain NWR Using Method 6				
Method 6				
Year	**Maximum Impact**	**98th Percentile**	**Number Days >5%**	**Number Days >10%**
2001				
2002				
2003				
Method 6 with IMPROVE Tool				
2001				
2002				
2003				

As shown, the facility does show exceedances of the 5% threshold on the highest impact day. However, as evidenced by the 98th percentile values (8th highest day), these high days occur very infrequently. Therefore, taking into account the intensity, duration, frequency, and time of visibility impairment, the impacts from the facility do not create an adverse impact on visibility.

OR
VISCREEN visibility section

VISCREEN was used following the guidelines published in the *Workbook for Plume Visual Impact Screening and Analysis* (EPA-450/4-88-015, 1988; Revised 1992) (hereafter referred to as the workbook). EPA has developed two guidance documents for VISCREEN modeling: a workbook and a tutorial to assist with the application of the model itself. [http://www.epa.gov/scram001/dispersion_screening.htm#viscreen] To address the one percentile worst-case meteorological conditions, these guidance documents provide two different methods that can be used to determine the worst-case meteorological conditions for use in the Level II analysis. Neither of the methods is described as "preferred" and both are considered to be valid.

The facility used the workbook approach and the default settings of F stability and a 1 m/s wind speed (a worst-case meteorological condition).

The guidance documents provide two different approaches to analyze the data, resulting in slightly different conditions. The tutorial approach used by the facility evaluated worst-case meteorological conditions for each of the five data years (1987-1991) to determine the worst-case dispersion characteristics. The workbook procedure used by the Department analyzed the full, five-year (1987-1991) dataset to determine the one-percentile worst-case meteorological condition for persistence

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and frequency of occurrence. This one-percentile worst-case meteorology is indicative of the worst-day plume visual impacts when the probability of worst-case meteorological conditions is coupled with the probability of other factors being ideal for maximizing the plume visual impacts.

The Cape Romain Wildlife Refuge is located __km south/southwest of the facility. The impacts were evaluated against the VISCREEN criteria and passed. Calculations were performed for two assumed plume-viewing backgrounds: the horizon sky and a dark terrain object. Five years of meteorological data were analyzed. The table below shows the screening values from the Departments results obtained using the workbook method.

Table 28 – Visibility Impairment Analysis

Background	Theta	Azi	Distance (km)	Alpha	ΔE Critical	ΔE Plume	Contrast Critical	Contrast Plume
Sky	10	145	44.1	24	2.0		0.05	
Sky	140	145	44.1	24	2.0		0.05	
Terrain	10	158	63.5	10	2.0		0.05	
Terrain	140	158	63.5	10	2.0		0.05	

Table 29 – Visibility Impairment Analysis Inputs

Parameter	Value	Units
Particulate Matter	10.37	ton/yr
Nitrogen Dioxides	236.87	ton/yr
Primary Sulfur	0	ton/yr
Background Ozone	0.04	ppm
Plume-source-observer angle	11.25	degrees
Background visual range	182	km
Wind Speed	1	meters/sec
Stability Class	F	-

May need to renumber table D.5 depending on which tables are used in this section.

7.3.4 Class I Deposition Analysis

Since the facility screened out of the Class I AQRV analysis based on their Q/D calculation, analyses for visibility and deposition are not required.

OR

For the sulfate/nitrate deposition analysis, modeling was performed for the Class I area following the refined CALPUFF methodology outlined above. The table below

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presents the annual deposition values for each Class I area compared to the Deposition Analysis Threshold (DAT) for sulfur and nitrogen deposition of 0.01 kg/ha/yr. These DAT values are a guideline established by the FLM, not a regulatory standard. The estimated nitrate deposition was less than the applicable DAT and the sulfate deposition was slightly higher than the East U.S. DAT. Considering that coastal ecosystems have evolved under naturally higher sulfur deposition rates, an adverse impact on the Cape Romain NWR is not expected.

Table # shows...

Table 30 – Sulfate/Nitrate Deposition at Cape Romain NWR – SIL Emissions						
Year	**Deposition Rate by Year of Meteorological Data, kg/ha/yr**					
	Sulfur	**DAT**	**Exceeds**	**Nitrogen**	**DAT**	**Exceeds**
2001						
2002						
2003						

7.4 South Carolina Facility-Wide Compliance Demonstration

All minor and major sources proposing new construction or construction modifications in South Carolina are required to demonstrate compliance with South Carolina Regulation No. 62.5 Standards Nos. 2 (NAAQS), 7 (Class II PSD Increment), and 8 (Air Toxics). Standard No. 7 (PSD) Part k - "Source Impact Analysis" and Part p - "Sources Impacting Federal Class I Areas - Additional Requirements" require Class II modeling. Facility-wide emissions from the COMPANY facility only were modeled to demonstrate compliance with Standards 2, 7, and 8.

Table # shows... Table # shows... Table # shows... Table # shows...

Table 31 – Standard No. 2 – Ambient Air Quality Standards Modeling Analysis							
Pollutant	**Averaging Time**	**Model Used**	**Maximum Modeled Concentration ($\mu g/m^3$) (1)**	**Background Concentration ($\mu g/m^3$)**	**Total ($\mu g/m^3$)**	**Standard ($\mu g/m^3$)**	**% of Standard**
PM_{10}	24 Hour	AERMOD	(1a)			150	
	Annual	AERMOD				50	
$PM_{2.5}$	24 Hour	AERMOD	(2) (3) (4)			35	
	Annual	AERMOD	(2) (3) (5)			15	
SO_2	3 Hour	AERMOD				1300	

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Table 31 – Standard No. 2 – Ambient Air Quality Standards Modeling Analysis

Pollutant	Averaging Time	Model Used	Maximum Modeled Concentration (µg/m³) (1)	Background Concentration (µg/m³)	Total (µg/m³)	Standard (µg/m³)	% of Standard
	24 Hour	AERMOD				365	
	Annual	AERMOD				80	
NO_2	Annual	AERMOD				100	
CO	1 Hour	AERMOD				40,000	
	8 Hour	AERMOD				10,000	
Lead	3 Month (5)	AERMOD	(7)			0.15	
Gaseous Fluorides	12 Hour	AERMOD		(8)		3.7	
	24 Hour	AERMOD		(8)		2.9	
	Weekly	AERMOD	(9) (10)	(8)	(10)	1.6	
	Monthly	AERMOD	(9) (10)	(8)	(10)	0.8	

1) The highest-first-high modeled concentration was used for annual averaging periods and the highest-second-high was used for all other averaging periods, except Lead and Fluorides.

1a) The 6th high over five years of met data running the mult-year option was used for the 24-hr averaging time.

2) The PM10 surrogate was used to demonstrate compliance with the PM2.5 standards.

3) There was no speciation for PM2.5, therefore, PM10 was used to compare to the PM2.5 Standard.

4) The highest-eighth-high was used. OR The 8th high averaged over the five years of modeling was used.

5) The highest-first-high was used. OR The average of the maximum annual concentration over five years was used.

6) Lead is the maximum 3-month rolling average over the modeling period.

7) The highest monthly concentration was compared to the standard. This is a conservative approach.

8) There is no background value for HF.

9) The 24-hour average concentration was used to compare to the weekly standard. This is a conservative approach.

10) Compliance demonstrated by passing the other HF averaging periods.

Table 32 – Background Monitoring Data (µg/m³)

Pollutant	Site Name	County	Year	1-Hr	3-Hr	8-Hr	24-Hr	3-Mo	Annual
PM_{10}			08-10						
$PM_{2.5}$			08-10						
SO_2			08-10						
NO_2			08-10						
CO			08-10						
Pb			08-10						

Lead is the maximum 3-month rolling average over the three-year period.

PM10 24-hr is the fourth-high over three-year period.

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Table 32 – Background Monitoring Data (µg/m³)									
Pollutant	**Site Name**	**County**	**Year**	**1-Hr**	**3-Hr**	**8-Hr**	**24-Hr**	**3-Mo**	**Annual**
Annual for pollutants other than PM2.5 is the average of the annual averages over the three-year period.									
All other averaging periods are the average of the three year second-high values.									

Table 33 – Standard No. 7 – Class II PSD Modeling Analysis					
Pollutant	Averaging Time	Model Used	Maximum Modeled Concentration (µg/m³) (1)	Standard (µg/m³)	% of Standard
PM_{10}	24 Hour	AERMOD		30	
	Annual	AERMOD		17	
SO_2	3 Hour	AERMOD		512	
	24 Hour	AERMOD		91	
	Annual	AERMOD		20	
NO_2	Annual	AERMOD		25	
1) Mean was used for Annual Averaging Time and highest-second-high was used for all other averaging periods.					

Table 34 – Standard No. 8 – Toxic Air Pollutants Modeling Analysis					
POLLUTANT	CAS NUMBER	MODEL USED	MAXIMUM MODELED CONCENTRATION (µg/m³)	STANDARD (µg/m³)	% OF STANDARD
		AERMOD			
		AERMOD			
		AERMOD			

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8.0 Case-by-Case Maximum Achievable Control Technology (MACT) Determination

SC Regulation 61-62.63, Section 63.43 applies to an owner/operator who constructs or reconstructs a major source of hazardous air pollutant (HAP) subject to a case-by-case determination of maximum achievable control technology (MACT) pursuant to SC Regulation 61-62.63, Section 63.42(c). When a case-by-case determination of MACT is required by Section 63.42, the owner or operator shall obtain from the BAQ an approved MACT determination according to Section 63.43(c). Section 112 of the Clean Air Act (CAA or Act) requires emission limits be established for source categories emitting HAPs in the form of MACT standards. The Section 112(g) provision is designed to ensure that emissions of HAPs do not increase if a facility is constructed or reconstructed before EPA issues a MACT for that particular category of sources for facilities. Section 112(g) applies to new or reconstructed sources and requires a case-by-case MACT determination when a MACT standard has not yet been promulgated under Section 112(d) of the Act.

The CAA requires an approach for setting standards for HAPs that includes the development of technology-based MACT standards. These standards are developed under the authorities of Section 112(d), 112(g), and 112(j) of the CAA. MACT standards are based on the performance of technology, and not on the health and environmental effects of HAPs. Section 112(f) of the CAA requires the EPA to set health-based standards eight years after a MACT standard is developed for each regulated source category to address any residual (or remaining) risk after MACT has been applied to provide an "ample margin of safety to public health." Therefore, the Notice of MACT Approval (NOMA) will only address the available control technologies to reducing HAP emissions and does not address the health and environmental effects the HAP emissions may impose.

The United States Court of Appeals for the District of Columbia vacated 40 CFR 63.(f)(1) and 63.(h)(1). These two sections are part of a regulation, commonly referred to as the "General Provisions Rule", that exempt sources from the requirement to comply with Section 112(d) emission limits during periods of startup, shutdown, and malfunction ("SSM"). The requirement to develop a written startup, shutdown, and malfunction plan in 40 CFR 63.6(e)(3) was not vacated from the General Provision Rule. Therefore, affected sources subject to the General Provision Rule are still required to comply with 40 CFR 63.6(e)(3).

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Showa Denko manufactures graphite electrodes for use in the steel manufacturing industry at their Ridgeville, SC facility. The facility proposes to increase production of finished graphite electrodes from 45,000 metric tons per year to 85,000 metric tons per year. In doing this, some existing processes will be required for the new processes. Therefore, this project will be referred to as new construction/reconstruction. The proposed new construction/reconstruction has the potential to emit polycyclic organic matter (POM) which is a regulated HAP, VOC and SC toxic air pollutant (TAP), in amounts greater than 10 tons per year. POMs are also considered to be semi-volatile. Since the EPA has not promulgated a National Emission Standards for Hazardous Air Pollutants (NESHAP) for graphite electrode manufacturing where the facility is a major source of HAPs and the increased production consists of new or reconstructed processes that have the potential to emit a HAP in excess of the major source threshold, the facility must undergo a 112(g) determination.

Emissions

Showa Denko submitted an application to the BAQ to obtain a case-by-case MACT, also known as 112(g), determination for HAP emissions from the proposed new construction/reconstruction project. The application was deemed complete on June 30, 2011. In this project, the manufacturing processes will either be duplicated or have the existing annual throughputs modified. The processes are: Mill, Mix, and Extrusion (duplicate process), Bake/Rebake Process (duplicate process), Rebake Load (existing process only), Unload/Graphitizing Preparation (relocated existing process only), Bake Load and Unload and Baked Electrode Cleaning (existing process only), Pitch Impregnation (duplicate process), Insulating media Receiving (existing process only), Graphitizing (duplicate process), Cleaning and Inspection (existing process only), and Machining and Shipping (existing process only). This 112(g) determination has been prepared for the new construction/reconstruction with HAP emissions.

As discussed in the Preliminary Determination, Showa Denko manufactures graphite electrodes from two primary ingredients: needle coke (coke) and binder pitch. POM, is emitted from processing of the graphite electrodes in the autoclave and carbottom furnaces. Small amounts of HAPs from the insulating media (metallurgical coke) are emitted from the processing of graphite electrodes in the graphitizing furnaces. The facility proposes to install four (4) new mixers, cooling belts, homogenizer and a binder pitch tank (Equipment ID Nos. as listed below in Table 1) in the Mill, Mix and Extrusion process, fifteen (15) new carbottom furnaces (Equipment ID Nos. E-210-2-

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4271-18 through E-210-2-4271-32) in the Bake/Rebake Process, one (1) new autoclave/spray cooler/cooling bath (Equipment ID No. E-310-2-4201) will be installed in the new Pitch Impregnation area, and ten (10) new graphitizing furnaces (Equipment ID Nos. E-460-4271-01 through E-460-4271-20), as a part of this new construction/reconstruction project.

Carbottom Furnaces

POM emissions are generated from the heating of binder pitch and the pyrolysis of these materials in the carbottom furnaces. POM emissions are controlled by the thermal oxidizers. POM emissions to the incinerators are determined from process weights of the electrodes before and after the bake/rebake process. The difference in the process weight pre and post the bake/rebake process is assumed to be POM materials exhausted to and combusted by the incinerators. However, a portion of the difference in the pre and post weight is due to the emissions of PM and SO_2 from the furnaces during heating, the reclaim of pitch accumulated in the kiln baskets, and accumulation of carbon in the sand located in the saggers. The recovered sand contains approximately 10% carbon.

The fumes in this process have a heat content of approximately 17,500 Btu/lb. Due to the generation of the fumes within the carbottom furnaces under elevated temperature, it is believed that a large portion of these fumes are combusted within the furnace prior to being exhausted to the incinerator. This is based on the diminished burner feed during the periods of high fume conditions while the furnace continues to increase in temperature along its programmed cycle. Unburned fumes from the carbottom furnaces are then exhausted to one of the two thermal oxidizers. The existing thermal oxidizer (Equip ID CE-210-01) maintains its oxidation chamber at 800 to 1,225 oC with excess air provided during the upper range of this scale. The retention time of this unit is greater than one second with a standard retention time of approximately 2.0 to 2.8 seconds. The existing backup thermal oxidizer (Equipment ID CE-210-02) operates at 800 to 1,100 oC and also utilizes excess air to control excess temperatures. The retention time of this unit as provided by the manufacturer is a minimum of one second.

Uncontrolled emissions for the carbottom furnaces are based on an electrode feed rate of 6.63 tons/hour for baked and 7.29 tons/hour for rebaked. The controlled emission rate was calculated based on a control device (thermal oxidizer) with 99% removal efficiency. Subsequently, POM emissions from the new carbottom furnaces are estimated to be 6,191 tons per year (uncontrolled) and 61.91 tons per year (controlled).

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Autoclave/Spray Cooler/Cooling Bath

POM emissions from the autoclaves and spray coolers were based on a mass balance equation. The current facility-wide throughput of finished electrodes is 45,000 metric tons per year and the proposed project will result in an increase to 85,000 metric tons per year. This ratio was used in calculating the production rate on the proposed autoclaves and resulting POM emissions. Based on operation evaluation by Showa Denko, approximately 0.0965 tons of pitch is absorbed by each ton of electrode.

Uncontrolled emissions from the autoclave/cooling section are based on 54,427 tons/year of electrodes. The controlled emission rate was calculated based on a control device (thermal oxidizer) with 99% removal efficiency. Subsequently, POM emissions from the new autoclave/spray cooler/cooling bath are estimated to be 1,313 tons per year (uncontrolled) and 13.13 tons per year (controlled).

Small HAP Emission Units

In addition to the carbottom furnaces, autoclave/cooling section and graphitizing furnaces, other HAP-emitting sources have been identified. The new hot oil heaters, and preheater will generate low amounts of HAP emissions due to the combustion of natural gas, and propane. Small HAP emissions will also be generated from the insulating media handling equipment and the binder pitch tank.

All small HAP emission units has been given work practice standards.

Summary

POM emissions for the new sources were derived from the sample equations below. Tables 1 and 2 provide the estimated POM emission rates from the Mill, Mix, and Extrusion, Bake/Rebake, and Pitch Impregnation processes. Table 3 provides HAP emissions from the Graphitizing process.

Table 35 – Estimated HAP Emission Rates (Uncontrolled)

Equip ID	Description	Control Device ID	Stack ID	POM (lbs/hr)	POM (tons/yr)
Mill, Mix and Extrusion 110-2 (New)					
E-110-2-4253-01	Mixer No. 1	CD-110-4345-28	S-110-2-4349-03	0.71	3.12
E-110-2-4253-02	Mixer No. 2				
E-110-2-4253-03	Mixer No. 3				
E-110-2-4253-04	Mixer No. 4				
E-110-2-4221-10	Mixer Discharge Belt				

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Table 35 – Estimated HAP Emission Rates (Uncontrolled)					
Equip ID	**Description**	**Control Device ID**	**Stack ID**	**POM (lbs/hr)**	**POM (tons/yr)**
E-110-2-4222-20	Screw Spreader				
E-110-2-4221-11	Cooling Belt position 1				
E-110-2-4221-12	Cooling Belt position 2				
E-110-2-4253-05	Homogenizer				
E-110-2-4221-13	Homogenizer Discharge Belt				
E-110-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	S-110-2-4349-01	-	-
E-110-25	Binder Pitch Tank	CD-110-14	S-110-14	3.96	0.30
			Total	4.67	3.42
Bake/Rebake Process 210-2 (New)					
E-210-2-4271-18/32	Carbottom Furnaces Nos. 18-32 + Incinerator	CD-210-2-4333-01	S-210-2-4333-01	1,414	6,191
			Total	1,414	6,191
Pitch Impregnation 310-2 (New)					
E-310-2-4272-21	Preheater (6.0 million Btu/hr x 2 zones)	N/A	S-310-2-4349-23/ S-310-2-4349-24	-	-
E-310-2-4201-01	Autoclave/spray cooler/cooling bath	CD-310-2-4333-01	S-310-2-4349-02	300	1,313
-	Thermal Oxidizer (Control Device)	CD-310-2-4333-01	S-310-2-4349-02	-	-
E-310-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	S-310-2-4349-01	-	-
			Total	300	1,313
			New Project Total	1,718.67	7,507.42

Table 36 – Estimated HAP Emission Rates (Controlled)					
Equip ID	**Description**	**Control Device ID**	**Stack ID**	**POM (lbs/hr)**	**POM (tons/yr)**
Mill, Mix and Extrusion 110-2 (New)					
E-110-2-4253-01	Mixer No. 1	CD-110-4345-28	S-110-2-4349-03	0.071	0.31
E-110-2-4253-02	Mixer No. 2				
E-110-2-4253-03	Mixer No. 3				
E-110-2-4253-04	Mixer No. 4				
E-110-2-4221-10	Mixer Discharge Belt				
E-110-2-4222-20	Screw Spreader				
E-110-2-4221-11	Cooling Belt position 1				
E-110-2-4221-12	Cooling Belt position 2				

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Table 36 – Estimated HAP Emission Rates (Controlled)					
Equip ID	**Description**	**Control Device ID**	**Stack ID**	**POM (lbs/hr)**	**POM (tons/yr)**
E-110-2-4253-05	Homogenizer				
E-110-2-4221-13	Homogenizer Discharge Belt				
E-110-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	S-110-2-4349-01	-	-
E-110-25	Binder Pitch Tank	CD-110-14	S-110-14	0.40	0.03
			Total	0.471	0.34
Bake/Rebake Process 210-2 (New)					
E-210-2-4271-18/32	Carbottom Furnaces Nos. 18-32 + Incinerator	CD-210-2-4333-01	S-210-2-4333-01	14.17	62.08
			Total	14.17	62.08
Pitch Impregnation 310-2 (New)					
E-310-2-4272-21	Preheater (6.0 million Btu/hr x 2 zones)	N/A	S-310-2-4349-23/ S-310-2-4349-24	-	-
E-310-2-4201-01	Autoclave/spray cooler/cooling bath	CD-310-2-4333-01	S-310-2-4349-02	3.00	13.13
-	Thermal Oxidizer (Control Device)	CD-310-2-4333-01	S-310-2-4349-02	-	-
E-310-2-4275-01	Hot Oil Heater (5 million Btu/hr)	N/A	S-310-2-4349-01	-	-
			Total	3.00	13.13
			New Project Total	17.64	75.4

Table 37 – Estimated HAP Emission Rates					
Equip ID	**Description**	**Control Device ID**	**Stack ID**	**HAP (lbs/hr)**	**HAP (tons/yr)**
Graphitizing Furnaces E-460-4247-01/10 (New)					
E-460-4247-01/10	Graphitizing Furnaces (total of 10)	N/A	S-460-4349-03 / Roof Monitor	Utilizing metallurgical coke as the only insulating media or utilizing an alternate insulating media as approved by the Department	

112(g) Determination Approach

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This 112(g) determination will establish MACT emission limits for the proposed expansion. Emission limits applicable to new sources will be the basis for this 112(g) determination since this is a new production unit at an existing plant site that inherently emits HAPs in amounts that exceed the major source threshold. Therefore, this analysis will evaluate only those HAP emissions resulting from the new Bake/Rebake, Pitch Impregnation, and Graphitizing processes.

MACT Requirements

The MACT emission limitation for new sources is defined in SC Regulation 61-62.63, Section 63.41 and in 40 CFR 63.41 as "the emission limitation which is not less stringent than the emission limitation achieved in practice by the best controlled similar source, and which reflects the maximum degree of reduction in emissions that the permitted authority, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable by the constructed or reconstructed major source." In determining the MACT emission limits, the BAQ must take into account all HAPs emitted from the proposed new construction/reconstruction project.

Similar Sources

SC Regulation 61-62.63.41(s) defines similar source as a stationary source or process that has comparable emissions and is structurally similar in design and capacity to a constructed or reconstructed major source such that the source could be controlled using the same control technology. The facility has identified similar manufacturing operations at Graftech in Columbia, Tennessee, Graftech in St. Mary, Pennsylvania, and SGL Carbon (SGL) in Morganton, North Carolina; however, a review of the operating permits indicated that POM limits have not been established for those sources. Similar sources were found at Graftech in Harrison County, West Virginia, SGL in Ozark, Arkansas, Metaullics Systems Division of Pyrotech, Inc. (Metaullics) in Sanborn, NY, and Showa Denko Carbon in Ridgeville, SC. Refer to Tables 3, 4, and 5, respectively for those findings.

Showa Denko currently has existing similar sources installed. Emissions limitations for the existing sources are tabulated in Table 6.

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Table 38 – POM Emissions Limitations (Graftech, Harrison County, WV)		
Source Description	**Emission Rate (lbs/hr)**	**Emission Rate (tons/yr)**
Small carbottom furnace (2 million Btu/hr) controlled by thermal oxidizer (1.5 million Btu/hr)	0.3	0.51
Carbottom furnace nos. 1-3 (2.1 million Btu/hr, each) and two walk-in ovens (1 million Btu/hr, each) controlled by thermal oxidizer (3.5 million Btu/hr)	0.75	0.5
Carbottom furnace nos. 4-7 (2.1 million Btu/hr, each) controlled by thermal oxidizer (3.5 million Btu/hr)	0.75	0.5

Table 39 – POM Emissions Limitations (SGL Carbon, Ozark, AR)		
Source Description	**Emission Rate (lbs/hr)**	**Emission Rate (tons/yr)**
Eight carbottom furnaces controlled by thermal oxidizer (maximum of two furnaces firing simultaneously)	1.48	6.48
Pitch impregnation controlled by thermal oxidizer	0.5	2.19
Preheater No. 1	0.5	-
Preheater No. 2	1.0	-

Table 40 – POM Emissions Limitations (Metaullics Systems Division of Pyrotech, Inc., Sanborn, NY)	
Source Description	**Control Efficiency (%)**
Twelve electric and three natural gas-fired carbottom furnaces controlled by a natural gas-fired incinerator	99
Pitch impregnation controlled by a natural gas-fired incinerator	99

Table 41 – POM Emissions Limitations (Showa Denko Carbon, Inc., Ridgeville, SC)			
Source Description	**Emission Rate (lbs/hr)**	**Emission Rate (tons/yr)**	**Control Efficiency (%)**
Seventeen carbottom furnaces controlled by 15 million Btu/hr thermal oxidizer	0.41	1.78	99
6.1 million Btu/hr Feist-Icon Co. thermal oxidizer	0.08	0.36	99

In summary, Showa Denko has existing sources (carbottom furnaces) that are equipped with a control device (thermal oxidizer/fume incinerator) capable of achieving 99% efficiency. Additionally, research has identified other similar sources that are equipped with control equipment for HAPs.

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The Primary Aluminum MACT (40 CFR 63, Subpart LL) was also reviewed by the facility for the similar source category. The primary aluminum manufacturing facilities manufacture green anodes, for the consumption in the aluminum pot lines. The green electrodes are preheated, baked and cooled in natural gas fired ring furnaces, and it takes around 28 days for the complete process. Fluid coke is utilized as a packing medium in the baking pits, to fill voids, enhance heat transfer and assist in providing an inert atmosphere during the baking process. Emissions consist of POM and other hydrocarbons from the heating and carbonization of the paste binder pitch, as well as hydrogen fluoride (HF) and particulate fluoride from the spent anode butts that are recycled from the potlines back into the anode production process. As such, this industry utilizes dry alumina scrubbers which have an estimated control efficiency of around 97% for HF and around 84% for POM. The dry alumina scrubbers also utilize alumina, a raw material in the actual manufacturing process, as a scrubbing media, and once it has been utilized in the scrubber it is added to the pot lines to produce molten aluminum. As such the utilization of such a scrubber system doesn't produce any reside, such as sludge. The baking process at Showa Denko has some significant differences to the processes of the primary aluminum manufacturing facilities, in that carbottom furnaces are utilized and sand is utilized as a packing medium for the electrodes. There are also no fluoride emissions from the process at Showa Denko, hence a different control technology is utilized in the form of a thermal oxidizer, which will combust the POMs and the exhaust gas at a 99% control efficiency, rather than utilizing a scrubber. As such, the control strategy utilized for the primary aluminum manufacturing is not transferable to Showa Denko's process. The primary aluminum industry doesn't have a rebake or a graphitizing process, hence those processes have not been discussed.

8.1 112(g) Determination

Establishment of the Floor

Floor

MACT floor for new sources means the emission limitation achieved in practice by the best controlled similar source. To establish the MACT floor, several sources were reviewed. Among them were the following:

(1) NESHAP regulations related to graphite electrode manufacturing were searched. No NESHAP regulations (area or major source) were identified as similar. In addition, information from the Control Technology Center developed pursuant to Section 113

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of the CAA, the Aerometric Informational Retrieval System (AIRS), and the MACT database or 112(g) MACT Determination State Permit Engineers Clearinghouse were reviewed.

(2) The RBLC database was queried for all processes using POM as the only query variable. As shown in Table 7, the search resulted in the following processes: natural gas-fired duct burners, natural gas-fired turbine, and coal-fired boiler. The control technologies for POM emission control were listed as low sulfur natural gas and good combustion practices.

Table 42 – Case-by-Case MACT Determination Research

Process Type	Process Description
19.600	Duct Burners (DB-1 and DB-2)
15.110	Turbine, Combustion, Natural Gas
11.110	Boiler, Pulverized Coal

The RBLC database was also queried using a SIC code of 3624. Carbottom furnaces equipped with thermal oxidization (afterburner) were identified, but no similar sources for the autoclave/cooling section were identified.

(3) Information on air releases is contained in the AIRS, a computer-based repository for information about air pollution in the United States. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. The AIRS database was searched using a SIC code of 3624. No similar sources were found with add-on control equipment. Also, the 112(g) MACT Determination State Permit Engineers Clearinghouse revealed no similar sources.

(4) Additional research was conducted via internet searches for control technologies used at similar manufacturing operations. Air operating permits were reviewed for SGL in Morganton, Graftech in Harrison County, Metaullics in Sanborn, and Showa Denko Carbon in Ridgeville. Emissions from the autoclaves at Graftech are controlled by an electrostatic precipitator (ESP). The autoclaves at SGL and Metaullics are not equipped with any control device.

(5) Thermal Oxidizer

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Thermal oxidation is the process of oxidizing combustible materials by increasing the temperature of the material above its auto-ignition point in the presence of oxygen, and maintaining it at a high temperature for sufficient time to complete combustion to carbon dioxide (CO2) and water. Time, temperature, turbulence (for mixing), and the availability of oxygen all affect the rate and efficiency of the combustion process. There are three basic types of thermal oxidation systems: direct flame, recuperative, and regenerative. Direct flames systems have been used to control POM emissions, and Showa Denko is currently utilizing thermal oxidizers on their existing carbottom furnaces for the control of POM. Thermal oxidizers are deemed technically feasible for the carbottom furnaces and autoclave/cooling section.

(6) Insulating Media

Showa Denka is currently utilizing metallurgical coke as the insulating media for its graphitizing furnaces. An analysis of the metallurgical coke indicated that small amounts of HAP emissions were present, in particular mercury and chromium. Petroleum coke is utilized at other facilities as an insulating media.

Alternate materials may be utilized by Showa Denko as insulating media, if the HAP content of all regulated HAP pollutants in the alternate insulating media, is less than or equal to the HAP content in the metallurgical coke.

Table 43 – MACT Floor Emission Limitations (POM)

New Process/Source	Controls	Emission Limit (lb/hr)	Control Efficiency (%)
Mill, Mix and Extrusion	N/A	0.071 lb/hr (total from Dry Fume Scrubber/Baghouse)	N/A
Mill, Mix and Extrusion	Work practice standards for the vent condenser, controlling the Binder Pitch Tank	N/A	N/A
Bake/Rebake (Carbottom Furnaces)	Thermal Oxidizer	14.17	99
Pitch Impregnation (Autoclaves/Spray Cooler/Cooling bath)	Thermal Oxidizer	3.00	99
Graphitizing Furnaces	Utilizing metallurgical coke as the only insulating media or utilizing an alternate	N/A	N/A

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Table 43 – MACT Floor Emission Limitations (POM)			
New Process/Source	**Controls**	**Emission Limit (lb/hr)**	**Control Efficiency (%)**
	insulating media as approved by the Department		

Beyond the MACT Floor

After determining the "MACT floor," the BAQ must consider possible "beyond the floor" control technologies and emission limitations. The term "beyond the floor" signifies an emission limit more stringent than the limit established as the floor that can be achieved through further application of technology or other capability. Three factors must be taken into consideration: (a) the cost of achieving further reductions, (b) any non-air quality health and environmental impacts of achieving further reductions, and (c) energy requirements of achieving further reductions.

Showa Denko provided information on three (3) available control technologies that were considered for possible further POM emissions reductions beyond the floor. They are: baghouse, electrostatic precipitator (ESP), and wet scrubber.

(1) Baghouse

A baghouse (also known as fabric filter) consists of one or more isolated compartments containing rows of fabric bags in the form of round, flat, or shaped tubes, or pleated cartridges. Particle-laden gas passes up (usually) along the surface of the bags and the cleaned gas stream is vented to the atmosphere. The filter is operated cyclically, alternating between relatively long periods of filtering and short periods of cleaning. During cleaning, dust that has accumulated on the bags is removed from the fabric surface and deposited in a hopper for subsequent disposal.

Baghouses have been widely applied to control PM emissions from various sources. The maximum inlet temperature for a baghouse ranges from 275 – 500°F depending on the type of bag that is used. The exhaust gas temperature for the carbottom furnaces is 1,400 – 2,300°F and greatly exceeds this range. The exhaust gas temperature for the autoclave/cooling section at 480°F is on the upper range of an acceptable temperature. Therefore, baghouses are deemed not technically feasible for controlling POM for the carbottom furnaces and autoclave/cooling section.

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(2) ESP

ESPs have been widely applied to control PM emission from various sources in industrial settings. One of the advantages of the ESP is its ability to handle large volumes of gas at elevated temperatures if necessary with a reasonably small pressure drop and the removal of particles in the micrometer range. Inlet air flows for ESPs range from 1,000 to 1,000,000 standard cubic feet per minute (scfm). Based on information provided by the control equipment supplier, dry ESPs are much larger than wet ESPs and require much larger ductwork and supports. Therefore, cost estimates were obtained for wet ESPs for the autoclave/cooling section. ESPs are deemed not technically feasible for the carbottom furnaces due to the exhaust gas temperature exceeding the maximum inlet temperature for ESPs.

(3) Wet Scrubber

Different types of wet scrubbers (including condensation scrubbers, fiber bed scrubbers, impingement plate/tray tower scrubbers, mechanically-aided scrubber, orifice scrubber, packed bed/packed tower scrubbers, spray chamber/spray tower scrubbers and venture scrubbers) have been widely applied to control PM emissions from various industrial sources. Inlet air flows for wet scrubbers range from 1,000 to 100,000 scfm. Wet scrubbers can handle inlet gas temperatures of 40 ^{o}F-750 ^{o}F.

Wet scrubbers are deemed not technically feasible for the carbottom furnaces, since the exhaust gas temperature of the carbottom furnaces exceeds the maximum inlet temperature for wet scrubbers. Based on conversation with the equipment vendor, Beltran Technologies, Inc., a wet scrubber is not technically feasible for the autoclaves, due to the low VOC concentration and high volumetric flow rate of the exhaust gas.

In summary, installation and operation of add-on control equipment to control POM emissions from the carbottom furnaces and autoclave/spray cooler/cooling bath, as a beyond-the floor requirement are deemed not technically feasible.

8.2 Proposed MACT Limits and Requirements

Several similar sources have been identified that have hourly and annual

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emission limitations for carbottom furnaces and pitch impregnation. These sources were also controlled by thermal oxidizer with 99% removal efficiency. Showa Denko has proposed a thermal oxidizer as the MACT control and 99% control efficiency as the MACT limit for the carbottom furnaces and autoclave/cooling section. Showa Denko has proposed the utilization of metallurgical coke only as the packing medium for the graphitizing furnaces.

The BAQ has made an initial decision to approve Showa Denko's application for a MACT determination subject to the terms and conditions set forth in this NOMA. SC Regulation 61-62.63, Section 63.43(g) establishes that the BAQ will determine a MACT emission limitation or standard and include it along with any specific notification, operation and maintenance, performance testing, monitoring, reporting and recordkeeping requirements in a NOMA.

In conformity with the general principles of MACT determinations set forth in SC Regulation 61-62.63, Section 63.43(d), the BAQ's determination includes whether the MACT emission limitations or requirements recommended by the applicant and approved by the BAQ are not less stringent than the emission control which is achieved in practice by the best controlled similar source. The BAQ's determination is based upon available information on emission limitations and control technology, taking into consideration the associated costs of achieving such emission reduction and any non-air quality health and environmental impacts and energy requirements.

1. Emission Limits

a. Pursuant to 40 CFR 63.43(g) and SC Regulation 61-63.43(g)(1) MACT determination, the owner/operator shall not discharge or cause to be discharged into the atmosphere any emissions of POM in excess of the limits in Table 10.

Table 44 – MACT Emission Limitations (POM)

New Process/Source	Emission Limit	Emission Limit (lb/hr)	Control Efficiency (%)
Mill, Mix and Extrusion	N/A	0.071 lb/hr (total from Dry Fume Scrubber/Baghouse)	N/A
Mill, Mix and Extrusion	Work practice standards for the vent condenser, controlling the Binder Pitch Tank	N/A	N/A

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Table 44 – MACT Emission Limitations (POM)			
New Process/Source	**Emission Limit**	**Emission Limit (lb/hr)**	**Control Efficiency (%)**
Bake/Rebake (Carbottom Furnaces)	N/A	14.17	99
Pitch Impregnation (Autoclaves/Spray Cooler/Cooling bath)	N/A	3.00	99
Graphitizing Furnaces	Utilizing metallurgical coke as the only insulating media or utilizing an alternate insulating media as approved by the Department	N/A	N/A

2. General Compliance Requirements

a. The owner/operator must be in compliance with the emissions limitations in Table 10 including operating limits, at all times. Compliance is demonstrated when the emission rate of POM is equal to or less than the emission limit in Table 10 and when the insulating media of the graphitizing furnaces is metallurgical coke only.

b. The owner/operator must always operate and maintain each carbottom furnaces and autoclave/spray cooler/cooling bath including air pollution control and monitoring equipment, according to the provisions in 40 CFR 63.6(e)(1)(i).

c. The owner/operator must develop a written startup, shutdown, and malfunction plan, as outlined in 40 CFR 63.6(e)(3), that describes, in detail, procedures for operating and maintaining each carbottom furnaces and autoclave/spray cooler/cooling bath during periods of startup, shutdown, and malfunction; and a program of corrective action for malfunctioning process, air pollution control, and monitoring equipment used to comply with the emission limitations in Table 10. The startup, shutdown, and malfunction plan does not need to address any scenario that would not cause either equipment to exceed an emission limitation. This plan must be developed by the owner/operator by startup. During periods of startup, shutdown, and malfunction, the owner/operator must operate each carbottom furnaces and autoclave/spray cooler/cooling bath in accordance with the startup, shutdown, and malfunction plan.

d. The carbottom furnaces and autoclave/spray cooler/cooling bath are permitted to

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burn only natural gas or propane (back-up) as fuel. The use of any other substances as fuel is prohibited without prior written approval from the Bureau of Air Quality.

3. Initial Compliance Requirements

In order to demonstrate initial compliance with the emissions limitations in Table 10, the owner/operator must conduct an initial performance tests, establish a 3-hour block average minimum operating temperature, and conduct monitoring equipment performance evaluations within 60 days after achieving the maximum production rate at which the facility will be operated, but not later than 180 days after initial startup.

During the initial performance test, the facility must continuously monitor the firebox temperature during each of the required 1-hour test runs. The facility may measure the temperature in multiple locations (e.g., one location per burner) in the combustion chamber and calculate the average of the temperature measurements prior to reducing the temperature data to 15-minute averages for purposes of establishing the minimum firebox temperature. The minimum firebox temperature must then be established as the average of the three minimum 15-minute firebox temperatures monitored during each of the three 1-hour test runs.

Table 45 – Initial Compliance Requirements

Pollutant	Emission Limit	Method
POM	0.071 lb/hr (total) (Mill, Mix and Extrusion)	As Approved by the Bureau
HAP	Work practice standards consisting of the inspection and cleaning of the condenser coils on a semiannual basis (Binder Pitch Tank)	Recordkeeping
POM	14.7 lb/hr (carbottom furnaces)	As Approved by the Bureau
POM	3.00 lb/hr (autoclave/cooling section)	As Approved by the Bureau
HAPs	Utilizing metallurgical coke as the only insulating media or utilizing an alternate insulating media as approved by the Department (Graphitizing Furnaces)	Recordkeeping

4. Continuous Compliance Requirements

Pursuant to 40 CFR 63.43 (g)(2)(ii) and SC Regulation 61-63.43(g)(2), the owner/operator shall conduct the following monitoring to assure continuous compliance with the applicable emission limitations in Table 10.

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Table 46 – Continuous Compliance Requirements	
Pollutant/Parameter	**Monitoring**
Work practice standards consisting of the inspection and cleaning of the condenser coils on a semiannual basis (Binder Pitch Tank)	Recordkeeping
Dry Fume Scrubber/Baghouse(Mill, Mix and Extrusion)	Rotary vane rpm (coke flow) and fan amperage (air flow)
POM (thermal oxidizers)	Source Tests as specified below
Thermal Oxidizer Temperature (Carbottom Furnaces)	Continuous temperature monitoring
Thermal Oxidizer Temperature (autoclave/cooling section)	Continuous temperature monitoring
Utilizing metallurgical coke as the only insulating media or utilizing an alternate insulating media as approved by the Department (graphitizing furnaces)	Recordkeeping

To demonstrate continuous compliance with the POM emission limitations in Table 10, the owner/operator will record the 3-hour block average of all recorded readings, calculated after every 3 hours of operation as the average of the evenly spaced recorded readings in the previous 3 operating hours and maintain the 3-hour block average temperature above the minimum temperature established during the performance test.

A source test of the Fume Incinerator and the Thermal Oxidizer needs to be performed every three (3) years after the initial performance test. Less frequent source testing for POM from these two sources can be conducted if at least two (2) consecutive performance tests show that the emissions are at or below 75% of the emission limitation, and if there are no changes in the operation of the affected source or air pollution control equipment that could increase emissions. In this case, no performance testing will be required for the next four (4) years. A performance test must be conducted during the fifth year and no more than 60 months after the previous performance test.

5. Monitoring Installation, Operation, And Maintenance Requirements

Each continuous parameter monitoring system (CPMS) must be capable of completing a minimum of one cycle of operation (sampling, analyzing, and recording) for each successive 15-minute period.

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At all times, you must maintain the monitoring equipment including, but not limited to, maintaining necessary parts for routine repairs of the monitoring equipment.

Record the results of each inspection, calibration, and validation check.

For each temperature monitoring device, the facility must meet the following requirements:

(1) Locate the temperature sensor in a position that provides a representative temperature.

(2) Use a temperature sensor with a minimum accuracy of 4°F or 0.75 percent of the temperature value, whichever is larger.

(3) Perform an electronic calibration at least semiannually according to the procedures in the manufacturer's owners manual. Following the electronic calibration, conduct a temperature sensor validation check in which a second or redundant temperature sensor placed nearby the process temperature sensor must yield a reading within 30°F of the process temperature sensor's reading.

(4) Conduct calibration and validation checks any time the sensor exceeds the manufacturer's specified maximum operating temperature range or install a new temperature sensor.

(5) At least quarterly, inspect all components for integrity and all electrical connections for continuity, oxidation, and galvanic corrosion.

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Appendix A – Class I Area Map

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Appendix B – Site Location Map

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Appendix C – PSD Permit Application

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Appendix D – Draft Construction Permit

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Appendix E – Statement of Basis

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Appendix F – Public Notice of Draft PSD Construction Permit

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Appendix G – Correspondence

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Company Name	Showa Denko Carbon, Inc.	**Permit Writer:**	Sheila Watts
Permit Number:	0900-0025-CZ-R6	**Date:**	**DRAFT**

DATE APPLICATION RECEIVED: December 20, 2016

FACILITY DESCRIPTION The facility manufactures graphite electrodes for use in the steel manufacturing industry.

PROJECT DESCRIPTION The facility currently operates a graphitizing process that includes twenty-seven (27) graphitizing furnaces (will be referred to as existing graphitizing furnaces). The facility obtained a PSD permit (0900-0025-CZ), issued June 8, 2012 that included modifications to the facility to accommodate an increase in production of finished graphite electrodes from 45,000 to 85,000 metric tons per year. As part of the PSD, construction of a new graphitizing process was proposed that included ten (10) graphitizing furnaces (will be referred to as new graphitizing furnaces) along with other equipment. Also, as part of the PSD, the facility proposed to install an SO_2 scrubber on the existing graphitizing furnaces and an SO_2 scrubber on the new graphitizing furnaces. Installation of the scrubbers allowed the facility to net out of SO_2 BACT analysis. The facility conducted an initial source test in August 2016, on the SO_2 scrubber stack for the existing graphitizing furnaces, followed by an engineering source test in October 2016. During the engineering source test, the facility discovered gaseous organic emissions at the portion of the graphitizing process cycle that precedes the furnace reaching "high-fire". The majority of the newly discovered gaseous organic emissions have been identified by the facility as one of the greenhouse gases, methane, and a portion of the gaseous organic emissions are in the form of Volatile Organic Compounds (VOCs) and Hazardous Air Pollutants (HAPs). The PSD application for the new graphitizing furnaces had proposed emissions estimated based on the existing graphitizing furnaces (past stack testing, sulfur content of raw materials, supplier information, engineering test data, CEMS, and 40 CFR Part 98 equations and factors). The PSD application did not address any potential VOC emissions or additional methane emissions (other than estimated greenhouse gas emissions) from the new graphitizing furnaces since the facility had been unaware of these emissions until the source test was performed. Therefore, the Preliminary Determination and Notice of MACT Approval issued April 13, 2012 did not account for these emissions, and the new graphitizing furnaces did not undergo BACT for VOC, nor did the PSD permit contain VOC PSD limits for the new graphitizing furnaces. This PSD permit revision will include revising the Preliminary Determination and Notice of MACT Approval and PSD permit in order to include and address these emissions. This PSD permit revision does not involve any changes to the existing graphitizing furnaces. This PSD revision will undergo public notice. During this PSD revision, the Department will also modify any conditions that have changed due to Departmental regulatory updates. The following is a list of changes that will occur during this PSD revision:

1) This statement of basis will provide an update to the GHG uncontrolled potential emissions and include VOC uncontrolled potential emissions from the new graphitizing furnaces. This statement of basis will also establish an updated Table 1. Showa Denko – PSD Applicability Analysis to account for additional emissions from the new graphitizing furnaces.
2) The statement, "Also, in the Utility MACT proposal (40 CFR 63, Subpart UUUUU), the EPA established work practice standards in lieu of a limit for CO" was removed from the April 13, 2012 Preliminary Determination (located under BACT for CO). The Utility MACT has been finalized and no work practice standards have been established in lieu of a limit for CO.
3) Update the Preliminary Determination and Notice of MACT Approval (issued April 13, 2012) to include estimated VOC and HAP emissions for the new graphitizing furnaces and address VOC BACT.
4) Update the Preliminary Determination and Notice of MACT Approval (issued April 13, 2012) NOX BACT in order to remove quantified maximum nitrogen content limits (previously approved during PSD Revision #5, no

public notice was required for this change). Further testing revealed no direct correlation in restricting nitrogen content in raw materials to lowering NOX process emissions from the carbottom and graphitizing furnaces. The PSD will allow changes to be made to the nitrogen content based on prior Departmental approval, however the lb/hr NOX limits for the carbottom and graphitizing furnaces will remain in place and are not subject to change.

5) Update Modeling.....
6) Establish conditions in the PSD permit to address potential VOC and HAP emission from the new graphitizing furnaces (under Part 5.B.3.h – Conditions for New Graphitizing Process and Part 7.D – NESHAP Part 63 Subpart B, Affected Sources).
7) The SO_2 limit of 3.5 lbs SO_2/million Btu heat input found in Condition 5.B.3.a(7) and Condition 5.B.3.e(6) will be changed to 2.3 lbs SO_2/million Btu heat input to reflect Departmental updates to S.C. Regulation 61-62.5, Standard No. 1 – Fuel Burning Operations.
8) Due to the repeal of S.C. Regulation 61-62.5, Standard No. 5.1, Best Available Control Technology (BACT)/Lowest Achievable Emission Rate ("LAER") Applicable to Volatile Organic Compounds, all references will be removed from the Preliminary Determination as the Standard is no longer applicable.
9) 40 CFR Part 63 Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters) is applicable and will be addressed in the revised permit and revised Preliminary Determination.

CHANGES SINCE PSD (0900-0025-CZ) ISSUANCE The PSD permit (0900-0025-CZ) was issued June 8, 2012. Below is a record of the revisions to the PSD that have taken place. None of the revisions listed below required public notice.

RECORD OF REVISIONS		
Date	**PSD Revision #**	**Description of Change**
10/17/2013	1	Condition 5.C.6 was clarified to list that it applied to the new carbottom and new graphitizing sources (E-210-2-4271-18/32 and E-460-4271-01/10). Also a typographical error was corrected for Condition 5.B.3.h(2).
5/8/2014	2	Condition 5.C.5 was revised (raw material sulfur contents) and Modeling Attachment was updated to reflect changes to raw material sulfur content and stack reconfiguration of the existing graphitizing furnaces. These changes resulted in more SO_2 emissions being captured and controlled (PSD Netting Analysis for SO_2 updated in Statement of Basis).
7/10/2014	3	The raw material nitrogen content limits listed in Condition 5.C.6, for proposed carbottom furnaces (E-210-2-4271-18/32) and proposed graphitizing furnaces (E-460-4271-01/10), were revised.
4/23/2015	4	Update design information and air dispersion modeling results for retrofits to the existing graphitizing furnaces (E-430-01). Updates to the Modeling Attachment were from design information and air dispersion modeling that reflect no control of PM, CO, and NO_X emissions from the scrubber being proposed to control SO_2 emissions from the existing graphitizing furnaces. Condition 5.B.3.b(6) has been revised to clarify that verification of low NOX burners will be required on both sets of burners for the thermal oxidizer.

3/23/2016	5	Conditions 5.C.5 and 5.C.6 have been changed to allow increases in the sulfur and nitrogen content of the raw materials without amending the permit granted the facility provide 15-day notification to the Department prior to utilizing the raw material. Monitoring of opacity for the existing graphitizing furnaces stack has been included and will supersede Title V monitoring of opacity for the existing graphitizing furnaces stack. This revision includes the addition of an initial source test for filterable PM, PM_{10} and $PM_{2.5}$ emissions from the existing graphitizing furnaces stack. Also, updates to Part 7.A - NESHAP Periodic Reporting Schedule Summary for Subpart ZZZZ occurred during this revision. There is no reporting for Subpart ZZZZ for the new emergency generator, therefore N/A (Not Applicable) was put in the Reporting Schedule Summary and notes 3 and 4 were added that pertain to emergency generators.

SOURCE TEST REQUIREMENTS Source test requirements for VOC emissions from the new graphitizing furnaces has been added during this revision. Other source test requirements have remained the same as previous revision and are specified in the permit. VOC source testing for the new graphitizing furnaces will involve an initial source test conducted within 180 days after startup and every three (3) years thereafter (option for less frequent subsequent testing is outlined in permit). Testing of VOC emissions for 96 continuous hours shall take place at the roof monitor and graphitizing stack scrubber. Testing of VOC emissions for the existing graphitizing furnaces will be incorporated during TV renewal for the facility. Testing for the existing graphitizing furnaces will take place over 120 continuous hours at the existing roof monitor and existing graphitizing stack scrubber. The difference in continuous hours of testing is attributed to the differences in time of batch cycles for the existing and new graphitizing furnaces.

SPECIAL CONDITIONS, MONITORING, LIMITS Special conditions, monitoring, and limits are listed in the revised preliminary determination and the permit. Changes with this permit revision are additional monitoring requirements and VOC BACT limits for the new graphitizing furnaces.

EMISSIONS Emissions in the facility's modified PSD application, received December 20, 2016, have been reviewed for accuracy. The tables below only address changes from this sixth PSD revision. Refer to Statement of Basis dated June 8, 2012 and Statement of Basis dated May 8, 2014 for remaining emissions from the new graphitizing furnaces and from other equipment involved in the PSD.

UNCONTROLLED POTENTIAL EMISSIONS (Project Only) (H designates a hazardous air pollutant, T designates a toxic air pollutant, and V designates a volatile organic compound)				
Equipment ID	**Pollutant**	**lb/hr**	**TPY**	**Method for Estimating Emissions**
E-460-4271-01/10 (new graphitizing furnaces)	VOC	47.3 (maximum) 3.3 (average)	14.4	Based on engineering source test (10/2016) on existing graphitizing furnaces, using 36 hours of test data. Variability factors were applied to existing graphitizing furnace values in order to estimate new graphitizing
	Methane	141.4 (maximum)	104.5	

		23.9 (average)		furnace emissions. TPY estimate is based on the average lb/hr value and 8760 hours of operation. See example calculations below.
	GHG (CO_2e) from recently discovered methane	-------	2,612	Converting to CO_2e by using a methane global warming potential of 25.
	Methyl Chloride (V,H,T)	1.25	5.48	Based on engineering source test (10/2016) on existing graphitizing furnaces, using 36 hours of test data. The nine regulated speciated non-methane gaseous organic emissions that resulted in 0.01 lb/hr or greater emissions were quantified in the application. Variability factors were applied to existing graphitizing furnace highest maximum peak lb/hr values for each of the nine pollutants in order to estimate new graphitizing furnace worst case of emissions. TPY estimate is based on 8760 hours of operation. See example calculations below.
	Carbon Disulfide (V,H,T)	2.64	11.55	
	Hexane (V,H,T)	0.235	1.03	
	Benzene (V,H,T)	0.85	3.72	
	1,4- Dioxane (V,H,T)	0.01	0.045	
	Toluene (V,H,T)	0.068	0.30	
	Xylenes, total (V,H,T)	0.04	0.18	
	Methylene Chloride (H,T)	0.027	0.12	
	Vinyl Acetate (V,H,T)	0.012	0.05	
Total VOCs for New Graphitizing Furnaces	36.77 TPY			
Total GHG (CO_2e) for New Graphitizing Furnaces	32,852 TPY (previously established) + 2,612 TPY (from recently discovered methane) = 35,464 TPY			
Total HAPs for New Graphitizing Furnaces	1.69×10^{-4} TPY (previous emissions from chromium and mercury) + 22.48 TPY (from recently discovered non-methane gaseous organic emissions) = 22.48 TPY			

New graphitizing furnace emissions above estimate the potential worst case of uncontrolled emissions (scrubber stack + roof vent). The average lb/hr values for VOC and methane are the average taken over 36 hours of engineering test data. The facility stated that previous engineering testing has shown that the new SO_2 scrubbers (one for the existing graphitizing furnaces and one for the new graphitizing furnaces) have nominal or no control efficiency for gaseous organics, therefore uncontrolled = controlled emissions for the pollutants listed above.

Example Calculations:

Engineering source test (10/2016) on the existing graphitizing furnaces report results "as methane" because the Method 25A analyzer was calibrated with methane calibration gas. The facility acquired 36 hours of test data over 4 days.

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Total hydrocarbons lb/hr (as methane) minus Methane lb/hr (as methane) = VOC lb/hr (as methane)
For the existing graphitizing furnaces stack the source testing resulted in a maximum of 122.2 lb/hr Methane (as methane) and a maximum of 176.7 lb/hr Total hydrocarbons (as methane); therefore VOC lb/hr (as methane) = 176.7 lb/hr Total hydrocarbons (as methane) minus 122.2 lb/hr Methane (as methane) = 54.5 lb/hr VOC (as methane) from the scrubber stack. The same methods were used to calculate a 3.2 lb/hr VOC (as methane) average from the scrubber stack except the data was averaged over 36 hours. VOC lb/hr (as methane) from the existing graphitizing furnaces roof vent was estimated based on a 84% captured emissions going through the scrubber and the remaining 16 % assumed to exhaust through the roof vent. Calculations take into account the 84/16 (scrubber stack/roof vent) split for the existing graphitizing furnaces in order to estimate roof vent emissions (all testing took place at the scrubber stack). VOC lb/hr (as methane) total from stack + roof vent = 54.5 lb/hr VOC (as methane) x (100/84) = 64.9 lb/hr VOC (as methane). 64.9 lb/hr VOC (as methane) converted to VOC (as carbon) = 64.9 lb/hr VOC (as methane) x 12/16 (molecular wt. of carbon/molecular wt. of methane) = 48.7 lb/hr VOC (as carbon).
Using the above methodologies and stack test data the facility provided the following:
Total (stack + roof vent) for existing graphitizing furnaces = 141.75 lb/hr Methane (as methane), maximum
Total for existing graphitizing furnaces = 27.9 lb/hr Methane (as methane), average
Total for existing graphitizing furnaces = 122.1 tpy Methane (as methane), based on average lb/hr value and 8760 hours of operation.
Total for existing graphitizing furnaces = 48.7 lb/hr VOC (as carbon), maximum
Total for existing graphitizing furnaces = 3.9 lb/hr VOC (as carbon), average
Total for existing graphitizing furnaces = 16.87 tpy VOC (as carbon), based on average lb/hr value and 8760 hours of operation.
To estimate VOC lb/hr (as carbon) emissions from the new graphitizing furnaces several factors were taken into account: 1) the existing graphitizing furnaces can produce 45,000 metric tons per year of finished electrodes while the new graphitizing furnaces are estimated to a produce 35,000 metric tons of finished electrodes, 2) new graphitizing furnaces are larger than the existing graphitizing furnaces (process longer, larger diameter electrodes), 3) still working on understanding the formation mechanism for gaseous organics emissions during the graphitizing process and the uncertainty of applying gaseous organic test results from a single engineering source test. Along with the production scaling factor (35,000/45,000), a variability factor of 1.1 has been applied to calculations of average hourly and annual emissions from the new graphitizing furnaces and a variability factor of 1.25 applied to the calculations for maximum hourly emissions. Therefore maximum VOC lb/hr (as carbon) for the new graphitizing furnaces = 47.415 lb/hr VOC (as carbon) x (35,000/45,000) x 1.25 = 46.10 lb/hr VOC (as carbon), maximum for new graphitizing furnaces.
Emissions from the new graphitizing furnaces have a 95/5 (scrubber stack/roof vent) split; however the scrubber does not control the gaseous organic emissions, therefore the split is not taken into account when estimating emissions from the new graphitizing furnaces.
Total (stack + roof vent) for new graphitizing furnaces = 145.48 lb/hr Methane (as methane), maximum for existing graphitizing furnaces x (35,000/45,000) x 1.25 = <u>141.4 lb/hr Methane (as methane), maximum</u>
Total for new graphitizing furnaces = 27.9 lb/hr Methane (as methane), average x (35,000/45,000) x 1.1 = <u>23.9 lb/hr Methane (as methane), average</u>
Total for new graphitizing furnaces = 122.1 tpy Methane (as methane) x (35,000/45,000) x 1.1 = <u>104.5 tpy Methane (as methane</u>
Total for new graphitizing furnaces = 48.7 lb/hr VOC (as carbon), maximum x (35,000/45,000) x 1.25 = <u>47.3 lb/hr VOC (as carbon), maximum</u>

Total for new graphitizing furnaces = 3.9 lb/hr VOC (as carbon), average x (35,000/45,000) x 1.1 = 3.3 lb/hr VOC (as carbon), average
Total for new graphitizing furnaces = 16.87 tpy VOC (as carbon) x (35,000/45,000) x 1.1 = 14.4 tpy VOC (as carbon)

Testing of the existing graphitizing furnaces provided data for the nine regulated speciated non-methane gaseous organic emissions that resulted in 0.01 lb/hr or greater emissions. The data was obtained by using Method 25A testing over 36 hours that consisted of taking sorbent tube samples and Tedlar bag samples during peak gaseous organic emissions. The highest maximum peak lb/hr value (comparing maximum peak lb/hr and average peak lb/hr) for each of the nine regulated speciated non-methane gaseous organic emissions was used to calculate potential emissions for the new graphitizing furnaces. Calculations take into account the 84/16 (scrubber stack/roof vent) split for the existing graphitizing furnaces in order to estimate roof vent emissions (all testing took place at the scrubber stack). For example: Carbon disulfide lb/hr total from stack + roof vent = 2.85 lb/hr Carbon disulfide (highest max. peak) x (100/84) = 3.39 lb/hr Carbon disulfide.
Using the above methodologies and stack test data the facility provided the following:
Total (stack + roof vent) for existing graphitizing furnaces = 3.39 lb/hr Carbon disulfide
Total for existing graphitizing furnaces = 14.85 tpy Carbon disulfide, based on highest max. peak lb/hr value and 8760 hours of operation.
Emissions from the new graphitizing furnaces were estimated using a (35,000/45,000) production factor. Emissions from the new graphitizing furnaces have a 95/5 (scrubber stack/roof vent) split; however the scrubber does not control the gaseous organic emissions, therefore the split is not taken into account when estimating emissions from the new graphitizing furnaces.
Total (stack + roof vent) for new graphitizing furnaces = 3.39 lb/hr Carbon disulfide x (35,000/45,000) = 2.64 lb/hr Carbon disulfide
Total for new graphitizing furnaces = 14.85 tpy Carbon disulfide x (35,000/45,000) = 11.55 tpy Carbon disulfide
Calculations for the remaining 8 regulated speciated non-methane gaseous organic emissions that resulted in 0.01 lb/hr or greater emissions were estimated the same way.

OPERATING PERMIT STATUS
This facility currently operates under a Title V operating permit that was issued July 1, 2005 and expired September 20, 2010. A Title V renewal application for the facility was received May 2010.

REGULATORY APPLICABILITY REVIEW (Project Only)	
Regulations	**Comments/Periodic Monitoring Requirements**
Section II.E – Synthetic Minor	Not Applicable. No synthetic minor limits are being established with this PSD revision.
Standard No. 1	Applicable. The PSD permit has two (2), 5 million Btu/hr hot oil heaters that will be indirect fired fuel burning sources. Due to Departmental changes to Standard 1 since the issuance of the original PSD, the maximum allowable SO_2 emission rate will be 2.3 lbs SO_2/million Btu heat input instead of 3.5 lbs SO_2/million Btu heat input for each hot oil heater. This PSD revision will reflect these changes.
Standard No. 3 (state only)	Applicable. No change with this PSD revision.
Standard No. 4	Applicable. No change with this PSD revision.
Standard No. 5	Not Applicable. The facility was not in existence in 1979 or 1980; it was constructed in 1983 after issuance of a construction permit on 01/11/1982.

Company Name	Showa Denko Carbon, Inc.	**Permit Writer:**	Sheila Watts
Permit Number:	0900-0025-CZ-R6	**Date:**	**DRAFT**

REGULATORY APPLICABILITY REVIEW (Project Only)	
Regulations	**Comments/Periodic Monitoring Requirements**
Standard No. 5.1	Not Applicable. Due to the repeal of Standard No. 5.1, this regulation is no longer applicable and the revised Preliminary Determination for this project will reflect this change.
Standard No. 5.2	Not Applicable. No change with this PSD revision.
Standard No. 7	Applicable. Previously the project exceeded the significant threshold as defined under PSD for PM, PM_{10}, $PM_{2.5}$, NO_X, CO, VOC, and GHG emissions. A BACT analysis was performed and proposed BACT limits were outlined in the Preliminary Determination. The facility netted out of SO_2 due to installation of a control device on the existing graphitizing furnaces. This is still the case, however the facility did not account for VOC or additional methane emissions from the new graphitizing furnaces (based on recent testing of existing graphitizing furnaces). For this PSD revision the facility, for the new graphitizing furnaces, is required to go through VOC BACT analysis, establish VOC PSD limits, and re-evaluate the GHG PSD limit (additional methane emissions). See Table 1 below (updated to included additional VOC and methane emissions).
61-62.6	Applicable. No change with this PSD revision.
40 CFR 60 and 61-62.60	Applicable. There is no change to the emergency diesel-fired generator being subject to comply with 40 CFR Subpart IIII during this PSD revision.
40 CFR 61 and 61-62.61	Not Applicable. No change with this PSD revision.
40 CFR 63 and 61-62.63	Applicable. The facility is major for HAP emissions (PTE is greater than 10 TPY single HAP or 25 TPY combination HAPs). The PSD issued June 8, 2012 was subject to a case-by-case MACT determination (112g). The Notice of MACT Approval (NOMA) was included within the Preliminary Determination/NOMA document. For this PSD revision, the case-by-case MACT determination (112g) was evaluated to determine if changes needed to be made. Previous conditions will remain in place and no changes to the 112g are required at this time. There are no changes to the emergency diesel-fired generator being subject to 40 CFR 63 Subpart ZZZZ and the requirements of 40 CFR 63 Subpart ZZZZ being met by complying with 40 CFR 60 Subpart IIII which is more stringent. A change with this PSD revision is that 40 CFR Part 63 Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters), applies to the new, two 5 million Btu/hr hot oil heaters.
61-62.68	Not Applicable. No change with this PSD revision.
40 CFR 64 (CAM)	Not Applicable. No change with this PSD revision.

AMBIENT AIR STANDARDS REVIEW	
Regulations	**Comments/Periodic Monitoring Requirements**
Standard No. 2	Applicable. The facility has demonstrated compliance through modeling; see modeling summary dated DATE.
Standard No. 7.c	Applicable. The facility has demonstrated compliance through modeling for the PSD Class II increments; see modeling summary dated DATE.

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AMBIENT AIR STANDARDS REVIEW	
Regulations	**Comments/Periodic Monitoring Requirements**
Standard No. 8 (state only)	Applicable. The facility has demonstrated compliance through modeling for all TAPs as of DATE.

Table 1. Showa Denko – PSD Applicability Analysis			
Pollutant	**Controlled Emissions Increase**	**PSD Significant Threshold**	**Significant Increase?**
	TPY	**TPY**	
PM	93.4	25	Yes
PM_{10}	93.08	15	Yes
$PM_{2.5}$	92.8	10	Yes
SO_2	**-342.7**	40	No
NO_X	324.6	40	Yes
CO	4,757.0	100	Yes
VOC	**152.3**	40	Yes
Lead	0.0001	0.6	No
Combustion CO_{2e} (GHG)	**258,067**	75,000	Yes

The bold font in Table 1 represents changes. The increased reduction in SO_2 emissions was part of PSD Revision 2 (0900-0025-CZ-R2). Controlled emissions increase of SO_2 reflect installing a wet scrubber on the existing graphitizing furnaces and proposed graphitizing furnaces. Therefore the PSD project does not contribute to a PSD significant increase for SO_2 emissions. See table below.

PSD Netting Analysis for SO_2			
Equipment ID	Source Description	Stack ID	SO_2 (TPY)
Project Emissions			
E-110-2-4275-01	Hot Oil Heater (New Mill, Mix, and Extrusion)	S-110-2-4349-01	0.01
E-210-2-4271-18/32	Carbottom Furnaces Nos. 18-32 equipped with Thermal Oxidizer (New Bake/Rebake Process)	S-210-2-4333-01	105.6
E-310-2-4272-21	Preheater (New Pitch Impregnation Process)	S-310-2-4349-24	0.03
E-310-2-4275-01	Hot Oil Heater (New Pitch Impregnation Process)	S-310-2-4349-02	0.02
E-310-2-4201-01/ CD-310-2-4333-01	Autoclave/Spray Cooler/Cooling Bath equipped with Thermal Oxidizer (New Pitch Impregnation Process)	S-310-02-4349-01	0.01

PSD Netting Analysis for SO_2			
E-460-4271-01/10	Graphitizing Furnaces/Stack Emissions (New Graphitizing Process)	S-460-4349-03	53.2
E-460-4271-01/10	Graphitizing Furnaces/Roof Monitor Emissions (New Graphitizing Process)	Roof Monitor	40.0
		Total for New Source Emissions	**198.87**
Average Past Actual Emissions (2007-2008)			
E-210-01	Carbottom Furnaces Nos. 1-17 equipped with Thermal Oxidizer (Existing Bake/Rebake Process)	S-210-01/S-210-02	128.83
E-430-01	Graphitizing Furnaces/Stack Emissions (Existing Graphitizing Process)	S-430-03	443.3
E-430-01	Graphitizing Furnaces/Roof Monitor Emissions (Existing Graphitizing Process)	S-430-01 (Roof Monitor)	308.03
		Total Past Actual Emissions	**880.2**
Creditable Emissions Increase – Sources that were new/modified within the last 5 years			
E-310-01	(2) Preheaters (installed burners with increased Btu rating; original 2.1 million Btu/hr; new 4.2 million Btu/hr each) (2010)	S-310-03/ S-310-04/ S-310-05/ S-310-06	0.02
E-310-11	Hot Oil Heater (4.5 million Btu/hr) (2010)	S-310-10	0.01
		Total Creditable Emissions Increase – New/Modified Sources	**0.03**
New Allowable Emissions – Existing Sources			
E-210-01	Carbottom Furnaces Nos. 1-17 equipped with Thermal Oxidizer (Existing Bake/Rebake Process)	S-210-01/S-210-02	118.8
E-430-01	Graphitizing Furnaces/Stack Emissions (Existing Graphitizing Process)	S-430-03	75.7
E-430-01	Graphitizing Furnaces/Roof Monitor Emissions (Existing Graphitizing Process)	S-430-01 (Roof Monitor)	144.1
		Total New Allowable Emissions – Existing Sources	**338.6**
		Creditable Decrease (Total New Allowable + Total Creditable Increase minus Total Past Actual)	**(541.6)**
		SO_2 Net Increase/Decrease	**(342.7)**

PUBLIC NOTICE

This construction permit will undergo a 30-day public notice period to establish a new VOC BACT limit for the new graphitizing furnaces and modifying the exiting GHG BACT limit for the new graphitizing furnaces in accordance with SC Regulation 61-62.1, Section II.N. This permit(s) was placed in the NAME OF NEWSPAPER on DATE. The comment period was open from DATE to DATE and was placed on the BAQ website during that time period.

ADDITIONAL PUBLIC PARTICIPATION The facility held a public meeting (the Department was not present) at the facility on December 14, 2016 where an update on the status of the PFC-75 project (0900-0025-CZ) was provided.

SUMMARY AND CONCLUSIONS

It has been determined that this source, if operated in accordance with the submitted application, will meet all applicable requirements and emission standards.

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Watts, Sheila G.

From: Barringer, Veronica
Sent: Tuesday, January 17, 2017 3:14 PM
To: bernie.hawkins@nelsonmullins.com; jwm@gel.com; jfelker@sdkc.com; Pascazio, Daniel
Cc: Thompson, Rhonda; Porter, Henry; Watts, Sheila G.
Subject: Draft PSD permit revision
Attachments: Draft Preliminary Determination for SD PSD Revision (1-17)_sent to SD 2017-01-17.docx; Draft PSD Revision for SD (1-17)_sent to SD 2017-01-17.docx; Draft Statement of Basis for Showa Denko PSD Revision (1-17)_sent to SD 2017-01-17.docx

Bernie,

As discussed, attached are the draft permits for the PSD revision. Note that modeling has not yet been completed and is not included. The modeling section on the preliminary determination also needs to be changed over to the new template and will be forthcoming.

All changes done to the draft preliminary determination and the draft permit have been highlighted in yellow. Note that our agency logo and formatting of documents have changed. The preliminary determination and statement of bases uses the new formatting, however switching the permit over to the new template would change all of the condition numbers. As such only the new agency logo and cover page has been changed on that document.

Also, as discussed the goal is to have these documents finalized this week, such that we can move forward with public noticing. As such please let me know at your earliest convenience of any issues and/or concerns you may have.

Thanks,

Veronica

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality – Engineering Services Division
S.C. Dept. of Health & Environmental Control
Office: (803) 898-4127
Connect: www.scdhec.gov Facebook Twitter

Barringer, Veronica

From: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Sent: Friday, December 30, 2016 4:40 PM
To: Barringer, Veronica
Subject: RE: Showa Denko documentation

Thank you.

Sent from my Verizon, Samsung Galaxy smartphone

-------- Original message --------
From: "Barringer, Veronica" <barrinv@dhec.sc.gov>
Date: 12/30/16 3:50 PM (GMT-05:00)
To: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Subject: Showa Denko documentation

Bernie,

Attached are the two preliminary determinations as well.

Thanks,

Veronica

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality – Engineering Services Division
S.C. Dept. of Health & Environmental Control
Office: (803) 898-4127
Connect: www.scdhec.gov Facebook Twitter

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Watts, Sheila G.

From: McLure, John <jwm@gel.com>
Sent: Monday, October 10, 2016 8:35 PM
To: Nichols, Bryan T.
Cc: Frost, Keith; Watts, Sheila G.; Dan Pascazio (dpascazio@sdkc.com); bernie.hawkins@nelsonmullins.com
Subject: Rescheduling of Showa Denko SO2 and PM Compliance Testing on Existing Graphitizing Scrubber Outlet (Hurricane Matthew)

Importance: High

Bryan

We need to reschedule the above referenced compliance test due to the hurricane last week. Bernie Hawkins discussed this situation with Keith Frost today. Mr. Frost suggested that we follow up this discussion with an e-mail.

Showa Denko declared startup for retrofitted existing graphitizing on May 1, 2016.

Conditions 5.C.5 (SO2) and 5.C.8 (Filterable PM) of the PSD permit require the initial performance test within 180 days of startup.

180 days after May 1 is October 28.

The performance testing was scheduled to occur this week (the week of October 10). Hurricane Matthew came through the Charleston area October 7/8. The plant curtailed operations in preparation for the hurricane's arrival. The plant suffered a partial power loss due to the hurricane. The plant is in the process of restoring power and restarting operations. At this time, the facility is not sure when it will again reach the representative full production conditions described in the approved test plan. Thus, the testing scheduled for this week needs to be postponed.

The GEL stack test crews are booked at other client sites the weeks of October 17 and October 24. We can accommodate the Showa Denko testing the week of October 31. The schedule would be mobilize Monday October 31, and test Tuesday-Thursday November 1-3. This puts the testing slightly after the 180 day window called out in the PSD permit. Based upon discussions with Mr. Frost, we understand that he was going to review this request with your group. In addition, based upon those discussions, it is our understanding that, given the facts surrounding the hurricane, Mr. Frost did not believe this request would present an issue from the perspective of the compliance section. We ask that you review this request and let us know if you concur with it or have any additional concerns with rescheduling the testing in question to the week of October 31. As always, we appreciate your cooperation.

Thanks

John
--

John W. McLure, P.E., Principal

GEL Engineering LLC

2040 Savage Road, Charleston, SC 29407 | P.O. Box 30712, Charleston, SC 29417
Cell: 843.906.3636 | General Office: 843.769.7378 x4420
Environmental | Engineering | Surveying

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Watts, Sheila G.

From: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Sent: Friday, January 20, 2017 9:07 PM
To: Barringer, Veronica; Watts, Sheila G.
Cc: Pascazio, Daniel; jwm@gel.com; Thompson, Rhonda; Gorman, Veronica; Glass, John
Subject: RE: Draft documents

Thank you.

Bernard F. Hawkins
Nelson Mullins Riley & Scarborough LLP
1320 Main Street/Columbia SC 29201
Tel: 803.255.9581 Mobile: 803.331.5410
bernie.hawkins@nelsonmullins.com

From: Barringer, Veronica [mailto:barrinv@dhec.sc.gov]
Sent: Friday, January 20, 2017 7:05 PM
To: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>; Watts, Sheila G. <wattssg@dhec.sc.gov>
Cc: Pascazio, Daniel <DPascazio@SDKC.com>; jwm@gel.com; Thompson, Rhonda <thompsrb@dhec.sc.gov>; Gorman, Veronica <gormanvm@dhec.sc.gov>; Glass, John <glassjp@dhec.sc.gov>
Subject: RE: Draft documents

Bernie,

Attached, is the updated modeling section for your review.

Thanks,

Veronica

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality – Engineering Services Division
S.C. Dept. of Health & Environmental Control
Office: (803) 898-4127
Connect: www.scdhec.gov Facebook Twitter

From: Bernie Hawkins [mailto:bernie.hawkins@nelsonmullins.com]
Sent: Friday, January 20, 2017 4:20 PM
To: Barringer, Veronica <barrinv@dhec.sc.gov>; Watts, Sheila G. <wattssg@dhec.sc.gov>
Cc: Pascazio, Daniel <DPascazio@SDKC.com>; jwm@gel.com; Thompson, Rhonda <thompsrb@dhec.sc.gov>
Subject: RE: Draft documents

Veronica,

We will review and get back to you. Can you send us a copy of the updated PD when it is available?

Thanks,

Bernie

Bernard F. Hawkins
Nelson Mullins Riley & Scarborough LLP
1320 Main Street/Columbia SC 29201
Tel: 803.255.9581 Mobile: 803.331.5410
bernie.hawkins@nelsonmullins.com

From: Barringer, Veronica [mailto:barrinv@dhec.sc.gov]
Sent: Friday, January 20, 2017 3:38 PM
To: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>; Watts, Sheila G. <wattssg@dhec.sc.gov>
Cc: Pascazio, Daniel <DPascazio@SDKC.com>; jwm@gel.com; Thompson, Rhonda <thompsrb@dhec.sc.gov>
Subject: Draft documents

Bernie,

Attached, are the updated draft documents. The changes left that needs to be reviewed are highlighted in yellow. Below is a list of some of them:

1. On the PD we added the nitrogen and sulfur % back in. These were left in the permit as part of revision 5 and it would be better if the permit and PD matched up.
2. On the SOB a comment on the 14.4 TPY number has been added. Please can you confirm that the thought process is correct. We tried calling GEL for confirmation but were unable to reach anybody.
3. On the permit we added methane as being included in the initial test as the limit now reflects CO2 and methane and source testing only had CO2.
4. The modeling section on the PD has been converted over from the original PD. The modeling section is in the process of updating it, to include the other revisions and Std 8 modeling for this revision. Updating the PD just ensure that we are moving forward with one complete and accurate PD for the facility. As these revisions have already been included in the permit, the only change to the permit will be to include the Std 8 modeling.

Please let me know asap, but no later than 8am Monday morning (January 23rd), if you have any issues with moving forward.

Thanks,

Veronica

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality – Engineering Services Division
S.C. Dept. of Health & Environmental Control
Office: (803) 898-4127
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Watts, Sheila G.

From: Watts, Sheila G.
Sent: Wednesday, January 11, 2017 10:10 AM
To: 'Bernie Hawkins'; jwm@gel.com
Cc: Barringer, Veronica
Subject: RE: Applicability of 40 CFR Part 63, Subpart 5D with Showa's PSD Revision.....

Thank you, Bernie!

From: Bernie Hawkins [mailto:bernie.hawkins@nelsonmullins.com]
Sent: Wednesday, January 11, 2017 10:07 AM
To: Watts, Sheila G. <wattssg@dhec.sc.gov>; jwm@gel.com
Subject: RE: Applicability of 40 CFR Part 63, Subpart 5D with Showa's PSD Revision.....

Sheila,

Thank you for your email. Answering your question below, SDKC has identified the following equipment from permit 0900-0025-CZ as being subject to 40 CFR Part 63, Subpart DDDDD:

- **E-110-2-4275-01 Hot Oil Heater (5 million Btu/Hr)**
- **E-310-2-4275-01 Hot Oil Heater (5 million Btu/Hr)**

These sources are subject to the work practice standards included in Table 3 of the regulation (tune-up provisions). For clarity, these sources are not impacted by the current permit application to address VOC/methane emissions from the new graphitizing operation.

Let us know If you have any questions.

Thanks,

Bernie

Bernard F. Hawkins
Nelson Mullins Riley & Scarborough LLP
1320 Main Street/Columbia SC 29201
Tel: 803.255.9581 Mobile: 803.331.5410
bernie.hawkins@nelsonmullins.com

From: Watts, Sheila G. [mailto:wattssg@dhec.sc.gov]
Sent: Tuesday, January 10, 2017 10:58 AM
To: jwm@gel.com
Cc: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Subject: Applicability of 40 CFR Part 63, Subpart 5D with Showa's PSD Revision.....

Hi John,

Could you please address applicability of NESHAP, Subpart 5D for Showa Denko's PSD revision? Previously, EPA had issued a stay and it was not applicable, now it is applicable. Please let me know which equipment (from 0900-0025-CZ) would be involved in being subject to Subpart 5D.

We will likely add placeholder language to the revised permit and reference the regulation as applicable in the revised Preliminary Determination.
Please let me know if you have any questions.

Thank You,

Sheila

Sheila Watts, P.E.
Environmental Engineer
Engineering Services Division/Bureau of Air Quality
S.C. Dept. of Health & Environmental Control
2600 Bull Street, Columbia, SC 29201-1708
Office: (803) 898-1161
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Watts, Sheila G.

From: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Sent: Tuesday, January 10, 2017 9:29 AM
To: Barringer, Veronica
Cc: Thompson, Rhonda; Watts, Sheila G.; Frost, Keith
Subject: RE: Additional questions

Thank you very much. We appreciate your and Shelia's assistance in working through these items.

Thanks again,

Bernie

Sent from my Verizon, Samsung Galaxy smartphone

-------- Original message --------
From: "Barringer, Veronica" <barrinv@dhec.sc.gov>
Date: 1/10/17 8:28 AM (GMT-05:00)
To: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Cc: "Thompson, Rhonda" <thompsrb@dhec.sc.gov>, "Watts, Sheila G." <wattssg@dhec.sc.gov>, "Frost, Keith" <frostrk@dhec.sc.gov>
Subject: RE: Additional questions

Bernie,

Thank you so much for the additional information. Sheila and I have reviewed and at this point we have no further questions and are moving forward with drafting the documents.

Thank you,

Veronica

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality – Engineering Services Division
S.C. Dept. of Health & Environmental Control
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From: Bernie Hawkins [mailto:bernie.hawkins@nelsonmullins.com]
Sent: Friday, January 06, 2017 2:06 PM
To: Barringer, Veronica <barrinv@dhec.sc.gov>
Cc: Thompson, Rhonda <thompsrb@dhec.sc.gov>; Watts, Sheila G. <wattssg@dhec.sc.gov>; Frost, Keith <frostrk@dhec.sc.gov>
Subject: Additional questions

Veronica,

Based upon our discussion earlier today, please find below the responses and proposed approach for moving forward (using a batch averaging period). Let me know if you have any additional questions.

Thanks,

Bernie

From: Barringer, Veronica [mailto:barrinv@dhec.sc.gov]
Sent: Wednesday, January 4, 2017 12:46 PM
To: Bernie Hawkins <bernie.hawkins@nelsonmullins.com>
Cc: Watts, Sheila G. <wattssg@dhec.sc.gov>; Thompson, Rhonda <thompsrb@dhec.sc.gov>; Frost, Keith <frostrk@dhec.sc.gov>
Subject: Additional questions

Bernie,

Thank you for your responses (received via e-mail on December 30, 2016) to our questions on the Showa Denko Gaseous Organics PSD Revision Application.

As per our discussion today, below are the additional questions:

1) In the e-mail from Bernie to the Department on December 26, 2016, a statement was added that the 58.69 TPY VOC limit was established from a prior construction permit on the basis of a twelve month rolling average. The Department has been unable to find this in a construction permit issued to the facility. Please provide which construction permit it is that the facility is referring too.

Response:

Based upon our review of our respective permitting files, we both found that various permits reflect the 13.4 lb/hr value as well as the 58.69 tpy for VOC emissions from the existing graphitizing operations at the SDKC facility. SDKC is uncertain as to what construction permit first reflected the 58.69 tpy VOC value. However, these values have been carried forward in numerous permits over time. These values are reflected in the current Title V permit for the facility. DHEC would not have arbitrarily assigned the tpy value. We have not located a written description for the precise rationale on the origin of the VOC values for the existing graphitizing operations; such rationale, dating back to as early as 1981, may presently be unavailable. Considering what we do know, it seems apparent that the 13.4 lbs/hr value was based upon a yearly average value, corresponding to 58.69 tpy.

Examining what we know, the original construction permit application forms for the facility in 1981 requested emission data only in the form of hourly data (not tons per year). This is likely the explanation for why the original permit included only a lb/hr value. There is no indication that a lb/hr value provided for existing graphitizing operations resulted from stack testing allowing identification of an instantaneous maximum value for the graphitizing operation. This would have been even more implausible considering the facility had not been constructed at the time. There was no control device or work practice standard required for the existing graphitizing operations for control

of VOCs. Thus, there is no short term control efficiency to verify on a lb/hr VOC basis. The graphitizing operations is not analogous to a coating operation; VOC emission rates could not be identified on some short-term basis given the amount of raw material used or produced. Raw materials are not expected to contain VOCs. Thus, there would have been no basis from which to assign a short term/instantaneous BACT limit. BACT at the time, for an overlapping batch/peaking operation with no requirements for emission controls, would likely to have been prescribed by describing the operation and reflecting VOC emissions associated with the operation (i.e., for future comparison purposes since this was likely the first source ever to be evaluated in the category). Similarly, there likely would have been no focus on a short term/instantaneous VOC limits in 1981. The Ozone NAAQS was based upon a 3-year comparison (with focus on three separate 12 month periods). South Carolina is NOx limited state. There would have been no reason to focus on short-term VOC limits under these circumstances.

Also, we know the graphitizing operation is a batch operation and that there are peak values for VOC emissions. To the extent expected at the time of permitting, any VOC emission rates would be expected to vary significantly during normal operation – with peaks observed during limited periods of operation at elevated furnace temperatures. This has been confirmed by recent stack testing. The inherent engineering limitations of an operation such as the graphitizing operation prevent it from having a peak VOC emission rate that continues on a 8,760 hour basis. Thus, if a peak VOC emission rate was assigned for the SDKC graphitizing operation, this would not be the same as the PTE for the operation on an annual basis. Again, the graphitizing operation could not maintain a peak VOC rate for 8,760 hours per year. The only way for a lb/hr value reflected for the graphitizing operation to correspond to a maximum tpy value for this operation would be for the lb/hr value to be a 12 month average. That is 13.4 lbs/hr x 8760 hrs/yr (yearly average basis) ÷ 2000 lbs/ton = 58.69 tpy. Based upon this correlation, the logical assumption is that 13.4 lbs/hr is an annual average, which correlates to 58.69 tpy.

The above position would also be consistent with the batch/peaking nature of the graphitizing operation. The graphitizing operation involves multiple furnaces, each going through multiple batch/peaking operations, over the course of a year of normal operation. Under these conditions, it would be appropriate to allow any short-term emission conditions for such operation to be averaged over a longer period of time, such as 12 months. At a minimum, the averaging period for a batch/peaking operation would be the duration of a batch. For existing graphitizing operation, the furnace batch period is 120 hours. The recent stack testing conducted for the existing graphitizing operation covered a period of 36 hours. However, SDKC believes this testing reflected representative emission rates. Considering the averaging period of the test (36 hours), the facility was well within the 13.4 lb/hr value for existing graphitizing operations. SDKC does agree to conduct an additional source test for the existing graphitizing operation in the future covering a period of 120 hours of operation to further confirm compliance with the 13.4 lb/hr value, on a batch average basis of 120 hours. A Site-Specific Test Plan for this 120 hour test would be submitted to the Department for review and approval in advance of the test.

With respect to the new graphitizing operation, SDKC in the December 15, 2016 permit application inferred a lb/hr VOC limit for the new graphitizing operation based upon the 36 hour stack tested conducted in October. SDKC proposes that DHEC issue a construction permit for the new graphitizing operation based upon the requested VOC limit, considering it based upon a 36 hour average basis. With respect to the new graphitizing operation, a batch cycle is slightly shorter as compared to existing graphitizing, at 96 hours per batch. SDKC would accept an additional permit requirement that it conduct a source test for the new graphitizing operation as soon as practicable, but in no case later than 180 days, with such testing to cover 96 hours of operation. A Site-Specific Test Plan for this 96 hour test would be submitted to the Department for review and approval in advance of the test. This stack testing would then be used to make any required adjustment to the lb/hr basis, established on a 96 hour batch average basis. Assuming this testing triggered no new substantive requirements, this change could be made on the basis of an administrative amendment.

2) It was stated that the lb/hr VOC limit for the existing graphitizing furnace operations will be addressed as an average over 12 months and a newly proposed lb/hr VOC limit for the new graphitizing furnaces would be averaged over a 12 month rolling basis. Please explain how the SDKC conducted 36 hour stack test can be correlated to a 12 month average.

Response:

SDKC is proposing that the initial VOC limit for new graphitizing operation be based upon a 36 hour average period. SDKC is also proposing to conduct additional stack testing for the new graphitizing operation within 180 days of operation to cover the duration of 96 hours, and, use this test to further confirm a short-term VOC value on a per batch average. A Site-Specific Test Plan for this 96 hour test would be submitted to the Department for review and approval in advance of the test.

3) It was stated that methane formation could increase CO2e emissions by 2,612 tpy. The previously established CO2e PSD limit of 32,852 tpy was based on installing 10 graphitizing furnaces, however only 8 are being installed. It seems that the decrease in potential CO2e emissions from installing 2 less furnaces (approx. 6,570.4 tpy) would offset the increase of 2,612 tpy from methane formation. Submitted information indicates that the requested increase accounts for potential variability, however no information as to what the potential variability would be has been included. Please explain.

Response:

With respect to the variability requested in setting the proposed CO2e limit for new graphitizing operation, SDKC had to scale emissions from the existing graphitizing operation to establish this value. A 10% adjustment was made to reflect the differences between new and existing graphitizing operations. The new graphitizing operations are able to process electrodes that are longer and wider. The new graphitizing operations can be loaded and unloaded in a more efficient manner, resulting in a somewhat shorter batch time. The existing graphitizing operations are over 30 years in age. Considering these differences, the 10% adjustment for new graphitizing operations is a conservative value.

4) It was stated that the stack test covered a total of 36 hours of production for normal operation of the 27 graphitizing furnaces, operating in a manner consistent with high production of electrodes. Will the new graphitizing furnaces operate in the same manner as the existing graphitizing furnaces when it comes to normal operation and high production of electrodes? If not, please explain.

Response:

New graphitizing operation will be operated in a manner substantially identical to the existing graphitizing operation. However, there are minor differences in these operations as noted above in the response to Question No. 3.

5) SDKC has proposed to conduct stack tests within 180 days of startup and every 3 years thereafter, with reduced testing frequency if emissions (VOC and methane) are below certain levels. What is proposed for maintaining compliance between stack tests? What parametric monitoring or work practice standards be proposed?

Response:

Pitch-impregnated electrodes could be rebaked in the carbottom furnaces or, alternatively, in the graphitizing furnaces. If pitch-impregnated electrodes were rebaked in the graphitizing furnaces, VOC emissions would be expected to result. SDKC has committed to rebaking all pitch-impregnated electrodes in the carbottom furnaces where VOCs are controlled by a thermal oxidizer. No pitch-impregnated electrodes will be rebaked in the graphitizing furnaces.

Metallurgic coke or petroleum based coke could be used as an insulating media in the graphitizing furnaces. Metallurgic coke has been exposed to high temperatures prior to use. Thus, VOCs should not be emitted (or limited to the extent possible) from use of this insulating material. SDKC has committed to using only metallurgic coke in the graphitizing operations.

The above items reflect the most stringent work practice standards that exist for the graphitizing furnaces. SDKC agrees to follow these practices between stack tests.

It is our understanding that an updated application that includes modeling will be available for our review on Friday, January 6, 2017. If this date changes please let us know.

Thank you,

Veronica

E. A. Veronica Barringer
Manager, Coastal Plains and Power Section
Bureau of Air Quality – Engineering Services Division
S.C. Dept. of Health & Environmental Control
Office: (803) 898-4127
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<image001.jpg>

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