$PM_{2.5}$ BACT/BACM Analysis

Hexcel Corporation, West Valley City, UT

Prepared For:
Bryan Wheeler, PE; **Hexcel Corporation**

Prepared By:
Miriam Hacker, PE; Aspen Outlook, LLC
miriamhacker@aspenoutlook.com

April, 2017

April 25, 2017

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April 25, 2017

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DEPARTMENT OF
ENVIRONMENTAL QUALITY

HAND DELIVERED

Mr. Bryce Bird
Executive Secretary
State of Utah
Department of Environmental Quality
Division of Air Quality
1950 West North Temple
Salt Lake City, Utah 84116-4820

Re: Serious Nonattainment Area SIP Control Strategy Requirements

Dear Mr. Bird:

Please find attached the $PM_{2.5}$ BACT/BACM Analysis for Hexcel Corporations (Hexcel) carbon fiber and fabric pre-impregnation (pre-preg) manufacturing plant located in West Valley City, Utah.

Hexcel received a letter dated January 23, 2017 from Utah Department of Environmental Quality - Division of Air Quality (UDAQ) indicating that the division has begun work on a serious area attainment control plan as required by 40 CFR 51 Subpart Z. This letter requested that all major sources subject to this rule submit a BACT/BACM analysis in support of this effort no later than April 30, 2017. The attached $PM_{2.5}$ BACT/BACM Analysis fulfills this requirement.

If you have any questions concerning this report or require additional information, please contact me at (801) 209-2427 or the address listed below.

Sincerely,

Bryan Wheeler
Sr. Environmental Engineer

Attachment

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Executive Summary

Hexcel received a letter dated January 23, 2017 from Utah Department of Environmental Quality – Division of Air Quality (UDAQ) indicating that the division has begun work on a serious area attainment control plan as required by 40 CFR 51 Subpart Z. This rule requires that UDAQ implement Best Available Control Measures (BACM) for major sources of particulate matter with diameter less than 2.5 microns ($PM_{2.5}$) and $PM_{2.5}$ precursors within the nonattainment area. As a source permitted to emit 70 tons per year of $PM_{2.5}$ and/or its precursors within the nonattainment area, the Hexcel West Valley City Plant falls within this category.

Hexcel owns and operates a carbon fiber and fabric pre-impregnation (pre-preg) manufacturing plant (Hexcel West Valley City Plant) located at 6800 West 5400 South, West Valley City, Salt Lake County, Utah. The Hexcel West Valley City Plant currently operates under UDAQ's Approval Order (AO) No. DAQE- AN113860028-16. In January 2012, Hexcel submitted a $PM_{2.5}$ Reasonably Available Control Technology (RACT) assessment to UDAQ for the Hexcel West Valley City Plant at the request of UDAQ. An addendum to this assessment was submitted to UDAQ in August 2013, in response to adjustments in calculations, as well as UDAQ comments and questions. Additional requested information on start-up and shutdown emission controls and RACT implementation dates was submitted to UDAQ on April 30, 2014.

At present, Salt Lake County is a moderate nonattainment area for $PM_{2.5}$ based on the 2006 standard[1]. In an effort to complete the requirements for the serious area attainment control plan, UDAQ has requested that Hexcel complete a comprehensive Best Available Control Technology (BACT)/BACM analysis for all affected sources at the West Valley City Plant. The BACT analysis was performed consistent with the guidance provided by UDAQ to Hexcel.[2] Reaching attainment under the Serious SIP requires that all applicable control technologies and techniques be identified and evaluated (or re-evaluated) to determine their applicability. The evaluation must include a detailed written justification of each available control technology or technique, accounting for technological and economic feasibility, and including documentation to justify eliminating any potential controls.

Subpart Z requires that UDAQ identify all potential control technologies or methods that will reduce emissions of $PM_{2.5}$ and its precursors, which include:

- Nitrogen oxides (NO_X),
- Sulfur oxides (SO_X),
- Volatile organic compounds (VOC), and
- Ammonia (NH_3)

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[1] U.S. EPA Greenbook, https://www3.epa.gov/airquality/greenbook/rnca.html#PM-2.5.2006.Salt_Lake

[2] Meeting at UDAQ offices with Nando Meli and Martin Grey of UDAQ, Bryan Wheeler (Hexcel) and Miriam Hacker (Aspen Outlook, LLC), February 28, 2017.

As a part of BACT analysis for direct $PM_{2.5}$, condensable particulate matter (CPM) emissions were also considered in the analysis.

Based on guidance provided by UDAQ, the Hexcel $PM_{2.5}$ BACT analysis includes the following components for the primary pollutant ($PM_{2.5}$) and its precursors.

- Potential Control Technology Identification
- Potential Control Technology Emission Impact Evaluation
- Cost/Benefit Analysis for Potential Control Technologies
- Evaluation of Potential Emission Limits and Monitoring Requirements, and
- An Implementation Calendar

Tables 1 and 2 provide summaries of each BACT determination for $PM_{2.5}$ and its precursors for the main Fiber Line process, and other miscellaneous processes present at the facility, respectively.

Details of the BACT analysis for each pollutant from each of these sources are provided in the following sections.

Table 1. Summary of $PM_{2.5}$ and Its Precursors BACT Analysis for Fiber Line Emissions

Process	Pollutants	Proposed BACT
Oxidation Ovens; Incinerators; Low-Temperature Furnaces; High Temperature Furnaces; Surface Treatment Equipment; and Ammonium Bicarbonate/RO Water Mix Rooms	VOC	Good Combustion Practices Natural Gas Combustion Only Incinerators (Lines 2-7, 8, 10, 11 and 12) Dual Chambered Regenerative Thermal Oxidizer (RTO) for newer lines (Lines 13, 14, 15 and 16)
	$PM_{2.5}$	Good Combustion Practices Natural Gas Combustion Only Baghouse for newer lines (Lines 13, 14, 15, and 16)
	NO_X	Good Combustion Practices Natural Gas Combustion Only Low-NO_X burners for newer lines (Lines 13, 14, 15 and 16)
	SO_2	Natural Gas Combustion Only
	NH_3	Good Operating Practices

Table 2. Summary of $PM_{2.5}$ and Its Precursors BACT Analysis for Miscellaneous Processes

Process	Pollutants	Proposed BACT
Pilot Furnaces and Ovens	NO_X, SO_2, $PM_{2.5}$, VOC, NH_3	Natural Gas Combustion Only Good Operation and Combustion Practices Incinerator
Matrix Incinerators	NO_X, SO_2, $PM_{2.5}$, VOC	Natural Gas Combustion Only Good Operation and Combustion Practices Incinerators, or Regenerative Thermal Oxidizers (RTO)
HVAC systems	NO_X, SO_2, $PM_{2.5}$, VOC	Natural Gas Combustion Only Good Operation and Combustion Practices
Emergency Generators	NO_X, SO_2, $PM_{2.5}$, VOC	Annual Hours of Operation Restrictions and Use of Low Sulfur Fuel Engines compliant with NSPS IIII and JJJJ and NESHAP ZZZZ

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Attachment E – April 30, 2014 Letter to UDAQ RE: PM2.5 SIP RACT-Responses to Request for Additional Information

Attachment F – AO Requirement Summary

April 25, 2017

Non-Attainment Area BACT Review

In addition to a review of the RACT/BACT/LAER Clearinghouse (RBLC) database, Hexcel reviewed control strategies proposed in other $PM_{2.5}$ nonattainment areas. Based on the 2006 Hourly $PM_{2.5}$ NAAQS area designations[3], the following areas were designated as being in serious nonattainment for $PM_{2.5}$:

- Los Angeles – South Coast Air Basin, CA
- San Joaquin Valley, CA

The following areas were designated as being in moderate nonattainment for $PM_{2.5}$:

- Fairbanks, AK
- Nogales, AZ
- West Central Pinal, AZ
- Chico, CA
- Imperial Co, CA
- Sacramento, CA
- San Francisco Bay Area, CA
- Klamath Falls, OR
- Oakridge, OR
- Knoxville-Sevierville-La Follette, TN
- Liberty-Clairton, PA
- Logan, UT-ID
- Provo, UT
- Salt Lake City, UT

Provided below is a list of proposed control strategies and BACT determinations for other facilities with similar processes and equipment, located in $PM_{2.5}$ nonattainment areas.

Alaska

According to the Fairbanks, AK SIP Plan (last amended December 2016), solid fuel-burning devices are the largest contributors to the nonattainment status for $PM_{2.5}$. As such, many of the proposed control strategies are aimed at reducing the use of wood and coal as a fuel and improving the fuel-burning devices.[4] As Hexcel uses natural gas as a fuel for their fiber line and miscellaneous processes, there are no control technologies or strategies proposed in AK pertinent to Hexcel.

Arizona

There are currently 20 major sources permitted under Pinal County Air Quality Control District (PCAQCD) which oversees the West Central Pinal nonattainment area. Table 3 provides details

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[3] Nonattainment areas for hourly $PM_{2.5}$ NAAQS obtained from the following website: https://www3.epa.gov/airquality/greenbook/rnc.html

[4] Information found on pages III.D.5.7-1-11 and obtained from the following website: http://dec.alaska.gov/air/anpms/comm/docs/fbxSIPpm2-5/III.D.5-PM2.5_SIP_Sections-Adopted_09.07.16.pdf *(footnote continued)*

of facilities that have processes and equipment similar to that of Hexcel and their respective control technologies and methods.[5]

Table 3 – PCAQCD Facility Control Technology Determinations

Facility	Equipment	Control Technology
Frito-Lay, Inc.	Boiler Dryer Ovens	Use of natural gas
Mesa Fully Formed, LLC	Thermal Form Oven	Baghouse with 99% control efficiency
Prowall Building Products, Inc.	Boilers Bed Dryer	Use of natural gas

As Hexcel already uses natural gas and baghouse control on newer ovens and other combustion sources, there are no new control technologies or strategies proposed in AZ applicable to the West Valley City Plant. Baghouse technology will be evaluated for the currently uncontrolled ovens and other combustion sources at the Plant.

Nogales, AZ is considered nonattainment for $PM_{2.5}$ primarily due to emissions resulting from traffic at the U.S./Mexico border. Currently there are no major sources for $PM_{2.5}$ located in Nogales county.[6]

California

California Air Resources Board (CARB) provides a statewide BACT clearinghouse. The database was developed by staff from various air pollution control and air quality management districts located in California.[7] Search results provided BACT determinations for dryers and ovens emitting $PM_{2.5}$ and its precursors. Low NOx burners were determined to be BACT for these processes in CA. Table 4 provides a full list of determinations for dryers and ovens from the BACT clearinghouse. All facilities are located within the South Coast Air Quality Control District (AQMD).

Table 4 – South Coast AQMD BACT Determinations

Plant Name	Pollutant	BACT Determination
Dart Container Corporation of California	NOx, CO, PM	Emission limits
Color America Textile Processing, Inc.	NOx	Low NOx burner
Aramark Uniform Services	NOx	Low NOx burner

[5] Facilities and permits obtained from the following website: http://www.pinalcountyaz.gov/AirQuality/Pages/TitleVPermitsIssued.aspx and accessed on March 28, 2017.

[6] Information found on pages 17-18 of "Technical Support Document for Recommendation that Nogales, Arizona Area Be Designated as a $PM_{2.5}$ Nonattainment Area" and obtained from the following website: https://www3.epa.gov/pmdesignations/2006standards/rec/letters/09_AZ_rec_a2.pdf

[7] BACT Clearinghouse obtained from the following website: https://www.arb.ca.gov/bact/bact.htm

Fletcher Coating	NOx, VOC	Low NOx burner
Newell Rubbermaid	NOx	Low NOx burner
Sargent Fletcher	NOx, CO	Eclipse Combustion-Nozzle-Mix Low-NOx burner
BMCA Insulation Products	NOx, CO	Low NOx burner

As Hexcel already uses low NO_X burner control technology on newer ovens and other combustion units, there are no new control technologies or strategies proposed in CA for these sources applicable to the West Valley City Plant. Low NO_X burner technology will be evaluated for the currently uncontrolled combustion sources at the Plant.

In addition, BACT was determined for a fiber impregnation facility located in CA. Cytec Fiberite, Inc. (Cytec) is a fiber impregnation facility located in the South Coast AQMD $PM_{2.5}$ serious nonattainment area in Orange County. Based on information obtained from the CARB BACT clearinghouse, Cytec operates under the following very stringent BACT conditions[8]:

- Hood designed for at least 95% collection efficiency;
- Baghouse guaranteed to meet 99.999% collection efficiency for 1 micron particles;
- HEPA filter downstream of baghouse guaranteed to meet 99.97% collection efficiency for 0.3; micron particles;
- Use of some zero-VOC materials purchased from Proviron Fine Chemicals.

Hexcel currently employs baghouse control technology on the newer fiber lines (Fiber Lines 13, 14, 15 and 16). Baghouse control technology will be evaluated for the currently uncontrolled fiber lines (Fiber Lines 2 – 7, 8, 10, 11 and 12). A required collection efficiency for the routing/ducting of the Fiber Line pollutant stream to the baghouse *has not been* established. However, it is understood that the ducting is designed to maintain persistent air flow and temperature to the baghouse, and will be inherently efficient for collection of the pollutant stream.

Oregon

As a part of their Klamath Falls $PM_{2.5}$ Attainment Plan, Oregon Department of Environmental Quality (ODEQ) has implemented a number of emission reduction actions. One action included identifying RACT strategies for major sources located in Klamath Falls.[9] The four major sources identified are Columbia Forest Products, Jeld-Wen, Collins Products, and Klamath Cogeneration. It was determined that complying with existing state regulations and use of low-NOx burners is considered RACT for Klamath Cogeneration. For Jeld-Wen and Collins Products, complying with MACT rules for Plywood and Composite Wood Products is considered sufficient control.

[8] BACT determination for Cytec obtained from the following website: https://www.arb.ca.gov/bact/bactnew/determination.php?var=820 and accessed on March 16, 2017.

[9] Information from page 3 of Klamath Falls $PM_{2.5}$ Attainment Plan obtained from the following website: http://www.deq.state.or.us/aq/planning/docs/kfalls/KFallsAttPlan2012.pdf
(footnote continued)

Columbia Forest Products will be required to meet new RACT standards imposed for wood combustion.[10] As Hexcel already uses low NO_X burner control technology on newer ovens and other combustion units, there are no new control technologies or strategies proposed in OR for these sources applicable to the West Valley City Plant. Low NO_X burner technology will be evaluated for the currently uncontrolled combustion sources at the Plant.

No additional BACT determinations were made for major sources located in Oakridge, OR, as industrial sources of $PM_{2.5}$ only account for less than 1% of the base emission inventory.[11]

Pennsylvania

According to the Allegheny County Health Department $PM_{2.5}$ SIP, there are two major stationary sources located in the Liberty-Clairton nonattainment area: U.S. Steel Clairton Plant and Koppers Industries. U.S. Steel was required to perform a BACT analysis for their Clairton Plant, however the BACT determinations are not pertinent to Hexcel due to the differing steel processes and equipment. Koppers Industries is chemical processing plant that operate a number of process heaters and a dryer. No additional controls were determined as BACT for the process heaters as both flares and catalytic oxidation were considered too costly. Use of a pulse-jet baghouse was determined as BACT for the dryer.[12] Hexcel currently employs baghouse control technology on the newer fiber lines (Fiber Lines 13, 14, 15 and 16). Baghouse control technology will be evaluated for the currently uncontrolled fiber lines (Fiber Lines 2 – 7, 8, 10, 11 and 12).

Tennessee

There are few major sources operating within the Tennessee $PM_{2.5}$ nonattainment area. No similar processes or equipment were found however information on boilers has been included. Provided below is Table 5, detailing control technologies and strategies used for boilers within or near the nonattainment area.[13]

Table 5 – TN $PM_{2.5}$ Nonattainment Area Facility Control Technology Determinations

Facility	Location	Equipment	Control Technology
Johnson Matthey, Inc.	Sevierville, TN	Boiler	Use of natural gas Low NO_x burner
University of Tennessee Steam Plant[a]	Knoxville, TN	Boilers	Use of natural gas

a – Information obtained from application. Title V permit has not yet been issued.

[10] Information found in Appendix 15-1 of Klamath Falls $PM_{2.5}$ Attainment Plan obtained from the following website: http://www.deq.state.or.us/aq/planning/docs/kfalls/A-15-1Combined.pdf

[11] Information found on page 32 of Oakridge $PM_{2.5}$ Attainment Plant obtained from the following website: http://www.lrapa.org/DocumentCenter/View/1848

[12] Information from pages 58-59 of "Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan - Attainment Demonstration for the Liberty-Clairton PM2.5 Nonattainment Area" obtained from the following website: http://www.achd.net/airqual/Liberty-Clairton_PM2.5_SIP-Apr2011.pdf

[13] Facilities and permits obtained from the following website: http://environment-online.tn.gov:8080/pls/enf_reports/f?p=19031:34001:::NO::: and accessed on March 31, 2017.

As Hexcel already uses low NO_X burner control technology on newer ovens and other recently replaced combustion units, there are no new control technologies or strategies proposed in TN for these sources applicable to the West Valley City Plant. Low NO_X burner technology will be evaluated for the currently uncontrolled combustion sources at the Plant.

BACT Methodology

Per 40 CFR § 52.21(b)(12) and UDAQ R307-401-2(1), BACT is defined as follows:

> Best available control technology means an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results.

The United States Environmental Protection Agency (U.S. EPA) prepared a guidance document in October 1990 entitled the "New Source Review Workshop Manual."[14] In it, the U.S. EPA recommends the use of a standardized "top-down" process for BACT determinations. The top-down process requires that available control technologies be ranked in descending order of control effectiveness. Under the top-down methodology, the most stringent or top alternative is represented as BACT unless it can be determined, and the permitting authority agrees, that technical considerations or energy, environmental, or economic impacts justify that the most stringent technology is not achievable for the specified source. If it is determined that the top alternative is not achievable, then the next most stringent alternative is considered, until a BACT

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14 U.S. EPA, New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting (Draft) (Oct. 1990) [hereinafter "NSR Manual"].

control option is selected. The five basic steps of a top-down BACT review as identified by the U.S. EPA are identified below.

- Step 1 – Identify all available control technologies
- Step 2 – Eliminate technically infeasible options
- Step 3 – Rank remaining control technologies according to control efficiency
- Step 4 – Evaluate the most effective controls according to energy, environmental and economic impact.
- Step 5 – Select BACT

The UDAQ NOI Guide also details the requirement to achieve BACT as required in the State of Utah permitting process. The proposed BACT must be based on the most effective engineering techniques and control equipment to minimize emission of air contaminants into the outside environment from its process. Hexcel has ensured that this BACT analysis is in compliance with the UDAQ BACT requirements, which are similar to the U.S. EPA top down requirements.

Based on guidance provided by UDAQ and in accordance with BACT top-down procedures, the following methodologies were used to complete each component of the analysis[15].

Step 1 - Potential Control Technology Identification

Available control technologies were identified for each emission unit. The following methods were used to identify potential control technologies for all Hexcel sources of $PM_{2.5}$ and its precursors:

- Researching the RACT/ BACT/Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC) database[16],
- Reviewing BACT implemented by other regulatory agencies and $PM_{2.5}$ and Ozone non-attainment areas,
- Applying previous engineering experience,
- Reviewing and discussions with air pollution control equipment vendors, and/or
- Reviewing available literature.

Step 2 – Evaluation of Technical Feasibility

Each identified potential control technology was evaluated to determine its technical feasibility in relation to incorporation with sources at the Hexcel site. Only options determined to be technically feasible were further evaluated.

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[15] Meeting at UDAQ offices with Nando Meli and Martin Grey of UDAQ, Bryan Wheeler (Hexcel) and Miriam Hacker (Aspen Outlook, LLC), February 28, 2017.

[16] U.S. EPA Technology Transfer Network Clean Air Technology Center – RACT/BACT/LAER Clearinghouse, https://cfpub.epa.gov/rblc/index.cfm?action=Search.BasicSearch&lang=en

Step 3 – Ranking of Control Technologies

All technically feasible options were ranked based on their control effectiveness. If there was only one remaining option or if all of the remaining technologies could achieve equivalent control efficiencies, ranking based on control efficiency is not required.

Step 4 – Evaluation of most effective controls

Beginning with the most efficient control option in the ranking, detailed economic, energy, and environmental impact evaluations were performed. If the most effective control was shown to be economically feasible, without negative energy or environmental impacts, no further evaluation of controls is necessary.

Potential Control Technology Emission Impact Evaluation

As part of the BACT assessment, emissions associated with existing and potential control technologies for Hexcel sources of PM$_{2.5}$ and its precursors were evaluated based on the following tasks:

1. Provide a summary of existing emissions for each source of PM$_{2.5}$ and PM$_{2.5}$ precursors.
2. Calculate emissions reductions for technically feasible options.

Cost/Benefit Analysis for Potential Control Technologies

The economic feasibility evaluated the cost effectiveness of each control option. Costs of installing and operating control technologies were estimated and annualized following the methodologies outlined in the U.S. EPA's Office of Air Quality Planning and Standards (OAQPS) *Air Pollution Control Cost Manual* (CCM) and other industry resources[17]. Additional resources obtained from Hexcel engineering specifications and control technology vendor estimates were also used to determine costs for implementation of the control technologies.

As no cost effectiveness threshold has been established by UDAQ or U.S. EPA for this BACT analyses, a very conservative value of $30,000 per ton of pollutant reduced has been established as the expected cost effectiveness threshold for BACT for this analysis, based on discussions with UDAQ.[18]

Environmental Impact Analysis for Potential Control Technologies

Impacts of waste disposal and additional energy requirements were evaluated for each control option.

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[17] Office of Air Quality Planning and Standards (OAQPS), *EPA Air Pollution Control Cost Manual*, Sixth Edition, EPA 452-02-001 (http://www.epa.gov/ttn/catc/products.html#cccinfo), Daniel C. Mussatti & William M. Vatavuk, January 2002.

[18] Meeting at UDAQ offices with Nando Meli and Martin Grey of UDAQ, Bryan Wheeler (Hexcel) and Miriam Hacker (Aspen Outlook, LLC), February 28, 2017.

Step 5 – Select BACT

In the final step, one pollutant-specific control option has been proposed as BACT for each emission unit under review, for $PM_{2.5}$ and its precursors based on evaluations from the previous step.

BACT Analysis for Fiber Line Emissions

Fiber Line Process Description

Because Hexcel's process is complex, an understanding of it is important for determining technical and economic feasibility of various control options. The first step in converting polyacrylonitrile (PAN) fiber into carbon fiber is the stabilization of the PAN fibers in an air oxidation process. The intent of this step is to prepare the PAN fibers for the high temperature processing of carbonization.

Completion of the oxidation process occurs with the operation of oxidizer ovens. The ovens are set at specified temperatures in order to achieve the required amount of oxidation reaction for the fiber stabilization process. The ovens employed in the process are either electrical or natural gas heated. Fiber Lines 2, 3 and 4 have been established with electrically heated ovens, which emit no combustion emissions. Fiber Lines 5, 6, 7, 8, 10, 11, 12, 13, 14, 15 and 16 have been established with natural gas heated ovens. Natural gas combustion related emissions are minimal, with NO_X being the primary emission from these sources. (There are no Fiber Lines 1 or 9.)

Process emissions are also generated during the oxidizing process within the ovens. They are not combined with the natural gas combustion emissions in the existing configuration of Fiber Lines 5 – 7, but are combined with the combustion emissions in the configuration of Fiber Lines 8, 10, 11, 12, 13, 14, 15 and 16. Emissions associated with the stabilization process occurring in the oxidation ovens are primarily hydrogen cyanide (HCN), VOCs, NH_3, CO and filterable and condensable PM_{10} and $PM_{2.5}$. Exhaust gases containing process emissions from the ovens are captured in hoods at either ends of each oven or within the oven structure.

Carbonization is the next downstream step in the manufacturing of carbon fiber. This step is comprised of two (2) different phases. The first phase is tar removal. This occurs within a furnace through which the fiber continuously passes, commonly referred to as the low temperature furnace. The tar removal step takes place in an electrically heated furnace at temperatures ranging from 300 °C to 800 °C. Process emissions generated from the tar removal phase are primarily HCN, VOCs, and particulates.

The second carbonization phase occurs at temperatures higher than those of the tar removal phase, ranging from 1,200 °C to 1,450 °C. The high temperature treatment of the fiber occurs in another electrically heated furnace, commonly referred to as the high temperature furnace or HT furnace. This phase of carbonization primarily generates HCN, VOC, and particulates emissions.

Hexcel is permitted to operate 14 Fiber Lines, each located in a separate building. The proposed control device options evaluated for each Fiber Line were based on the assumption that all stack flow would be directed to one control device per building.

BACT Analysis for $PM_{2.5}$ Emissions

Condensable Particulate Matter

UDAQ is required to evaluate condensable $PM_{2.5}$, in addition to the filterable fraction of the pollutant. Condensable particulate matter (CPM) comprises a considerable fraction of $PM_{2.5}$ and can be converted to submicron filterable particles under certain atmospheric conditions.

Review of the RBLC and other sources indicates that recently determined BACT controls have no direct control for CPM. CPM are mainly made up of organics, nitrates, and sulfates. Therefore, controlling VOCs, NO_X, and SO_2 will provide control for CPMs. Since this analysis includes BACT reviews for VOC, NO_x, and SO_x, further review of specific controls for CPM was not conducted.

Queries of the U.S. EPA's RBLC database and other sources were conducted to determine what emission controls have been accepted by permitting authorities as RACT, BACT or LAER for all forms of particulate, including condensable PM_{10} or $PM_{2.5}$. The result of this query is included in the summary for the $PM_{2.5}$ BACT and did not identify any RACT, BACT or LAER determinations for condensable PM_{10} or $PM_{2.5}$.

It has therefore been assumed that control technologies that were found to be BACT for particulate matter (PM_{10} and $PM_{2.5}$), apply to the filterable portion and that the condensable portion has been addressed through BACT analyses for VOCs, NO_X, and SO_2.

Identify All Control Technologies for $PM_{2.5}$

Based on the review of U.S. EPA RBLC database and similar operations, Hexcel has identified the following control technologies that would be applicable for controlling filterable $PM_{2.5}$ emissions from the proposed gas streams:

1. Good Combustion Practices,
2. Use of Natural Gas Only as Fuel,
3. Baghouse,
4. Venturi Scrubber, and
5. Wet Electrostatic Precipitator (ESP)

The search of the RBLC database produced two carbon fiber manufacture facilities. Results of this search are presented in Attachment C, Table C-1. Additional searches of the database, for similar combustion units fired with natural gas were also conducted. The results of these searches for all particulate are presented in Table C-2. The controls applicable to filterable PM and PM_{10} are assumed to provide a level of control for $PM_{2.5}$ as well.

Good Combustion Practices

Several operations are listed in the U.S. EPA's RBLC database where good combustion practices are the accepted technology for minimizing particulate emissions. Particulate emissions are reduced by good combustion practices by keeping the burners maintained properly so that they continue to operate according to their design.

Use of Natural Gas Only as Fuel

Particulate emissions from combustion of natural gas are typically very low and generally lower than from combustion of other fuels such as diesel. Hexcel currently employs natural gas as fuel for control of particulate emissions from combustion sources at the facility.

Baghouse

Baghouse operation involves removal of particulates by collecting particulates on filter bags as an exhaust stream passes through the baghouse. Optimal operational temperature of a baghouse is at 500 °F or less, and cannot typically withstand higher exhaust temperatures. Baghouse technology is a well-established particulate control technology that has historically been established as BACT for many types of facilities and processes. Baghouse control efficiencies are highly dependent upon inlet grain loading to the baghouse, but have been shown to obtain a particulate collection efficiency up to 99.5% for PM_{10}, and up to 99% capture for $PM_{2.5}$. Although many of the calculated grain loadings for the Fiber Lines were less than 0.005 gr/dscf, a commonly achievable baghouse control standard, controlled emission rates were conservatively calculated for all Fiber Lines according to presumed baghouse control efficiency.

Venturi Scrubber

Venturi scrubbers are generally applied for controlling particulate matter and sulfur dioxide. They are designed for applications requiring high removal efficiencies of particles with diameters between 0.5 and 5.0 micrometers. Venturi scrubbers accelerate the waste gas stream to atomize the scrubbing liquid to improve gas to liquid contact. Scrubbers employ gradually narrowing and then expanding sections, called the throat, to accelerate the gaseous streams. Liquid is either introduced to the venturi upstream of the throat or injected directly into the throat where it is atomized into small droplets by turbulence. Once the liquid is atomized, the mixture decelerates causing additional impacts and agglomeration of the droplets. Once the particulate is captured within the liquid, the wet particulate is separated from excess water using a cyclonic separator and/or mist eliminator.

The high pressure drop required for these systems results in high energy use. The relatively short gas-liquid contact time restricts their application to highly soluble gases. Therefore, they are infrequently used for the control of volatile organic compound emissions in dilute concentration[19]. Venturi scrubber particulate collection efficiencies range from 70% to greater than 99%, depending on the application. The BACT analysis estimates scrubber $PM_{2.5}$ control efficiency at 98% based on vendor information[20]. Although there is a potential for particulate from Hexcel operations to clog a packed bed scrubber, the quote provided by Pollution Control Systems is for a 2-stage unit with a venturi scrubber upstream of a packed bed scrubber, for control of $PM_{2.5}$, SO_2 and NH_3 to 98%.

Wet ESP

The possibility of using a Wet Electrostatic Precipitator (ESP) was reviewed for this analysis. Particulates are removed by electrically charging the particles and collecting the charged particles on plates. Collected particulate is washed off the plates and collected in hoppers below the ESP. High efficiency, wet ESPs can achieve 99%+ removal efficiency for submicron particles at minimum pressure drop.[21].

Eliminate Technically Infeasible Options

Wet ESP

At a Davis County disposal facility in the 1990's, Hexcel experienced systematic failure of an ESP due to the presence of small carbon fiber filaments upon incineration of carbon pre-impregnated fiber. The very fine broken carbon filaments in the process gas stream are conductive and, as a result, they short circuited the ESP. Based on this proven technical infeasibility, Hexcel will not be considering this control technology further for this application.

Rank Technically Feasible Control Technologies

Based on the information provided in the previous section, control technologies applicable for control of filterable $PM_{2.5}$ are the following, with most effective control first and least effective control last.

1. Baghouse
2. Venturi Scrubber
3. Good Combustion Practices
4. Use of Natural Gas Only as Fuel

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[19] OAQPS, *EPA Air Pollution Control Cost Manual*, Sixth Edition, EPA 452-02-001, Daniel C. Mussatti & William M. Vatavuk, January 2002. Section 5 SO2 and Acid Gas Controls, Section 5.2 Post-Combustion Controls, *Chapter 1 Wet Scrubbers for Acid Gas*, p. 1-5.

[20] The basic equipment cost of a 2-stage unit, with a venturi scrubber upstream of a packed-bed scrubber able to achieve 98% removal efficiency was e-mailed on 03/31/17 from Pollution Control Systems to L. Courtright (Aspen Outlook, LLC).

[21] Clean Gas Systems, Inc (CGS) Wet Electrostatic Precipitators, http://www.cgscgs.com/precip.htm

Evaluation of Most Effective Controls

Evaluate Emission Impacts from Potential Control Technologies

Attachment A presents emissions for each Fiber Line associated with the existing process operation, as well as the emissions once each particulate control technology under evaluation is applied. Supporting detailed emission calculations are provided in Attachment B, Table B-1.

Because existing operations of the Fiber Lines incorporates good combustion practices and natural gas as fuel as part of current operations, these controls have not been further evaluated beyond calculation of existing emissions from the facility. Baghouse emissions were calculated assuming a particulate collection efficiency of 99.5% for PM_{10}, and 99% capture for $PM_{2.5}$. Although many of the calculated grain loadings for the Fiber Lines were less than 0.005 gr/dscf, a commonly achievable baghouse control standard, controlled emission rates were conservatively calculated for all Fiber Lines according to presumed baghouse control efficiency[22]. Control efficiency associated with operation of a 2-stage system with a venturi scrubber upstream of a packed bed was estimated at 98% for $PM_{2.5}$ based on a vendor cost estimate for control of $PM_{2.5}$, SO_2 and NH_3[23].

Cost/Benefit Analysis for Potential Control Technologies

Annualized costs associated with implementing the baghouse and wet scrubber technologies on Fiber Lines 2 – 7, 8, 10, 11, 12, 13, 14, 15 and 16 were calculated and are summarized in Attachment A for each of the Fiber Lines. Detailed annualized cost calculations are provided in Attachment B, Tables B-2 and B-3.

Environmental Impact Analysis for Potential Control Technologies

Additional environmental impact is associated with waste disposal requirements for both the operation of a baghouse or a wet scrubber. Baghouse operation requires disposal of the solid waste collected from the filters. Wet scrubber operation for control of PM requires disposal of waste in the form of a slurry or wet sludge. This creates a need for both wastewater treatment and solid waste disposal.

Select BACT for Filterable $PM_{2.5}$

The review of U.S. EPA RBLC database for operations similar to Hexcel's showed that technologies typically used for particulate controls include: good combustion practices, baghouse, wet scrubber, or wet ESP. The RBLC database does not contain any examples of carbon fiber facilities installing particulate control devices for RACT, BACT, or LAER. As described above, the wet ESP technology is incompatible with Hexcel's operations.

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[22] The 0.005 gr/scf emitted after control is a commonly achievable baghouse standard cited in many BACT findings. This limit is also attributable to the maximum achievable control technology standards for iron and steel foundries, found in 40 CFR 63.7690.

[23] The basic equipment cost of a 2-stage unit, with a venturi scrubber upstream of a packed-bed scrubber able to achieve 98% removal efficiency was e-mailed on 03/31/17 from Pollution Control Systems to L. Courtright (Aspen Outlook, LLC).

Hexcel has installed baghouses in compliance with BACT requirements to control the new Fiber Lines 13 and 14. Hexcel is also committed to installing baghouses, in compliance with BACT requirements to control permitted, but not yet constructed Fiber Lines 15 and 16. As implementation of the baghouse technology has been shown to be the most effective control of filterable $PM_{2.5}$, no additional particulate control is warranted to meet BACT for Fiber Lines 13, 14, 15 and 16.

Low particulate emission rates, in addition to excessive retrofit costs associated with the other existing individual Hexcel Fiber Lines make add-on control device technology cost prohibitive. Redesign of the Fiber Lines would also require significant loss in production for Hexcel. Costs associated with loss of production have conservatively not been included in the total costs associated with the installation of particulate controls for the older lines. The estimated annualized cost effectiveness of installing a baghouse or particulate scrubber on existing Fiber Lines (2 -7, 8, 10, 11 and 12) is more than $725,000 per ton of particulate reduced, substantially more than the proposed $30,000 BACT threshold. Therefore, existing controls, including good combustion practices and use of natural gas as fuel are determined to be $PM_{2.5}$ BACT for Fiber Lines 2-7, 8, 10, 11 and 12.

BACT Analysis for SO_2 Emissions

Identify All Control Technologies for SO_2

Hexcel has identified the following control technologies applicable for controlling SO_2 emissions from the Fiber Lines, based on the review of U.S. EPA RBLC database and similar operations:

1. Use of Natural Gas Only as Fuel, and
2. Venturi Scrubber

Two carbon fiber manufacture facilities were identified in the search of the RBLC database. Attachment C, Table C-1 presents a summary of controls identified for the carbon fiber manufacturing facilities. As shown in this table, SO_2 is not a regulated pollutant for these facilities. Table C-3 presents the results of searches of the database conducted for similar combustion units fired with natural gas for SO_2. These results indicate that SO_2 controls are rarely implemented for similar types of units.

Use of Natural Gas Only as Fuel

SO_2 emissions from combustion of natural gas are typically very low and generally lower than from combustion of other fuels such as diesel. Hexcel currently employs natural gas as fuel for control of SO_2 emissions from combustion sources at the facility.

Venturi Scrubber

Venturi scrubbers are generally applied for controlling particulate matter and sulfur dioxide. Operation of this unit is described in detail in the $PM_{2.5}$ BACT section.

The BACT analysis estimates scrubber SO_2 control efficiency at 98% based on vendor information[24]. Although there is a potential for particulate from Hexcel operations to clog a packed bed scrubber, the quote provided by Pollution Control Systems is for a 2-stage unit with a venturi scrubber upstream of a packed bed scrubber, for control of $PM_{2.5}$, SO_2 and NH_3 to 98%.

Eliminate Technically Infeasible Options

None of the identified technologies are technically infeasible.

Rank Technically Feasible Control Technologies

Based on the information provided in the previous section, control technologies applicable for control of SO_2 are the following, with most effective control first and least effective control last.

1. Venturi Scrubber
2. Use of Natural Gas Only as Fuel

Evaluation of Most Effective Controls

Evaluate Emission Impacts from Potential Control Technologies

Emissions associated with existing process operation for each Fiber Line, and the emissions once each SO_2 control technology under evaluation is applied are presented in Attachment A. Supporting emission calculations are provided in Attachment B, Table B-1.

Because existing operations of the Fiber Lines incorporates good combustion practices and natural gas as fuel as part of current operations, these controls have not been further evaluated beyond calculation of existing emissions from the facility. Emissions estimates from the fiber lines with Venturi scrubber technology installed are calculated assuming 98% control efficiency.

Cost/Benefit Analysis for Potential Control Technologies

Annualized costs associated with implementing the Venturi scrubber technology on Fiber Lines 2 – 7, 8, 10, 11, 12, 13, 14, 15 and 16 were calculated and are summarized in Attachment A for each of the Fiber Lines. Detailed annualized cost calculations are provided in Attachment B, Table B-4.

Environmental Impact Analysis for Potential Control Technologies

Additional environmental impact is associated with waste disposal requirements for the operation of a Venturi scrubber which creates a need for wastewater treatment. High energy use requirements are also associated with these units, creating increased combustion emissions.

[24] The basic equipment cost of a 2-stage unit, with a venturi scrubber upstream of a packed-bed scrubber able to achieve 98% removal efficiency was e-mailed on 03/31/17 from Pollution Control Systems to L. Courtright (Aspen Outlook, LLC).

Select BACT for SO_2

The review of U.S. EPA RBLC database for operations similar to Hexcel's showed that technologies typically used for control of SO_2 include: combustion of natural gas as a fuel and use of scrubber technologies. The RBLC database does not contain any examples of carbon fiber facilities installing SO_2 control devices for RACT, BACT, or LAER. Low SO_2 emission rates, in addition to excessive retrofit costs associated with the other existing individual Hexcel Fiber Lines make add-on control device technology cost prohibitive. Redesign of the Fiber Lines would also require significant loss in production for Hexcel. Costs associated with loss of production have conservatively not been included in the total costs associated with the installation of SO_2 controls for the older lines. The estimated annualized cost effectiveness of installing scrubber technology on existing Fiber Lines is more than $1,000,000 per ton of SO_2 reduced, substantially more than the proposed $30,000 BACT threshold. Therefore, existing controls, including use of natural gas as fuel is determined to be SO_2 BACT for all Fiber Lines.

BACT Analysis for NO_x Emissions

As described previously, Fiber Line operation depends on the oxidation process, completed with oxidizer ovens set at specified temperatures to achieve the required oxidation for fiber stabilization. The ovens have the capability to be either electrical or natural gas heated. Fiber lines 2, 3 and 4 have been established with electrically heated ovens, which emit no combustion emissions Fiber Lines 5, 6, 7, 8, 10, 11, 12, 13, 14, 15 and 16 have been established with natural gas heated ovens. Natural gas combustion related emissions are minimal, with NO_X being the primary emission from these sources. Process emissions generated during the oxidizing process within the ovens are not combined with the natural gas combustion emissions in the existing configuration of Fiber Lines 5 – 7, but are combined with the combustion emissions in the configuration of Fiber Lines 8, 10, 11, 12, 13, 14, 15 and 16. For this analysis, combined emissions from the fiber lines were evaluated.

Identify All Control Technologies

Hexcel has identified the following control technologies applicable for controlling NO_X emissions from the Fiber Lines, based on the review of U.S. EPA RBLC database and similar operations:

1. Good Combustion Practices,
2. Use of Natural Gas Only as Fuel,
3. Low-NO_X Burners,
4. Ultra-Low-NO_X Burners,
5. $LoTO_X$
6. Selective Catalytic Reduction (SCR), and
7. Selective Non-Catalytic Reduction (SNCR)

Two carbon fiber manufacture facilities were identified in the search of the RBLC database. Attachment C, Table C-1 presents a summary of controls identified for the carbon fiber manufacturing facilities. These facilities maintained combustion of natural gas as the accepted

NO_X control. Table C-4 presents the results of searches of the database conducted for similar combustion units fired with natural gas for NO_X. The list above is a summary of these results.

Good Combustion Practices

The search of the U.S. EPA RBLC database identified many operations where NO_X emissions are controlled by good combustion practices. Good combustion practices include keeping burners maintained and operating within design parameters, thereby keeping NO_X emissions to a minimum.

Use of Natural Gas Only as Fuel

The search of the U.S. EPA RBLC database identified some operations where NO_X emissions are controlled by firing of natural gas. NO_X emissions may be limited by restricting fuel type to natural gas because combustion of other fuels may increase NO_X emission rates. Hexcel currently employs natural gas as fuel and good combustion practices for control of NO_X emissions from many of the combustion sources at the facility.

Low-NO_X Burners

Low NO_X burners (LNB) are accepted technology for control of NO_X from sources similar to the oxidation ovens. Low NOx burner technology implements a staged combustion process utilizing lean fuel conditions and a lower temperature environment. Lean combustion is achieved by increasing the air-to-fuel ratio such that peak and average temperatures in the combustion zone are lowered. The addition of excess air can also reduce residence times at peak temperatures. These conditions reduce thermal NO_X formation. Standard LNB technology can reduce NO_X emissions as compared with standard burners by 50%[25].

Ultra Low-NO_X Burners

Ultra LNBs (ULNB) add on to the LNB technology to include a process such as flue gas recirculation to further reduce NO_X. Recirculation of cooled flue gas reduces temperature by diluting the oxygen content of the combustion air and by causing heat to be diluted in the larger quantity of flue gas. ULNBs provide a stable flame using several different zones, such as a primary combustion zone, a zone where fuel is added to chemically reduce NO_X, and a zone for final combustion with low excess air to limit temperature. There are many variations on the ULNB theme of reducing NO_X that can produce more than 80% Destruction Removal Efficiency (DRE)[26]. NO_X emission rates as low as 9 ppmv have been achieved in practice[27].

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[25] Based on assumptions contained in emission factors available through AP-42 Table 1.4-1 – Emission Factors for Nitrogen Oxides (NO_X) and Carbon Monoxide (CO) from Natural Gas Combustion. Uncontrolled emissions from a small boiler are 100 lb/10^6 scf while controlled Low-NO_X burner emissions from a small boiler are 50 lb/10^6 scf. Therefore, Low NO_X burners are assumed to control emissions by 50%. [1-50/100 = 50%]

[26] U.S. EPA Technical Bulletin "Nitrogen Oxides (NO_X) Why and How are They Controlled", EPA 456/F-99-006R November 1999.

[27] Manufacturer guarantees, including http://rto.american-environmental.us/Ultra_Low_NOx_Burners_9ppm.html

(footnote continued)

LoTOx System™

The LoTOx System™ is a relatively new NO_x control system. It is a low temperature oxidation process which reduces NO_x emissions by the addition of ozone at an optimum temperature of 325 °F. The ozone oxidizes nitrous oxides to higher oxides of nitrogen such as N_2O_5. After oxidation, these oxides can be removed using other conventional pollutant control technologies. The LoTOx System™ must be used in conjunction with an absorption or adsorption process, such as scrubbers because the system oxidizes the NO_X to N_2O_5 which is soluble in water or reactive with alkaline solids. Ozone required for the process is produced from oxygen on-site through a conventional industrial ozone generator.[28]

SCR

SCR reduces NO_X emissions through a post combustion process involving the injection of a reductant (ammonia) into the exhaust gas stream, upstream of a catalyst. The catalyst lowers the activation energy for the reaction to occur between NO_X in the exhaust and the reductant to form nitrogen and water. SCR can be applied as a stand-alone NO_X control or with other technologies such as combustion controls. In practice, SCR systems operate at to achieve NO_X control efficiencies in the range of 70% to 90%[29].

SNCR

SNCR controls NO_X emissions by injecting ammonia or a urea solution into the post combustion zone, reducing NO_X to molecular N_2 and water. The reagent can react with a number of flue gas components. However, the NO_X reduction reaction is favored over other chemical reaction processes for a specific temperature range and in the presence of oxygen, therefore, it is considered a selective chemical process[30].

The technique requires thorough mixing of reagent into the furnace chamber with at least 0.5 seconds of residence time at a temperature above 1,600 °F and below 2,100 °F. Optimally, the reagent is injected into the furnace at approximately 1,900 – 1,950 °F which is a good tradeoff between the competing reaction of oxidation of ammonia to NO_X and maximizing the residence time prior to the low temperature limit[31].

SNCR can be applied as a stand-alone NO_X control or with other technologies such as combustion controls. The SNCR system can be designed for seasonal or year-round operations. SNCR can achieve NO_X reduction efficiencies of up to 75% in short-term demonstrations. In

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[28] Information on the LoTOx System™ obtained from the following website: http://www.linde-gas.com/en/products_and_supply/emissions_solutions/lotox/index.html and provided by The Linde Group on March 31, 2017.

[29] OAQPS, *EPA Air Pollution Control Cost Manual*, Sixth Edition, EPA/424/B-02-001 (http://www.epa.gov/ttn/catc/dir1/c_allchs.pdf); January 2002

[30] OAQPS, *EPA Air Pollution Control Cost Manual*, Sixth Edition, EPA/424/B-02-001 (http://www.epa.gov/ttn/catc/dir1/c_allchs.pdf); January 2002

[31] *SNCR System – Design, Installation and Operating Experience*, David L. Wojichowski, De-NOx Technologies LLC

(footnote continued)

typical field applications, however, it provides 30% to 50% NO_X reduction. Reductions of up to 65% have been reported for some field applications of SNCR in tandem with combustion control equipment such as LNB[32].

The hardware associated with an SNCR installation is relatively simple and readily available. Consequently, SNCR applications tend to have low capital costs compared to LNB and SCR. Installation of SNCR equipment requires minimum downtime.

Eliminate Technically Infeasible Options

LoTOx System™

The LoTOx System™ must be used in conjunction with an absorption or adsorption process, such as a scrubber. Therefore, it is not an ideal NO_X control option for Hexcel as these additional controls are not currently used at the facility. In addition, the system operates optimally at a temperature of 325 °F. The temperature of the ovens and other combustion sources are variable and typically not at this specified temperature. The air stream would need to be cooled or heated to the optimal temperature of 325 °F for proper LoTOx operation. This would require additional operational expense and as well as increased combustion related emissions.

For these combined reasons, LoTOx technology is considered to be technically infeasible for controlling NO_X emissions from the Fiber Lines.

SCR

In the review of the RBLC database and other control technology resources for ovens, furnaces, dryers and burners, as shown in Tables C-1 through C-4, application of SCR is found in association with devices and processes such as gas turbines, nitric acid plants, and steel mill annealing furnaces. These particular types of operations are not the same as the operations found at the Hexcel facility, therefore, it has been shown that this type of control technology has not been used in operations similar to Hexcel operations.

Inherent to Hexcel's operations in the presence of Silica Oxide (SiO_2) at a very small particle size (0.3 μm) in the gas stream. Because of the particulate laden stream, installation of a baghouse would be required prior to operation of a SCR for the Hexcel stream to minimize catalyst plugging or poisoning. The very small size of the particulate in the Hexcel stream may not be captured within the baghouse, and have a high potential to poison or plug the catalyst of the SCR. This would make the SCR ineffective for the fiber line process.

Because the SCR technology does not control emissions effectively at high temperatures, in excess of 1,000 °F, as well as at low temperatures, below 700 °F, the air stream would need to be cooled to a maximum of 450 °F for proper baghouse operation and the air stream would be

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[32] Ibid.

reheated to above 700 °F for proper SCR operation. This would require significant operational expense and additional combustion related emissions.

An additional negative aspect associated with the SCR system is additional ammonia emissions. Ammonia slip (release of ammonia emissions) increases as the SCR catalyst activity decreases. Therefore, an increase in ammonia emissions would be expected with the operation of the SCR. As noted in the introduction to this analysis, ammonia is a $PM_{2.5}$ precursor.

For these combined reasons, SCR technology is considered to be technically infeasible for controlling NO_X emissions from the Fiber Lines.

SNCR

Though simple in concept, it is challenging in practice to design an SNCR system that is reliable, economical, simple to control, and meets other technical, environmental, and regulatory criteria. The review of the RBLC database and other control technology resources for ovens, furnaces, dryers and burners shown in Tables C-1 through C-4 show that this type of control technology has not been used in operations similar to Hexcel operations.

The SNCR technology does not control emissions effectively at temperatures below 1,600 °F. Because the Hexcel the air stream will be controlled by baghouse for particulate emissions, it would need to be cooled to a maximum of 450 °F for proper baghouse operation and the air stream would be reheated to above 1,600 °F for proper SNCR operation. This would require significant operational expense and additional combustion related emissions.

Additional ammonia emissions are also associated with the ammonia injection process for the SNCR. Most of the excess reagent used in the process is destroyed through other chemical reactions. However, a small portion remains in the flue gas as ammonia slip[33]. Ammonia is considered as a precursor to $PM_{2.5}$ formation.

For these reasons, the SNCR technology is considered to be technically infeasible for the Hexcel Fiber Line process.

Rank Technically Feasible Control Technologies

Based on the information provided in the previous section, control technologies applicable for control of NO_X are the following, with most effective control first and least effective control last.

1. Ultra-Low-NO_X Burners,
2. Low-NO_X Burners,
3. Good Combustion Practices,
4. Use of Natural Gas Only as Fuel,

[33] OAQPS, *EPA Air Pollution Control Cost Manual*, Sixth Edition, EPA/424/B-02-001 (http://www.epa.gov/ttn/catc/dir1/c_allchs.pdf); January 2002

Evaluation of Most Effective Controls

Evaluate Emission Impacts from Potential Control Technologies

Emissions associated with existing process operation for each Fiber Line, and the emissions once each NO_X control technology under evaluation is applied are presented in Attachment A. Supporting emission calculations are provided in Attachment B, Table B-1.

Because existing operations of the Fiber Lines incorporates good combustion practices and natural gas as fuel as part of current operations, these controls have not been further evaluated beyond calculation of existing emissions from the facility. Emissions associated with implementation of the LNB burner technology were calculated assuming 50% control efficiency[34]. Emissions associated with implementation of the ULNB burner technology were calculated assuming 80% control efficiency[35].

Cost/Benefit Analysis for Potential Control Technologies

Annualized costs associated with implementing the LNB burner technologies on Fiber Lines 2 – 7, 8, 10, 11, and 12 were calculated and are summarized in Attachment A for each of the Fiber Lines. Detailed annualized cost calculations are provided in Attachment B, Tables B-6 and B-7.

Environmental Impact Analysis for Potential Control Technologies

Additional environmental impact is associated with additional energy requirements and potential emissions associated with the firing of LNBs.

Select BACT for NO_x

The review of U.S. EPA RBLC database for operations similar to Hexcel's showed that technologies typically used for NO_X controls include: good combustion practices, use of natural gas as a fuel, use of LNBs, and use of $LoTO_X$, SCR or SNCR. It has been shown that $LoTO_X$, SCR and SNCR technologies are technically infeasible for Hexcel's operations. Therefore, the proposed operation of LNB technology is the best available control for this type of gas stream.

Hexcel has installed LNBs in compliance with BACT requirements to control the new Fiber Lines 13 and 14. Hexcel is also committed to installing LNBs in compliance with BACT requirements to control permitted, but not built Fiber Lines 15 and 16. On May 19, 2015, Hexcel submitted a letter to UDAQ regarding "Supplemental Responses – BACT for Oxidation Ovens of Proposed New Carbon Fiberlines 15 and 16 Modification of AO DAQE-AN113860023-0015 to Add Carbon Fiber Lines 15 and 16".[36] This letter provides supplemental information regarding determination of BACT for the oxidation ovens for Fiber Lines 15 and 16 as implementation of LNB technology,

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[34] Based on assumptions contained in emission factors available through AP-42 Table 1.4-1 – Emission Factors for Nitrogen Oxides (NO_X) and Carbon Monoxide (CO) from Natural Gas Combustion. Uncontrolled emissions from a small boiler are 100 $lb/10^6$ scf while controlled Low-NO_X burner emissions from a small boiler are 50 $lb/10^6$ scf. Therefore, Low NO_X burners are assumed to control emissions by 50%. [1-50/100 = 50%]

[35] U.S. EPA Technical Bulletin "Nitrogen Oxides (NO_X) Why and How are They Controlled", EPA 456/F-99-006R November 1999.

[36] Letter to Nando Meli, UDAQ from Bryan Wheeler, Hexcel Corporation May 19, 2015.

and is provided as Attachment D. Cost calculations provided in this letter in 2015 dollars determined a cost per ton threshold for installation of ULNB on the Fiber Line 13, 14, 15 or 16 oxidation ovens at $47,890 per ton of NO_X reduced. This threshold will be higher in 2017 dollars, in addition to requiring retrofit costs for Fiber Lines 13 and 14. As implementation of the LNB technology has been shown to be the most effective control of NO_X at the Hexcel facility, no additional NO_X control is warranted to meet BACT for Fiber Lines 13, 14, 15 and 16.

Burners installed for existing units in Fiber Lines 2 through 7, 8, 10, 11, and 12 were installed from 1981 through 2011. The burners on the ovens for these Fiber Lines were installed based on Hexcel's permitted allowable emissions at the time of permitting. Retrofit of the existing burners to incorporate LNB technology would require many expensive operational adjustments to the ovens, including, but not limited to:

- Demolition of existing operations;
- Redesign of hoods;
- Ductwork, ID-fan and stack redesign;
- Air flow adjustments;
- Gas line input retrofit; and
- Installation of pressure regulators.

A retrofit factor of 1.4 was included in the cost of installing the LNBs based on documentation provided in the OAQPS manual, however this does not represent the true additional costs associated with retrofitting the older lines to incorporate newer burners. Because proper oxidation is essential to the carbon stabilization process, redesign of the oven burner operations would require a complete redesign of the Fiber Line process to achieve permitted production levels. Redesign of the Fiber Lines would create significant loss in production for Hexcel. Hexcel estimates up to 3 weeks of down time per line for Fiber Lines 2 -7, 8 and 10, and 2 weeks per each of 4 ovens per line of lost time for Fiber Lines 11 and 12 to install LNB technology. Costs associated with loss of production have been included in the total costs associated with the installation of LNBs for the older lines.

For these reasons, this proposed technology is cost prohibitive for controlling NO_X emissions from Fiber Lines 2 through 7, 8, 10, 11 and 12. The estimated cost effectiveness of implementing this technology on existing Fiber Lines (2 -7, 8, 10, 11 and 12) is substantially more than the expected cost effectiveness threshold for BACT of $30,000 per ton of NO_X reduced. The estimated annualized cost to install and operate an add-on control device for NO_X is more than $500,000 per ton of NO_X reduced per Fiber Line. Thus, the LNB technology has been determined to be cost prohibitive.

Existing controls, including good combustion practices and use of natural gas as fuel is determined to be NO_X BACT for Fiber Lines 2-7, 8, 10, 11, and 12. NO_X control for the newer Fiber Lines 13 and 14, and proposed Fiber Lines 15 and 16 will incorporate LNB as established in the AOs approved for Hexcel December 2011 and August 2015, respectively.

BACT Analysis for VOC Emissions

Identify All Control Technologies

Hexcel has identified the following control technologies applicable for controlling VOC emissions from the Fiber Lines, based on the review of U.S. EPA RBLC database and similar operations:

1. Good Combustion Practices,
2. Use of Natural Gas Only as Fuel,
3. Oxidation Catalyst,
4. Flares,
5. Incinerators, and
6. Regenerative Thermal Oxidizer (RTO)

Two *carbon fiber manufacture* facilities were identified in the search of the RBLC database. Attachment C, Table C-1 presents a summary of controls identified for the carbon fiber manufacturing facilities. The only VOC control associated with the identified carbon fiber manufacture facilities is a wet scrubber for the control of VOCs from an acrylonitrile delivery storage tank. This type of system does not exist at the Hexcel *facility*. *Table* C-5 *presents* the results of searches of the database conducted for similar combustion units fired with natural gas for VOC. The list above is a summary of these results. Each identified control technology is discussed further below.

Good Combustion Practices

Good combustion practices are the accepted technology for minimizing VOC emissions for many sources listed in the U.S. EPA's RBLC database. In this practice, VOC emissions are reduced by keeping burners maintained properly and operating according to their design. Hexcel has opted for this level of control for combustion sources.

Use of Natural Gas Only as Fuel

The use of natural gas as fuel limits VOC emissions, as compared to other fuel *options, such as* diesel or coal, because these options generate more VOC emissions per heat output. VOC emissions from combustion of natural gas are lower than emissions from any other readily available fuel. Therefore, Hexcel has opted for this level of control for combustion sources.

Catalytic Oxidation

Catalytic air purification is characterized by flameless oxidation of the pollutants contained in the exhaust air at temperatures between 200 and 500 °C. This control technology is typically used for abatement for low to medium air volumes. After the exhaust air has been heated up, the pollutants are oxidized by the catalyst to CO_2 and H_2O. The process can only be applied to certain pollutants and to exhaust air containing no dust. Certain contaminants will chemically react or alloy with common catalysts and cause deactivation. Control by catalytic oxidation can achieve VOC reductions greater than 95% at optimal temperatures and conditions.

Flares

Flaring/vapor combustion is a VOC combustion control process in which the VOCs are piped to a remote, usually elevated, location and burned in an open flame in the open air using a specially

designed burner tip, auxiliary fuel, and steam or air to promote mixing for nearly complete destruction. VOC destruction efficiency depends on an adequate flame temperature, sufficient residence time in the combustion zone, and turbulent mixing. A properly operated flare can achieve a destruction efficiency of 98% or greater. The waste gas stream must have a heating value greater than 300 Btu/scf. If this minimum is not met, auxiliary fuel must be introduced to achieve sufficient combustion.

Flares can be used to control almost any high concentration VOC stream, and can handle fluctuations in VOC concentration, flow rate, heating value, and inert content. Flaring is appropriate for continuous, batch, and variable flow vent stream applications[37].

Incinerators

Incineration destroys organic emissions by oxidizing them to carbon dioxide and water vapor. Incineration is the most universally applicable control method for organics. Given the proper conditions, any organic compound will oxidize. Oxidation proceeds more rapidly at higher temperatures and a higher organic pollutant content.

The heart of an incinerator system is a combustion chamber in which the VOC-containing waste stream is burned. Since the inlet waste gas stream temperature is generally much lower than that required for combustion, energy must be supplied to the incinerator to raise the waste gas temperature. The energy released by the combustion of the VOCs in the waste gas stream is rarely sufficient to raise its own temperature to the desired levels, so that auxiliary fuel (e.g., natural gas) must be added.

The reactor temperature is determined by the required level of VOC control of the waste gas that must be achieved within the time that it spends in the thermal combustion chamber. The shorter the residence time, the higher the reactor temperature must be. Once the unit is designed and built, the residence time is not easily changed, so that the required reaction temperature becomes a function of the particular gaseous species and the desired level of control[38].

Regenerative Thermal Oxidizer

A RTO destroys HAPs, VOCs and odorous emissions that are often discharged from industrial or manufacturing processes. Emission destruction is achieved through the process of high temperature thermal oxidation, using the proper mix of temperature, residence time, turbulence and oxygen to convert pollutants into carbon dioxide and water vapor. RTOs repurpose the thermal energy generated during operation to reduce operating costs and energy consumption of the system itself.

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[37] OAQPS, *EPA Air Pollution Control Cost Manual*, Sixth Edition, EPA 452-02-001, Daniel C. Mussatti & William M. Vatavuk, January 2002. Section 3 VOC Controls, Section 3.2 VOC Destruction Controls, Chapter 1 Flares, p. 1-5.

[38] OAQPS, *EPA Air Pollution Control Cost Manual*, Sixth Edition, EPA 452-02-001, Daniel C. Mussatti & William M. Vatavuk, January 2002. Section 3 VOC Controls, Section 3.2 VOC Destruction Controls, Chapter 2 Incinerators, p. 2-6.

VOC and HAP-laden process gas is either pushed or pulled into the inlet manifold of the oxidizer via a system fan. Flow control directs this gas into energy recovery chambers where it is preheated. The process gas and contaminants are progressively heated in ceramic media beds as they move toward the combustion chamber.

Once oxidized in the combustion chamber, the hot purified air releases thermal energy as it passes through the media bed in the outlet flow direction. The outlet bed is heated and the gas is cooled so that the outlet gas temperature is only slightly higher than the process inlet temperature. Poppet valves alternate the airflow direction into the media beds to maximize energy recovery within the oxidizer. The high-energy recovery within these oxidizers reduces the auxiliary fuel requirement and saves operating cost. RTOs can achieve high destruction efficiency and self-sustaining operation with no auxiliary fuel usage at low concentrations.

Emissions associated with implementation of the RTO technology were calculated assuming 98% control efficiency[39].

Eliminate Technically Infeasible Options

Catalytic Oxidation

The catalytic oxidation process can only be applied to certain pollutants and to exhaust air containing no dust in a small temperature range. Certain contaminants will chemically react or alloy with common catalysts and cause deactivation. Hexcel has had issues with the silica dust associated with the Fiber Lines and catalysts in the past.

Additional negative aspects may include the products of combustion, which may increase the emissions of some pollutants. Specifically, sulfur containing compounds will be converted to their oxides, and halogen containing compounds will be converted to acids.

For these reasons, catalytic oxidation is considered to be technically infeasible for the Hexcel Fiber Line process.

Rank Technically Feasible Control Technologies

Based on the information provided in the previous section, control technologies applicable for control of VOC are the following, with most effective control first and least effective control last.

1. Regenerative Thermal Oxidizer
2. Incinerators
3. Flares
4. Use of Natural Gas Only as Fuel
5. Good Combustion Practices

[39] OAQPS, *EPA Air Pollution Control Cost Manual*, Sixth Edition, EPA 452-02-001, Daniel C. Mussatti & William M. Vatavuk, January 2002. Section 3 VOC Controls, Section 3.2 VOC Destruction Controls, Chapter 2 Incinerators, p. 2-7.

Evaluation of Most Effective Controls

Evaluate Emission Impacts from Potential Control Technologies

Emissions associated with existing process operation for each Fiber Line, and the emissions once each VOC control technology under evaluation is applied are presented in Attachment A. Supporting emission calculations are provided in Attachment B, Table B-1.

Because the existing operations of the Fiber Lines include good combustion practices, natural gas as fuel, flaring and incineration, the estimated emissions associated with these controls are equal to existing emissions from the facility.

Cost/Benefit Analysis for Potential Control Technologies

Annualized costs associated with implementing the RTO on Fiber Lines 2 – 7, 8, 10, 11 and 12 were calculated and are summarized in Attachment A for each of the Fiber Lines. Supporting cost calculations are provided in Attachment B, Table B-8.

Environmental Impact Analysis for Potential Control Technologies

Additional environmental impact is associated with additional energy requirements and potential emissions associated with the firing of the RTO.

Select BACT for VOC

Based on the review of U.S. EPA RBLC database for operations somewhat similar to Hexcel's, control technologies typically used for VOC controls include: good combustion practices, use of natural gas as a fuel, and use of thermal oxidizer technologies. The proposed operation of a RTO, following a high temperature furnace is clearly the best available control for this type of gas stream and has been installed for use with Fiber Lines 13 and 14, and has been planned for installation for the proposed Fiber Lines 15 and 16.

However, the estimated cost effectiveness of implementing this technology on existing Fiber Lines (2 -7, 8, 10, 11 and 12) is more than is the expected cost effectiveness threshold for BACT of $30,000 per ton of VOC reduced. The estimated annualized cost to install and operate an add-on control device for VOC is more than $300,000 per ton of VOC reduced. In addition, redesign of the Fiber Lines would require significant loss in production for Hexcel. Costs associated with loss of production have conservatively not been included in the total costs associated with the installation of VOC controls for the older lines. Thus, installation of the RTO technology on the older lines has been shown to be cost prohibitive. Therefore, existing controls, including good combustion practices, use of natural gas as fuel, incineration and flaring technology are determined to be VOC BACT for Fiber Lines 2-7, 8, 10, 11 and 12.

BACT Analysis for Ammonia Emissions

The stabilization process occurring in the oxidation ovens produce NH_3 emissions. Exhaust gases containing oxidation process emissions from the ovens are captured in hoods at either ends of each oven or within the oven structure.

Identify All Control Technologies

Hexcel has identified the following control technologies applicable for controlling NH_3 emissions from the Fiber Lines, based on the review of U.S. EPA RBLC database and similar operations:

1. Good operating practices,
2. Leak Detection and Repair Program (LDAR), and
3. Wet scrubber

Two carbon fiber manufacture facilities were identified in the search of the RBLC database. Attachment C, Table C-1 presents a summary of controls identified for the carbon fiber manufacturing facilities. The facility did not install NH_3 control equipment. Table C-6 contains the results of additional searches for NH_3 controls in the database, for similar combustion units fired with natural gas. The only sources identified with NH_3 BACT requirements were associated with the operation of a SCR, or a combustion turbine. No specific control devices for NH_3 were identified.

Ammonia emissions can be controlled by various control technologies including both add-on control devices and pollution prevention techniques. The wet packed tower scrubber can control ammonia emissions with control efficiencies up to 99%. Condensers can remove ammonia by converting gas to a liquid, with the condensate being returned to the process for reuse. Ammonia recycle, where ammonia is collected from the exhaust gas stream and subsequently returned to the process, is a common pollution prevention method. This process is most often used in the manufacture of fertilizers where quantities of ammonia are abundant and subsequently render the method feasible. Each identified control technology is discussed further below.

Good Operating Practices

Good operating practices limit ammonia emissions by ensuring that fugitive emissions are minimized. U.S. EPA acknowledged in the OAQPS manual, that, where the cost of add-on controls is not warranted, ammonia emissions may be limited by applying good management practices[40].

LDAR

Leak Detection and Repair Programs (LDAR) are used in operations where liquid ammonia is contained in pipes. The program entails routine monitoring for leaks around piping connections and pumps using a handheld analyzer.

Wet Scrubber

The most common add-on control device used to control ammonia emissions is the wet scrubber which employs the method of absorption. Through absorption, gaseous material is collected through direct contact with a scrubbing liquid, which is usually water. The success of

[40] OAQPS Control Technology Center, *Control and Pollution Prevention Options for Ammonia Emissions*, EPA 456/R-95-002, Jennifer Phillips, April 1995. p. 2.

the scrubber is dependent on the solubility of a gas in the scrubbing liquor. Since ammonia is highly soluble in water, the wet scrubber is effective in controlling ammonia emissions. Control efficiencies up to 99% have been demonstrated in actual applications.

Venturi scrubbers are generally applied for controlling particulate matter and SO_2. However, with the incorporation of a packed bed scrubber, NH_3 may be efficiently controlled as well. Operation of this unit is described in detail in the $PM_{2.5}$ BACT section.

The BACT analysis estimates scrubber/packed bed NH_3 control efficiency at 98% based on vendor information[41]. Although there is a potential for particulate from Hexcel operations to clog a packed bed scrubber, the quote provided by Pollution Control Systems is for a 2-stage unit with a venturi scrubber upstream of a packed bed scrubber, for control of $PM_{2.5}$, SO_2 and NH_3 to 98%.

Disadvantages associated with the use of wet scrubbers include a possible water disposal problem, possibility of high pressure drop and horsepower requirements, and corrosion of the unit. The high pressure drop through these systems results in high energy use, and the relatively short gas-liquid contact time restricts their application to highly soluble gases.

Eliminate Technically Infeasible Options

Leak Detection and Repair Program

The LDAR programs that are cited in the RBLC are associated with processes involving concentrated, aqueous ammonia containment where ammonia is emitted from fugitive components, not a stack. The ammonia associated with the Hexcel process is primarily emitted at the stack, is gaseous and dilute, and formed as a by-product of either the combustion process or the open surface treatment operations. A LDAR program would not be an effective control for either of these types of operations, and is not considered further.

Rank Technically Feasible Control Technologies

Based on the information provided in the previous section, control technologies applicable for control of VOC are the following, with most effective control first and least effective control last.

1. Wet scrubber
2. Good operating practices,

[41] The basic equipment cost of a 2-stage unit, with a venturi scrubber upstream of a packed-bed scrubber able to achieve 98% removal efficiency was e-mailed on 03/31/17 from Pollution Control Systems to L. Courtright (Aspen Outlook, LLC).

Evaluation of Most Effective Controls

Evaluate Emission Impacts from Potential Control Technologies

Attachment A presents for each Fiber Line the emissions associated with the existing process operation, and the emissions once each NH_3 control technology under evaluation is applied. The supporting detailed emission calculations are provided in Attachment B, Table B-1.

Because the existing operations of the Fiber Lines includes good operational practices as part of the existing process, no further evaluation of emissions associated with these controls were evaluated beyond calculation of existing emissions from the facility. Emissions associated with implementation of a wet scrubber/packed bed technology were calculated assuming 98% based on vendor information[42].

Cost/Benefit Analysis for Potential Control Technologies

Annualized costs associated with implementing a wet scrubber/packed bed on all Fiber Lines were calculated and are summarized in Attachment A for each of the Fiber Lines. Supporting cost calculations are provided in Attachment B, Table B-5.

Environmental Impact Analysis for Potential Control Technologies

Additional environmental impact associated with the use of wet scrubber/packed beds include water disposal requirements and potential packed bed replacement resulting in solid waste disposal. The high pressure drop through these systems results in high energy use, resulting in additional combustion emissions.

Select BACT for Ammonia

Based on the review of U.S. EPA RBLC database and other sources for operations somewhat similar to Hexcel's, other control technologies typically used for ammonia controls include: good operating practices, leak detection and repair programs, and use of wet scrubber technologies. Use of an LDAR program for ammonia at Hexcel has been shown to be technically inapplicable.

Installation of wet scrubber/packed bed technology would require redesign of the Fiber Lines. Redesign of the Fiber Lines would require significant loss in production for Hexcel. Costs associated with loss of production have conservatively not been included in the total costs associated with the installation of NH_3 controls for the older lines. The estimated cost effectiveness of implementing a wet scrubber technology on all Fiber Lines is more than is the expected cost effectiveness threshold for BACT of $30,000 per ton of NH_3 reduced. The estimated annualized cost to install and operate an add-on control device for ammonia is more than $500,000 per ton of NH_3 reduced. In addition, redesign of the Fiber Lines would require significant loss in production for Hexcel, which has, conservatively, not been included in the

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[42] The basic equipment cost of a 2-stage unit, with a venturi scrubber upstream of a packed-bed scrubber able to achieve 98% removal efficiency was e-mailed on 03/31/17 from Pollution Control Systems to L. Courtright (Aspen Outlook, LLC).

total costs associated with the installation of NH_3 controls for the Fiber Lines. Therefore, the wet scrubber/packed bed technology has been determined to be cost prohibitive.

Existing controls, including good operating practices is determined to be ammonia BACT for all Fiber Lines. The RBLC database indicates that good management practices is a common control technology used in conjunction with similar types of processes. Thus, the RBLC search results support Hexcel's BACT determination.

BACT Analysis for Miscellaneous Operations Associated with the Fiber Lines

Hexcel's primary Fiber Line manufacturing operations require operation of associated operations which include: pilot plant operations, matrix operations, comfort heating and emergency generation equipment. The pilot plant is a research facility which is essentially a small Fiber Line. Matrix or Pre-Preg operations involve the finishing process of application of resins to the carbon fiber. Emissions associated with these operations primarily include ammonia, xylene, and combustion emissions from operation of the pilot plant, the matrix incinerators, the HVAC system and emergency generators.

The discussions provided for the Fiber Line operations also apply to the Pilot operations, as well as the Matrix incinerator operations, except for the inclusion of ammonia and VOC emissions from the Matrix process.

Annualized costs associated with implementing proposed control technologies on the Pilot and Matrix operations were calculated and are summarized in Attachment A for each of the Pilot and Matrix operations. Supporting cost calculations are provided in Attachment B.

Over the last few years Hexcel has updated the control technology associated with the Matrix, Tower 1 and Tower 3 incinerators. These upgrades included installation of a more efficient incinerator for Tower 1 and an RTO for Tower 3 in place of the previously existing incinerators, reducing incinerator and combustion related emissions. Hexcel is in the planning stages for replacing the Tower 4 incinerator as well.

BACT for the Pilot and Matrix operations is determined to be maintenance of Good Operation and Combustion Practices and operation of all incinerators and burners with natural gas fuel, consistent with the Fiber Line BACT determinations. Hexcel will continue to evaluate the functionality of existing control technologies on the Matrix operations and upgrade as appropriate.

BACT for the HVAC system is determined to be maintenance of Good Operation and Combustion Practices and operation of all burners with natural gas fuel.

BACT for the emergency generators will be the use of engines in compliance with NSPS Subparts IIII and JJJJ and NESHAP ZZZZ, a restriction on the number of hours the generators are allowed to operate annually, and use of low sulfur diesel fuel, propane or natural gas. These types of controls have been clearly established as BACT for these types of sources. There is no precedence established for implementing add-on controls such as baghouse, SCR, scrubber technology, or thermal oxidation technology on a small diesel engine that is used for emergency purposes. No further evaluation of these controls has been conducted.

A summary of emission rates associated with the HVAC and diesel generator sources is provided in Attachment A.

Startup/Shutdown Emissions Controls for BACT Listed Equipment

On April 30, 2014 Hexcel submitted a response to a request from UDAQ for additional information related to the $PM_{2.5}$ SIP RACT Request. In this request, Hexcel was asked to provide recommendations for startup and shutdown controls for the RACT listed equipment at the facility. In the response to the request, Hexcel provided a detailed evaluation of the start-up/shutdown emission controls for Hexcel's processes including Fiber Lines 2, 3, 4, 5-7, 8, 10, 11, 12, 13, and 14 and Matrix (pre-preg) operations which manufacture solvated resins and perform solvated resin impregnation. This analysis provided a description of the available controls, best operational practices, and Hexcel's procedures including those above and beyond the AO requirements to eliminate or prevent emissions during startup/shutdown.

Hexcel's standard operating procedure is to not start processing product until desired operating conditions have been achieved. Therefore, the startup sequence begins and runs to completion prior to the input or passing of PAN or pre-preg through the system. Similarly, shutdown of the system is conducted at a time which no product is running through the fiber lines or pre-preg processes. Therefore, during start-up and shutdown of the carbon fiber lines, process related emissions are not expected; only natural gas combustion related emissions are expected. These emissions have already been accounted as part of Hexcel's normal emissions and are permitted as a part of facility-wide natural gas consumption limits. Hexcel currently accounts for emissions during startup/shutdown of equipment and reports them to UDAQ in its annual emissions inventory.

Hexcel will refer to the April 30, 2014 letter submitted to UDAQ for the detailed description of startup/shutdown operations and best practices associated with the Hexcel West Valley City Facility.[43] These identified operations satisfy startup/shutdown BACT conditions for the facility and apply to Fiber Lines 15 and 16 as well. A copy of this letter is provided in Attachment E for reference.

[43] Letter to Ms. Camron Harry, UDAQ from Shannon Storrud, Hexcel Corporation, dated April 30, 2014, RE: PM2.5 SIP RACT - Responses to Request for Additional Information.

Recommended Emission Limits and Monitoring Requirements

Hexcel currently operates under Approval Order DAQE-AN113860028-16. Within this AO, Hexcel is bound to existing emission limits and monitoring requirements. A summary of the AO requirements is provided in Attachment F.

All Hexcel sources are listed in the Special Provision Section, Section II.A of the AO. This section details source type, manufacturer and rating where available for each Hexcel emission source. All sources have been discussed and evaluated in the previous BACT sections. $PM_{2.5}$ BACT determinations have been made for each of the facility sources.

Emission limits and monitoring requirements for the facility as a whole, as well as for each identified source are listed in the Special Provision Section, Section II.B of the AO. All requirements have been established to ensure the Hexcel facility meets all applicable state and federal standards and requirements. In permitting this facility, BACT determinations have been made for the most recently permitted Fiber Lines (Fiber Lines 13, 14, 15 and 16).

In the previous sections of this BACT Analysis, it has been shown that no additional controls are required for this facility to meet the requirements of a $PM_{2.5}$ BACT determination. Therefore, the emission limits and monitoring requirements established for the facility in its AO are sufficient to meet $PM_{2.5}$ BACT/ BACM requirements.

Hexcel's Efforts Above and Beyond - ISO 14001 Environmental Management System Procedures

Hexcel has implemented and maintains a rigorous system of training, inspections and reporting at the Facility as a part of ISO 14001 procedures that ensures compliance with the all applicable emission standards and limits.

Hexcel environmental staff ensure that all employees are properly trained to do the required monitoring to maintain compliance with the facility AO and other environmental requirements. The staff environmental engineer requires that at least one employee conduct daily inspections of all operations. During these inspections, the employee observes any opacity events, as well as other non-conforming environmental conditions, and reports them.

An Emission Control Record (ECR) system is maintained to complement the inspection procedures. The ECR system helps Hexcel to efficiently identify and respond to any deviations or excess emissions events. A thorough investigation is conducted for each identified concern or nonconformance to determine its viability or any impacts. Appropriate actions will be identified, taken, and documented on the ECR form to mitigate all concerns or impacts resulting from each nonconformance. The ECR itself is not an excess emission event. The ECR is simply an internal procedure to track all deviations. Once an ECR is initiated, the Environmental Engineer determines whether to notify UDAQ with an Unavoidable Breakdown report or not. Emission standards and limits, which are tracked at the Facility, are part of the ECR. The ECR system essentially is a Nonconformance and Corrective/Preventative Action Plan that is part of Hexcel's overall Environmental Management System Procedure.

BACT Implementation Calendar

As a result of this $PM_{2.5}$ BACT analysis, the Hexcel facility is not required to install additional controls or implement additional monitoring requirements on any existing or permitted facility sources. Therefore, there is no timeline required for implementation of specific BACT requirements.

Hexcel is committed to meeting all monitoring and reporting requirements established in its AO, and will continue to do so within the required schedule.

Attachment A

$PM_{2.5}$ BACT Summaries

April 25, 2017

Table A-1: PM2.5 BACT Summary - Fiber Line 2

Site Name:	Hexcel Corporation Salt Lake City Operations		Site Location:	West Valley City, UT	
Component ID:	Quick Component Description:		Fiber Line 2		

BACT Option Analysis

	PM2.5	SO2	NOx	VOC	NH3
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		

Controlled Emissions Table (tpy):

	PM2.5	SO2	NOx	VOC	NH3
Existing Allowable Emissions (ton/yr)	0.00	0.06	0.09	0.70	0.00
BACT option 1	NA[1]	0.06	0.09	0.70	NA[1]
BACT option 2	NA[1]	0.001	0.09	0.70	NA[1]
BACT option 3	NA[1]		0.046	0.70	NA[1]
BACT option 4	NA[1]		0.018	0.01	
BACT option 5			NA[1]		
BACT option 6			NA[1]		

Option 2 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	NA[1]	$149,312.8	NA[2]	NA[2]	NA[1]
Emission Reduction (tons)		0.05568			
Cost Effectiveness ($/ton)		$ 2,681,695			

Option 3 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	NA[1]		$223,421.7	NA[2]	NA[1]
Emission Reduction (tons)			0.046		
Cost Effectiveness ($/ton)			$ 4,906,671		

Option 4 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	NA[1]		$228,442.9	$650,728	
Emission Reduction (tons)			0.073	0.69	
Cost Effectiveness ($/ton)			$ 3,135,590	$ 945,870	

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Existing conditions

Table A-2: PM2.5 BACT Summary - Fiber Line 3

Site Name:	Hexcel Corporation Salt Lake City Operations	Site Location:	West Valley City, UT
Component ID:	Quick Component Description:	Fiber Line 3	

BACT Option Analysis

	PM2.5	SO2	NOx	VOC	NH3
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		

Controlled Emissions Table (tpy):

	PM2.5	SO2	NOx	VOC	NH3
Existing Allowable Emissions (tn/yr)	0.46	0.18	1.48	0.42	0.40
BACT option 1	0.46	0.18	1.48	0.42	0.40
BACT option 2	0.00	0.00	1.48	0.42	NA[1]
BACT option 3	0.01		0.93	0.42	0.008
BACT option 4	NA[1]		0.61	0.01	
BACT option 5			NA[1]		
BACT option 6			NA[1]		

Option 2 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	$ 579,551	$191,928.5	NA[2]	NA[2]	NA[1]
Emission Reduction (tons)	0.46	0.17			
Cost Effectiveness ($/ton)	$ 1,269,013	$ 1,104,365			

Option 3 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	$ 327,798		$607,849.2	NA[2]	$191,928.5
Emission Reduction (tons)	0.45		0.54		0.35
Cost Effectiveness ($/ton)	$ 725,087		$ 1,125,464		$ 543,652

Option 4 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	NA[1]		$612,134.4	$1,711,998	
Emission Reduction (tons)			0.86	0.41	
Cost Effectiveness ($/ton)			$ 708,374	$ 4,130,911	

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Existing conditions

Table A-3: PM2.5 BACT Summary - Fiber Line 4

Site Name:	Hexcel Corporation Salt Lake City Operations		Site Location:	West Valley City, UT	
Component ID:	Quick Component Description:		Fiber Line 4		
BACT Option Analysis					
	PM2.5	SO2	NOx	VOC	NH3
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		
Controlled Emissions Table (tpy):					
	PM2.5	SO2	NOx	VOC	NH3
Existing Allowable Emissions (tn/yr)	0.43	0.12	0.99	0.39	0.35
BACT option 1	0.43	0.12	0.99	0.39	0.35
BACT option 2	0.00	0.002	0.99	0.39	NA[1]
BACT option 3	0.01		0.63	0.39	0.007
BACT option 4	NA[1]		0.42	0.01	
BACT option 5			NA[1]		
BACT option 6			NA[1]		
Option 2 Cost/Benefit Analysis Summary					
	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	$ 606,328	$190,670.1	NA[2]	NA[2]	NA[1]
Emission Reduction (tons)	0.42	0.11			
Cost Effectiveness ($/ton)	$ 1,439,571	$ 1,670,339			
Option 3 Cost/Benefit Analysis Summary					
	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	$ 356,423		$503,713.2	NA[2]	$190,670.1
Emission Reduction (tons)	0.42		0.35		0.35
Cost Effectiveness ($/ton)	$ 854,870		$ 1,419,120		$ 548,921
Option 4 Cost/Benefit Analysis Summary					
	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	NA[1]		$509,615.9	$1,531,056	
Emission Reduction (tons)			0.57	0.38	
Cost Effectiveness ($/ton)			$ 897,344	$ 4,018,770	

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Existing conditions

Table A-4: PM2.5 BACT Summary - Fiber Line 5

Site Name:	Hexcel Corporation Salt Lake City Operations	Site Location:	West Valley City, UT
Component ID:	Quick Component Description:	Fiber Line 5	

BACT Option Analysis

	PM2.5	SO2	NOx	VOC	NH3
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		

Controlled Emissions Table (tpy):

	PM2.5	SO2	NOx	VOC	NH3
Existing Allowable Emissions (tn/yr)	0.27	0.11	1.86	0.34	0.14
BACT option 1	0.27	0.11	1.86	0.34	0.14
BACT option 2	0.00	0.002	1.86	0.34	NA[1]
BACT option 3	0.01		0.93	0.34	0.003
BACT option 4	NA[1]		0.37	0.01	
BACT option 5			NA[1]		
BACT option 6			NA[1]		

Option 2 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	$ 714,678	$244,784.0	NA[2]	NA[2]	NA[1]
Emission Reduction (tons)	0.27	0.11			
Cost Effectiveness ($/ton)	$ 2,663,747	$ 2,246,135			

Option 3 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	$ 445,862		$827,188.4	NA[2]	$244,784.0
Emission Reduction (tons)	0.27		0.93		0.13
Cost Effectiveness ($/ton)	$ 1,678,773		$ 887,259		$ 1,829,625

Option 4 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	NA[1]		$878,329.4	$1,846,550	
Emission Reduction (tons)			1.49	0.33	
Cost Effectiveness ($/ton)			$ 588,821	$ 5,594,141	

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Existing conditions

Table A-5: PM2.5 BACT Summary - Fiber Line 6

Site Name:	Hexcel Corporation Salt Lake City Operations		Site Location:	West Valley City, UT	
Component ID:	Quick Component Description:		Fiber Line 6		
BACT Option Analysis					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		
Controlled Emissions Table (tpy):					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Existing Allowable Emissions (tn/yr)	0.26	0.10	1.81	0.45	0.32
BACT option 1	0.26	0.10	1.81	0.45	0.32
BACT option 2	0.00	0.002	1.81	0.45	NA[1]
BACT option 3	0.01		0.91	0.45	0.006
BACT option 4	NA[1]		0.36	0.01	
BACT option 5			NA[1]		
BACT option 6			NA[1]		
Option 2 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	$ 652,082	$221,438.3	NA[2]	NA[2]	NA[1]
Emission Reduction (tons)	0.26	0.10			
Cost Effectiveness ($/ton)	$ 2,504,861	$ 2,244,155			
Option 3 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	$ 392,022		$1,272,021.1	NA[2]	$221,438.3
Emission Reduction (tons)	0.26		0.91		0.31
Cost Effectiveness ($/ton)	$ 1,521,252		$ 1,403,031		$ 703,017
Option 4 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[1]		$1,322,453.3	$2,661,868	
Emission Reduction (tons)			1.45	0.44	
Cost Effectiveness ($/ton)			$ 911,661	$ 6,074,486	

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Existing conditions

Table A-6: PM2.5 BACT Summary - Fiber Line 7

Site Name:	Hexcel Corporation Salt Lake City Operations		Site Location:	West Valley City, UT	
Component ID:	Quick Component Description:		Fiber Line 7		
BACT Option Analysis					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		
Controlled Emissions Table (tpy):					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Existing Allowable Emissions (tn/yr)	0.38	0.19	3.08	0.99	0.22
BACT option 1	0.38	0.19	3.08	0.99	0.22
BACT option 2	0.00	0.00	3.08	0.99	NA[1]
BACT option 3	0.01		1.54	0.99	0.004
BACT option 4	NA[1]		0.62	0.02	
BACT option 5			NA[1]		
BACT option 6			NA[1]		
Option 2 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	$ 734,722	$250,366.8	$ -	$ -	NA[1]
Emission Reduction (tons)	0.37	0.18			
Cost Effectiveness ($/ton)	$ 1,969,400	$ 1,357,133			
Option 3 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	$ 495,772		$1,641,586.8	$ -	$250,366.8
Emission Reduction (tons)	0.37		1.54		0.22
Cost Effectiveness ($/ton)	$ 1,342,460		$ 1,065,678		$ 1,141,555
Option 4 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[1]		$1,691,481.0	$3,565,071	
Emission Reduction (tons)			2.46	0.98	
Cost Effectiveness ($/ton)			$ 686,292	$ 3,656,145	

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Existing conditions

Table A-7: PM2.5 BACT Summary - Fiber Line 8

Site Name:	Hexcel Corporation Salt Lake City Operations	Site Location:	West Valley City, UT
Component ID:	Quick Component Description:	**Fiber Line 8**	

BACT Option Analysis

	PM2.5	SO2	NOx	VOC	NH3
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		

Controlled Emissions Table (tpy):

	PM2.5	SO2	NOx	VOC	NH3
Existing Allowable Emissions (tn/yr)	0.71	0.28	0.72	2.42	0.80
BACT option 1	0.71	0.28	0.72	2.42	0.80
BACT option 2	0.01	0.01	0.72	2.42	NA[1]
BACT option 3	0.01		0.36	2.42	0.016
BACT option 4	NA[1]		0.14	0.05	
BACT option 5			NA[1]		
BACT option 6			NA[1]		

Option 2 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	$ 1,169,422	$1,084,979.8	NA[2]	NA[2]	NA[1]
Emission Reduction (tons)	0.70	0.28			
Cost Effectiveness ($/ton)	$ 1,662,054	$ 3,898,930			

Option 3 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	$ 842,880		$1,381,159.4	NA[2]	$1,084,979.8
Emission Reduction (tons)	0.70		0.36		0.78
Cost Effectiveness ($/ton)	$ 1,210,176		$ 3,848,560		$ 1,387,751

Option 4 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	NA[1]		$1,431,870.8	$3,531,663	
Emission Reduction (tons)			0.57	2.37	
Cost Effectiveness ($/ton)			$ 2,493,666	$ 1,491,039	

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Existing conditions

Table A-8: PM2.5 BACT Summary - Fiber Line 10

Site Name:	Hexcel Corporation Salt Lake City Operations		Site Location:	West Valley City, UT	
Component ID:	Quick Component Description:		***Fiber Line 10***		
BACT Option Analysis					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		
Controlled Emissions Table (tpy):					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Existing Allowable Emissions (tn/yr)	0.80	0.32	0.81	2.63	0.90
BACT option 1	0.80	0.32	0.81	2.63	0.90
BACT option 2	0.01	0.01	0.81	2.63	NA[1]
BACT option 3	0.02		0.40	2.63	0.018
BACT option 4	NA[1]		0.16	0.05	
BACT option 5			NA[1]		
BACT option 6			NA[1]		
Option 2 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	$ 1,169,426	$1,084,979.8	NA[2]	NA[2]	NA[1]
Emission Reduction (tons)	0.79	0.31			
Cost Effectiveness ($/ton)	$ 1,478,045	$ 3,467,263			
Option 3 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	$ 842,880		$2,611,024.4	NA[2]	$1,084,979.8
Emission Reduction (tons)	0.78		0.40		0.88
Cost Effectiveness ($/ton)	$ 1,076,192		$ 6,470,036		$ 1,234,107
Option 4 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[1]		$2,661,735.8	$5,991,393	
Emission Reduction (tons)			0.65	2.58	
Cost Effectiveness ($/ton)			$ 4,122,311	$ 2,325,286	

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Existing conditions

Table A-9: PM2.5 BACT Summary - Fiber Line 11

Site Name:	Hexcel Corporation Salt Lake City Operations	Site Location:	West Valley City, UT
Component ID:	Quick Component Description:	**Fiber Line 11**	

BACT Option Analysis

	PM2.5	SO2	NOx	VOC	NH3
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		

Controlled Emissions Table (tpy):

	PM2.5	SO2	NOx	VOC	NH3
Existing Allowable Emissions (tn/yr)	0.98	0.39	0.99	8.06	1.10
BACT option 1	0.98	0.39	0.99	8.06	1.10
BACT option 2	0.01	0.01	0.99	8.06	NA[1]
BACT option 3	0.02		0.50	8.06	0.022
BACT option 4	NA[1]		0.20	0.16	
BACT option 5			NA[1]		
BACT option 6			NA[1]		

Option 2 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	$ 1,052,687	$942,301.9	NA[2]	NA[2]	NA[1]
Emission Reduction (tons)	0.97	0.38			
Cost Effectiveness ($/ton)	$ 1,084,572	$ 2,454,705			

Option 3 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	$ 743,552		$2,056,173.7	NA[2]	$942,301.9
Emission Reduction (tons)	0.96		0.50		1.08
Cost Effectiveness ($/ton)	$ 773,891		$ 4,153,361		$ 873,706

Option 4 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	NA[1]		$2,106,730.8	$2,446,441	
Emission Reduction (tons)			0.79	7.90	
Cost Effectiveness ($/ton)			$ 2,659,677	$ 309,641	

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Existing conditions

Table A-10: PM2.5 BACT Summary - Fiber Line 12

Site Name:	Hexcel Corporation Salt Lake City Operations		Site Location:	West Valley City, UT	
Component ID:	Quick Component Description:		Fiber Line 12		
BACT Option Analysis					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		
Controlled Emissions Table (tpy):					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Existing Allowable Emissions (tn/yr)	0.98	0.39	0.99	8.06	1.10
BACT option 1	0.98	0.39	0.99	8.06	1.10
BACT option 2	0.01	0.01	0.99	8.06	NA[1]
BACT option 3	0.02		0.50	8.06	0.022
BACT option 4	NA[1]		0.20	0.16	
BACT option 5			NA[1]		
BACT option 6			NA[1]		
Option 2 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	$ 1,052,687	$942,301.9	NA[2]	NA[2]	NA[1]
Emission Reduction (tons)	0.97	0.38			
Cost Effectiveness ($/ton)	$ 1,083,790	$ 2,452,933			
Option 3 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	$ 743,552		$2,056,173.7	NA[2]	$942,301.9
Emission Reduction (tons)	0.96		0.50		1.08
Cost Effectiveness ($/ton)	$ 773,332		$ 4,150,363		$ 873,076
Option 4 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[1]		$2,106,730.8	$2,446,441	
Emission Reduction (tons)			0.79	7.90	
Cost Effectiveness ($/ton)			$ 2,657,757	$ 309,576	

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Existing conditions

Table A-11: PM2.5 BACT Summary - Fiber Line 13

Site Name:	Hexcel Corporation Salt Lake City Operations			West Valley City, UT	
Component ID:	Quick Component Description:		Fiber Line 13		
BACT Option Analysis					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		
Controlled Emissions Table (tpy):					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Existing Allowable Emissions (tn/yr)	6.04	0.76	18.48	4.10	2.12
BACT option 1	6.04	0.76	18.48	4.10	2.12
BACT option 2	NA[2]	0.02	18.48	4.10	NA[1]
BACT option 3	NA[2]		NA[3]	NA[2]	0.042
BACT option 4	NA[1]		NA[2]	NA[2]	
BACT option 5			NA[1]		
BACT option 6			NA[1]		
Option 2 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[2]	$1,343,133.2	NA[3]	NA[3]	NA[1]
Emission Reduction (tons)		0.74			
Cost Effectiveness ($/ton)		$ 1,806,546			
Option 3 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[2]		NA[3]	NA[3]	$1,343,133.2
Emission Reduction (tons)					2.07
Cost Effectiveness ($/ton)					$ 649,585
Option 4 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[1]		NA[2]	NA[2]	
Emission Reduction (tons)					
Cost Effectiveness ($/ton)					

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Not applicable - maximum control already applied

3 - Existing conditions

Table A-12: PM2.5 BACT Summary - Fiber Line 14

Site Name:	Hexcel Corporation Salt Lake City Operations	Site Location:	West Valley City, UT		
Component ID:	Quick Component Description:	Fiber Line 14			
BACT Option Analysis					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		
Controlled Emissions Table (tpy):					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Existing Allowable Emissions (tn/yr)	6.04	0.76	18.48	4.10	2.12
BACT option 1	6.04	0.76	18.48	4.10	2.12
BACT option 2	6.04	0.02	18.48	4.10	NA[1]
BACT option 3	NA[2]		NA[3]	4.10	0.042
BACT option 4	NA[1]		NA[2]	4.10	
BACT option 5			NA[1]		
BACT option 6			NA[1]		
Option 2 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[2]	$1,484,529.7	NA[3]	NA[3]	NA[1]
Emission Reduction (tons)		0.74			
Cost Effectiveness ($/ton)		$ 1,996,727			
Option 3 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[2]		NA[3]	NA[3]	$1,484,529.7
Emission Reduction (tons)					2.07
Cost Effectiveness ($/ton)					$ 717,970
Option 4 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[1]		NA[2]	NA[2]	
Emission Reduction (tons)					
Cost Effectiveness ($/ton)					

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Not applicable - maximum control already applied

3 - Existing conditions

Table A-13: PM2.5 BACT Summary - Fiber Line 15

Site Name:	Hexcel Corporation Salt Lake City Operations		Site Location:	West Valley City, UT	
Component ID:	Quick Component Description:		Fiber Line 15		
BACT Option Analysis					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		
Controlled Emissions Table (tpy):					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Existing Allowable Emissions (tn/yr)	6.56	0.82	20.05	4.44	2.30
BACT option 1	6.56	0.82	20.05	4.44	2.30
BACT option 2	6.56	0.02	20.05	4.44	NA[1]
BACT option 3	NA[2]		NA[3]	4.44	0.046
BACT option 4	NA[1]		NA[2]	4.44	
BACT option 5			NA[1]		
BACT option 6			NA[1]		
Option 2 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[2]	$2,180,930.4	NA[3]	NA[3]	NA[1]
Emission Reduction (tons)		0.81			
Cost Effectiveness ($/ton)		$ 2,703,776			
Option 3 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[2]		NA[3]	NA[3]	$2,180,930.4
Emission Reduction (tons)					2.24
Cost Effectiveness ($/ton)					$ 972,205
Option 4 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[1]		NA[2]	NA[2]	
Emission Reduction (tons)					
Cost Effectiveness ($/ton)					

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Not applicable - maximum control already applied

3 - Existing conditions

Table A-14: PM2.5 BACT Summary - Fiber Line 16

Site Name:	Hexcel Corporation Salt Lake City Operations		Site Location:	West Valley City, UT	
Component ID:	Quick Component Description:		Fiber Line 16		
BACT Option Analysis					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		
Controlled Emissions Table (tpy):					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Existing Allowable Emissions (tn/yr)	6.56	0.82	20.05	4.44	2.30
BACT option 1	6.56	0.82	20.05	4.44	2.30
BACT option 2	6.56	0.02	20.05	4.44	NA[1]
BACT option 3	NA[2]		NA[3]	4.44	0.046
BACT option 4	NA[1]		NA[2]	4.44	
BACT option 5			NA[1]		
BACT option 6			NA[1]		
Option 2 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[2]	$2,180,930.4	NA[3]	NA[3]	NA[1]
Emission Reduction (tons)		0.81			
Cost Effectiveness ($/ton)		$ 2,703,776			
Option 3 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[2]		NA[3]	NA[3]	$2,180,930.4
Emission Reduction (tons)					2.24
Cost Effectiveness ($/ton)					$ 972,205
Option 4 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[1]		NA[2]	NA[2]	
Emission Reduction (tons)					
Cost Effectiveness ($/ton)					

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Not applicable - maximum control already applied

3 - Existing conditions

Table A-15: PM2.5 BACT Summary - Pilot Fiber Line

Site Name:	Hexcel Corporation Salt Lake City Operations	Site Location:	West Valley City, UT
Component ID:	Quick Component Description:	**Pilot Fiber Line**	

BACT Option Analysis

	PM2.5	SO2	NOx	VOC	NH3
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	Good Operating Practices
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	Leak Detection and Repair Program
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	Venturi Scrubber
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		

Controlled Emissions Table (tpy):

	PM2.5	SO2	NOx	VOC	NH3
Existing Allowable Emissions (tn/yr)	0.01	0.00001	0.035	0.04	0.03
BACT option 1	0.01	0.00001	0.035	0.04	0.03
BACT option 2	0.00	0.000000	0.035	0.04	NA[1]
BACT option 3	0.0001		0.018	0.04	0.001
BACT option 4	NA[1]		0.0071	0.001	
BACT option 5			NA[1]		
BACT option 6			NA[1]		

Option 2 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	$ 543,937	$170,213.4	NA[2]	NA[2]	NA[1]
Emission Reduction (tons)	0.01	0.00			
Cost Effectiveness ($/ton)	$ 106,088,303	$ 25,635,651,590			

Option 3 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	$ 304,135		$19,721.7	NA[2]	$170,213.4
Emission Reduction (tons)	0.01		0.02		0.03
Cost Effectiveness ($/ton)	$ 59,923,168		$ 1,116,358		$ 5,915,460

Option 4 Cost/Benefit Analysis Summary

	PM2.5	SO2	NOx	VOC	NH3
Annualized Cost ($)	NA[1]		$21,875.4	$418,836	
Emission Reduction (tons)			0.03	0.04	
Cost Effectiveness ($/ton)			$ 773,921	$ 11,460,072	

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Existing conditions

Table A-16: PM2.5 BACT Summary - Matrix Operations

Site Name:	Hexcel Corporation Salt Lake City Operations		Site Location:	West Valley City, UT	
Component ID:	Quick Component Description:		Matrix Operations		
BACT Option Analysis					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
BACT option 1	Good Combustion Practices	Natural Gas	Good Combustion Practices	Good Combustion Practices	
BACT option 2	Baghouse	Venturi Scrubber	Natural Gas	Natural Gas	
BACT option 3	Venturi Scrubber		Low NOx Burner	Existing Incineration/ Flares	
BACT option 4	Wet ESP		Ultra Low NOx Burner with Flue Gas Recirculation	Thermal Oxidization	
BACT option 5			Selective Catalytic Reduction		
BACT option 6			Selective Non-Catalytic Reduction		
Controlled Emissions Table (tpy):					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Existing Allowable Emissions (tn/yr)	0.79	0.06257	5.21	0.59	0.00
BACT option 1	0.79	0.06257	5.21	0.59	
BACT option 2	0.01	0.00125	5.21	0.59	
BACT option 3	0.02		NA[3]	0.59	
BACT option 4	NA[1]		NA[2]	NA[2]	
BACT option 5			NA[1]		
BACT option 6			NA[1]		
Option 2 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[1]	$300,603.0	NA[3]	NA[3]	
Emission Reduction (tons)		0.06			
Cost Effectiveness ($/ton)		$ 4,902,202			
Option 3 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	$ 306,401		NA[2]	NA[3]	
Emission Reduction (tons)	0.78				
Cost Effectiveness ($/ton)	$ 394,481				
Option 4 Cost/Benefit Analysis Summary					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Annualized Cost ($)	NA[1]		NA[2]	NA[2]	
Emission Reduction (tons)					
Cost Effectiveness ($/ton)					

Option 1 Cost/Benefit Analysis Summary is not presented because it represents existing conditions

1 - Not technically feasible

2 - Not applicable - maximum control already applied

3 - Existing conditions

Table A-17: PM2.5 BACT Summary - Emergency Generators

Site Name:	Hexcel Corporation Salt Lake City Operations		Site Location:	West Valley City, UT	
Component ID:	Quick Component Description:		Emergency Generators		
BACT Option Analysis					
	PM2.5	SO2	NOx	VOC	NH3
BACT Condition	Annual Hours of Operation Restriction	Annual Hours of Operation Restriction	Annual Hours of Operation Restriction	Annual Hours of Operation Restriction	NA
BACT Condition	Restrictions and Use of Low Sulfur Fuel	Restrictions and Use of Low Sulfur Fuel	Restrictions and Use of Low Sulfur Fuel	Restrictions and Use of Low Sulfur Fuel	NA
BACT Condition	Engines compliant with NSPS IIII and JJJJ and NESHAP ZZZZ	Engines compliant with NSPS IIII and JJJJ and NESHAP ZZZZ	Engines compliant with NSPS IIII and JJJJ and NESHAP ZZZZ	Engines compliant with NSPS IIII and JJJJ and NESHAP ZZZZ	NA
Controlled Emissions Table (tpy):					
	PM2.5	SO2	NOx	VOC	NH3
Existing Allowable Emissions (tn/yr)	0.75	1.08	11.65	1.03	NA

Table A-18: PM2.5 BACT Summary - HVAC Systems

Site Name:	Hexcel Corporation Salt Lake City Operations		Site Location:	West Valley City, UT
Component ID:	Quick Component Description:		HVAC Systems	
BACT Option Analysis				
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
BACT Condition	Burning of Natural Gas Fuel	Burning of Natural Gas Fuel	Burning of Natural Gas Fuel	Burning of Natural Gas Fuel	NA
BACT Condition	Good Combustion Practices	Good Combustion Practices	Good Combustion Practices	Good Combustion Practices	NA
Controlled Emissions Table (tpy):					
	PM2.5	**SO2**	**NOx**	**VOC**	**NH3**
Existing Allowable Emissions (tn/yr)	0.56	0.04	6.98	0.41	NA

Attachment B

Emission and Cost Calculations

April 25, 2017

Table B-1a: Emission Reduction Calculations

					Uncontrolled Emission Rate[a]									Controlled Emission Rate											
														Baghouse			Venturi Scrubber				Low-NO_x Burner	Low-NO_x Burner	Ultra Low-NO_x Burner	RTO	
Fiberline ID	Building	Source ID	Source Code	Source Description	Annual NOx Emission Rate Before Control (lb/hr)	PM_{10} Emission Rate Before Control (lb/hr)	$PM_{2.5}$ Emission Rate Before Control (lb/hr)	SOx Emission Rate Before Control (lb/hr)	NH3 Emission Rate Before Control (lb/hr)	CO Emission Rate Before Control (lb/hr)	VOC Emission Rate Before Control (lb/hr)	SCFM Ave (scfm)	PM_{10} grain loading[b] (gr/scf)	PM_{10} Controlled[c] (lb/hr)	Technically feasible[d]? (Y/N)	$PM_{2.5}$ controlled[e] (lb/hr)	PM_{10} Controlled[f] (lb/hr)	$PM_{2.5}$ Controlled[g] (lb/hr)	SO_2[h] Controlled (lb/hr)	NH_3[h] Controlled (lb/hr)	Technically feasible[i]? (Y/N)	NO_x[j] Controlled (lb/hr)	NO_x[k] Controlled (lb/hr)	VOC[l] Controlled (lb/hr)	CO[m] Controlled (lb/hr)
2	2344	200	2344 200	Ox Oven Vest	--	--	--	--	--	--	--														
2	2344	202	2344 202	Ox Oven Hoods	--	--	--	--	--	--	--														
2	2344	203	2344 203	Incinerator	2 0792E-02	--	--	1 2971E-02	--	--	4 5853E-04	253 7							2 594E-04		Y	1 040E-02	4 158E-03	9 171E-06	
2	2344	204	2344 204	LTF Seal Ex Out	--	--	--	--	--	--	--														
2	2344	205	2344 205	LTF Seal Ex Out	--	--	--	--	--	--	--														
2	2344	206	2344 206	HTF Seal Ex In	--	--	--	--	--	--	--														
2	2344	207	2344 207	HTF Seal Ex In	--	--	--	--	--	--	--														
2	2344	208	2344 208	HTF Seal Ex Out	--	--	--	--	--	--	--														
2	2344	209	2344 209	HMF Seal Ex In	--	--	--	--	--	--	7 9909E-02													1 598E-03	
2	2344	210	2344 210	HMF Seal Ex Out	--	--	--	--	--	--	7 9909E-02													1 598E-03	
2	2344	211	2344 211	Surface Treat Ex	--	--	--	--	--	--	--														
2	2344	212	2344 212	Sizing Dryer Ex	--	--	--	--	--	--	--														
3	2344	301	2344 301	Ox Ov #1 In Vest	1.7944E-03	7 1825E-03	5 0704E-03	--	5 7973E-03	4 5877E-03	4 7223E-03	1115 3	0 001	3 591E-05	Y	5 070E-05	3.591E-05	1 014E-04		1 159E-04	N	1 794E-03	1 794E-03	9 445E-05	4 588E-04
3	2344	302	2344 302	Ox Ov #1 OutVest	1 7944E-03	7 1825E-03	5 0704E-03	--	5 7973E-03	4 5877E-03	4 7223E-03	1115 3	0 001	3 591E-05	Y	5 070E-05	3 591E-05	1 014E-04		1 159E-04	N	1 794E-03	1 794E-03	9 445E-05	4 588E-04
3	2344	303	2344 303	Ox Ov #2 In Vest	1 7944E-03	7 1825E-03	5 0704E-03	--	5 7973E-03	4.5877E-03	4 7223E-03	1115 3	0 001	3 591E-05	Y	5 070E-05	3 591E-05	1 014E-04		1 159E-04	N	1 794E-03	1 794E-03	9 445E-05	4 588E-04
3	2344	304	2344 304	Ox Ov #2 OutVest	1 7944E-03	7 1825E-03	5 0704E-03	--	5 7973E-03	4 5877E-03	4.7223E-03	1115 3	0 001	3 591E-05	Y	5 070E-05	3 591E-05	1 014E-04		1 159E-04	N	1 794E-03	1 794E-03	9 445E-05	4 588E-04
3	2344	305	2344 305	Ox Ov #3 In Vest	1 7944E-03	7 1825E-03	5 0704E-03	--	5 7973E-03	4 5877E-03	4 7223E-03	1115 3	0 001	3 591E-05	Y	5 070E-05	3 591E-05	1 014E-04		1 159E-04	N	1 794E-03	1 794E-03	9 445E-05	4 588E-04
3	2344	306	2344 306	Ox Ov #3 OutVest	1 7944E-03	7 1825E-03	5 0704E-03	--	5 7973E-03	4.5877E-03	4 7223E-03	1115 3	0 001	3.591E-05	Y	5 070E-05	3 591E-05	1 014E-04		1 159E-04	N	1 794E-03	1 794E-03	9 445E-05	4 588E-04
3	2344	308	2344 308	Incinerator	2 4662E-01	7 2330E-02	3 7179E-02	3 9037E-02	2 0975E-05	2 3001E-03	1 8285E-02	1860 8	0 005	3 617E-04	Y	3 718E-04	3 617E-04	7 436E-04	7 807E-04	4 195E-07	Y	1 233E-01	4 932E-02	3 657E-04	2 300E-04
3	2344	309	2344 309	HTF/LTF Seal Ex	4 1674E-04	8 5503E-03	4 3949E-03	--	1 1496E-02	3 9518E-03	9 5562E-03	1680 0	0 001	4 275E-05	Y	4 395E-05	4 275E-05	8 790E-05		2 299E-04				1 911E-04	
3	2344	310	2344 310	HTF Seal Ex Out	4 6864E-03	--	--	--	9 8660E-05	1 0524E-02	1 0935E-02	1680.0		--						1 973E-06	N	2 343E-03	4 686E-03	2 187E-04	1 052E-03
3	2344	311	2344 311	Surface Treat Ex	--	--	--	--	9 6281E-03	--	--			--						1 926E-04					
3	2344	312	2344 312	Sizing Dryer Ex	--	--	--	--	--	--	--			--											
3	2344	313	2344 313	Ox Ov #1 In Hood	1 7944E-03	7 1825E-03	5 0704E-03	--	5 7973E-03	4 5877E-03	4.7223E-03	676 9	0 001	3 591E-05	Y	5 070E-05	3 591E-05	1 014E-04		1 159E-04	N	1 794E-03	1 794E-03	9 445E-05	4 588E-04
3	2344	314	2344 314	Ox Ov #1 OutHood	1.7944E-03	7 1825E-03	5 0704E-03	--	5 7973E-03	4 5877E-03	4 7223E-03	676 9	0 001	3.591E-05	Y	5.070E-05	3.591E-05	1 014E-04		1 159E-04	N	1 794E-03	1 794E-03	9 445E-05	4 588E-04
3	2344	315	2344 315	Ox Ov #2 In Hood	1 7944E-03	7 1825E-03	5 0704E-03	--	5 7973E-03	4.5877E-03	4 7223E-03	676 9	0 001	3 591E-05	Y	5 070E-05	3.591E-05	1 014E-04		1 159E-04	N	1 794E-03	1 794E-03	9.445E-05	4 588E-04
3	2344	316	2344 316	Ox Ov #2 OutHood	1 7944E-03	7 1825E-03	5 0704E-03	--	5 7973E-03	4.5877E-03	4 7223E-03	676 9	0 001	3 591E-05	Y	5 070E-05	3 591E-05	1 014E-04		1 159E-04	N	1 794E-03	1 794E-03	9 445E-05	4 588E-04
3	2344	317	2344 317	Ox Ov #3 In Hood	1 7944E-03	7 1825E-03	5 0704E-03	--	5 7973E-03	4.5877E-03	4 7223E-03	676 9	0 001	3 591E-05	Y	5 070E-05	3 591E-05	1 014E-04		1 159E-04	N	1 794E-03	1 794E-03	9 445E-05	4 588E-04
3	2344	318	2344 318	Ox Ov #3 OutHood	1 7944E-03	7 1825E-03	5 0704E-03	--	5 7973E-03	4.5877E-03	4 7223E-03	676 9	0 001	3 591E-05	Y	5 070E-05	3.591E-05	1 014E-04		1 159E-04	N	1 794E-03	1 794E-03	9 445E-05	4 588E-04
3	2344	322	2344 322	Burner Box - Dragonmouth	6 4644E-02	5 6483E-03	2 9033E-03	1 4510E-03	1 0629E-03	1.7067E-03	1 1067E-03	347 3	0 002	2 824E-05	Y	2 903E-05	2.824E-05	5 807E-05	2 902E-05	2 126E-05	N	6 464E-02	6 464E-02	2 213E-05	1 707E-04
4	2436	400A	2436 400A	Ox Oven #1 In A	1 0645E-03	3 7056E-03	2 6159E-03	--	5 5654E-03	2 3505E-03	3 3122E-03	632 0	0 001	1 853E-05	Y	2 616E-05	1 853E-05	5.232E-05		1 113E-04	N	1 064E-03	1 064E-03	6 624E-05	2 350E-04
4	2436	400B	2436 400B	Ox Oven #1 In B	5 2412E-04	5 8572E-03	4 1348E-03	--	3 8904E-03	1 7939E-03	2 4855E-03	632 0	0 001	2 929E-05	Y	4 135E-05	2 929E-05	8 270E-05		7 781E-05	N	5 241E-04	5 241E-04	4 971E-05	1 794E-04
4	2436	401A	2436 401A	Ox Oven #1 OutA	1 1401E-03	8 2131E-03	5 7979E-03	--	5 6735E-03	2 7503E-03	4 7765E-03	632 0	0 002	4 107E-05	Y	5 798E-05	4 107E-05	1 160E-04		1.135E-04	N	1 140E-03	1 140E-03	9 553E-05	2 750E-04
4	2436	401B	2436 401B	Ox Oven #1 OutB	1 2320E-03	5 6265E-03	3 9719E-03	--	5 1926E-03	2.8097E-03	4 0039E-03	632 0	0 001	2 813E-05	Y	3 972E-05	2 813E-05	7 944E-05		1 039E-04	N	1 232E-03	1 232E-03	8 008E-05	2 810E-04
4	2436	402A	2436 402A	Ox Oven #2 In.A	1 1793E-03	4 7204E-03	3 3323E-03	--	3 8100E-03	3 0151E-03	3 1035E-03	632 0	0 001	2 360E-05	Y	3 332E-05	2 360E-05	6 665E-05		7 620E-05	N	1 179E-03	1 179E-03	6 207E-05	3 015E-04
4	2436	402B	2436 402B	Ox Oven #2 In B	1 1793E-03	4 7204E-03	3 3323E-03	--	3 8100E-03	3 0151E-03	3 1035E-03	632 0	0 001	2 360E-05	Y	3 332E-05	2 360E-05	6 665E-05		7 620E-05	N	1 179E-03	1 179E-03	6 207E-05	3 015E-04
4	2436	403A	2436 403A	Ox Oven #2 OutA	1 1793E-03	4 7204E-03	3 3323E-03	--	3 8100E-03	3 0151E-03	3 1035E-03	632 0	0 001	2 360E-05	Y	3 332E-05	2 360E-05	6 665E-05		7 620E-05	N	1 179E-03	1 179E-03	6 207E-05	3 015E-04
4	2436	403B	2436 403B	Ox Oven #2 OutB	1 1793E-03	4 7204E-03	3 3323E-03	--	3.8100E-03	3 0151E-03	3 1035E-03	632 0	0 001	2 360E-05	Y	3 332E-05	2 360E-05	6 665E-05		7 620E-05	N	1 179E-03	1 179E-03	6 207E-05	3 015E-04
4	2436	404A	2436 404A	Ox Oven #3 In A	1 3616E-03	7 5377E-03	5 3211E-03	--	4 7117E-03	5 1548E-03	3 5392E-03	632 0	0 001	3 769E-05	Y	5 321E-05	3 769E-05	1 064E-04		9 423E-05	N	1 362E-03	1 362E-03	7 078E-05	5 155E-04
4	2436	404B	2436 404B	Ox Oven #3 In B	1.2374E-03	2 3634E-03	1 6684E-03	--	3 1177E-03	3 6256E-03	2 9340E-03	632 0	0 000	1 182E-05	Y	1 668E-05	1 182E-05	3 337E-05		6 235E-05	N	1 237E-03	1 237E-03	5 868E-05	3 626E-04
4	2436	405A	2436 405A	Ox Oven #3 OutA	1 1793E-03	4 7204E-03	3 3323E-03	--	3 8100E-03	3 0151E-03	3 1035E-03	632 0	0 001	2 360E-05	Y	3 332E-05	2 360E-05	6 665E-05		7 620E-05	N	1 179E-03	1 179E-03	6 207E-05	3 015E-04
4	2436	405B	2436 405B	Ox Oven #3 OutB	1 1793E-03	4 7204E-03	3 3323E-03	--	3 8100E-03	3.0151E-03	3 1035E-03	632 0	0 001	2.360E-05	Y	3 332E-05	2 360E-05	6 665E-05		7 620E-05	N	1 179E-03	1 179E-03	6 207E-05	3 015E-04
4	2436	406A	2436 406A	Ox Oven #4 In A	1 1793E-03	4 7204E-03	3 3323E-03	--	3.8100E-03	3 0151E-03	3 1035E-03	632 0	0 001	2 360E-05	Y	3 332E-05	2 360E-05	6 665E-05		7 620E-05	N	1 179E-03	1 179E-03	6.207E-05	3 015E-04
4	2436	406B	2436 406B	Ox Oven #4 In B	1 1793E-03	4 7204E-03	3 3323E-03	--	3 8100E-03	3.0151E-03	3 1035E-03	632 0	0 001	2 360E-05	Y	3 332E-05	2 360E-05	6 665E-05		7 620E-05	N	1 179E-03	1 179E-03	6 207E-05	3 015E-04
4	2436	407A	2436 407A	Ox Oven #4 OutA	1 7939E-03	2 9227E-03	2 0632E-03	--	1 1725E-03	3 7175E-03	2 3937E-03	632 0	0 001	1.461E-05	Y	2 063E-05	1 461E-05	4 126E-05		2 345E-05	N	1 794E-03	1 794E-03	4 787E-05	3 717E-04
4	2436	407B	2436 407B	Ox.Oven #4 OutB	1 0807E-03	1 5367E-03	1 0848E-03	--	1.1563E-03	1 9182E-03	1 3833E-03	632 0	0 000	7.684E-06	Y	1 085E-05	7 684E-06	2 170E-05		2 313E-05	N	1 081E-03	1 081E-03	2 767E-05	1 918E-04
4	2436	409	2436 409	LTF Incinerator	1 6208E-01	4 7536E-02	2 4434E-02	2 5640E-02	1 3785E-05	1 5116E-03	1 1405E-02	1748 7	0 003	2.377E-04	Y	2 443E-04	2 377E-04	4 887E-04	5 128E-04	2 757E-07	Y	8 104E-02	3 242E-02	2 281E-04	1 512E-04
4	2436	410	2436 410	LTF Seal Exhaust	2 5027E-04	1 6102E-02	8 2768E-03	--	1 0389E-03	6 1387E-04	2 4083E-03	1070 9	0 002	8 051E-05	Y	8 277E-05	8 051E-05	1 655E-04		2 078E-05				4 817E-05	6 139E-05
4	2436	411	2436 411	LTF/HTF Seal Ex	2 7388E-04	5 6193E-03	2 8884E-03	--	7 5553E-03	2.5971E-03	6 2804E-03	3272 2	0 000	2 810E-05	Y	2 888E-05	2 810E-05	5 777E-05		1 511E-04				1 256E-04	
4	2436	412	2436 412	HTF Seal Exhaust	--	1 2275E-02	6.3093E-03	--	4 2638E-03	--	1 1092E-02	778 4	0 002	6 137E-05	Y	6 309E-05	6 137E-05	1 262E-04		8 528E-05				2 218E-04	
4	2436	413	2436 413	HTF Seal Exhaust	3 0799E-03	--	--	--	6 4840E-05	6 9163E-03	7 1864E-03	1536 0		--						1 297E-06	N	1 540E-03	3 080E-03	1 437E-04	6 916E-04
4	2436	414	2436 414	Surface Treat Ex	--	--	--	--	3 1638E-03	--	--			--						6 328E-05					
4	2436	415	2436 415	Surface Treat Ex	--	--	--	--	3 1638E-03	--	--			--						6 328E-05					
4	2436	416	2436 416	Sizing Dryer Ex	--	--	--	--	--	--	--			--											
4	2436	417	2436 417	--	--	--	--	--	--	--	--			--											
4	2436	418	2436 418	--	--	--	--	--	--	--	--			--											
4	2436	419	2436 419	--	--	--	--	--	--	--	--			--											
4	2436	420	2436 420	--	--	--	--	--	--	--	--			--											
4	2436	421	2436 421	--	--	--	--	--	--	--	--			--											
4	2436	422	2436 422	Burner Box - Dragonmouth	4 2484E-02	3 7121E-03	1 9081E-03	9 5363E-04	6 9851E-04	1 1217E-03	7 2735E-04	347 3	0 001	1 856E-05	Y	1 908E-05	1 856E-05	3 816E-05	1 907E-05	1 397E-05	N	4 248E-02	4 248E-02	1 455E-05	1 122E-04
5	2436	501A	2436 501A	Ox Ov #1 In Vest	--	3 1841E-03	2 2478E-03	--	2 5488E-03	--	3 7757E-03	817 9	0 000	1 592E-05	Y	2.248E-05	1 592E-05	4 496E-05		5 098E-05				7 551E-05	
5	2436	501B	2436 501B	Ox Ov #1 In.Hood	--	3 5379E-04	2 4975E-04	--	2 8361E-04	--	4 1924E-04	1279 8	0 000	1 769E-06	Y	2 498E-06	1 769E-06	4 995E-06		5 672E-06				8 385E-06	
5	2436	501C	2436 501C	Ox Ov #1 In Gas	3 0090E-02	2 2868E-03	1 6144E-03	1 8054E-04	--	2 5276E-02	1 6549E-03	357 0	0 001	1 143E-05	Y	1.614E-05	1 143E-05	3 229E-05	3 611E-06		Y	1 504E-02	6.018E-03	3.310E-05	2 528E-03
5	2436	502A	2436 502A	Ox Ov #1 OutVest	--	2 5617E-03	1 8084E-03	--	2 0617E-03	--	3 7263E-03	1115 3	0 000	1 281E-05	Y	1 808E-05	1 281E-05	3 617E-05		4 123E-05				7 453E-05	
5	2436	502B	2436 502B	Ox Ov.#1-2 Hood	--	4 9978E-04	3 5281E-04	--	3 7732E-04	--	8 0150E-04	1279 8	0 000	2 499E-06	Y	3 528E-06	2 499E-06	7 056E-06		7 546E-06				1 603E-05	
5	2436	502C	2436 502C	Ox Ov #1 Out Gas	3 0090E-02	2 2868E-03	1 6144E-03	1 8054E-04	--	2 5276E-02	1 6549E-03	357 0	0 001	1 143E-05	Y	1 614E-05	1 143E-05	3 229E-05	3 611E-06		Y	1 504E-02	6.018E-03	3 310E-05	2 528E-03
5	2436	503A	2436 503A	Ox Ov #2 In Vest	--	1 9394E-03	1 3691E-03	--	1 3366E-03	--	3 4970E-03	1115 3	0 000	9 697E-06	Y	1 369E-05	9 697E-06	2 738E-05		2 673E-05				6.994E-05	
5	2436	503C	2436 503C	Ox Ov #2 In Gas	3 0090E-02	2 2868E-03	1.6144E-03	1 8054E-04	--	2 5276E-02	1 6549E-03	357 0	0 001	1 143E-05	Y	1 614E-05	1 143E-05	3 229E-05	3 611E-06		Y	1 504E-02	6.018E-03	3 310E-05	2 528E-03
5	2436	504A	2436 504A	Ox Ov #2 OutVest	--	1 9394E-03	1.3691E-03	--	1 3366E-03	--	3 4970E-03	1115 3	0 000	9 697E-06	Y	1 369E-05	9 697E-06	2 738E-05		2 673E-05				6 994E-05	
5	2436	504B	2436 504B	Ox Ov #2-3 Hood	--	4 3904E-04	3 0993E-04	--	3 3663E-04	3 3786E-04	8 5575E-04	1279 8	0 000	2 195E-06	Y	3 099E-06	2 195E-06	6 199E-06		6 733E-06				1 712E-05	3 379E-05
5	2436	504C	2436 504C	Ox Ov #2 Out Gas	3 0090E-02	2 2868E-03	1 6144E-03	1 8054E-04	--	2 5276E-02	1 6549E-03	357 0	0 001	1 143E-05	Y	1 614E-05	1 143E-05	3 229E-05	3 611E-06		Y	1 504E-02	6.018E-03	3 310E-05	2 528E-03
5	2436	505A	2436 505A	Ox Ov #3 In Vest	--	2 0098E-03	1 4188E-03	--	1 6979E-03	3 0358E-03	4 2011E-03	1115 3	0 000	1 005E-05	Y	1 419E-05	1 005E-05	2 838E-05		3 396E-05				8 402E-05	3 036E-04
5	2436	505C	2436 505C	Ox Ov #3 In Gas	3 0090E-02	2 2868E-03	1 6144E-03	1 8054E-04	--	2 5276E-02	1 6549E-03	357 0	0 001	1 143E-05	Y	1 614E-05	1 143E-05	3 229E-05	3 611E-06		Y	1 504E-02	6 018E-03	3 310E-05	2 528E-03
5	2436	506A	2436 506A	Ox Ov #3 OutVest	--	2 0769E-03	1 4662E-03	--	2 0469E-03	5 9693E-03	4 8817E-03	1115 3	0 000	1 038E-05	Y	1 466E-05	1 038E-05	2 932E-05		4 094E-05				9 763E-05	5 969E-04
5	2436	506B	2436 506B	Ox Ov #3-4 Hood	--	4 6141E-04	3 2573E-04	--	4 5500E-04	1 3268E-03	1 0851E-03	1279 8	0 000	2 307E-06	Y	3 257E-06	2 307E-06	6 515E-06		9 100E-06				2 170E-05	1 327E-04
5	2436	506C	2436 506C	Ox Ov #3 Out Gas	3 0090E-02	2 2868E-03	1 6144E-03	1 8054E-04	--	2 5276E-02	1 6549E-03	357 0	0 001	1 143E-05	Y	1 614E-05	1 143E-05	3 229E-05	3 611E-06		Y	1 504E-02	6 018E-03	3 310E-05	2 528E-03

Fiberline ID	Building	Source ID	Source Code	Source Description	Uncontrolled Emission Rate[a]									Controlled Emission Rate											
														Baghouse			Venturi Scrubber				Low-NO_x Burner	Low-NO_x Burner	Ultra Low-NO_x Burner	RTO	
					Annual NOx Emission Rate Before Control (lb/hr)	PM_{10} Emission Rate Before Control (lb/hr)	$PM_{2.5}$ Emission Rate Before Control (lb/hr)	SOx Emission Rate Before Control (lb/hr)	NH3 Emission Rate Before Control (lb/hr)	CO Emission Rate Before Control (lb/hr)	VOC Emission Rate Before Control (lb/hr)	SCFM Ave (scfm)	PM_{10} grain loading[b] (gr/scf)	PM_{10} Controlled[c] (lb/hr)	Technically feasible[d]? (Y/N)	$PM_{2.5}$ controlled[e] (lb/hr)	PM_{10} Controlled[f] (lb/hr)	$PM_{2.5}$ Controlled[g] (lb/hr)	SO_2[h] Controlled (lb/hr)	NH_3[h] Controlled (lb/hr)	Technically feasible[i]? (Y/N)	NO_x[j] Controlled (lb/hr)	NO_x[k] Controlled (lb/hr)	VOC[l] Controlled (lb/hr)	CO[m] Controlled (lb/hr)
5	2436	507A	2436 507A	Ox Ov #4 In Vest	--	2.0769E-03	1.4662E-03	--	2.0469E-03	5.9693E-03	4.8817E-03	1115.3	0.000	1.038E-05	Y	1.466E-05	1.038E-05	2.932E-05		4.094E-05				9.763E-05	5.969E-04
5	2436	507C	2436 507C	Ox Ov #4 In Gas	3.0090E-02	2.2868E-03	1.6144E-03	1.8054E-04	--	2.5276E-02	1.6549E-03	357.0	0.001	1.143E-05	Y	1.614E-05	1.143E-05	3.229E-05	3.611E-06		Y	1.504E-02	6.018E-03	3.310E-05	2.528E-03
5	2436	508A	2436 508A	Ox Ov #4 OutVest	--	2.0769E-03	1.4662E-03	--	2.0469E-03	5.9693E-03	4.8817E-03	1115.3	0.000	1.038E-05	Y	1.466E-05	1.038E-05	2.932E-05		4.094E-05				9.763E-05	5.969E-04
5	2436	508B	2436 508B	Ox Ov #4 OutHood	--	2.3124E-04	1.6324E-04	--	2.2689E-04	6.6339E-04	5.4132E-04	1279.8	0.000	1.156E-06	Y	1.632E-06	1.156E-06	3.265E-06		4.538E-06				1.083E-05	6.634E-05
5	2436	508C	2436 508C	Ox Ov #4 Out Gas	3.0090E-02	2.2868E-03	1.6144E-03	1.8054E-04	--	2.5276E-02	1.6549E-03	357.0	0.001	1.143E-05	Y	1.614E-05	1.143E-05	3.229E-05	3.611E-06		Y	1.504E-02	6.018E-03	3.310E-05	2.528E-03
5	2436	509	2436 509	LTF Incinerator	1.4619E-01	4.2877E-02	2.2039E-02	2.3085E-02	1.2434E-05	1.3635E-03	8.5746E-03	1748.7	0.003	2.144E-04	Y	2.204E-04	2.144E-04	4.408E-04	4.617E-04	2.487E-07	Y	7.310E-02	2.924E-02	1.715E-04	1.363E-04
5	2436	510	2436 510	LTF Seal Exhaust	2.2574E-04	1.4524E-02	7.4656E-03	--	9.3705E-04	5.5371E-04	2.1722E-03	1070.9	0.002	7.262E-05	Y	7.466E-05	7.262E-05	1.493E-04		1.874E-05	Y	1.129E-04	4.515E-05	4.344E-05	5.537E-05
5	2436	511	2436 511	HTF Seal Exhaust	2.4704E-04	5.0686E-03	2.6053E-03	--	6.8149E-03	2.3426E-03	5.6649E-03	1466.6	0.000	2.534E-05	Y	2.605E-05	2.534E-05	5.211E-05		1.363E-04	Y	1.235E-04	4.941E-05	1.133E-04	2.343E-04
5	2436	512	2436 512	HTF Seal Exhaust	--	2.1685E-03	1.1146E-03	--	2.6511E-04	5.4625E-04	9.5477E-03	1466.6	0.000	1.084E-05	Y	1.115E-05	1.084E-05	2.229E-05		5.302E-06				1.910E-04	5.463E-05
5	2436	513	2436 513	Surface Treat Ex	--	--	--	--	5.7075E-03	--	--			--						1.141E-04					
5	2436	515	2436 515	Sizing Dryer Ex	--	--	--	--	--	--	--			--											
5	2436	517	2436 517	Hood Exhaust	--	--	--	--	--	--	--			--											
5	2436	518	2436 518	--	--	--	--	--	--	--	--			--											
5	2436	519	2436 519	--	--	--	--	--	--	--	--			--											
5	2436	520	2436 520	--	--	--	--	--	--	--	--			--											
5	2436	521	2436 521	--	--	--	--	--	--	--	--			--											
5	2436	522	2436 522	Dragonmouth	3.8321E-02	3.3483E-03	1.7211E-03	8.6017E-04	6.3005E-04	1.0117E-03	6.5607E-04	347.3	0.001	1.674E-05	Y	1.721E-05	1.674E-05	3.442E-05	1.720E-05	1.260E-05	Y	1.916E-02	7.664E-03	1.312E-05	1.012E-04
6	2479	601A	2479 601A	Ox Ov #1 In A	4.8660E-05	1.5865E-03	1.5056E-03	--	4.8715E-03	2.0459E-03	5.7828E-03	1039.9	0.000	7.932E-06	Y	1.506E-05	7.932E-06	3.011E-05		9.743E-05	Y	2.433E-05	9.732E-06	1.157E-04	2.046E-04
6	2479	601B	2479 601B	Ox Ov #1 In B	4.8660E-05	1.5865E-03	1.5056E-03	--	4.8715E-03	2.0459E-03	5.7828E-03	1039.9	0.000	7.932E-06	Y	1.506E-05	7.932E-06	3.011E-05		9.743E-05	Y	2.433E-05	9.732E-06	1.157E-04	2.046E-04
6	2479	601C	2479 601C	Ox Ov #1 Gas	3.1010E-02	2.3568E-03	2.2366E-03	1.8606E-04	--	2.6049E-02	1.7056E-03	287.4	0.001	1.178E-05	Y	2.237E-05	1.178E-05	4.473E-05	3.721E-06		Y	1.551E-02	6.202E-03	3.411E-05	2.605E-03
6	2479	602A	2479 602A	Ox. Ov #1 Out A	4.8660E-05	1.5865E-03	1.5056E-03	--	4.8715E-03	2.0459E-03	5.7828E-03	1039.9	0.000	7.932E-06	Y	1.506E-05	7.932E-06	3.011E-05		9.743E-05	Y	2.433E-05	9.732E-06	1.157E-04	2.046E-04
6	2479	602B	2479 602B	Ox Ov #1 Out B	4.8660E-05	1.5865E-03	1.5056E-03	--	4.8715E-03	2.0459E-03	5.7828E-03	1039.9	0.000	7.932E-06	Y	1.506E-05	7.932E-06	3.011E-05		9.743E-05	Y	2.433E-05	9.732E-06	1.157E-04	2.046E-04
6	2479	602C	2479 602C	Ox Ov #1 Gas	3.1010E-02	2.3568E-03	2.2366E-03	1.8606E-04	--	2.6049E-02	1.7056E-03	287.4	0.001	1.178E-05	Y	2.237E-05	1.178E-05	4.473E-05	3.721E-06		Y	1.551E-02	6.202E-03	3.411E-05	2.605E-03
6	2479	603A	2479 603A	Ox Ov #2 In A	--	9.6623E-04	9.1695E-04	--	4.6769E-03	3.3619E-03	3.7169E-03	1039.9	0.000	4.831E-06	Y	9.170E-06	4.831E-06	1.834E-05		9.354E-05				7.434E-05	3.362E-04
6	2479	603B	2479 603B	Ox Ov #2 In B	--	9.6623E-04	9.1695E-04	--	4.6769E-03	3.3619E-03	3.7169E-03	743.5	0.000	4.831E-06	Y	9.170E-06	4.831E-06	1.834E-05		9.354E-05				7.434E-05	3.362E-04
6	2479	603C	2479 603C	Ox Ov #2 Gas	3.1010E-02	2.3568E-03	2.2366E-03	1.8606E-04	--	2.6049E-02	1.7056E-03	287.4	0.001	1.178E-05	Y	2.237E-05	1.178E-05	4.473E-05	3.721E-06		Y	1.551E-02	6.202E-03	3.411E-05	2.605E-03
6	2479	604A	2479 604A	Ox Ov #2 Out A	--	9.6623E-04	9.1695E-04	--	4.6769E-03	3.3619E-03	3.7169E-03	743.5	0.000	4.831E-06	Y	9.170E-06	4.831E-06	1.834E-05		9.354E-05				7.434E-05	3.362E-04
6	2479	604B	2479 604B	Ox Ov #2 Out B	--	9.6623E-04	9.1695E-04	--	4.6769E-03	3.3619E-03	3.7169E-03	743.5	0.000	4.831E-06	Y	9.170E-06	4.831E-06	1.834E-05		9.354E-05				7.434E-05	3.362E-04
6	2479	604C	2479 604C	Ox Ov #2 Gas	3.1010E-02	2.3568E-03	2.2366E-03	1.8606E-04	--	2.6049E-02	1.7056E-03	287.4	0.001	1.178E-05	Y	2.237E-05	1.178E-05	4.473E-05	3.721E-06		Y	1.551E-02	6.202E-03	3.411E-05	2.605E-03
6	2479	605A	2479 605A	Ox Ov #3 In A	--	9.6623E-04	9.1695E-04	--	4.6769E-03	3.3619E-03	3.7169E-03	743.5	0.000	4.831E-06	Y	9.170E-06	4.831E-06	1.834E-05		9.354E-05				7.434E-05	3.362E-04
6	2479	605B	2479 605B	Ox Ov #3 In B	--	9.6623E-04	9.1695E-04	--	4.6769E-03	3.3619E-03	3.7169E-03	743.5	0.000	4.831E-06	Y	9.170E-06	4.831E-06	1.834E-05		9.354E-05				7.434E-05	3.362E-04
6	2479	605C	2479 605C	Ox Ov #3 Gas	3.1010E-02	2.3568E-03	2.2366E-03	1.8606E-04	--	2.6049E-02	1.7056E-03	287.4	0.001	1.178E-05	Y	2.237E-05	1.178E-05	4.473E-05	3.721E-06		Y	1.551E-02	6.202E-03	3.411E-05	2.605E-03
6	2479	606A	2479 606A	Ox Ov #3 Out A	--	1.0350E-03	9.8226E-04	--	2.2406E-03	2.8742E-03	3.1175E-03	743.5	0.000	5.175E-06	Y	9.823E-06	5.175E-06	1.965E-05		4.481E-05				6.235E-05	2.874E-04
6	2479	606B	2479 606B	Ox. Ov #3 Out B	--	1.0350E-03	9.8226E-04	--	2.2406E-03	2.8742E-03	3.1175E-03	743.5	0.000	5.175E-06	Y	9.823E-06	5.175E-06	1.965E-05		4.481E-05				6.235E-05	2.874E-04
6	2479	606C	2479 606C	Ox Ov #3 Gas	3.1010E-02	2.3568E-03	2.2366E-03	1.8606E-04	--	2.6049E-02	1.7056E-03	287.4	0.001	1.178E-05	Y	2.237E-05	1.178E-05	4.473E-05	3.721E-06		Y	1.551E-02	6.202E-03	3.411E-05	2.605E-03
6	2479	607A	2479 607A	Ox Ov #4 In A	--	1.0350E-03	9.8226E-04	--	2.2406E-03	2.8742E-03	3.1175E-03	743.5	0.000	5.175E-06	Y	9.823E-06	5.175E-06	1.965E-05		4.481E-05				6.235E-05	2.874E-04
6	2479	607B	2479 607B	Ox Ov #4 In B	--	1.0350E-03	9.8226E-04	--	2.2406E-03	2.8742E-03	3.1175E-03	743.5	0.000	5.175E-06	Y	9.823E-06	5.175E-06	1.965E-05		4.481E-05				6.235E-05	2.874E-04
6	2479	607C	2479 607C	Ox Ov #4 Gas	3.1010E-02	2.3568E-03	2.2366E-03	1.8606E-04	--	2.6049E-02	1.7056E-03	287.4	0.001	1.178E-05	Y	2.237E-05	1.178E-05	4.473E-05	3.721E-06		Y	1.551E-02	6.202E-03	3.411E-05	2.605E-03
6	2479	608A	2479 608A	Ox Ov #4 Out A	--	1.0350E-03	9.8226E-04	--	2.2406E-03	2.8742E-03	3.1175E-03	743.5	0.000	5.175E-06	Y	9.823E-06	5.175E-06	1.965E-05		4.481E-05				6.235E-05	2.874E-04
6	2479	608B	2479 608B	Ox Ov #4 Out B	--	1.0350E-03	9.8226E-04	--	2.2406E-03	2.8742E-03	3.1175E-03	743.5	0.000	5.175E-06	Y	9.823E-06	5.175E-06	1.965E-05		4.481E-05				6.235E-05	2.874E-04
6	2479	608C	2479 608C	Ox. Ov #4 Gas	3.1010E-02	2.3568E-03	2.2366E-03	1.8606E-04	--	2.6049E-02	1.7056E-03	287.4	0.001	1.178E-05	Y	2.237E-05	1.178E-05	4.473E-05	3.721E-06		Y	1.551E-02	6.202E-03	3.411E-05	2.605E-03
6	2479	609A	2479 609A	LTF Seal In A	--	5.5241E-04	2.8394E-04	--	1.1170E-04	1.9464E-04	1.0915E-03	391.1	0.000	2.762E-06	Y	2.839E-06	2.762E-06	5.679E-06		2.234E-06				2.183E-05	1.946E-05
6	2479	609B	2479 609B	LTF Seal In B	--	5.5241E-04	2.8394E-04	--	1.1170E-04	1.9464E-04	1.0915E-03	391.1	0.000	2.762E-06	Y	2.839E-06	2.762E-06	5.679E-06		2.234E-06				2.183E-05	1.946E-05
6	2479	610	2479 610	LTF Incinerator	1.3112E-01	3.8455E-02	1.9766E-02	2.0728E-02	1.1152E-05	1.2229E-03	8.6596E-03	983.4	0.005	1.923E-04	Y	1.977E-04	1.923E-04	3.953E-04	4.146E-04	2.230E-07	Y	6.556E-02	2.622E-02	1.732E-04	1.223E-04
6	2479	611A	2479 611A	LTF Seal Out A	1.1078E-04	2.2729E-03	1.1683E-03	--	3.0560E-03	1.0505E-03	2.5403E-03	391.1	0.001	1.136E-05	Y	1.168E-05	1.136E-05	2.337E-05		6.112E-05	Y	5.539E-05	2.216E-05	5.081E-05	1.051E-04
6	2479	611B	2479 611B	LTF Seal Out B	1.1078E-04	2.2729E-03	1.1683E-03	--	3.0560E-03	1.0505E-03	2.5403E-03	391.1	0.001	1.136E-05	Y	1.168E-05	1.136E-05	2.337E-05		6.112E-05	Y	5.539E-05	2.216E-05	5.081E-05	1.051E-04
6	2479	612A	2479 612A	HTF Seal In A	1.7184E-02	1.5015E-03	7.7178E-04	3.8573E-04	2.8254E-04	4.5370E-04	2.9420E-04	391.1	0.000	7.507E-06	Y	7.718E-06	7.507E-06	1.544E-05	7.715E-06	5.651E-06	Y	8.592E-03	3.437E-03	5.884E-06	4.537E-05
6	2479	612B	2479 612B	HTF Seal In B	1.7184E-02	1.5015E-03	7.7178E-04	3.8573E-04	2.8254E-04	4.5370E-04	2.9420E-04	391.1	0.000	7.507E-06	Y	7.718E-06	7.507E-06	1.544E-05	7.715E-06	5.651E-06	Y	8.592E-03	3.437E-03	5.884E-06	4.537E-05
6	2479	613A	2479 613A	HTF Seal Out A	--	4.9697E-04	2.5545E-04	--	1.8026E-04	1.0230E-03	3.8972E-03	391.1	0.000	2.485E-06	Y	2.555E-06	2.485E-06	5.109E-06		3.605E-06				7.794E-05	1.023E-04
6	2479	613B	2479 613B	HTF Seal Out B	--	4.9697E-04	2.5545E-04	--	1.8026E-04	1.0230E-03	3.8972E-03	391.1	0.000	2.485E-06	Y	2.555E-06	2.485E-06	5.109E-06		3.605E-06				7.794E-05	1.023E-04
6	2479	614	2479 614	Surface Treatment Hood	--	--	--	--	5.1189E-03	--	--			--						1.024E-04					
6	2479	615	2479 615	Sizing Dryer	--	--	--	--	--	--	--			--											
6	2479	616A	2479 616A	Sizing Enclosure	--	--	--	--	--	--	--			--											
6	2479	616B	2479 616B	Sizing Enclosure	--	--	--	--	--	--	--			--											
6	2479	617	2479 617	Sizing Mix Tank	--	--	--	--	--	--	--			--											
6	2479	618	2479 618	Sizing Tank Vent	--	--	--	--	--	--	--			--											
6	2479	619	2479 619	NH3HCO3 Mix Tank	--	--	--	--	--	--	--			--											
6	2479	620	2479 620	Spill Vent	--	--	--	--	--	--	--			--											
7	2479	701A	2479 701A	Ox Ov #1 In A	9.2124E-05	3.0036E-03	2.1203E-03	--	6.0006E-03	3.8734E-03	1.8686E-02	1599.8	0.000	1.502E-05	Y	2.120E-05	1.502E-05	4.241E-05		1.200E-04	Y	4.606E-05	1.842E-05	3.737E-04	3.873E-04
7	2479	701B	2479 701B	Ox Ov #1 In B	9.2124E-05	3.0036E-03	2.1203E-03	--	6.0006E-03	3.8734E-03	1.8686E-02	1599.8	0.000	1.502E-05	Y	2.120E-05	1.502E-05	4.241E-05		1.200E-04	Y	4.606E-05	1.842E-05	3.737E-04	3.873E-04
7	2479	701C	2479 701C	Ox Ov #1 Gas	4.8662E-02	3.6983E-03	2.6108E-03	2.9197E-04	--	4.0876E-02	2.6764E-03	287.4	0.002	1.849E-05	Y	2.611E-05	1.849E-05	5.222E-05	5.839E-06		Y	2.433E-02	9.732E-03	5.353E-05	4.088E-03
7	2479	702A	2479 702A	Ox Ov #1 Out A	9.2124E-05	3.0036E-03	2.1203E-03	--	1.5410E-03	3.8734E-03	1.0986E-02	1599.8	0.000	1.502E-05	Y	2.120E-05	1.502E-05	4.241E-05		3.082E-05	Y	4.606E-05	1.842E-05	2.197E-04	3.873E-04
7	2479	702B	2479 702B	Ox Ov #1 Out B	9.2124E-05	3.0036E-03	2.1203E-03	--	1.5410E-03	3.8734E-03	1.0986E-02	1599.8	0.000	1.502E-05	Y	2.120E-05	1.502E-05	4.241E-05		3.082E-05	Y	4.606E-05	1.842E-05	2.197E-04	3.873E-04
7	2479	702C	2479 702C	Ox Ov #1 Gas	4.8662E-02	3.6983E-03	2.6108E-03	2.9197E-04	--	4.0876E-02	2.6764E-03	287.4	0.002	1.849E-05	Y	2.611E-05	1.849E-05	5.222E-05	5.839E-06		Y	2.433E-02	9.732E-03	5.353E-05	4.088E-03
7	2479	703A	2479 703A	Ox Ov #2 In A	--	1.8293E-03	1.2914E-03	--	1.4792E-03	6.3649E-03	1.0115E-02	1173.2	0.000	9.146E-06	Y	1.291E-05	9.146E-06	2.583E-05		2.958E-05				2.023E-04	6.365E-04
7	2479	703B	2479 703B	Ox Ov #2 In B	--	1.8293E-03	1.2914E-03	--	1.4803E-03	6.3649E-03	1.0115E-02	1173.2	0.000	9.146E-06	Y	1.291E-05	9.146E-06	2.583E-05		2.961E-05				2.023E-04	6.365E-04
7	2479	703C	2479 703C	Ox Ov #2 Gas	4.8662E-02	3.6983E-03	2.6108E-03	2.9197E-04	--	4.0876E-02	2.6764E-03	287.4	0.002	1.849E-05	Y	2.611E-05	1.849E-05	5.222E-05	5.839E-06		Y	2.433E-02	9.732E-03	5.353E-05	4.088E-03
7	2479	704A	2479 704A	Ox Ov #2 Out A	--	1.8293E-03	1.2914E-03	--	1.4174E-03	6.3649E-03	1.0720E-02	1173.2	0.000	9.146E-06	Y	1.291E-05	9.146E-06	2.583E-05		2.835E-05				2.144E-04	6.365E-04
7	2479	704B	2479 704B	Ox Ov #2 Out B	--	1.8293E-03	1.2914E-03	--	1.4174E-03	6.3649E-03	1.0720E-02	1173.2	0.000	9.146E-06	Y	1.291E-05	9.146E-06	2.583E-05		2.835E-05				2.144E-04	6.365E-04
7	2479	704C	2479 704C	Ox Ov #2 Gas	4.8662E-02	3.6983E-03	2.6108E-03	2.9197E-04	--	4.0876E-02	2.6764E-03	287.4	0.002	1.849E-05	Y	2.611E-05	1.849E-05	5.222E-05	5.839E-06		Y	2.433E-02	9.732E-03	5.353E-05	4.088E-03
7	2479	705A	2479 705A	Ox Ov #3 In A	--	1.8293E-03	1.2914E-03	--	1.0301E-03	6.3649E-03	9.1475E-03	1139.4	0.000	9.146E-06	Y	1.291E-05	9.146E-06	2.583E-05		2.060E-05				1.829E-04	6.365E-04
7	2479	705B	2479 705B	Ox Ov #3 In B	--	1.8293E-03	1.2914E-03	--	1.0301E-03	6.3649E-03	9.1475E-03	1139.4	0.000	9.146E-06	Y	1.291E-05	9.146E-06	2.583E-05		2.060E-05				1.829E-04	6.365E-04
7	2479	705C	2479 705C	Ox Ov #3 Gas	4.8662E-02	3.6983E-03	2.6108E-03	2.9197E-04	--	4.0876E-02	2.6764E-03	287.4	0.002	1.849E-05	Y	2.611E-05	1.849E-05	5.222E-05	5.839E-06		Y	2.433E-02	9.732E-03	5.353E-05	4.088E-03
7	2479	706A	2479 706A	Ox Ov #3 Out A	--	1.9596E-03	1.3833E-03	--	1.0301E-03	5.4416E-03	9.1475E-03	1139.4	0.000	9.798E-06	Y	1.383E-05	9.798E-06	2.767E-05		2.060E-05				1.829E-04	5.442E-04
7	2479	706B	2479 706B	Ox Ov #3 Out B	--	1.9596E-03	1.3833E-03	--	1.0301E-03	5.4416E-03	9.1475E-03	1139.4	0.000	9.798E-06	Y	1.383E-05	9.798E-06	2.767E-05		2.060E-05				1.829E-04	5.442E-04
7	2479	706C	2479 706C	Ox Ov #3 Gas	4.8662E-02	3.6983E-03	2.6108E-03	2.9197E-04	--	4.0876E-02	2.6764E-03	287.4	0.002	1.849E-05	Y	2.611E-05	1.849E-05	5.222E-05	5.839E-06		Y	2.433E-02	9.732E-03	5.353E-05	4.088E-03
7	2479	707A	2479 707A	Ox Ov #4 In A	--	1.9596E-03	1.3833E-03	--	1.0301E-03	5.4416E-03	9.1475E-03	1115.3	0.000	9.798E-06	Y	1.383E-05	9.798E-06	2.767E-05		2.060E-05				1.829E-04	5.442E-04
7	2479	707B	2479 707B	Ox Ov #4 In B	--	1.9596E-03	1.3833E-03	--	1.0301E-03	5.4416E-03	9.1475E-03	1115.3	0.000	9.798E-06	Y	1.383E-05	9.798E-06	2.767E-05		2.060E-05				1.829E-04	5.442E-04
7	2479	707C	2479 707C	Ox Ov #4 Gas	4.8662E-02	3.6983E-03	2.6108E-03	2.9197E-04	--	4.0876E-02	2.6764E-03	287.4	0.002	1.849E-05	Y	2.611E-05	1.849E-05	5.222E-05	5.839E-06		Y	2.433E-02	9.732E-03	5.353E-05	4.088E-03
7	2479	708A	2479 708A	Ox Ov #4 Out A	--	1.9596E-03	1.3833E-03	--	6.4277E-04	5.4416E-03	7.5751E-03	1115.3	0.000	9.798E-06	Y	1.383E-05	9.798E-06	2.767E-05		1.286E-05				1.515E-04	5.442E-04

					Uncontrolled Emission Rate[a]									Controlled Emission Rate											
														Baghouse			Venturi Scrubber				Low-NO_x Burner	Low-NO_x Burner	Ultra Low-NO_x Burner	RTO	
Fiberline ID	Building	Source ID	Source Code	Source Description	Annual NOx Emission Rate Before Control (lb/hr)	PM_{10} Emission Rate Before Control (lb/hr)	$PM_{2.5}$ Emission Rate Before Control (lb/hr)	SOx Emission Rate Before Control (lb/hr)	NH3 Emission Rate Before Control (lb/hr)	CO Emission Rate Before Control (lb/hr)	VOC Emission Rate Before Control (lb/hr)	SCFM Ave (scfm)	PM_{10} grain loading[b] (gr/scf)	PM_{10} Controlled[c] (lb/hr)	Technically feasible[d]? (Y/N)	$PM_{2.5}$ controlled[e] (lb/hr)	PM_{10} Controlled[f] (lb/hr)	$PM_{2.5}$ Controlled[g] (lb/hr)	SO_2[h] Controlled (lb/hr)	NH_3[h] Controlled (lb/hr)	Technically feasible[i]? (Y/N)	NO_x[j] Controlled (lb/hr)	NO_x[k] Controlled (lb/hr)	VOC[l] Controlled (lb/hr)	CO[m] Controlled (lb/hr)
7	2479	708B	2479 708B	Ox Ov #4 Out B	--	1.9596E-03	1.3833E-03	--	6.4277E-04	5.4416E-03	7.5751E-03	1115.3	0.000	9.798E-06	Y	1.383E-05	9.798E-06	2.767E-05		1.286E-05				1.515E-04	5.442E-04
7	2479	708C	2479 708C	Ox Ov #4 Gas	4.8662E-02	3.6983E-03	2.6108E-03	2.9197E-04	--	4.0876E-02	2.6764E-03	287.4	0.002	1.849E-05	Y	2.611E-05	1.849E-05	5.222E-05	5.839E-06		Y	2.433E-02	9.732E-03	5.353E-05	4.088E-03
7	2479	709	2479 709	Tar Removal Furn	--	--	--	--	--	--	--			--											
7	2479	710	2479 710	LTF Seal In	--	1.0458E-03	5.3757E-04	--	2.1147E-04	3.6849E-04	2.0665E-03	1955.5	0.000	5.229E-06	Y	5.376E-06	5.229E-06	1.075E-05		4.229E-06				4.133E-05	3.685E-05
7	2479	711	2479 711	LTF Incinerator	2.4823E-01	7.2804E-02	2.9398E-02	3.9182E-02	2.1113E-05	2.3152E-03	1.3974E-02	1860.8	0.005	3.640E-04	Y	2.940E-04	3.640E-04	5.880E-04	7.836E-04	4.223E-07	Y	1.241E-01	4.965E-02	2.795E-04	2.315E-04
7	2479	712	2479 712	LTF Seal Out A	4.1947E-04	8.6063E-03	4.4237E-03	--	1.1572E-02	3.9777E-03	9.6188E-03	1222.2	0.001	4.303E-05	Y	4.424E-05	4.303E-05	8.847E-05		2.314E-04	Y	2.097E-04	8.389E-05	1.924E-04	3.978E-04
7	2479	713	2479 713	HTF Seal In	6.5067E-02	5.6853E-03	5.2932E-03	1.4606E-03	1.0698E-03	1.7179E-03	1.1140E-03	1885.6	0.000	2.843E-05	Y	5.293E-05	2.843E-05	1.059E-04	2.921E-05	2.140E-05	Y	3.253E-02	1.301E-02	2.228E-05	1.718E-04
7	2479	714	2479 714	HTF Seal Out.A	--	1.8818E-03	9.6725E-04	--	1.8634E-04	3.8734E-03	7.9331E-03	1222.2	0.000	9.409E-06	Y	9.672E-06	9.409E-06	1.934E-05		3.727E-06				1.587E-04	3.873E-04
7	2479	715	2479 715	Surface Treat	--	--	--	--	9.6911E-03	--	--			--						1.938E-04					
7	2479	716	2479 716	Not Used	--	--	--	--	--	--	--			--											
7	2479	717	2479 717	Sizing Dryer	--	--	--	--	--	--	--			--											
7	2479	718	2479 718	Sizing Enclosure	--	--	--	--	--	--	--			--											
7	2479	719	2479 719	MeCl Storage	--	--	--	--	--	--	--			--											
7	2479	720	2479 720	TCA Storage	--	--	--	--	--	--	--			--											
7	2479	721	2479 721	Solv Size Stor	--	--	--	--	--	--	--			--											
8	2480	801	2480 801	Ox Ov #1 In PAN	1.0238E-02	3.0950E-02	2.5359E-02	6.9304E-03	1.3309E-02	8.6630E-03	4.4024E-02	5370.8	0.001	1.548E-04	Y	2.536E-04	1.548E-04	5.072E-04	1.386E-04	2.662E-04	Y	5.119E-03	2.048E-03	8.805E-04	8.663E-04
8	2480	802	2480 802	Ox Ov #1 Out.PAN	1.8113E-02	4.5599E-02	3.7014E-02	6.3003E-03	5.2923E-02	1.7641E-02	7.2926E-02	5370.8	0.001	2.280E-04	Y	3.701E-04	2.280E-04	7.403E-04	1.260E-04	1.058E-03	Y	9.057E-03	3.623E-03	1.459E-03	1.764E-03
8	2480	803	2480 803	Ox Ov #2 In PAN	1.3388E-02	1.9846E-02	1.3703E-02	6.0641E-03	2.6776E-02	2.0949E-02	4.1661E-02	5370.8	0.000	9.923E-05	Y	1.370E-04	9.923E-05	2.741E-04	1.213E-04	5.355E-04	Y	6.694E-03	2.678E-03	8.332E-04	2.095E-03
8	2480	804	2480 804	Ox Ov #2 Out PAN	1.1026E-02	2.3547E-02	1.5908E-02	5.4340E-03	3.6069E-02	2.1500E-02	5.5207E-02	5370.8	0.001	1.177E-04	Y	1.591E-04	1.177E-04	3.182E-04	1.087E-04	7.214E-04	Y	5.513E-03	2.205E-03	1.104E-03	2.150E-03
8	2480	805	2480 805	Ox Ov. #3 In PAN	9.4505E-03	1.4963E-02	8.5842E-03	5.8278E-03	9.2142E-03	1.7483E-02	4.4417E-02	5370.8	0.000	7.482E-05	Y	8.584E-05	7.482E-05	1.717E-04	1.166E-04	1.843E-04	Y	4.725E-03	1.890E-03	8.883E-04	1.748E-03
8	2480	806	2480 806	Ox Ov #3 Out PAN	9.4505E-03	1.7090E-02	1.1734E-02	5.4340E-03	8.2692E-03	1.7326E-02	4.1582E-02	5370.8	0.000	8.545E-05	Y	1.173E-04	8.545E-05	2.347E-04	1.087E-04	1.654E-04	Y	4.725E-03	1.890E-03	8.316E-04	1.733E-03
8	2480	807	2480 807	Ox Ov #4 In PAN	9.4505E-03	1.2443E-02	8.9780E-03	5.4340E-03	3.7802E-03	1.9295E-02	3.6857E-02	5370.8	0.000	6.222E-05	Y	8.978E-05	6.222E-05	1.796E-04	1.087E-04	7.560E-05	Y	4.725E-03	1.890E-03	7.371E-04	1.929E-03
8	2480	808	2480 808	Ox Ov #4 Out A	9.4505E-03	1.4254E-02	9.5292E-03	5.6703E-03	5.5915E-03	1.4963E-02	2.9612E-02	5370.8	0.000	7.127E-05	Y	9.529E-05	7.127E-05	1.906E-04	1.134E-04	1.118E-04	Y	4.725E-03	1.890E-03	5.922E-04	1.496E-03
8	2480	809	2480 809	Not Designated	--	--	--	--	--	--	--			--											
8	2480	810	2480 810	LTF Seal In	--	--	--	--	--	--	--	1543.0													
8	2480	811	2480 811	LTF Incinerator	4.1740E-04	2.6855E-02	1.0750E-02	5.7491E-03	1.7326E-03	1.0238E-03	4.0165E-03	1478.3	0.002	1.343E-04	Y	1.075E-04	1.343E-04	2.150E-04	1.150E-04	3.465E-05	Y	2.087E-04	8.348E-05	8.033E-05	1.024E-04
8	2480	812	2480 812	LTF Seal Out	4.5677E-04	9.3717E-03	6.7729E-03	5.3553E-03	1.2601E-02	4.3315E-03	1.0474E-02	1543.0	0.001	4.686E-05	Y	6.773E-05	4.686E-05	1.355E-04	1.071E-04	2.520E-04	Y	2.284E-04	9.135E-05	2.095E-04	4.331E-04
8	2480	813	2480 813	HTF Seal In	7.0854E-02	6.1910E-03	4.8716E-03	1.5904E-03	1.1650E-03	1.8707E-03	1.2131E-03	1491.1	0.000	3.095E-05	Y	4.872E-05	3.095E-05	9.743E-05	3.181E-05	2.330E-05	Y	3.543E-02	1.417E-02	2.426E-05	1.871E-04
8	2480	814	2480 814	HTF Seal Out	1.5751E-03	1.1656E-02	9.0567E-03	5.0403E-03	1.5751E-04	1.1026E-03	7.2995E-03	1543.0	0.001	5.828E-05	Y	9.057E-05	5.828E-05	1.811E-04	1.008E-04	3.150E-06	Y	7.875E-04	3.150E-04	1.460E-04	1.103E-04
8	2480	815	2480 815	Surface Treat	--	--	--	--	1.0553E-02	--	--			--						2.111E-04					
8	2480	816	2480 816	Surface Treat Rinse	--	--	--	--	--	--	--			--											
8	2480	817	2480 817	Sizing Dryer 1	--	--	--	--	--	--	1.6252E-01	3158.8		--										3.250E-03	
8	2480	818	2480 818	Sizing Dryer 2	--	--	--	--	--	--	--			--											
8	2480	819	2480 819	Bicarb Mix Room	--	--	--	--	--	--	--			--											
8	2480	820	2480 820	Not Designated	--	--	--	--	--	--	--			--											
8	2480	821	2480 821	Not Designated	--	--	--	--	--	--	--			--											
10	2481	10-01	2481 10-01	Ox Ov. #1 In PAN	1.1513E-02	3.4804E-02	2.8516E-02	7.7932E-03	1.4966E-02	9.7415E-03	4.9504E-02	5370.8	0.001	1.740E-04	Y	2.852E-04	1.740E-04	5.703E-04	1.559E-04	2.993E-04	Y	5.756E-03	2.303E-03	9.901E-04	9.741E-04
10	2481	10-02	2481 10-02	Ox Ov #1 Out PAN	2.0369E-02	5.1276E-02	4.1623E-02	7.0847E-03	5.9512E-02	1.9837E-02	8.2005E-02	5370.8	0.001	2.564E-04	Y	4.162E-04	2.564E-04	8.325E-04	1.417E-04	1.190E-03	Y	1.018E-02	4.074E-03	1.640E-03	1.984E-03
10	2481	10-03	2481 10-03	Ox Ov #2 In PAN	1.5055E-02	2.2317E-02	1.5409E-02	6.8190E-03	3.0110E-02	2.3557E-02	4.6848E-02	5370.8	0.000	1.116E-04	Y	1.541E-04	1.116E-04	3.082E-04	1.364E-04	6.022E-04	Y	7.528E-03	3.011E-03	9.370E-04	2.356E-03
10	2481	10-04	2481 10-04	Ox Ov #2 Out PAN	1.2398E-02	2.6479E-02	1.7889E-02	6.1106E-03	4.0560E-02	2.4177E-02	6.2080E-02	5370.8	0.001	1.324E-04	Y	1.789E-04	1.324E-04	3.578E-04	1.222E-04	8.112E-04	Y	6.199E-03	2.480E-03	1.242E-03	2.418E-03
10	2481	10-05	2481 10-05	Ox Ov #3 In PAN	1.0627E-02	1.6826E-02	9.6529E-03	6.5534E-03	1.0361E-02	1.9660E-02	4.9947E-02	5370.8	0.000	8.413E-05	Y	9.653E-05	8.413E-05	1.931E-04	1.311E-04	2.072E-04	Y	5.314E-03	2.125E-03	9.989E-04	1.966E-03
10	2481	10-06	2481 10-06	Ox Ov #3 Out PAN	1.0627E-02	1.9217E-02	1.3195E-02	6.1106E-03	9.2987E-03	1.9483E-02	4.6759E-02	5370.8	0.000	9.609E-05	Y	1.320E-04	9.609E-05	2.639E-04	1.222E-04	1.860E-04	Y	5.314E-03	2.125E-03	9.352E-04	1.948E-03
10	2481	10-07	2481 10-07	Ox Ov #4 In PAN	1.0627E-02	1.3992E-02	1.0096E-02	6.1106E-03	4.2508E-03	2.1697E-02	4.1446E-02	5370.8	0.000	6.996E-05	Y	1.010E-04	6.996E-05	2.019E-04	1.222E-04	8.502E-05	Y	5.314E-03	2.125E-03	8.289E-04	2.170E-03
10	2481	10-08	2481 10-08	Ox Ov #4 Out A	1.0627E-02	1.6029E-02	1.0716E-02	6.3762E-03	6.2877E-03	1.6826E-02	3.3298E-02	5370.8	0.000	8.015E-05	Y	1.072E-04	8.015E-05	2.143E-04	1.275E-04	1.258E-04	Y	5.314E-03	2.125E-03	6.660E-04	1.683E-03
10	2481	10-09	2481 10-09	Not Designated	--	--	--	--	--	--	--			--											
10	2481	10-10	2481 10-10	LTF Seal In	--	--	--	--	--	--	--	1543.0													
10	2481	10-11	2481 10-11	LTF Incinerator	4.6936E-04	3.0199E-02	1.2089E-02	6.4648E-03	1.9483E-03	1.1513E-03	4.5165E-03	1478.3	0.002	1.510E-04	Y	1.209E-04	1.510E-04	2.418E-04	1.293E-04	3.897E-05	Y	2.347E-04	9.387E-05	9.033E-05	1.151E-04
10	2481	10-12	2481 10-12	LTF Seal Out	5.1364E-04	1.0539E-02	7.6161E-03	6.0220E-03	1.4169E-02	4.8707E-03	1.1778E-02	1543.0	0.001	5.269E-05	Y	7.616E-05	5.269E-05	1.523E-04	1.204E-04	2.834E-04	Y	2.568E-04	1.027E-04	2.356E-04	4.871E-04
10	2481	10-13	2481 10-13	HTF Seal In	7.9675E-02	6.9617E-03	5.4781E-03	1.7885E-03	1.3100E-03	2.1036E-03	1.3641E-03	1491.1	0.001	3.481E-05	Y	5.478E-05	3.481E-05	1.096E-04	3.577E-05	2.620E-05	Y	3.984E-02	1.594E-02	2.728E-05	2.104E-04
10	2481	10-14	2481 10-14	HTF Seal Out	1.7712E-03	1.3107E-02	1.0184E-02	5.6678E-03	1.7712E-04	1.2398E-03	8.2083E-03	1543.0	0.001	6.553E-05	Y	1.018E-04	6.553E-05	2.037E-04	1.134E-04	3.542E-06	Y	8.856E-04	3.542E-04	1.642E-04	1.240E-04
10	2481	10-15	2481 10-15	Surface Treat	--	--	--	--	1.1867E-02	--	--			--						2.373E-04					
10	2481	10-16	2481 10-16	Surface Treat Rinse	--	--	--	--	--	--	--			--											
10	2481	10-17	2481 10-17	Sizing Dryer 1	--	--	--	--	--	--	1.6252E-01	3158.8		--										3.250E-03	
10	2481	10-18	2481 10-18	Sizing Dryer 2	--	--	--	--	--	--	--			--											
10	2481	10-19	2481 10-19	Bicarb Mix Room	--	--	--	--	--	--	--			--											
10	2481	10-20	2481 10-20	Not Designated	--	--	--	--	--	--	--			--											
10	2481	10-21	2481 10-21	Not Designated	--	--	--	--	--	--	--			--											
11	2482	11-01	2482 11-01	Ox Ov #1 In PAN	1.4123E-02	4.2695E-02	3.4982E-02	9.5603E-03	1.8360E-02	1.1950E-02	1.9872E-01	3989.7	0.001	2.135E-04	Y	3.498E-04	2.135E-04	6.996E-04	1.912E-04	3.672E-04	Y	7.062E-03	2.825E-03	3.974E-03	1.195E-03
11	2482	11-02	2482 11-02	Ox Ov #1 Out PAN	2.4987E-02	6.2902E-02	5.1061E-02	8.6912E-03	7.3006E-02	2.4335E-02	2.3859E-01	3989.7	0.002	3.145E-04	Y	5.106E-04	3.145E-04	1.021E-03	1.738E-04	1.460E-03	Y	1.249E-02	4.997E-03	4.772E-03	2.434E-03
11	2482	11-03	2482 11-03	Ox Ov #2 In PAN	1.8469E-02	2.7377E-02	1.8903E-02	8.3652E-03	3.6937E-02	2.8898E-02	1.9546E-01	3989.7	0.001	1.369E-04	Y	1.890E-04	1.369E-04	3.781E-04	1.673E-04	7.387E-04	Y	9.234E-03	3.694E-03	3.909E-03	2.890E-03
11	2482	11-04	2482 11-04	Ox Ov #2 Out PAN	1.5210E-02	3.2483E-02	2.1945E-02	7.4961E-03	4.9757E-02	2.9659E-02	2.1415E-01	3989.7	0.001	1.624E-04	Y	2.195E-04	1.624E-04	4.389E-04	1.499E-04	9.951E-04	Y	7.605E-03	3.042E-03	4.283E-03	2.966E-03
11	2482	11-05	2482 11-05	Ox Ov #3 In PAN	1.3037E-02	2.0642E-02	1.1842E-02	8.0393E-03	1.2711E-02	2.4118E-02	1.9926E-01	3989.7	0.001	1.032E-04	Y	1.184E-04	1.032E-04	2.368E-04	1.608E-04	2.542E-04	Y	6.518E-03	2.607E-03	3.985E-03	2.412E-03
11	2482	11-06	2482 11-06	Ox Ov #3 Out PAN	1.3037E-02	2.3575E-02	1.6187E-02	7.4961E-03	1.1407E-02	2.3901E-02	1.9535E-01	3989.7	0.001	1.179E-04	Y	1.619E-04	1.179E-04	3.237E-04	1.499E-04	2.281E-04	Y	6.518E-03	2.607E-03	3.907E-03	2.390E-03
11	2482	11-07	2482 11-07	Ox Ov. #4 In PAN	1.3037E-02	1.7165E-02	1.2385E-02	7.4961E-03	5.2147E-03	2.6617E-02	1.8883E-01	3989.7	0.001	8.583E-05	Y	1.238E-04	8.583E-05	2.477E-04	1.499E-04	1.043E-04	Y	6.518E-03	2.607E-03	3.777E-03	2.662E-03
11	2482	11-08	2482 11-08	Ox Ov #4 Out A	1.3037E-02	1.9664E-02	1.3145E-02	7.8220E-03	7.7134E-03	2.0642E-02	1.7884E-01	3989.7	0.001	9.832E-05	Y	1.315E-04	9.832E-05	2.629E-04	1.564E-04	1.543E-04	Y	6.518E-03	2.607E-03	3.577E-03	2.064E-03
11	2482	11-09	2482 11-09	Not Designated	--	--	--	--	--	--	--			--											
11	2482	11-10	2482 11-10	LTF Seal In	--	--	--	--	--	--	--	2906.4													
11	2482	11-11	2482 11-11	LTF Incinerator	5.7579E-04	3.7046E-02	1.4830E-02	7.9307E-03	2.3901E-03	1.4123E-03	5.5406E-03	1478.3	0.003	1.852E-04	Y	1.483E-04	1.852E-04	2.966E-04	1.586E-04	4.780E-05	Y	2.879E-04	1.152E-04	1.108E-04	1.412E-04
11	2482	11-12	2482 11-12	LTF Seal Out	6.3011E-04	1.2928E-02	9.3430E-03	7.3875E-03	1.7382E-02	5.9752E-03	1.4449E-02	2906.4	0.001	6.464E-05	Y	9.343E-05	6.464E-05	1.869E-04	1.477E-04	3.476E-04	Y	3.151E-04	1.260E-04	2.890E-04	5.975E-04
11	2482	11-13	2482 11-13	HTF Seal In	9.7742E-02	8.5403E-03	6.7202E-03	2.1940E-03	1.6070E-03	2.5806E-03	1.6734E-03	2185.5	0.000	4.270E-05	Y	6.720E-05	4.270E-05	1.344E-04	4.388E-05	3.214E-05	Y	4.887E-02	1.955E-02	3.347E-05	2.581E-04
11	2482	11-14	2482 11-14	HTF Seal Out	2.1728E-03	1.6079E-02	1.2494E-02	6.9529E-03	2.1728E-04	1.5210E-03	1.0069E-02	2893.1	0.001	8.039E-05	Y	1.249E-04	8.039E-05	2.499E-04	1.391E-04	4.346E-06	Y	1.086E-03	4.346E-04	2.014E-04	1.521E-04
11	2482	11-15	2482 11-15	Surface Treat	--	--	--	--	1.4558E-02	--	--			--						2.912E-04					
11	2482	11-16	2482 11-16	Surface Treat Rinse	--	--	--	--	--	--	--			--											
11	2482	11-17	2482 11-17	Sizing Dryer 1	--	--	--	--	--	--	1.9973E-01	3390.8		--										3.995E-03	
11	2482	11-18	2482 11-18	Sizing Dryer 2	--	--	--	--	--	--	--			--											
11	2482	11-19	2482 11-19	Bicarb Mix Room	--	--	--	--	--	--	--			--											
11	2482	11-20	2482 11-20	Not Designated	--	--	--	--	--	--	--			--											
11	2482	11-21	2482 11-21	Not Designated	--	--	--	--	--	--	--			--											
12	2483	12-01	2483 12-01	Ox Ov #1 In PAN	1.4133E-02	4.2726E-02	3.5007E-02	9.5672E-03	1.8373E-02	1.1959E-02	1.9876E-01	3989.7	0.001	2.136E-04	Y	3.501E-04	2.136E-04	7.001E-04	1.913E-04	3.675E-04	Y	7.067E-03	2.827E-03	3.975E-03	1.196E-03
12	2483	12-02	2483 12-02	Ox Ov #1 Out PAN	2.5005E-02	6.2948E-02	5.1097E-02	8.6974E-03	7.3058E-02	2.4353E-02	2.3866E-01	3989.7	0.002	3.147E-04	Y	5.110E-04	3.147E-04	1.022E-03	1.739E-04	1.461E-03	Y	1.250E-02	5.001E-03	4.773E-03	2.435E-03

					Uncontrolled Emission Rate[a]									Controlled Emission Rate											
														Baghouse			Venturi Scrubber				Low-NOx Burner	Low-NOx Burner	Ultra Low-NOx Burner	RTO	
Fiberline ID	Building	Source ID	Source Code	Source Description	Annual NOx Emission Rate Before Control (lb/hr)	PM_{10} Emission Rate Before Control (lb/hr)	$PM_{2.5}$ Emission Rate Before Control (lb/hr)	SOx Emission Rate Before Control (lb/hr)	NH3 Emission Rate Before Control (lb/hr)	CO Emission Rate Before Control (lb/hr)	VOC Emission Rate Before Control (lb/hr)	SCFM Ave (scfm)	PM_{10} grain loading[b] (gr/scf)	PM_{10} Controlled[c] (lb/hr)	Technically feasible[d]? (Y/N)	$PM_{2.5}$ controlled[e] (lb/hr)	PM_{10} Controlled[f] (lb/hr)	$PM_{2.5}$ Controlled[g] (lb/hr)	SO_2[h] Controlled (lb/hr)	NH_3[h] Controlled (lb/hr)	Technically feasible[i]? (Y/N)	NO_x[j] Controlled (lb/hr)	NO_x[k] Controlled (lb/hr)	VOC[l] Controlled (lb/hr)	CO[m] Controlled (lb/hr)
12	2483	12-03	2483 12-03	Ox Ov #2 In PAN	1.8482E-02	2.7397E-02	1.8917E-02	8.3713E-03	3.6964E-02	2.8919E-02	1.9550E-01	3989.7	0.001	1.370E-04	Y	1.892E-04	1.370E-04	3.783E-04	1.674E-04	7.393E-04	Y	9.241E-03	3.696E-03	3.910E-03	2.892E-03
12	2483	12-04	2483 12-04	Ox Ov #2 Out.PAN	1.5221E-02	3.2507E-02	2.1961E-02	7.5015E-03	4.9793E-02	2.9680E-02	2.1420E-01	3989.7	0.001	1.625E-04	Y	2.196E-04	1.625E-04	4.392E-04	1.500E-04	9.959E-04	Y	7.610E-03	3.044E-03	4.284E-03	2.968E-03
12	2483	12-05	2483 12-05	Ox Ov #3 In PAN	1.3046E-02	2.0656E-02	1.1850E-02	8.0451E-03	1.2720E-02	2.4135E-02	1.9931E-01	3989.7	0.001	1.033E-04	Y	1.185E-04	1.033E-04	2.370E-04	1.609E-04	2.544E-04	Y	6.523E-03	2.609E-03	3.986E-03	2.414E-03
12	2483	12-06	2483 12-06	Ox Ov #3 Out PAN	1.3046E-02	2.3592E-02	1.6199E-02	7.5015E-03	1.1415E-02	2.3918E-02	1.9539E-01	3989.7	0.001	1.180E-04	Y	1.620E-04	1.180E-04	3.240E-04	1.500E-04	2.283E-04	Y	6.523E-03	2.609E-03	3.908E-03	2.392E-03
12	2483	12-07	2483 12-07	Ox Ov #4 In PAN	1.3046E-02	1.7177E-02	1.2394E-02	7.5015E-03	5.2185E-03	2.6636E-02	1.8887E-01	3989.7	0.001	8.589E-05	Y	1.239E-04	8.589E-05	2.479E-04	1.500E-04	1.044E-04	Y	6.523E-03	2.609E-03	3.777E-03	2.664E-03
12	2483	12-08	2483 12-08	Ox Ov #4 Out A	1.3046E-02	1.9678E-02	1.3155E-02	7.8277E-03	7.7190E-03	2.0656E-02	1.7887E-01	3989.7	0.001	9.839E-05	Y	1.315E-04	9.839E-05	2.631E-04	1.566E-04	1.544E-04	Y	6.523E-03	2.609E-03	3.577E-03	2.066E-03
112	2483	12-09	2483 12-09	Not Designated	--	--	--	--	--	--	--			--											
12	2483	12-10	2483 12-10	LTF Seal In	--	--	--	--	--	--	--	2906.4													
12	2483	12-11	2483 12-11	LTF Incinerator	5.7621E-04	3.7073E-02	1.4841E-02	7.9364E-03	2.3918E-03	1.4133E-03	5.5446E-03	1478.3	0.003	1.854E-04	Y	1.484E-04	1.854E-04	2.968E-04	1.587E-04	4.784E-05	Y	2.881E-04	1.152E-04	1.109E-04	1.413E-04
12	2483	12-12	2483 12-12	LTF Seal Out	6.3056E-04	1.2937E-02	9.3497E-03	7.3928E-03	1.7395E-02	5.9795E-03	1.4459E-02	2906.4	0.001	6.469E-05	Y	9.350E-05	6.469E-05	1.870E-04	1.479E-04	3.479E-04	Y	3.153E-04	1.261E-04	2.892E-04	5.979E-04
12	2483	12-13	2483 12-13	HTF Seal In	9.7812E-02	8.5465E-03	6.7251E-03	2.1956E-03	1.6082E-03	2.5824E-03	1.6746E-03	2185.5	0.000	4.273E-05	Y	6.725E-05	4.273E-05	1.345E-04	4.391E-05	3.216E-05	Y	4.891E-02	1.956E-02	3.349E-05	2.582E-04
12	2483	12-14	2483 12-14	HTF Seal Out	2.1744E-03	1.6090E-02	1.2503E-02	6.9580E-03	2.1744E-04	1.5221E-03	1.0077E-02	2893.1	0.001	8.045E-05	Y	1.250E-04	8.045E-05	2.501E-04	1.392E-04	4.349E-06	Y	1.087E-03	4.349E-04	2.015E-04	1.522E-04
12	2483	12-15	2483 12-15	Surface Treat	--	--	--	--	1.4568E-02	--	--			--						2.914E-04					
12	2483	12-16	2483 12-16	Surface Treat Rinse	--	--	--	--	--	--	--			--											
12	2483	12-17	2483 12-17	Sizing Dryer 1	--	--	--	--	--	--	1.9973E-01	3390.8		--										3.995E-03	
12	2483	12-18	2483 12-18	Sizing Dryer 2	--	--	--	--	--	--	--			--											
12	2483	12-19	2483 12-19	Bicarb Mix Room	--	--	--	--	--	--	--			--											
12	2483	12-20	2483 12-20	Not Designated	--	--	--	--	--	--	--			--											
12	2483	12-21	2483 12-21	Not Designated	--	--	--	--	--	--	--			--											
13	2484	13-01	2484 13-01	Ox Ov #1 Zn 1 & 2	1.0347E-01	1.4103E-02	1.4103E-02	1.2757E-02	8.6463E-04	6.9950E-03	4.7696E-03	2455.2	0.001	7.052E-05	Y	1.410E-04	7.052E-05	2.821E-04	2.551E-04		N	1.035E-01	1.035E-01		6.995E-04
13	2484	13-02	2484 13-02	Ox Ov #2 Zn 1 & 2	1.1268E-01	1.7860E-02	1.7860E-02	1.6300E-02	1.2402E-03	9.8511E-03	9.2132E-03	3989.7	0.001	8.930E-05	Y	1.786E-04	8.930E-05	3.572E-04	3.260E-04		N	1.127E-01	1.127E-01		9.851E-04
13	2484	13-03	2484 13-03	Ox Ov #3 Zn 1 & 2	1.0064E-01	5.8185E-03	5.8185E-03	5.3862E-03	2.6577E-04	3.4018E-03	1.0737E-03	3989.7	0.000	2.909E-05	Y	5.819E-05	2.909E-05	1.164E-04	1.077E-04		N	1.006E-01	1.006E-01		3.402E-04
13	2484	13-04	2484 13-04	Ox Ov #4 Zn 1 & 2	9.7093E-02	5.4642E-03	5.4642E-03	4.3940E-03	2.8632E-04	3.3735E+00	1.4139E-03	3989.7	0.000	2.732E-05	Y	5.464E-05	2.732E-05	1.093E-04	8.788E-05		N	9.709E-02	9.709E-02		3.373E-01
13	2484	13-05	2484 13-05	RTO & Baghouse	3.8048E+00	1.4258E+00	1.3366E+00	1.3437E-01	3.2108E-01	1.9378E-01	7.1903E-01	47897.0	0.003	7.129E-03	Y	1.337E-02	7.129E-03	2.673E-02	2.687E-03	6.422E-03	N	3.805E+00	3.805E+00	1.438E-02	1.938E-02
13	2484	13-06	2484 13-06	Surface Treatment	--	--	--	--	1.6063E-01	--	--			--						3.213E-03					
13	2484	13-07	2484 13-07	Sizing Dryer #1	--	--	--	--	--	--	1.9973E-01			--										3.995E-03	
13	2484	13-08	2484 13-08	Sizing Dryer #2	--	--	--	--	--	--	--			--											
13	2484	13-09	2484 13-09	Sizing Dryer #3	--	--	--	--	--	--	--			--											
13	2484	13-10	2484 13-10	Bicarb Mix Room	--	--	--	--	--	--	--			--											
14	2485	14-01	2485 14-01	Ox Ov #1 Zn 1 & 2	1.0347E-01	1.4103E-02	1.4103E-02	1.2757E-02	8.6463E-04	6.9950E-03	4.7696E-03	2455.2	0.001	7.052E-05	Y	1.410E-04	7.052E-05	2.821E-04	2.551E-04		N	1.035E-01	1.035E-01		6.995E-04
14	2485	14-02	2485 14-02	Ox Ov #2 Zn 1 & 2	1.1268E-01	1.7860E-02	1.7860E-02	1.6300E-02	1.2402E-03	9.8511E-03	9.2132E-03	3989.7	0.001	8.930E-05	Y	1.786E-04	8.930E-05	3.572E-04	3.260E-04		N	1.127E-01	1.127E-01		9.851E-04
14	2485	14-03	2485 14-03	Ox Ov #3 Zn 1 & 2	1.0064E-01	5.8185E-03	5.8185E-03	5.3862E-03	2.6577E-04	3.4018E-03	1.0737E-03	3989.7	0.000	2.909E-05	Y	5.819E-05	2.909E-05	1.164E-04	1.077E-04		N	1.006E-01	1.006E-01		3.402E-04
14	2485	14-04	2485 14-04	Ox Ov #4 Zn 1 & 2	9.7093E-02	5.4642E-03	5.4642E-03	4.3940E-03	2.8632E-04	3.3735E+00	1.4139E-03	3989.7	0.000	2.732E-05	Y	5.464E-05	2.732E-05	1.093E-04	8.788E-05		N	9.709E-02	9.709E-02		3.373E-01
14	2485	14-05	2485 14-05	RTO & Baghouse	3.8048E+00	1.4258E+00	1.3366E+00	1.3437E-01	3.2108E-01	1.9378E-01	7.1903E-01	47897.0	0.003	7.129E-03	Y	1.337E-02	7.129E-03	2.673E-02	2.687E-03	6.422E-03	N	3.805E+00	3.805E+00	1.438E-02	1.938E-02
14	2485	14-06	2485 14-06	Surface Treatment	--	--	--	--	1.6063E-01	--	--			--						3.213E-03					
14	2485	14-07	2485 14-07	Sizing Dryer #1	--	--	--	--	--	--	1.9973E-01			--										3.995E-03	
14	2485	14-08	2485 14-08	Sizing Dryer #2	--	--	--	--	--	--	--			--											
14	2485	14-09	2485 14-09	Sizing Dryer #3	--	--	--	--	--	--	--			--											
14	2485	14-10	2485 14-10	Bicarb Mix Room	--	--	--	--	--	--	--			--											
15	2489	15-01	2489 15-01	Ox Ov #1 Zn 1 & 2	1.1226E-01	1.5301E-02	1.5301E-02	1.3840E-02	9.3806E-04	7.5890E-03	5.1747E-03	4591.7	0.000	7.651E-05	Y	1.530E-04	7.651E-05	3.060E-04	2.768E-04		N	1.123E-01	1.123E-01		7.589E-04
15	2489	15-02	2489 15-02	Ox Ov #2 Zn 1 & 2	1.2226E-01	1.9376E-02	1.9376E-02	1.7685E-02	1.3456E-03	1.0688E-02	9.9957E-03	7461.6	0.000	9.688E-05	Y	1.938E-04	9.688E-05	3.875E-04	3.537E-04		N	1.223E-01	1.223E-01		1.069E-03
15	2489	15-03	2489 15-03	Ox Ov #3 Zn 1 & 2	1.0918E-01	6.3127E-03	6.3127E-03	5.8436E-03	2.8834E-04	3.6907E-03	1.1649E-03	7461.6	0.000	3.156E-05	Y	6.313E-05	3.156E-05	1.263E-04	1.169E-04		N	1.092E-01	1.092E-01		3.691E-04
15	2489	15-04	2489 15-04	Ox Ov #4 Zn 1 & 2	1.0534E-01	5.9282E-03	5.9282E-03	4.7672E-03	3.1064E-04	3.6600E+00	1.5340E-03	7461.6	0.000	2.964E-05	Y	5.928E-05	2.964E-05	1.186E-04	9.534E-05		N	1.053E-01	1.053E-01		3.660E-01
15	2489	15-05	2489 15-05	TO/Baghouse/SCR/Heat Recove	4.1280E+00	1.5468E+00	1.4502E+00	1.4578E-01	3.4835E-01	2.1023E-01	7.8009E-01	97391.3	0.002	7.734E-03	Y	1.450E-02	7.734E-03	2.900E-02	2.916E-03	6.967E-03	N	4.128E+00	4.128E+00	1.560E-02	2.102E-02
15	2489	15-06	2489 15-06	Surface Treatment	--	--	--	--	1.7427E-01	--	--			--						3.485E-03					
15	2489	15-07	2489 15-07	Sizing Dryers #1,2,3	--	--	--	--	--	--	2.1669E-01			--										4.334E-03	
15	2489	15-10	2489 15-10	Bicarb Mix Room	--	--	--	--	--	--	--														
16	2490	16-01	2490 16-01	Ox Ov #1 Zn 1 & 2	1.1226E-01	1.5301E-02	1.5301E-02	1.3840E-02	9.3806E-04	7.5890E-03	5.1747E-03	4591.7	0.000	7.651E-05	Y	1.530E-04	7.651E-05	3.060E-04	2.768E-04		N	1.123E-01	1.123E-01		7.589E-04
16	2490	16-02	2490 16-02	Ox Ov #2 Zn 1 & 2	1.2226E-01	1.9376E-02	1.9376E-02	1.7685E-02	1.3456E-03	1.0688E-02	9.9957E-03	7461.6	0.000	9.688E-05	Y	1.938E-04	9.688E-05	3.875E-04	3.537E-04		N	1.223E-01	1.223E-01		1.069E-03
16	2490	16-03	2490 16-03	Ox Ov #3 Zn 1 & 2	1.0918E-01	6.3127E-03	6.3127E-03	5.8436E-03	2.8834E-04	3.6907E-03	1.1649E-03	7461.6	0.000	3.156E-05	Y	6.313E-05	3.156E-05	1.263E-04	1.169E-04		N	1.092E-01	1.092E-01		3.691E-04
16	2490	16-04	2490 16-04	Ox Ov #4 Zn 1 & 2	1.0534E-01	5.9282E-03	5.9282E-03	4.7672E-03	3.1064E-04	3.6600E+00	1.5340E-03	7461.6	0.000	2.964E-05	Y	5.928E-05	2.964E-05	1.186E-04	9.534E-05		N	1.053E-01	1.053E-01		3.660E-01
16	2490	16-05	2490 16-05	TO/Baghouse/SCR/Heat Recove	4.1280E+00	1.5468E+00	1.4502E+00	1.4578E-01	3.4835E-01	2.1023E-01	7.8009E-01	97391.3	0.002	7.734E-03	Y	1.450E-02	7.734E-03	2.900E-02	2.916E-03	6.967E-03	N	4.128E+00	4.128E+00	1.560E-02	2.102E-02
16	2490	16-06	2490 16-06	Surface Treatment	--	--	--	--	1.7427E-01	--	--			--						3.485E-03					
16	2490	16-07	2490 16-07	Sizing Dryers #1,2,3	--	--	--	--	--	--	2.1669E-01			--										4.334E-03	
16	2490	16-10	2490 16-10	Bicarb Mix Room	--	--	--	--	--	--	--														
PILOT	8162	PL01	8162 PL01	Pilot Plant Oxidation Ovens	5.3418E-05	1.6155E-04	8.3037E-05	--	1.7258E-04	1.3657E-04	1.4058E-04	1787.5	0.000	8.077E-07	Y	8.304E-07	8.077E-07	1.661E-06		3.452E-06	Y	2.671E-05	1.068E-05	2.812E-06	1.366E-05
PILOT	8162	PL02a	8162 PL02a	Pilot Plant LT Furnace #1 In	--	5.7904E-05	2.9763E-05	--	1.8577E-07	--	2.8800E-05	623.6	0.000	2.895E-07	Y	2.976E-07	2.895E-07	5.953E-07		3.715E-09				5.760E-07	
PILOT	8162	PL02b	8162 PL02b	Pilot Plant LT Furnace #1 Out	--	6.1934E-04	3.1835E-04	--	1.7908E-04	5.7019E-04	2.3702E-03	623.6	0.000	3.097E-06	Y	3.183E-06	3.097E-06	6.367E-06		3.582E-06				4.740E-05	5.702E-05
PILOT	8162	PL03a	8162 PL03a	Pilot Plant LT Furnace #2 In	--	1.1340E-03	5.8286E-04	--	1.3301E-04	--	4.8735E-03	623.6	0.000	5.670E-06	Y	5.829E-06	5.670E-06	1.166E-05		2.660E-06				9.747E-05	
PILOT	8162	PL03b	8162 PL03b	Pilot Plant LT Furnace #2 Out	--	5.7904E-05	2.9763E-05	--	1.8577E-07	--	2.8800E-05	623.6	0.000	2.895E-07	Y	2.976E-07	2.895E-07	5.953E-07		3.715E-09				5.760E-07	
PILOT	8162	PL04a	8162 PL04a	Pilot Plant HT Furnace In	--	5.7904E-05	2.9763E-05	--	1.8577E-07	--	2.6460E-04	623.6	0.000	2.895E-07	Y	2.976E-07	2.895E-07	5.953E-07		3.715E-09				5.292E-06	
PILOT	8162	PL04b	8162 PL04b	Pilot Plant HT Furnace Out	--	5.7904E-05	2.9763E-05	--	6.2179E-03	--	2.6460E-04	623.6	0.000	2.895E-07	Y	2.976E-07	2.895E-07	5.953E-07		1.244E-04				5.292E-06	
PILOT	8162	PL05a	8162 PL05a	Pilot Plant HM Furnace In	--	5.7904E-05	2.9763E-05	--	1.8577E-07	--	2.6460E-04	623.6	0.000	2.895E-07	Y	2.976E-07	2.895E-07	5.953E-07		3.715E-09				5.292E-06	
PILOT	8162	Pl05b	8162 Pl05b	Pilot Plant HM Furnace Out	--	5.7904E-05	2.9763E-05	--	1.8577E-07	--	2.6460E-04	623.6	0.000	2.895E-07	Y	2.976E-07	2.895E-07	5.953E-07		3.715E-09				5.292E-06	
PILOT	8162	PL06	8162 PL06	Pilot Plant Incinerator	8.01E-03	1.96E-05	1.96E-05	1.55E-06	--	1.03E-04	1.42E-05	253.7	0.000	9.797E-08	Y	1.959E-07	9.797E-08	3.919E-07	3.094E-08		Y	4.007E-03	1.603E-03	2.836E-07	1.031E-05
Matrix	2478	2478_1	2478_1	Tower 1 RTO	0.30952	0.0470	0.0470	0.0037	--	0.2476	0.0271	2589.4	0.002	2.352E-04	Y	4.705E-04	2.352E-04	9.410E-04	7.429E-05		N	3.095E-01	3.095E-01	2.714E-02	2.476E-01
Matrix	2478	2478_16	2478_16	Tower 4 RTO	0.42857	0.0651	0.0651	0.0051	--	0.3429	0.0543	2275.1	0.003	3.257E-04	Y	6.514E-04	3.257E-04	1.303E-03	1.029E-04		N	4.286E-01	4.286E-01	5.429E-02	3.429E-01
Matrix	2478	2478_17	2478_17	Tower 3 RTO	0.45238	0.0688	0.0688	0.0054	--	0.3619	0.0543	2275.1	0.004	3.438E-04	Y	6.876E-04	3.438E-04	1.375E-03	1.086E-04		N	4.524E-01	4.524E-01	5.429E-02	3.619E-01
EmGen	2344	G-31	G-31	Emergency Generator	3.627	0.2574	2.5740E-01	0.23985	--	0.78156	0.2941497														
EmGen	2344	G-35	G-35	Emergency Generator	3.627	0.2574	2.5740E-01	0.23985	--	0.78156	0.2941497														
EmGen	2436	G-54	G-54	Emergency Generator	9.455	0.671	6.7100E-01	0.62525	--	2.0374	0.7668005														
EmGen	2436	G-58	G-58	Emergency Generator	9.455	0.671	6.7100E-01	0.62525	--	2.0374	0.7668005														
EmGen	2478	G-76	G-76	Emergency Generator	13.95	0.99	9.9000E-01	0.9225	--	3.006	1.131345														
EmGen	2479	G-81	G-81	Emergency Generator	15.035	1.067	1.0670E+00	0.99425	--	3.2398	1.2193385														
EmGen	8132	G-83	G-83	Emergency Generator	6.944	0.4928	4.9280E-01	0.4592	--	1.49632	0.5631584														
EmGen	2479	G-84	G-84	Emergency Generator	14.415	1.023	1.0230E+00	0.95325	--	3.1062	1.1690565														
EmGen	2478	G-85	G-85	Emergency Generator	16.585	1.177	1.1770E+00	1.09675	--	3.5738	1.3450435														
EmGen	2480	G-86	G-86	Emergency Generator	23.312	1.6544	1.6544E+00	1.5416	--	5.02336	1.8906032														
EmGen	2480	G-87	G-87	Emergency Generator	23.312	1.6544	1.6544E+00	1.5416	--	5.02336	1.8906032														
EmGen	2481	G-88	G-88	Emergency Generator	23.467	1.6654	1.6654E+00	1.55185	--	5.05676	1.9031737														

					Uncontrolled Emission Rate[a]									Controlled Emission Rate											
														Baghouse			Venturi Scrubber				Low-NO_X Burner	Low-NO_X Burner	Ultra Low-NO_X Burner	RTO	
Fiberline ID	Building	Source ID	Source Code	Source Description	Annual NOx Emission Rate Before Control (lb/hr)	PM_{10} Emission Rate Before Control (lb/hr)	$PM_{2.5}$ Emission Rate Before Control (lb/hr)	SOx Emission Rate Before Control (lb/hr)	NH3 Emission Rate Before Control (lb/hr)	CO Emission Rate Before Control (lb/hr)	VOC Emission Rate Before Control (lb/hr)	SCFM Ave (scfm)	PM_{10} grain loading[b] (gr/scf)	PM_{10} Controlled[c] (lb/hr)	Technically feasible[d]? (Y/N)	$PM_{2.5}$ controlled[e] (lb/hr)	PM_{10} Controlled[f] (lb/hr)	$PM_{2.5}$ Controlled[g] (lb/hr)	SO_2[h] Controlled (lb/hr)	NH_3[h] Controlled (lb/hr)	Technically feasible[i]? (Y/N)	NO_X[j] Controlled (lb/hr)	NO_X[k] Controlled (lb/hr)	VOC[l] Controlled (lb/hr)	CO[m] Controlled (lb/hr)
EmGen	2481	G-89	G-89	Emergency Generator	23.467	1.6654	1.6654E+00	1.55185	--	5.05676	1.9031737														
EmGen	2482	G-2482-1 West	G-2482-1 West	Emergency Generator	23.312	1.6544	1.6544E+00	1.5416	--	5.02336	1.8906032														
EmGen	2482	G-2482-2 East	G-2482-2 East	Emergency Generator	23.312	1.6544	1.6544E+00	1.5416	--	5.02336	1.8906032														
EmGen	2483	G-2483-1 West	G-2483-1 West	Emergency Generator	23.312	1.6544	1.6544E+00	1.5416	--	5.02336	1.8906032														
EmGen	2483	G-2483-2 East	G-2483-2 East	Emergency Generator	23.312	1.6544	1.6544E+00	1.5416	--	5.02336	1.8906032														
EmGen	2484	G-2484-1 West	G-2484-1 West	Emergency Generator	5.4902	0.0840	0.0840	1.5621	--	1.7807	0.7758														
EmGen	2484	G-2484-2 East	G-2484-2 East	Emergency Generator	5.4902	0.0840	0.0840	1.5621	--	1.7807	0.7758														
EmGen	2485	G-2485-1 West	G-2485-1 West	Emergency Generator	5.4902	0.0840	0.0840	1.5621	--	1.7807	0.7758														
EmGen	2485	G-2485-2 East	G-2485-2 East	Emergency Generator	5.4902	0.0840	0.0840	1.5621	--	1.7807	0.7758														
EmGen	2486	G-2486-1 West	G-2486-1 West	Emergency Generator	5.4902	0.0840	0.0840	1.5621	--	1.7807	0.7758														
EmGen	2486	G-2486-2 East	G-2486-2 East	Emergency Generator	5.4902	0.0840	0.0840	1.5621	--	1.7807	0.7758														
EmGen	2487	G-2487-1 West	G-2487-1 West	Emergency Generator	5.4902	0.0840	0.0840	1.5621	--	1.7807	0.7758														
EmGen	2487	G-2487-2 East	G-2487-2 East	Emergency Generator	5.4902	0.0840	0.0840	1.5621	--	1.7807	0.7758														
EmGen	2478	G-90	G-90	Emergency Generator	6.107	0.4334	4.3340E-01	0.40385	--	1.31596	0.4952777														
EmGen	2478	G-91	G-91	Emergency Generator	1.519	0.1078	1.0780E-01	0.10045	--	0.32732	0.1231909														
EmGen	2486	G-92	G-92	Emergency Generator	19.189	1.3618	1.3618E+00	1.26895	--	4.13492	1.5562279														
EmGen	Plant	CA-239	CA-239	Air Compressor	7.75	0.55	5.5000E-01	0.5125	--	1.67	0.628525														
HVAC	2344	2344-7	2344-7	HVAC Heaters	0.1401	0.0113	0.0113	0.0009	--	0.0596	0.0082														
HVAC	2343	2343-1	2343-1	HVAC Heaters	0.0686	0.0055	0.0055	0.0004	--	0.0292	0.0040														
HVAC	2422	2422-1	2422-1	HVAC Heaters	0.0123	0.0010	0.0010	0.0001	--	0.0053	0.0007														
HVAC	2436	2436-1	2436-1	Boiler-Out of Service	0.0000	0.0000	0.0000	0.0000	--	0.0000	0.0000														
HVAC	2436	2436-10	2436-10	HVAC Heaters	0.1577	0.0128	0.0128	0.0010	--	0.0671	0.0092														
HVAC	2478	2478-16	2478-16	Boiler	0.0290	0.0023	0.0023	0.0002	--	0.0124	0.0017														
HVAC	2479	2479-1	2479-1	HVAC Heaters	0.1509	0.0122	0.0122	0.0010	--	0.0642	0.0088														
HVAC	2480	2480-1	2480-1	HVAC Heaters	0.1339	0.0108	0.0108	0.0009	--	0.0570	0.0078														
HVAC	2481	2481-1	2481-1	HVAC Heaters	0.1339	0.0108	0.0108	0.0009	--	0.0570	0.0078														
HVAC	2482	2482-18	2482-18	HVAC Heaters	0.2678	0.0217	0.0217	0.0017	--	0.1140	0.0157														
HVAC	2483	2483-18	2483-18	HVAC Heaters	0.2678	0.0217	0.0217	0.0017	--	0.1140	0.0157														
HVAC	2486	2486-1	2486-1	HVAC unit downflow	0.0073	0.0006	0.0006	0.0000	--	0.0031	0.0004														
HVAC	2486	2486-2	2486-2	HVAC unit side discharge	0.0056	0.0004	0.0004	0.0000	--	0.0024	0.0003														
HVAC	2486	2486-3	2486-3	Heaters	0.0038	0.0003	0.0003	0.0000	--	0.0016	0.0002														
HVAC	2486	2486-4	2486-4	Boilers	0.0158	0.0013	0.0013	0.0001	--	0.0067	0.0009														
HVAC	2488	2488-1	2488-1	HVAC Heaters	0.0039	0.0003	0.0003	0.0000	--	0.0017	0.0002														
HVAC	8156	8156-1	8156-1	HVAC Heaters	0.0171	0.0014	0.0014	0.0001	--	0.0073	0.0010														
HVAC	8132	8132-1	8132-1	HVAC Heaters	0.0153	0.0012	0.0012	0.0001	--	0.0065	0.0009														
HVAC	8162	8162-2	8162-2	HVAC Heaters	0.0287	0.0023	0.0023	0.0002	--	0.0122	0.0017														
HVAC	8167	8167-1	8167-1	HVAC Heaters	0.0086	0.0007	0.0007	0.0001	--	0.0036	0.0005														
HVAC	8185	8185-1	8185-1	Air Conditioners	0.0086	0.0007	0.0007	0.0001	--	0.0036	0.0005														
HVAC	8186	8186-1	8186-1	Air Conditioners	0.0029	0.0002	0.0002	0.0000	--	0.0012	0.0002														
HVAC	8249	8249-1	8249-1	Boiler	0.0115	0.0009	0.0009	0.0001	--	0.0049	0.0007														
HVAC	8249	8249-2	8249-2	Hot Water Heater	0.0023	0.0002	0.0002	0.0000	--	0.0010	0.0001														
HVAC	8259	8259-1	8259-1	HVAC Heaters	0.0686	0.0055	0.0055	0.0004	--	0.0292	0.0040														
HVAC	9364	9364-1	9364-1	HVAC Heaters	0.0126	0.0010	0.0010	0.0001	--	0.0053	0.0007														
HVAC	9364	9364-2	9364-2	Boiler	0.0168	0.0014	0.0014	0.0001	--	0.0071	0.0010														
HVAC	9370	9370-1	9370-1	HVAC Heaters	0.0025	0.0002	0.0002	0.0000	--	0.0011	0.0001														

Notes

[a] Emissions updated per 2014 FL15/16 NOI update and 2016 FL13 stack tests

[b] PM_{10} grain loading (gr/scf) = lb/hr x 7000 gr/lb x 1 hr/60 min x min/scf

[c] The baghouse PM_{10} control efficiency was estimated at 99.5%

[d] Although operation of a baghouse for units with grain loadings below 0.005 gr/scfm is not considered to be efficient, baghouse technology was evaluated for all units, regardless of calculated grain loading

[e] The baghouse $PM_{2.5}$ control efficiency was estimated at 99.0%

[f] The scrubber PM_{10} control efficiency was estimated at 98% based on a vendor cost estimate for control of $PM_{2.5}$ at 98%

[g] The scrubber $PM_{2.5}$ control efficiency was estimated at 98% based on a vendor cost estimate indicating 98% control of $PM_{2.5}$

[h] The scrubber's SO_2 and NH_3 control efficiency was estimated at 98% based on a vendor cost estimate indicating 98% control of SO_2 and NH_3 by a 2-stage system including venturi scrubber and packed bed

[i] A low-NO_X burner is considered technically feasible if the existing burner is natural gas powered, not electric

[j] Low NO_X burner emissions were calculated assuming 50% control efficiency AP-42 Table 1.4-1 Comparison of uncontrolled emissions from a small boiler (100 lb/10^6 scf) to controlled Low-NO_X burner emissions from a small boiler (50 lb/10^6 scf) [1-50/100 = 50%]

[k] Ultra-Low NO_X burner emissions were calculated assuming 68% control efficiency AP-42 Table 1.4-1 Comparison of uncontrolled emissions from a small boiler (100 lb/106 scf) to controlled Ultra-Low-NOX burner emissions from a small boiler (32 lb/106 scf) [1-32/100 = 68%]

[l] The RTO control efficiency of VOC is estimated at 98% based on OAQPS manual page 2-7, which describes a thermal oxidizer operating at 1600 degrees Fahrenheit

[m] According to vendor's information, RTO provides 90% CO destruction efficiency or 10 ppmv CO outlet concentration, whichever is less stringent (per McGill AirClean 04/29/05) This calculation is based on 90% control efficiency

Table B-1b: Emission Reduction Calculations

Fiberline ID	Building	Source ID	Source Code	Source Description	Emission Reduction: Baghouse			Emission Reduction: Venturi Scrubber				Emission Reduction: Low-NO_x Burner	Emission Reduction: Low-NO_x Burner	Emission Reduction: Ultra Low-NO_x Burner	Emission Reduction: RTO	
					PM_{10} Controlled[c] (lb/hr)	Technically feasible[d]? (Y/N)	$PM_{2.5}$ controlled[e] (lb/hr)	PM_{10} Controlled[f] (lb/hr)	$PM_{2.5}$ Controlled[g] (lb/hr)	SO_2[h] Controlled (lb/hr)	NH_3[h] Controlled (lb/hr)	Technically feasible[i]? (Y/N)	NO_x[j] Controlled (lb/hr)	NO_x[k] Controlled (lb/hr)	VOC[l] Controlled (lb/hr)	CO[m] Controlled (lb/hr)
2	2344	200	2344 200	Ox Oven Vest												
2	2344	202	2344 202	Ox Oven Hoods												
2	2344	203	2344 203	Incinerator						1 271E-02		Y	1 040E-02	1 663E-02	4 494E-04	
2	2344	204	2344 204	LTF Seal Ex Out												
2	2344	205	2344 205	LTF Seal Ex Out												
2	2344	206	2344 206	HTF Seal Ex In												
2	2344	207	2344 207	HTF Seal Ex In												
2	2344	208	2344 208	HTF Seal Ex Out												
2	2344	209	2344 209	HMF Seal Ex In											7.831E-02	
2	2344	210	2344 210	HMF Seal Ex Out											7 831E-02	
2	2344	211	2344 211	Surface Treat Ex												
2	2344	212	2344 212	Sizing Dryer Ex												
3	2344	301	2344 301	Ox Ov #1 In Vest	7 147E-03	Y	5 020E-03	7 147E-03	4.969E-03		5 681E-03	N	1 794E-03	1 794E-03	4 628E-03	4 129E-03
3	2344	302	2344 302	Ox Ov #1 OutVest	7 147E-03	Y	5 020E-03	7 147E-03	4 969E-03		5 681E-03	N	1 794E-03	1 794E-03	4 628E-03	4 129E-03
3	2344	303	2344 303	Ox Ov.#2 In Vest	7 147E-03	Y	5 020E-03	7 147E-03	4.969E-03		5 681E-03	N	1 794E-03	1 794E-03	4 628E-03	4 129E-03
3	2344	304	2344 304	Ox Ov #2 OutVest	7 147E-03	Y	5 020E-03	7 147E-03	4 969E-03		5 681E-03	N	1 794E-03	1 794E-03	4 628E-03	4 129E-03
3	2344	305	2344 305	Ox Ov #3 In Vest	7 147E-03	Y	5 020E-03	7 147E-03	4 969E-03		5 681E-03	N	1 794E-03	1 794E-03	4 628E-03	4 129E-03
3	2344	306	2344 306	Ox Ov #3 OutVest	7 147E-03	Y	5 020E-03	7 147E-03	4 969E-03		5 681E-03	N	1 794E-03	1 794E-03	4 628E-03	4 129E-03
3	2344	308	2344 308	Incinerator	7 197E-02	Y	3 681E-02	7 197E-02	3 644E-02	3 826E-02	2 056E-05	Y	1 233E-01	1 973E-01	1 792E-02	2 070E-03
3	2344	309	2344 309	HTF/LTF Seal Ex	8 508E-03	Y	4 351E-03	8 508E-03	4 307E-03		1 127E-02				9 365E-03	
3	2344	310	2344 310	HTF Seal Ex Out							9 669E-05	N	4 686E-03	4 686E-03	1 072E-02	9 471E-03
3	2344	311	2344 311	Surface Treat Ex												
3	2344	312	2344 312	Sizing Dryer Ex												
3	2344	313	2344 313	Ox Ov #1 In Hood	7 147E-03	Y	5 020E-03	7 147E-03	4 969E-03		5 681E-03	N	1 794E-03	1 794E-03	4 628E-03	4 129E-03
3	2344	314	2344 314	Ox.Ov #1 OutHood	7 147E-03	Y	5 020E-03	7 147E-03	4 969E-03		5 681E-03	N	1 794E-03	1 794E-03	4 628E-03	4 129E-03
3	2344	315	2344 315	Ox Ov #2 In Hood	7 147E-03	Y	5 020E-03	7 147E-03	4 969E-03		5 681E-03	N	1 794E-03	1 794E-03	4 628E-03	4 129E-03
3	2344	316	2344 316	Ox Ov #2 OutHood	7 147E-03	Y	5 020E-03	7 147E-03	4 969E-03		5 681E-03	N	1 794E-03	1 794E-03	4.628E-03	4 129E-03
3	2344	317	2344 317	Ox Ov #3 In Hood	7 147E-03	Y	5 020E-03	7 147E-03	4 969E-03		5 681E-03	N	1 794E-03	1 794E-03	4 628E-03	4 129E-03
3	2344	318	2344 318	Ox Ov #3 OutHood	7.147E-03	Y	5 020E-03	7 147E-03	4 969E-03		5 681E-03	N	1 794E-03	1 794E-03	4.628E-03	4 129E-03
3	2344	322	2344 322	Burner Box - Dragonmouth	5.620E-03	Y	2 874E-03	5 620E-03	2 845E-03	1 422E-03	1 042E-03	N	6 464E-02	6 464E-02	1.085E-03	1 536E-03
4	2436	400A	2436 400A	Ox Oven #1 In A	3 687E-03	Y	2 590E-03	3 687E-03	2 564E-03		5 454E-03	N	1 064E-03	1 064E-03	3 246E-03	2 115E-03
4	2436	400B	2436 400B	Ox Oven #1 In B	5 828E-03	Y	4 093E-03	5 828E-03	4 052E-03		3 813E-03	N	5 241E-04	5 241E-04	2 436E-03	1 615E-03
4	2436	401A	2436 401A	Ox Oven #1 OutA	8 172E-03	Y	5 740E-03	8 172E-03	5 682E-03		5 560E-03	N	1 140E-03	1 140E-03	4 681E-03	2 475E-03
4	2436	401B	2436 401B	Ox Oven #1 OutB	5 598E-03	Y	3 932E-03	5 598E-03	3 893E-03		5 089E-03	N	1 232E-03	1 232E-03	3.924E-03	2 529E-03
4	2436	402A	2436 402A	Ox Oven #2 In A	4 697E-03	Y	3 299E-03	4 697E-03	3 266E-03		3 734E-03	N	1 179E-03	1 179E-03	3 041E-03	2 714E-03
4	2436	402B	2436 402B	Ox Oven #2 In B	4 697E-03	Y	3 299E-03	4.697E-03	3 266E-03		3 734E-03	N	1 179E-03	1 179E-03	3 041E-03	2 714E-03
4	2436	403A	2436 403A	Ox Oven #2 OutA	4 697E-03	Y	3 299E-03	4 697E-03	3 266E-03		3 734E-03	N	1 179E-03	1 179E-03	3 041E-03	2 714E-03
4	2436	403B	2436 403B	Ox Oven #2 OutB	4 697E-03	Y	3 299E-03	4 697E-03	3 266E-03		3 734E-03	N	1 179E-03	1 179E-03	3.041E-03	2 714E-03
4	2436	404A	2436 404A	Ox Oven #3 In A	7 500E-03	Y	5 268E-03	7 500E-03	5 215E-03		4 617E-03	N	1 362E-03	1 362E-03	3 468E-03	4 639E-03
4	2436	404B	2436 404B	Ox Oven #3 In B	2 352E-03	Y	1 652E-03	2 352E-03	1 635E-03		3 055E-03	N	1 237E-03	1 237E-03	2 875E-03	3 263E-03
4	2436	405A	2436 405A	Ox Oven #3 OutA	4 697E-03	Y	3.299E-03	4 697E-03	3 266E-03		3 734E-03	N	1 179E-03	1 179E-03	3 041E-03	2 714E-03
4	2436	405B	2436 405B	Ox Oven #3 OutB	4 697E-03	Y	3 299E-03	4 697E-03	3 266E-03		3.734E-03	N	1 179E-03	1 179E-03	3 041E-03	2 714E-03
4	2436	406A	2436 406A	Ox Oven #4 In A	4 697E-03	Y	3 299E-03	4 697E-03	3.266E-03		3 734E-03	N	1 179E-03	1 179E-03	3.041E-03	2 714E-03
4	2436	406B	2436 406B	Ox Oven #4 In B	4 697E-03	Y	3 299E-03	4 697E-03	3 266E-03		3 734E-03	N	1 179E-03	1.179E-03	3 041E-03	2 714E-03
4	2436	407A	2436 407A	Ox Oven #4 OutA	2 908E-03	Y	2 043E-03	2 908E-03	2 022E-03		1 149E-03	N	1 794E-03	1 794E-03	2 346E-03	3 346E-03
4	2436	407B	2436 407B	Ox Oven #4 OutB	1 529E-03	Y	1 074E-03	1 529E-03	1 063E-03		1.133E-03	N	1 081E-03	1 081E-03	1 356E-03	1 726E-03
4	2436	409	2436 409	LTF Incinerator	4 730E-02	Y	2 419E-02	4.730E-02	2 395E-02	2 513E-02	1 351E-05	Y	8 104E-02	1 297E-01	1 118E-02	1 360E-03
4	2436	410	2436 410	LTF Seal Exhaust	1.602E-02	Y	8 194E-03	1 602E-02	8 111E-03		1 018E-03				2 360E-03	5 525E-04
4	2436	411	2436 411	LTF/HTF Seal Ex	5 591E-03	Y	2 859E-03	5 591E-03	2 831E-03		7 404E-03				6 155E-03	
4	2436	412	2436 412	HTF Seal Exhaust	1 221E-02	Y	6 246E-03	1 221E-02	6 183E-03		4 179E-03				1 087E-02	
4	2436	413	2436 413	HTF Seal Exhaust							6 354E-05	N	3 080E-03	3 080E-03	7 043E-03	6 225E-03
4	2436	414	2436 414	Surface Treat Ex							3 101E-03					
4	2436	415	2436 415	Surface Treat Ex							3 101E-03					
4	2436	416	2436 416	Sizing Dryer Ex												
4	2436	417	2436 417	--												
4	2436	418	2436 418	--												
4	2436	419	2436 419	--												
4	2436	420	2436 420	--												
4	2436	421	2436 421	--												
4	2436	422	2436 422	Burner Box - Dragonmouth	3 694E-03	Y	1 889E-03	3 694E-03	1 870E-03	9 346E-04	6 845E-04	N	4 248E-02	4 248E-02	7 128E-04	1 009E-03
5	2436	501A	2436 501A	Ox Ov.#1 In Vest	3 168E-03	Y	2 225E-03	3 168E-03	2 203E-03		2 498E-03				3 700E-03	
5	2436	501B	2436 501B	Ox Ov #1 In Hood	3 520E-04	Y	2 473E-04	3 520E-04	2 448E-04		2 779E-04				4 109E-04	
5	2436	501C	2436 501C	Ox Ov #1 In Gas	2 275E-03	Y	1 598E-03	2 275E-03	1 582E-03	1 769E-04		Y	1 504E-02	2 407E-02	1 622E-03	2 275E-02
5	2436	502A	2436 502A	Ox Ov #1 OutVest	2 549E-03	Y	1 790E-03	2 549E-03	1 772E-03		2 020E-03				3 652E-03	
5	2436	502B	2436 502B	Ox Ov #1-2 Hood	4 973E-04	Y	3 493E-04	4 973E-04	3 458E-04		3 698E-04				7 855E-04	
5	2436	502C	2436 502C	Ox Ov #1 Out Gas	2 275E-03	Y	1 598E-03	2 275E-03	1 582E-03	1 769E-04		Y	1 504E-02	2 407E-02	1.622E-03	2 275E-02
5	2436	503A	2436 503A	Ox Ov #2 In Vest	1 930E-03	Y	1 355E-03	1 930E-03	1 342E-03		1 310E-03				3 427E-03	
5	2436	503C	2436 503C	Ox Ov #2 In Gas	2 275E-03	Y	1 598E-03	2 275E-03	1 582E-03	1 769E-04		Y	1 504E-02	2 407E-02	1 622E-03	2 275E-02
5	2436	504A	2436 504A	Ox Ov #2 OutVest	1 930E-03	Y	1 355E-03	1 930E-03	1 342E-03		1 310E-03				3 427E-03	
5	2436	504B	2436 504B	Ox Ov #2-3 Hood	4 368E-04	Y	3 068E-04	4 368E-04	3 037E-04		3 299E-04				8 386E-04	3 041E-04
5	2436	504C	2436 504C	Ox Ov #2 Out Gas	2 275E-03	Y	1 598E-03	2 275E-03	1 582E-03	1 769E-04		Y	1 504E-02	2 407E-02	1 622E-03	2 275E-02
5	2436	505A	2436 505A	Ox Ov #3 In Vest	2 000E-03	Y	1 405E-03	2 000E-03	1 390E-03		1 664E-03				4 117E-03	2 732E-03
5	2436	505C	2436 505C	Ox Ov #3 In Gas	2 275E-03	Y	1 598E-03	2 275E-03	1 582E-03	1 769E-04		Y	1 504E-02	2 407E-02	1 622E-03	2 275E-02
5	2436	506A	2436 506A	Ox Ov #3 OutVest	2 067E-03	Y	1 451E-03	2.067E-03	1 437E-03		2 006E-03				4 784E-03	5 372E-03
5	2436	506B	2436 506B	Ox Ov #3-4 Hood	4 591E-04	Y	3 225E-04	4 591E-04	3 192E-04		4 459E-04				1.063E-03	1 194E-03

					Emission Reduction											
					Baghouse			Venturi Scrubber				Low-NO_x Burner	Low-NO_x Burner	Ultra Low-NO_x Burner	RTO	
Fiberline ID	Building	Source ID	Source Code	Source Description	PM_{10} Controlled[c] (lb/hr)	Technically feasible[d]? (Y/N)	$PM_{2.5}$ controlled[e] (lb/hr)	PM_{10} Controlled[f] (lb/hr)	$PM_{2.5}$ Controlled[g] (lb/hr)	SO_2[h] Controlled (lb/hr)	NH_3[h] Controlled (lb/hr)	Technically feasible[i]? (Y/N)	NO_x[j] Controlled (lb/hr)	NO_x[k] Controlled (lb/hr)	VOC[l] Controlled (lb/hr)	CO[m] Controlled (lb/hr)
5	2436	506C	2436 506C	Ox Ov #3 Out Gas	2.275E-03	Y	1 598E-03	2 275E-03	1 582E-03	1 769E-04		Y	1 504E-02	2 407E-02	1 622E-03	2 275E-02
5	2436	507A	2436 507A	Ox Ov #4 In Vest	2.067E-03	Y	1 451E-03	2 067E-03	1 437E-03		2 006E-03				4 784E-03	5 372E-03
5	2436	507C	2436 507C	Ox Ov #4 In Gas	2.275E-03	Y	1 598E-03	2.275E-03	1 582E-03	1 769E-04		Y	1 504E-02	2 407E-02	1 622E-03	2 275E-02
5	2436	508A	2436 508A	Ox Ov #4 OutVest	2 067E-03	Y	1 451E-03	2 067E-03	1 437E-03		2 006E-03				4 784E-03	5 372E-03
5	2436	508B	2436 508B	Ox Ov #4 OutHood	2 301E-04	Y	1 616E-04	2 301E-04	1 600E-04		2 223E-04				5 305E-04	5 971E-04
5	2436	508C	2436 508C	Ox Ov #4 Out Gas	2 275E-03	Y	1 598E-03	2.275E-03	1 582E-03	1 769E-04		Y	1 504E-02	2 407E-02	1 622E-03	2 275E-02
5	2436	509	2436 509	LTF Incinerator	4 266E-02	Y	2 182E-02	4 266E-02	2 160E-02	2 262E-02	1 219E-05	Y	7 310E-02	1 170E-01	8 403E-03	1 227E-03
5	2436	510	2436 510	LTF Seal Exhaust	1 445E-02	Y	7 391E-03	1 445E-02	7 316E-03		9 183E-04	Y	1 129E-04	1 806E-04	2 129E-03	4 983E-04
5	2436	511	2436 511	HTF Seal Exhaust	5 043E-03	Y	2 579E-03	5 043E-03	2 553E-03		6 679E-03	Y	1 235E-04	1 976E-04	5 552E-03	2 108E-03
5	2436	512	2436 512	HTF Seal Exhaust	2 158E-03	Y	1 104E-03	2 158E-03	1 092E-03		2 598E-04				9 357E-03	4 916E-04
5	2436	513	2436 513	Surface Treat Ex							5 593E-03					
5	2436	515	2436 515	Sizing Dryer Ex												
5	2436	517	2436 517	Hood Exhaust												
5	2436	518	2436 518	--												
5	2436	519	2436 519	--												
5	2436	520	2436 520	--												
5	2436	521	2436 521	--												
5	2436	522	2436 522	Dragonmouth	3.332E-03	Y	1.704E-03	3 332E-03	1 687E-03	8 430E-04	6 175E-04	Y	1 916E-02	3 066E-02	6 429E-04	9 106E-04
6	2479	601A	2479 601A	Ox Ov #1 In A	1.579E-03	Y	1.491E-03	1 579E-03	1 475E-03		4 774E-03	Y	2 433E-05	3 893E-05	5 667E-03	1 841E-03
6	2479	601B	2479 601B	Ox Ov #1 In B	1 579E-03	Y	1.491E-03	1 579E-03	1 475E-03		4 774E-03	Y	2 433E-05	3 893E-05	5 667E-03	1 841E-03
6	2479	601C	2479 601C	Ox Ov #1 Gas	2 345E-03	Y	2 214E-03	2 345E-03	2 192E-03	1 823E-04		Y	1 551E-02	2 481E-02	1 671E-03	2 344E-02
6	2479	602A	2479 602A	Ox Ov #1 Out A	1 579E-03	Y	1 491E-03	1 579E-03	1 475E-03		4 774E-03	Y	2 433E-05	3 893E-05	5 667E-03	1 841E-03
6	2479	602B	2479 602B	Ox Ov #1 Out B	1 579E-03	Y	1 491E-03	1 579E-03	1 475E-03		4 774E-03	Y	2 433E-05	3 893E-05	5 667E-03	1 841E-03
6	2479	602C	2479 602C	Ox Ov #1 Gas	2.345E-03	Y	2 214E-03	2 345E-03	2 192E-03	1 823E-04		Y	1 551E-02	2 481E-02	1 671E-03	2 344E-02
6	2479	603A	2479 603A	Ox Ov #2 In A	9 614E-04	Y	9 078E-04	9 614E-04	8 986E-04		4 583E-03				3 643E-03	3 026E-03
6	2479	603B	2479 603B	Ox Ov #2 In.B	9 614E-04	Y	9 078E-04	9 614E-04	8 986E-04		4 583E-03				3 643E-03	3 026E-03
6	2479	603C	2479 603C	Ox Ov #2 Gas	2 345E-03	Y	2 214E-03	2 345E-03	2 192E-03	1 823E-04		Y	1 551E-02	2 481E-02	1 671E-03	2 344E-02
6	2479	604A	2479 604A	Ox Ov #2 Out A	9.614E-04	Y	9 078E-04	9 614E-04	8 986E-04		4 583E-03				3 643E-03	3 026E-03
6	2479	604B	2479 604B	Ox Ov #2 Out B	9 614E-04	Y	9 078E-04	9 614E-04	8 986E-04		4 583E-03				3 643E-03	3 026E-03
6	2479	604C	2479 604C	Ox Ov #2 Gas	2 345E-03	Y	2 214E-03	2 345E-03	2 192E-03	1.823E-04		Y	1 551E-02	2 481E-02	1 671E-03	2 344E-02
6	2479	605A	2479 605A	Ox Ov #3 In A	9 614E-04	Y	9 078E-04	9 614E-04	8 986E-04		4 583E-03				3 643E-03	3 026E-03
6	2479	605B	2479 605B	Ox Ov #3 In B	9.614E-04	Y	9 078E-04	9 614E-04	8.986E-04		4 583E-03				3 643E-03	3 026E-03
6	2479	605C	2479 605C	Ox Ov #3 Gas	2 345E-03	Y	2 214E-03	2 345E-03	2.192E-03	1 823E-04		Y	1 551E-02	2 481E-02	1 671E-03	2 344E-02
6	2479	606A	2479 606A	Ox Ov #3 Out A	1.030E-03	Y	9 724E-04	1 030E-03	9 626E-04		2 196E-03				3 055E-03	2 587E-03
6	2479	606B	2479 606B	Ox Ov #3 Out B	1.030E-03	Y	9 724E-04	1 030E-03	9 626E-04		2 196E-03				3 055E-03	2 587E-03
6	2479	606C	2479 606C	Ox Ov #3 Gas	2.345E-03	Y	2 214E-03	2 345E-03	2 192E-03	1 823E-04		Y	1 551E-02	2.481E-02	1 671E-03	2 344E-02
6	2479	607A	2479 607A	Ox Ov #4 In.A	1.030E-03	Y	9 724E-04	1 030E-03	9 626E-04		2 196E-03				3.055E-03	2 587E-03
6	2479	607B	2479 607B	Ox Ov #4 In B	1 030E-03	Y	9 724E-04	1 030E-03	9 626E-04		2 196E-03				3 055E-03	2 587E-03
6	2479	607C	2479 607C	Ox Ov #4 Gas	2 345E-03	Y	2 214E-03	2 345E-03	2 192E-03	1 823E-04		Y	1 551E-02	2 481E-02	1 671E-03	2 344E-02
6	2479	608A	2479 608A	Ox Ov #4 Out A	1 030E-03	Y	9 724E-04	1 030E-03	9 626E-04		2 196E-03				3 055E-03	2 587E-03
6	2479	608B	2479 608B	Ox Ov #4 Out B	1 030E-03	Y	9.724E-04	1 030E-03	9 626E-04		2 196E-03				3 055E-03	2 587E-03
6	2479	608C	2479 608C	Ox Ov #4 Gas	2 345E-03	Y	2 214E-03	2 345E-03	2 192E-03	1 823E-04		Y	1 551E-02	2 481E-02	1 671E-03	2 344E-02
6	2479	609A	2479 609A	LTF Seal In A	5 496E-04	Y	2 811E-04	5 496E-04	2 783E-04		1 095E-04				1 070E-03	1 752E-04
6	2479	609B	2479 609B	LTF Seal In B	5 496E-04	Y	2 811E-04	5 496E-04	2 783E-04		1 095E-04				1 070E-03	1 752E-04
6	2479	610	2479 610	LTF Incinerator	3 826E-02	Y	1 957E-02	3 826E-02	1 937E-02	2 031E-02	1 093E-05	Y	6 556E-02	1 049E-01	8 486E-03	1 101E-03
6	2479	611A	2479 611A	LTF Seal Out A	2.262E-03	Y	1 157E-03	2 262E-03	1 145E-03		2 995E-03	Y	5 539E-05	8 862E-05	2 490E-03	9 455E-04
6	2479	611B	2479 611B	LTF Seal Out B	2 262E-03	Y	1 157E-03	2 262E-03	1 145E-03		2 995E-03	Y	5 539E-05	8 862E-05	2 490E-03	9 455E-04
6	2479	612A	2479 612A	HTF Seal In A	1 494E-03	Y	7 641E-04	1 494E-03	7 563E-04	3 780E-04	2 769E-04	Y	8 592E-03	1 375E-02	2.883E-04	4 083E-04
6	2479	612B	2479 612B	HTF Seal In B	1 494E-03	Y	7 641E-04	1 494E-03	7 563E-04	3 780E-04	2 769E-04	Y	8 592E-03	1 375E-02	2 883E-04	4 083E-04
6	2479	613A	2479 613A	HTF Seal Out A	4.945E-04	Y	2 529E-04	4 945E-04	2 503E-04		1.767E-04				3 819E-03	9 207E-04
6	2479	613B	2479 613B	HTF Seal Out B	4 945E-04	Y	2 529E-04	4 945E-04	2 503E-04		1 767E-04				3 819E-03	9 207E-04
6	2479	614	2479 614	Surface Treatment Hood							5 016E-03					
6	2479	615	2479 615	Sizing Dryer												
6	2479	616A	2479 616A	Sizing Enclosure												
6	2479	616B	2479 616B	Sizing Enclosure												
6	2479	617	2479 617	Sizing Mix Tank												
6	2479	618	2479 618	Sizing Tank Vent												
6	2479	619	2479 619	NH3HCO3 Mix Tank												
6	2479	620	2479 620	Spill Vent												
7	2479	701A	2479 701A	Ox Ov #1 In A	2 989E-03	Y	2 099E-03	2 989E-03	2 078E-03		5 881E-03	Y	4 606E-05	7 370E-05	1 831E-02	3 486E-03
7	2479	701B	2479 701B	Ox Ov #1 In B	2 989E-03	Y	2 099E-03	2 989E-03	2 078E-03		5 881E-03	Y	4 606E-05	7 370E-05	1 831E-02	3 486E-03
7	2479	701C	2479 701C	Ox Ov #1 Gas	3 680E-03	Y	2 585E-03	3 680E-03	2 559E-03	2 861E-04		Y	2 433E-02	3 893E-02	2 623E-03	3 679E-02
7	2479	702A	2479 702A	Ox Ov #1 Out A	2 989E-03	Y	2 099E-03	2 989E-03	2 078E-03		1 510E-03	Y	4 606E-05	7 370E-05	1 077E-02	3 486E-03
7	2479	702B	2479 702B	Ox Ov #1 Out B	2 989E-03	Y	2 099E-03	2 989E-03	2 078E-03		1 510E-03	Y	4 606E-05	7 370E-05	1 077E-02	3 486E-03
7	2479	702C	2479 702C	Ox Ov #1 Gas	3 680E-03	Y	2 585E-03	3 680E-03	2 559E-03	2 861E-04		Y	2 433E-02	3 893E-02	2 623E-03	3 679E-02
7	2479	703A	2479 703A	Ox Ov #2 In.A	1 820E-03	Y	1 278E-03	1 820E-03	1 266E-03		1 450E-03				9 912E-03	5 728E-03
7	2479	703B	2479 703B	Ox Ov #2 In B	1 820E-03	Y	1 278E-03	1 820E-03	1 266E-03		1 451E-03				9 912E-03	5 728E-03
7	2479	703C	2479 703C	Ox Ov. #2 Gas	3 680E-03	Y	2 585E-03	3 680E-03	2.559E-03	2 861E-04		Y	2 433E-02	3 893E-02	2 623E-03	3 679E-02
7	2479	704A	2479 704A	Ox Ov #2 Out A	1 820E-03	Y	1 278E-03	1 820E-03	1 266E-03		1 389E-03				1 051E-02	5 728E-03
7	2479	704B	2479 704B	Ox Ov #2 Out B	1 820E-03	Y	1 278E-03	1 820E-03	1 266E-03		1 389E-03				1 051E-02	5 728E-03
7	2479	704C	2479 704C	Ox Ov #2 Gas	3 680E-03	Y	2 585E-03	3 680E-03	2 559E-03	2 861E-04		Y	2 433E-02	3 893E-02	2 623E-03	3 679E-02
7	2479	705A	2479 705A	Ox Ov #3 In A	1 820E-03	Y	1 278E-03	1 820E-03	1 266E-03		1 010E-03				8 965E-03	5 728E-03
7	2479	705B	2479 705B	Ox Ov #3 In B	1 820E-03	Y	1 278E-03	1 820E-03	1 266E-03		1 010E-03				8 965E-03	5 728E-03
7	2479	705C	2479 705C	Ox Ov #3 Gas	3 680E-03	Y	2 585E-03	3 680E-03	2 559E-03	2 861E-04		Y	2 433E-02	3 893E-02	2 623E-03	3 679E-02
7	2479	706A	2479 706A	Ox Ov #3 Out A	1 950E-03	Y	1 370E-03	1 950E-03	1 356E-03		1 010E-03				8 965E-03	4 897E-03
7	2479	706B	2479 706B	Ox Ov #3 Out B	1 950E-03	Y	1 370E-03	1 950E-03	1 356E-03		1 010E-03				8 965E-03	4 897E-03
7	2479	706C	2479 706C	Ox Ov #3 Gas	3 680E-03	Y	2 585E-03	3 680E-03	2 559E-03	2 861E-04		Y	2 433E-02	3 893E-02	2 623E-03	3 679E-02
7	2479	707A	2479 707A	Ox Ov #4 In A	1 950E-03	Y	1 370E-03	1 950E-03	1 356E-03		1 010E-03				8 965E-03	4 897E-03

Fiberline ID	Building	Source ID	Source Code	Source Description	Emission Reduction											
					Baghouse			Venturi Scrubber				Low-NO_x Burner	Low-NO_x Burner	Ultra Low-NO_x Burner	RTO	
					PM_{10} Controlled[c] (lb/hr)	Technically feasible[d]? (Y/N)	$PM_{2.5}$ controlled[e] (lb/hr)	PM_{10} Controlled[f] (lb/hr)	$PM_{2.5}$ Controlled[g] (lb/hr)	SO_2[h] Controlled (lb/hr)	NH_3[h] Controlled (lb/hr)	Technically feasible[i]? (Y/N)	NO_x[j] Controlled (lb/hr)	NO_x[k] Controlled (lb/hr)	VOC[l] Controlled (lb/hr)	CO[m] Controlled (lb/hr)
7	2479	707B	2479 707B	Ox Ov #4 In B	1 950E-03	Y	1 370E-03	1 950E-03	1 356E-03		1 010E-03				8 965E-03	4.897E-03
7	2479	707C	2479 707C	Ox Ov #4 Gas	3 680E-03	Y	2 585E-03	3 680E-03	2 559E-03	2 861E-04		Y	2 433E-02	3 893E-02	2 623E-03	3 679E-02
7	2479	708A	2479 708A	Ox Ov #4 Out A	1 950E-03	Y	1 370E-03	1 950E-03	1 356E-03		6 299E-04				7 424E-03	4 897E-03
7	2479	708B	2479 708B	Ox Ov #4 Out B	1 950E-03	Y	1 370E-03	1 950E-03	1 356E-03		6 299E-04				7 424E-03	4 897E-03
7	2479	708C	2479 708C	Ox Ov #4 Gas	3 680E-03	Y	2 585E-03	3 680E-03	2 559E-03	2 861E-04		Y	2 433E-02	3 893E-02	2 623E-03	3 679E-02
7	2479	709	2479 709	Tar Removal Furn												
7	2479	710	2479 710	LTF Seal In	1 041E-03	Y	5 322E-04	1 041E-03	5 268E-04		2 072E-04				2.025E-03	3 316E-04
7	2479	711	2479 711	LTF Incinerator	7 244E-02	Y	2 910E-02	7 244E-02	2 881E-02	3 840E-02	2 069E-05	Y	1 241E-01	1 986E-01	1 369E-02	2 084E-03
7	2479	712	2479 712	LTF Seal Out A	8 563E-03	Y	4 379E-03	8 563E-03	4 335E-03		1 134E-02	Y	2 097E-04	3 356E-04	9 426E-03	3 580E-03
7	2479	713	2479 713	HTF Seal In	5 657E-03	Y	5 240E-03	5 657E-03	5 187E-03	1 431E-03	1 048E-03	Y	3 253E-02	5 205E-02	1 092E-03	1 546E-03
7	2479	714	2479 714	HTF Seal Out A	1 872E-03	Y	9 576E-04	1 872E-03	9 479E-04		1 826E-04				7 774E-03	3 486E-03
7	2479	715	2479 715	Surface Treat							9 497E-03					
7	2479	716	2479 716	Not Used												
7	2479	717	2479 717	Sizing Dryer												
7	2479	718	2479 718	Sizing Enclosure												
7	2479	719	2479 719	MeCl Storage												
7	2479	720	2479 720	TCA Storage												
7	2479	721	2479 721	Solv Size Stor												
8	2480	801	2480 801	Ox Ov #1 In PAN	3 080E-02	Y	2 511E-02	3 080E-02	2 485E-02	6.792E-03	1 304E-02	Y	5 119E-03	8 190E-03	4 314E-02	7 797E-03
8	2480	802	2480 802	Ox Ov #1 Out PAN	4 537E-02	Y	3 664E-02	4 537E-02	3 627E-02	6 174E-03	5 186E-02	Y	9 057E-03	1 449E-02	7 147E-02	1 588E-02
8	2480	803	2480 803	Ox Ov #2 In PAN	1 975E-02	Y	1 357E-02	1 975E-02	1 343E-02	5 943E-03	2 624E-02	Y	6 694E-03	1 071E-02	4 083E-02	1 885E-02
8	2480	804	2480 804	Ox Ov #2 Out PAN	2 343E-02	Y	1 575E-02	2 343E-02	1 559E-02	5 325E-03	3 535E-02	Y	5 513E-03	8 820E-03	5 410E-02	1 935E-02
8	2480	805	2480 805	Ox Ov #3 In.PAN	1 489E-02	Y	8 498E-03	1 489E-02	8 413E-03	5 711E-03	9 030E-03	Y	4 725E-03	7 560E-03	4 353E-02	1 574E-02
8	2480	806	2480 806	Ox Ov #3 Out PAN	1 700E-02	Y	1 162E-02	1 700E-02	1 150E-02	5 325E-03	8 104E-03	Y	4 725E-03	7 560E-03	4 075E-02	1 559E-02
8	2480	807	2480 807	Ox Ov #4 In PAN	1 238E-02	Y	8 888E-03	1.238E-02	8 798E-03	5 325E-03	3 705E-03	Y	4 725E-03	7 560E-03	3 612E-02	1 737E-02
8	2480	808	2480 808	Ox Ov #4 Out A	1 418E-02	Y	9 434E-03	1 418E-02	9 339E-03	5 557E-03	5 480E-03	Y	4 725E-03	7 560E-03	2 902E-02	1 347E-02
8	2480	809	2480 809	Not Designated												
8	2480	810	2480 810	LTF Seal In												
8	2480	811	2480 811	LTF Incinerator	2 672E-02	Y	1 064E-02	2 672E-02	1 054E-02	5 634E-03	1 698E-03	Y	2 087E-04	3 339E-04	3.936E-03	9 214E-04
8	2480	812	2480 812	LTF Seal Out	9 325E-03	Y	6 705E-03	9 325E-03	6 637E-03	5 248E-03	1 235E-02	Y	2 284E-04	3 654E-04	1 026E-02	3 898E-03
8	2480	813	2480 813	HTF Seal In	6 160E-03	Y	4 823E-03	6 160E-03	4 774E-03	1 559E-03	1.142E-03	Y	3 543E-02	5 668E-02	1 189E-03	1.684E-03
8	2480	814	2480 814	HTF Seal Out	1 160E-02	Y	8 966E-03	1 160E-02	8 876E-03	4 939E-03	1 544E-04	Y	7 875E-04	1 260E-03	7.153E-03	9 923E-04
8	2480	815	2480 815	Surface Treat							1 034E-02					
8	2480	816	2480 816	Surface Treat Rinse												
8	2480	817	2480 817	Sizing Dryer 1											1 593E-01	
8	2480	818	2480 818	Sizing Dryer 2												
8	2480	819	2480 819	Bicarb Mix Room												
8	2480	820	2480 820	Not Designated												
8	2480	821	2480 821	Not Designated												
10	2481	10-01	2481 10-01	Ox Ov #1 In PAN	3 463E-02	Y	2 823E-02	3 463E-02	2 795E-02	7.637E-03	1.467E-02	Y	5 756E-03	9 210E-03	4 851E-02	8 767E-03
10	2481	10-02	2481 10-02	Ox Ov #1 Out PAN	5 102E-02	Y	4 121E-02	5 102E-02	4 079E-02	6 943E-03	5 832E-02	Y	1 018E-02	1 629E-02	8 037E-02	1 785E-02
10	2481	10-03	2481 10-03	Ox Ov #2 In PAN	2 221E-02	Y	1 526E-02	2 221E-02	1 510E-02	6 683E-03	2 951E-02	Y	7 528E-03	1 204E-02	4 591E-02	2 120E-02
10	2481	10-04	2481 10-04	Ox Ov #2 Out PAN	2 635E-02	Y	1 771E-02	2 635E-02	1 753E-02	5 988E-03	3 975E-02	Y	6 199E-03	9 919E-03	6 084E-02	2 176E-02
10	2481	10-05	2481 10-05	Ox Ov #3 In PAN	1 674E-02	Y	9 556E-03	1 674E-02	9 460E-03	6 422E-03	1 015E-02	Y	5 314E-03	8 502E-03	4 895E-02	1 769E-02
10	2481	10-06	2481 10-06	Ox Ov #3 Out PAN	1 912E-02	Y	1 306E-02	1 912E-02	1 293E-02	5 988E-03	9 113E-03	Y	5 314E-03	8 502E-03	4 582E-02	1 753E-02
10	2481	10-07	2481 10-07	Ox. Ov #4 In PAN	1 392E-02	Y	9 995E-03	1 392E-02	9 894E-03	5 988E-03	4 166E-03	Y	5 314E-03	8 502E-03	4 062E-02	1 953E-02
10	2481	10-08	2481 10-08	Ox Ov #4 Out A	1 595E-02	Y	1 061E-02	1 595E-02	1 050E-02	6 249E-03	6.162E-03	Y	5 314E-03	8 502E-03	3 263E-02	1.514E-02
10	2481	10-09	2481 10-09	Not Designated												
10	2481	10-10	2481 10-10	LTF Seal In												
10	2481	10-11	2481 10-11	LTF Incinerator	3 005E-02	Y	1 197E-02	3 005E-02	1 185E-02	6 335E-03	1 909E-03	Y	2 347E-04	3 755E-04	4 426E-03	1 036E-03
10	2481	10-12	2481 10-12	LTF Seal Out	1 049E-02	Y	7 540E-03	1 049E-02	7 464E-03	5 902E-03	1 389E-02	Y	2 568E-04	4 109E-04	1 154E-02	4.384E-03
10	2481	10-13	2481 10-13	HTF Seal In	6 927E-03	Y	5 423E-03	6 927E-03	5 369E-03	1 753E-03	1 284E-03	Y	3 984E-02	6 374E-02	1 337E-03	1.893E-03
10	2481	10-14	2481 10-14	HTF Seal Out	1 304E-02	Y	1 008E-02	1 304E-02	9 981E-03	5 554E-03	1 736E-04	Y	8 856E-04	1 417E-03	8 044E-03	1 116E-03
10	2481	10-15	2481 10-15	Surface Treat							1 163E-02					
10	2481	10-16	2481 10-16	Surface Treat Rinse												
10	2481	10-17	2481 10-17	Sizing Dryer 1											1 593E-01	
10	2481	10-18	2481 10-18	Sizing Dryer 2												
10	2481	10-19	2481 10-19	Bicarb Mix Room												
10	2481	10-20	2481 10-20	Not Designated												
10	2481	10-21	2481 10-21	Not Designated												
11	2482	11-01	2482 11-01	Ox Ov #1 In PAN	4 248E-02	Y	3 463E-02	4.248E-02	3 428E-02	9 369E-03	1 799E-02	Y	7 062E-03	1 130E-02	1 947E-01	1 076E-02
11	2482	11-02	2482 11-02	Ox Ov #1 Out PAN	6 259E-02	Y	5 055E-02	6 259E-02	5 004E-02	8 517E-03	7 155E-02	Y	1 249E-02	1 999E-02	2 338E-01	2 190E-02
11	2482	11-03	2482 11-03	Ox Ov #2 In PAN	2 724E-02	Y	1 871E-02	2 724E-02	1 853E-02	8 198E-03	3 620E-02	Y	9 234E-03	1 477E-02	1 916E-01	2 601E-02
11	2482	11-04	2482 11-04	Ox Ov #2 Out PAN	3 232E-02	Y	2 173E-02	3 232E-02	2 151E-02	7 346E-03	4 876E-02	Y	7 605E-03	1 217E-02	2 099E-01	2 669E-02
11	2482	11-05	2482 11-05	Ox Ov #3 In PAN	2 054E-02	Y	1 172E-02	2 054E-02	1 160E-02	7 879E-03	1 246E-02	Y	6 518E-03	1 043E-02	1 953E-01	2 171E-02
11	2482	11-06	2482 11-06	Ox Ov #3 Out PAN	2 346E-02	Y	1 603E-02	2.346E-02	1 586E-02	7 346E-03	1 118E-02	Y	6 518E-03	1 043E-02	1 914E-01	2 151E-02
11	2482	11-07	2482 11-07	Ox Ov #4 In PAN	1 708E-02	Y	1 226E-02	1 708E-02	1.214E-02	7 346E-03	5 110E-03	Y	6 518E-03	1 043E-02	1 851E-01	2 396E-02
11	2482	11-08	2482 11-08	Ox Ov #4 Out A	1 957E-02	Y	1 301E-02	1.957E-02	1 288E-02	7 666E-03	7 559E-03	Y	6 518E-03	1 043E-02	1.753E-01	1 858E-02
11	2482	11-09	2482 11-09	Not Designated												
11	2482	11-10	2482 11-10	LTF Seal In												
11	2482	11-11	2482 11-11	LTF Incinerator	3 686E-02	Y	1 468E-02	3 686E-02	1 453E-02	7 772E-03	2 342E-03	Y	2 879E-04	4 606E-04	5 430E-03	1 271E-03
11	2482	11-12	2482 11-12	LTF Seal Out	1 286E-02	Y	9 250E-03	1 286E-02	9 156E-03	7 240E-03	1 703E-02	Y	3 151E-04	5 041E-04	1 416E-02	5.378E-03
11	2482	11-13	2482 11-13	HTF Seal In	8 498E-03	Y	6 653E-03	8 498E-03	6 586E-03	2 150E-03	1 575E-03	Y	4 887E-02	7 819E-02	1 640E-03	2 323E-03
11	2482	11-14	2482 11-14	HTF Seal Out	1 600E-02	Y	1 237E-02	1 600E-02	1 224E-02	6 814E-03	2 129E-04	Y	1 086E-03	1 738E-03	9 868E-03	1 369E-03
11	2482	11-15	2482 11-15	Surface Treat							1 427E-02					
11	2482	11-16	2482 11-16	Surface Treat Rinse												
11	2482	11-17	2482 11-17	Sizing Dryer 1											1 957E-01	
11	2482	11-18	2482 11-18	Sizing Dryer 2												

					Emission Reduction											
					Baghouse			Venturi Scrubber				Low-NO_x Burner	Low-NO_x Burner	Ultra Low-NO_x Burner	RTO	
Fiberline ID	Building	Source ID	Source Code	Source Description	PM_{10} Controlled[c] (lb/hr)	Technically feasible[d]? (Y/N)	$PM_{2.5}$ controlled[e] (lb/hr)	PM_{10} Controlled[f] (lb/hr)	$PM_{2.5}$ Controlled[g] (lb/hr)	SO_2[h] Controlled (lb/hr)	NH_3[h] Controlled (lb/hr)	Technically feasible[i]? (Y/N)	NO_x[j] Controlled (lb/hr)	NO_x[k] Controlled (lb/hr)	VOC[l] Controlled (lb/hr)	CO[m] Controlled (lb/hr)
11	2482	11-19	2482 11-19	Bicarb Mix Room												
11	2482	11-20	2482 11-20	Not Designated												
11	2482	11-21	2482 11-21	Not Designated												
12	2483	12-01	2483 12-01	Ox Ov #1 In PAN	4 251E-02	Y	3 466E-02	4 251E-02	3 431E-02	9 376E-03	1 801E-02	Y	7 067E-03	1 131E-02	1 948E-01	1 076E-02
12	2483	12-02	2483 12-02	Ox Ov #1 Out PAN	6 263E-02	Y	5 059E-02	6 263E-02	5 008E-02	8 523E-03	7 160E-02	Y	1 250E-02	2 000E-02	2 339E-01	2 192E-02
12	2483	12-03	2483 12-03	Ox Ov #2 In PAN	2 726E-02	Y	1 873E-02	2 726E-02	1 854E-02	8 204E-03	3 622E-02	Y	9 241E-03	1 479E-02	1 916E-01	2 603E-02
12	2483	12-04	2483 12-04	Ox Ov #2 Out PAN	3 234E-02	Y	2 174E-02	3 234E-02	2 152E-02	7 352E-03	4 880E-02	Y	7 610E-03	1 218E-02	2 099E-01	2 671E-02
12	2483	12-05	2483 12-05	Ox Ov #3 In PAN	2 055E-02	Y	1 173E-02	2 055E-02	1 161E-02	7 884E-03	1 247E-02	Y	6 523E-03	1 044E-02	1 953E-01	2 172E-02
12	2483	12-06	2483 12-06	Ox Ov #3 Out PAN	2 347E-02	Y	1.604E-02	2 347E-02	1 588E-02	7 352E-03	1 119E-02	Y	6 523E-03	1 044E-02	1 915E-01	2 153E-02
12	2483	12-07	2483 12-07	Ox Ov #4 In PAN	1 709E-02	Y	1 227E-02	1 709E-02	1 215E-02	7 352E-03	5 114E-03	Y	6 523E-03	1 044E-02	1 851E-01	2 397E-02
12	2483	12-08	2483 12-08	Ox Ov #4 Out A	1 958E-02	Y	1 302E-02	1 958E-02	1 289E-02	7 671E-03	7 565E-03	Y	6 523E-03	1 044E-02	1 753E-01	1 859E-02
112	2483	12-09	2483 12-09	Not Designated												
12	2483	12-10	2483 12-10	LTF Seal In												
12	2483	12-11	2483 12-11	LTF Incinerator	3 689E-02	Y	1 469E-02	3 689E-02	1 454E-02	7 778E-03	2 344E-03	Y	2 881E-04	4 610E-04	5 434E-03	1 272E-03
12	2483	12-12	2483 12-12	LTF Seal Out	1.287E-02	Y	9 256E-03	1 287E-02	9 163E-03	7 245E-03	1 705E-02	Y	3 153E-04	5 045E-04	1 417E-02	5 382E-03
12	2483	12-13	2483 12-13	HTF Seal In	8 504E-03	Y	6 658E-03	8 504E-03	6 591E-03	2 152E-03	1 576E-03	Y	4 891E-02	7 825E-02	1 641E-03	2 324E-03
12	2483	12-14	2483 12-14	HTF Seal Out	1 601E-02	Y	1 238E-02	1.601E-02	1 225E-02	6 819E-03	2 131E-04	Y	1 087E-03	1 739E-03	9 875E-03	1 370E-03
12	2483	12-15	2483 12-15	Surface Treat							1 428E-02					
12	2483	12-16	2483 12-16	Surface Treat Rinse												
12	2483	12-17	2483 12-17	Sizing Dryer 1											1 957E-01	
12	2483	12-18	2483 12-18	Sizing Dryer 2												
12	2483	12-19	2483 12-19	Bicarb Mix Room												
12	2483	12-20	2483 12-20	Not Designated												
12	2483	12-21	2483 12-21	Not Designated												
13	2484	13-01	2484 13-01	Ox Ov #1 Zn 1 & 2	1 403E-02	Y	1 396E-02	1 403E-02	1 382E-02	1 250E-02		N	1 035E-01	1 035E-01		6 295E-03
13	2484	13-02	2484 13-02	Ox Ov #2 Zn 1 & 2	1 777E-02	Y	1 768E-02	1 777E-02	1 750E-02	1 597E-02		N	1 127E-01	1 127E-01		8 866E-03
13	2484	13-03	2484 13-03	Ox Ov #3 Zn 1 & 2	5 789E-03	Y	5 760E-03	5 789E-03	5 702E-03	5 278E-03		N	1 006E-01	1 006E-01		3 062E-03
13	2484	13-04	2484 13-04	Ox Ov #4 Zn 1 & 2	5 437E-03	Y	5 410E-03	5 437E-03	5 355E-03	4 306E-03		N	9 709E-02	9.709E-02		3 036E+00
13	2484	13-05	2484 13-05	RTO & Baghouse	1 419E+00	Y	1 323E+00	1 419E+00	1 310E+00	1 317E-01	3 147E-01	N	3 805E+00	3 805E+00	7 046E-01	1 744E-01
13	2484	13-06	2484 13-06	Surface Treatment							1 574E-01					
13	2484	13-07	2484 13-07	Sizing Dryer #1											1 957E-01	
13	2484	13-08	2484 13-08	Sizing Dryer #2												
13	2484	13-09	2484 13-09	Sizing Dryer #3												
13	2484	13-10	2484 13-10	Bicarb Mix Room												
14	2485	14-01	2485 14-01	Ox Ov. #1 Zn 1 & 2	1 403E-02	Y	1 396E-02	1 403E-02	1 382E-02	1 250E-02		N	1 035E-01	1 035E-01		6 295E-03
14	2485	14-02	2485 14-02	Ox Ov #2 Zn 1 & 2	1 777E-02	Y	1 768E-02	1 777E-02	1 750E-02	1 597E-02		N	1 127E-01	1 127E-01		8 866E-03
14	2485	14-03	2485 14-03	Ox Ov #3 Zn 1 & 2	5 789E-03	Y	5 760E-03	5 789E-03	5 702E-03	5 278E-03		N	1 006E-01	1 006E-01		3 062E-03
14	2485	14-04	2485 14-04	Ox Ov #4 Zn 1 & 2	5 437E-03	Y	5 410E-03	5 437E-03	5 355E-03	4 306E-03		N	9 709E-02	9 709E-02		3 036E+00
14	2485	14-05	2485 14-05	RTO & Baghouse	1 419E+00	Y	1 323E+00	1 419E+00	1.310E+00	1 317E-01	3 147E-01	N	3 805E+00	3 805E+00	7 046E-01	1 744E-01
14	2485	14-06	2485 14-06	Surface Treatment							1 574E-01					
14	2485	14-07	2485 14-07	Sizing Dryer #1											1 957E-01	
14	2485	14-08	2485 14-08	Sizing Dryer #2												
14	2485	14-09	2485 14-09	Sizing Dryer #3												
14	2485	14-10	2485 14-10	Bicarb Mix Room												
15	2489	15-01	2489 15 01	Ox. Ov #1 Zn 1 & 2	1 522E-02	Y	1 515E-02	1 522E-02	1 500E-02	1 356E-02		N	1 123E-01	1 123E-01		6 830E-03
15	2489	15-02	2489 15-02	Ox Ov #2 Zn 1 & 2	1 928E-02	Y	1.918E-02	1 928E-02	1 899E-02	1 733E-02		N	1 223E-01	1 223E-01		9 619E-03
15	2489	15-03	2489 15-03	Ox. Ov #3 Zn 1 & 2	6 281E-03	Y	6 250E-03	6 281E-03	6 186E-03	5 727E-03		N	1 092E-01	1 092E-01		3 322E-03
15	2489	15-04	2489 15-04	Ox Ov #4 Zn 1 & 2	5 899E-03	Y	5 869E-03	5 899E-03	5 810E-03	4 672E-03		N	1 053E-01	1 053E-01		3 294E+00
15	2489	15-05	2489 15-05	TO/Baghouse/SCR/Heat Recove	1 539E+00	Y	1 436E+00	1 539E+00	1.421E+00	1 429E-01	3 414E-01	N	4 128E+00	4 128E+00	7 645E-01	1 892E-01
15	2489	15-06	2489 15-06	Surface Treatment							1 708E-01					
15	2489	15 07	2489 15 07	Sizing Dryers #1 2,3											2 124E-01	
15	7489	15-10	2489 15-10	Bicarb Mix Room												
16	2490	16-01	2490 16-01	Ox Ov #1 Zn 1 & 2	1 522E-02	Y	1 515E-02	1 522E-02	1 500E-02	1 356E-02		N	1 123E-01	1 123E-01		6 830E-03
16	2490	16-02	2490 16-02	Ox Ov #2 Zn 1 & 2	1 928E-02	Y	1 918E-02	1 928E-02	1 899E-02	1 733E-02		N	1 223E-01	1 223E-01		9 619E-03
16	2490	16 03	2490 16 03	Ox Ov #3 Zn 1 & 2	6 281E-03	Y	6 250E-03	6 281E-03	6 186E-03	5 727E-03		N	1 092E-01	1 092E-01		3 322E-03
16	7490	16-04	2490 16-04	Ox Ov #4 Zn 1 & 2	5 899E-03	Y	5 869E-03	5 899E-03	5 810E-03	4 672E-03		N	1 053E-01	1 053E-01		3 294E+00
16	2490	16 05	2490 16 05	TO/Baghouse/SCR/Heat Recove	1 539E+00	Y	1 436E+00	1 539E+00	1 421E+00	1 429E-01	3 414E-01	N	4 128E+00	4 128E+00	7 645E-01	1 892E-01
16	2490	16-06	2490 16-06	Surface Treatment							1 708E-01					
16	2490	16-07	2490 16 07	Sizing Dryers #1,2,3											2 124E-01	
16	2490	16-10	2490 16-10	Bicarb Mix Room												
PILOT	8162	PL01	8162 PL01	Pilot Plant Oxidation Ovens	1 607E-04	Y	8 221E-05	1 607E-04	8 138E-05		1 691E-04	Y	2 671E-05	4 273E-05	1 378E-04	1 229E-04
PILOT	8162	PL02a	8162 PL02a	Pilot Plant LT Furnace #1 In	5 761E-05	Y	2 947E-05	5 761E-05	2 917E-05		1 821E-07				2 822E-05	
PILOT	8162	PL02b	8162 PL02b	Pilot Plant LT Furnace #1 Out	6 162E-04	Y	3 152E-04	6 162E-04	3 120E-04		1 755E-04				2 323E-03	5.132E-04
PILOT	8162	PL03a	8162 PL03a	Pilot Plant LT Furnace #2 In	1 128E-03	Y	5 770E-04	1 128E-03	5 712E-04		1 304E-04				4 776E-03	
PILOT	8162	PL03b	8162 PL03b	Pilot Plant LT Furnace #2 Out	5 761E-05	Y	2 947E-05	5 761E-05	2 917E-05		1 821E-07				2 822E-05	
PILOT	8162	PL04a	8162 PL04a	Pilot Plant HT Furnace In	5 761E-05	Y	2 947E-05	5.761E-05	2 917E-05		1 821E-07				2 593E-04	
PILOT	8162	PL04b	8162 PL04b	Pilot Plant HT Furnace Out	5 761E-05	Y	2.947E-05	5 761E-05	2 917E-05		6 094E-03				2 593E-04	
PILOT	8162	PL05a	8162 PL05a	Pilot Plant HM Furnace In	5 761E-05	Y	2 947E-05	5 761E-05	2 917E-05		1 821E-07				2.593E-04	
PILOT	8162	PI05b	8162 PI05b	Pilot Plant HM Furnace Out	5 761E-05	Y	2 947E-05	5 761E-05	2 917E-05		1 821E-07				2 593E-04	
PILOT	8162	PL06	8162 PL06	Pilot Plant Incinerator	1 950E-05	Y	1 940E-05	1 950E-05	1 920E-05	1 516E-06		Y	4 007E-03	6 411E-03	1 390E-05	9 281E-05
Matrix	2478	2478_1	2478_1	Tower 1 RTO	4 681E-02	Y	4 658E-02	4 681E-02	4 611E-02	3 640E-03		N	3 095E-01	3 095E-01	2 714E-02	2 476E-01
Matrix	2478	2478_16	2478_16	Tower 4 RTO	6 482E-02	Y	6 449E-02	6 482E-02	6 384E-02	5 040E-03		N	4 286E-01	4 286E-01	5 429E-02	3 429E-01
Matrix	2478	2478_17	2478_17	Tower 3 RTO	6 842E-02	Y	6 807E-02	6 842E-02	6 739E-02	5 320E-03		N	4 524E-01	4 524E-01	5 429E-02	3 619E-01
EmGen	2344	G-31	G-31	Emergency Generator												
EmGen	2344	G-35	G-35	Emergency Generator												
EmGen	2436	G-54	G-54	Emergency Generator												
EmGen	2436	G-58	G-58	Emergency Generator												
EmGen	2478	G-76	G-76	Emergency Generator												

					Emission Reduction											
					Baghouse			Venturi Scrubber				Low-NO_x Burner	Low-NO_x Burner	Ultra Low-NO_x Burner	RTO	
Fiberline ID	Building	Source ID	Source Code	Source Description	PM_{10} Controlled[c] (lb/hr)	Technically feasible[d]? (Y/N)	$PM_{2.5}$ controlled[e] (lb/hr)	PM_{10} Controlled[f] (lb/hr)	$PM_{2.5}$ Controlled[g] (lb/hr)	SO_2[h] Controlled (lb/hr)	NH_3[h] Controlled (lb/hr)	Technically feasible[i]? (Y/N)	NO_x[j] Controlled (lb/hr)	NO_x[k] Controlled (lb/hr)	VOC[l] Controlled (lb/hr)	CO[m] Controlled (lb/hr)
EmGen	2479	G-81	G-81	Emergency Generator												
EmGen	8132	G-83	G-83	Emergency Generator												
EmGen	2479	G-84	G-84	Emergency Generator												
EmGen	2478	G-85	G-85	Emergency Generator												
EmGen	2480	G-86	G-86	Emergency Generator												
EmGen	2480	G-87	G-87	Emergency Generator												
EmGen	2481	G-88	G-88	Emergency Generator												
EmGen	2481	G-89	G-89	Emergency Generator												
EmGen	2482	G-2482-1 West	G-2482-1 West	Emergency Generator												
EmGen	2482	G-2482-2 East	G-2482-2 East	Emergency Generator												
EmGen	2483	G-2483-1 West	G-2483-1 West	Emergency Generator												
EmGen	2483	G-2483-2 East	G-2483-2 East	Emergency Generator												
EmGen	2484	G-2484-1 West	G-2484-1 West	Emergency Generator												
EmGen	2484	G-2484-2 East	G-2484-2 East	Emergency Generator												
EmGen	2485	G-2485-1 West	G-2485-1 West	Emergency Generator												
EmGen	2485	G-2485-2 East	G-2485-2 East	Emergency Generator												
EmGen	2486	G-2486-1 West	G-2486-1 West	Emergency Generator												
EmGen	2486	G-2486-2 East	G-2486-2 East	Emergency Generator												
EmGen	2487	G-2487-1 West	G-2487-1 West	Emergency Generator												
EmGen	2487	G-2487-2 East	G-2487-2 East	Emergency Generator												
EmGen	2478	G-90	G-90	Emergency Generator												
EmGen	2478	G-91	G-91	Emergency Generator												
EmGen	2486	G-92	G-92	Emergency Generator												
EmGen	Plant	CA-239	CA-239	Air Compressor												
HVAC	2344	2344-7	2344-7	HVAC Heaters												
HVAC	2343	2343-1	2343-1	HVAC Heaters												
HVAC	2422	2422-1	2422-1	HVAC Heaters												
HVAC	2436	2436-1	2436-1	Boiler-Out of Service												
HVAC	2436	2436-10	2436-10	HVAC Heaters												
HVAC	2478	2478-16	2478-16	Boiler												
HVAC	2479	2479-1	2479-1	HVAC Heaters												
HVAC	2480	2480-1	2480-1	HVAC Heaters												
HVAC	2481	2481-1	2481-1	HVAC Heaters												
HVAC	2482	2482-18	2482-18	HVAC Heaters												
HVAC	2483	2483-18	2483-18	HVAC Heaters												
HVAC	2486	2486-1	2486-1	HVAC unit downflow												
HVAC	2486	2486-2	2486-2	HVAC unit side discharge												
HVAC	2486	2486-3	2486-3	Heaters												
HVAC	2486	2486-4	2486-4	Boilers												
HVAC	2488	2488-1	2488-1	HVAC Heaters												
HVAC	8156	8156-1	8156-1	HVAC Heaters												
HVAC	8132	8132-1	8132-1	HVAC Heaters												
HVAC	8162	8162-2	8162-2	HVAC Heaters												
HVAC	8167	8167-1	8167-1	HVAC Heaters												
HVAC	8185	8185-1	8185-1	Air Conditioners												
HVAC	8186	8186-1	8186-1	Air Conditioners												
HVAC	8249	8249-1	8249-1	Boiler												
HVAC	8249	8249-2	8249-2	Hot Water Heater												
HVAC	8259	8259-1	8259-1	HVAC Heaters												
HVAC	9364	9364-1	9364-1	HVAC Heaters												
HVAC	9364	9364-2	9364-2	Boiler												
HVAC	9370	9370-1	9370-1	HVAC Heaters												

Notes

[c] The baghouse PM_{10} control efficiency was estimated at 99 5%

[d] Although operation of a baghouse for units with grain loadings below 0 005 gr/scfm is not considered to be efficient, baghouse technology was evaluated for all units, regardless of calculated grain loading

[e] The baghouse $PM_{2.5}$ control efficiency was estimated at 99 0%

[f] The scrubber PM_{10} control efficiency was estimated at 98% based on a vendor cost estimate for control of $PM_{2.5}$ at 98%

[g] The scrubber $PM_{2.5}$ control efficiency was estimated at 98% based on a vendor cost estimate indicating 98% control of $PM_{2.5}$

[h] The scrubber's SO_2 and NH_3 control efficiency was estimated at 98% based on a vendor cost estimate indicating 98% control of SO_2 and NH_3 by a 2-stage system including venturi scrubber and packed bed

[i] A low-NO_x burner is considered technically feasible if the existing burner is natural gas powered, not electric

[j] Low NO_x burner emissions were calculated assuming 50% control efficiency AP-42 Table 1 4-1 Comparison of uncontrolled emissions from a small boiler (100 lb/10^6 scf) to controlled Low-NO_x burner emissions from a small boiler (50 lb/10^6 scf) [1-50/100 = 50%]

[k] Ultra-Low NO_x burner emissions were calculated assuming 68% control efficiency AP-42 Table 1 4-1 Comparison of uncontrolled emissions from a small boiler (100 lb/106 scf) to controlled Ultra-Low-NOX burner emissions from a small boiler (32 lb/106 scf) [1-32/100 = 68%]

[l] The RTO control efficiency of VOC is estimated at 98% based on OAQPS manual page 2-7, which describes a thermal oxidizer operating at 1600 degrees Fahrenheit.

[m] According to vendor's information, RTO provides 90% CO destruction efficiency or 10 ppmv CO outlet concentration, whichever is less stringent (per McGill AirClean 04/29/05) This calculation is based on 90% control efficiency

Table B-2: Baghouse Annualized Cost Estimate

Table B-2.1. Vendor Estimated Baghouse Cost

Flow Rate (scfm)	Basic Equipment Cost [a]
50,000	$1,389,500
40,000	$1,191,000
30,000	$992,500
20,000	$794,000
10,000	$595,500

[a] Durr estimate includes DFTO, RTO, baghouse, redundant RTO, heat recovery, stack ducting $3,970,000 00

Filter Box designed for 32,000 scfm $992,500 00

Assume Baghouse/Filter Box, alone is 25% of total cost

Assume Ductwork is 4% of total cost $158,800 00

Cost of each 10,000 increase or decrease from 30,000 estimated at cost +/- 2%

Table B-2.2. Hexcel Exhaust Flow Rate and PM Emissions

Hexcel Line No.	Average [b] Flow Rate (scfm)	Average [b] Flow Rate (acfm)	PM [c] Collected (lb/hr)
2	0	0	0 00
3	14,641	21,250	0 21
4	17,330	19,600	0 19
5	23,980	35,350	0 13
6	19,790	28,100	0 10
7	30,557	9,900	0 18
8	49,022	80,700	0 28
10	49,022	80,700	0 31
11	41,381	66,250	0 38
12	41,381	66,250	0 38
13	NA	NA	NA
14	NA	NA	NA
15	NA	NA	NA
16	NA	NA	NA
PILOT	7,030	8,900	0 00
Matrix	NA	NA	NA
112	NA	NA	NA

[b] Average flow rate is the sum of flow rates per Hexcel line presented in Table B-1

[c] PM Collected = PM10 collected / fraction of PM smaller than 10 microns. PM10 collected is the sum of PM_{10} collected per line for point sources The average fraction of PM smaller than 10 microns based on particle size distribution analyses of Hexcel dust is 78%

Table B-2.3. Annualized Baghouse Cost Per Hexcel Line[d]

Parameter	Hexcel Fiber Line No.										
	2	3	4	5	6	7	8	10	11	12	PILOT
<u>Direct Costs</u>											
Purchased equipment costs											
Basic Equipment, Baghouse (BE) [e]	$397,000	$687,628	$740,992	$873,010	$789,834	$1,003,549	$1,370,083	$1,370,083	$1,218,417	$1,218,417	$536,540
Ductwork[f]	not estimated	not estimated	not estimated	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800
Instrumentation	$39,700	$68,763	$74,099	$87,301	$78,983	$100,355	$137,008	$137,008	$121,842	$121,842	$53,654
Sales taxes	$11,910	$20,629	$22,230	$26,190	$23,695	$30,106	$41,102	$41,102	$36,553	$36,553	$16,096
Freight	$19,850	$34,381	$37,050	$43,650	$39,492	$50,177	$68,504	$68,504	$60,921	$60,921	$26,827
Purchased Equipment cost, PEC	$468,460	$811,401	$874,371	$1,030,151	$932,004	$1,184,187	$1,775,498	$1,775,498	$1,596,532	$1,596,532	$791,917
Direct Installation Costs											
Foundation & supports	$18,738	$32,456	$34,975	$41,206	$37,280	$47,367	$71,020	$71,020	$63,861	$63,861	$31,677
Handling & erection	$234,230	$405,700	$437,185	$515,076	$466,002	$592,094	$887,749	$887,749	$798,266	$798,266	$395,959
Electrical	$37,477	$64,912	$69,950	$82,412	$74,560	$94,735	$142,040	$142,040	$127,723	$127,723	$63,353
Piping	$4,685	$8,114	$8,744	$10,302	$9,320	$11,842	$17,755	$17,755	$15,965	$15,965	$7,919
Insulation for ductwork	$32,792	$56,798	$61,206	$72,111	$65,240	$82,893	$124,285	$124,285	$111,757	$111,757	$55,434
Painting	$18,738	$32,456	$34,975	$41,206	$37,280	$47,367	$71,020	$71,020	$63,861	$63,861	$31,677
Direct Installation Costs, DIC	$346,660	$600,437	$647,034	$762,312	$689,683	$876,299	$1,313,869	$1,313,869	$1,181,434	$1,181,434	$586,019
Site Preparation Cost Not Estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated
Assume No New Buildings Needed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Direct Costs, DC	$815,120	$1,411,838	$1,521,405	$1,792,463	$1,621,687	$2,060,486	$3,089,367	$3,089,367	$2,777,966	$2,777,966	$1,377,936
<u>Indirect Installation Costs</u>											
Engineering	$93,692	$162,280	$174,874	$206,030	$186,401	$236,837	$355,100	$355,100	$319,306	$319,306	$158,383
Construction & field expenses	$93,692	$162,280	$174,874	$206,030	$186,401	$236,837	$355,100	$355,100	$319,306	$319,306	$158,383
Contractor fees	$46,846	$81,140	$87,437	$103,015	$93,200	$118,419	$177,550	$177,550	$159,653	$159,653	$79,192
Start-up	$4,685	$8,114	$8,744	$10,302	$9,320	$11,842	$17,755	$17,755	$15,965	$15,965	$7,919
Performance test	$4,685	$8,114	$8,744	$10,302	$9,320	$11,842	$17,755	$17,755	$15,965	$15,965	$7,919
Contingencies	$14,054	$24,342	$26,231	$30,905	$27,960	$35,526	$53,265	$53,265	$47,896	$47,896	$23,758
Total Indirect Costs, IC	$257,653	$446,271	$480,904	$566,583	$512,602	$651,303	$976,524	$976,524	$878,093	$878,093	$435,554
TOTAL CAPITAL INVESTMENT [g] (2017$), TCI	**$1,501,883**	**$2,601,351**	**$2,803,233**	**$3,302,665**	**$2,988,004**	**$3,796,505**	**$5,692,247**	**$5,692,247**	**$5,118,482**	**$5,118,482**	**$2,538,886**

Table B-2.3. Annualized Baghouse Cost Per Hexcel Line[d]

Parameter	Hexcel Fiber Line No.										
	2	3	4	5	6	7	8	10	11	12	PILOT
Direct Annual Costs											
Operating Labor											
Operator	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760
Supervisor	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614
Maintenance											
Labor	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320
Electricity for fan, did not estimate compressed air cost[h]	$0	$23,870	$22,016	$39,708	$31,564	$11,120	$90,649	$90,649	$74,417	$74,417	$9,997
Bag Replacement, New Filters + Labor	$696	$21,946	$20,296	$36,046	$28,796	$10,596	$81,396	$81,396	$66,946	$66,946	$9,596
Waste disposal	$0	$22	$21	$14	$11	$20	$30	$34	$41	$41	$0
Total Direct Annual Cost	$90,390	$135,532	$132,027	$165,462	$150,065	$111,430	$261,768	$261,772	$231,098	$231,098	$109,287
Indirect Annual Costs											
Overhead	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816
Administrative charges	$30,038	$52,027	$56,065	$66,053	$59,760	$75,930	$113,845	$113,845	$102,370	$102,370	$50,778
Property tax	$15,019	$26,014	$28,032	$33,027	$29,880	$37,965	$56,922	$56,922	$51,185	$51,185	$25,389
Insurance	$15,019	$26,014	$28,032	$33,027	$29,880	$37,965	$56,922	$56,922	$51,185	$51,185	$25,389
Capital recovery factor, CRF	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11
Capital Recovery	$165,207	$286,149	$308,356	$363,293	$328,680	$417,616	$626,147	$626,147	$563,033	$563,033	$279,277
Total Indirect Annual Costs	$279,099	$444,019	$474,301	$549,216	$502,017	$623,292	$907,654	$907,654	$821,589	$821,589	$434,649
TOTAL ANNUAL COST	**$369,489**	**$579,551**	**$606,328**	**$714,678**	**$652,082**	**$734,722**	**$1,169,422**	**$1,169,426**	**$1,052,687**	**$1,052,687**	**$543,937**

[d] All cost calculations equations are provided in Table B-10 Unless otherwise noted, equations are taken from U S Environmental Protection Agency, EPA Air Pollution Control Cost manual, Sixth Edition EPA/452/B-02-001, January 2002

[e] Interpolated from Table B-2-1

[f] The ductwork cost was estimated based on a percentage (4%) of the total cost quote from Durr for the entire system for the 30,000 scfm RTO+ The ductwork cost estimate was conservatively added to the basic equipment cost only for flows greater than 20,000 scfm

[g] Retrofit factor based on average of 1 3 - 1 5, provided on OAQPS Manual, Section 6, Chapter 3, Page 3-41

[h] Electricity cost of $0 06/kW-hr communicated from Bryan Wheeler of Hexcel to Miriam Hacker of Aspen Outlook, LLC on 03/20/17 via email communication Electricty cost based on Cost Control Manual Equation 2 10

Table B-3: Venturi Scrubber Annualized Cost Estimate for PM Control

Table B-3.1. Vendor Estimated Venturi Scrubber Cost

Flow Rate (scfm)	Basic Equipment Cost [a]
17,000	$350,000
0	$0

[a] The basic equipment cost of a 2-stage unit, with a venturi scrubber upstream of a packed-bed scrubber able to acheive 98% removal efficiency was e-mailed on 03/31/17 from Pollution Control Systems to L Courtright (Aspen Outlook, LLC)

Table B-3.2. Hexcel Exhaust Flow Rate

Hexcel Line No.	Average [b] Flow Rate (scfm)	Average [b] Flow Rate (acfm)
2	0	0
3	14,641	21,250
4	17,330	19,600
5	23,980	35,350
6	19,790	28,100
7	30,557	9,900
8	49,022	80,700
10	49,022	80,700
11	41,381	66,250
12	41,381	66,250
13	NA	NA
14	NA	NA
15	NA	NA
16	NA	NA
PILOT	7,030	8,900
Matrix	7,140	10,000
112	NA	NA

[b] The average flow rate shown is the sum of flow rates per Hexcel line for point sources presented in Table B-1

Table B-3.3. Annualized Venturi Scrubber Cost Per Hexcel Line [c]

Parameter	Hexcel Fiber Line No.											
	2	3	4	5	6	7	8	10	11	12	PILOT	Matrix
Direct Costs												
Purchased equipment costs												
Basic Equipment, Venturi scrubber, BE [d]	$0	$301,437	$356,786	$493,713	$407,444	$629,107	$1,009,273	$1,009,273	$851,966	$851,966	$144,730	$146,991
Ductwork [e]	not estimated	not estimated	not estimated	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800
Instrumentation	$0	$30,144	$35,679	$49,371	$40,744	$62,911	$100,927	$100,927	$85,197	$85,197	$14,473	$14,699
Sales taxes	$0	$9,043	$10,704	$14,811	$12,223	$18,873	$30,278	$30,278	$25,559	$25,559	$4,342	$4,410
Freight	$0	$15,072	$17,839	$24,686	$20,372	$31,455	$50,464	$50,464	$42,598	$42,598	$7,236	$7,350
Purchased Equipment Cost, PEC	$0	$355,695	$421,007	$582,581	$480,783	$742,346	$1,349,742	$1,349,742	$1,164,120	$1,164,120	$329,581	$332,249
Direct Installation Costs, DIC	$0 00	$302,340 88	$357,855 92	$495,193 86	$408,665 87	$630,993 89	$1,147,280 57	$1,147,280 57	$989,501 93	$989,501 93	$280,143 72	$282,411 70
Total Direct Costs, DC	$0 00	$658,036 02	$778,862 88	$1,077,774 88	$889,449 25	$1,373,339 65	$2,497,022 41	$2,497,022 41	$2,153,621 85	$2,153,621 85	$609,724 56	$614,660 76
Indirect Installation Costs												
Engineering	$0	$35,570	$42,101	$58,258	$48,078	$74,235	$134,974	$134,974	$116,412	$116,412	$32,958	$33,225
Construction & field expenses	$0	$35,570	$42,101	$58,258	$48,078	$74,235	$134,974	$134,974	$116,412	$116,412	$32,958	$33,225
Contractor fees	$0	$35,570	$42,101	$58,258	$48,078	$74,235	$134,974	$134,974	$116,412	$116,412	$32,958	$33,225
Start-up	$0	$3,557	$4,210	$5,826	$4,808	$7,423	$13,497	$13,497	$11,641	$11,641	$3,296	$3,322
Performance test	$0	$3,557	$4,210	$5,826	$4,808	$7,423	$13,497	$13,497	$11,641	$11,641	$3,296	$3,322
Contingencies	$0	$10,671	$12,630	$17,477	$14,424	$22,270	$40,492	$40,492	$34,924	$34,924	$9,887	$9,967
Total Indirect Costs, IC	$0	$124,493	$147,352	$203,903	$168,274	$259,821	$472,410	$472,410	$407,442	$407,442	$115,353	$116,287
TOTAL CAPITAL INVESTMENT [f] (2017$)	$0	$1,095,541	$1,296,701	$1,794,350	$1,480,813	$2,286,425	$4,157,205	$4,157,205	$3,585,489	$3,585,489	$1,015,109	$1,023,327

Table B-3.3 Annualized Venturi Scrubber Cost Per Hexcel Line [c]

Parameter	Hexcel Fiber Line No.										PILOT	Matrix
	2	3	4	5	6	7	8	10	11	12		
Direct Annual Costs												
Operating Labor												
Operator	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760
Supervisor	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614
Maintenance												
Labor	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320
Operating Materials												
Water [g]	$0	$65	$60	$109	$86	$30	$248	$248	$204	$204	$27	$31
Chemical	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated	Not estimated
Wastewater												
Wastewater Sewer Fee - Not Applicable [h]												
Sludge Disposal - Not Estimated												
Electricity												
Fan [i]	$0	$19,891	$18,347	$33,090	$26,303	$9,267	$75,541	$75,541	$62,014	$62,014	$8,331	$9,361
Total Direct Annual Cost	$89,694	$109,651	$108,101	$122,893	$116,084	$98,991	$165,483	$165,483	$151,912	$151,912	$98,052	$99,085
Indirect Annual Costs												
Overhead	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816
Administrative charges	$0	$21,911	$25,934	$35,887	$29,616	$45,728	$83,144	$83,144	$71,710	$71,710	$20,302	$20,467
Property tax	$0	$10,955	$12,967	$17,943	$14,808	$22,864	$41,572	$41,572	$35,855	$35,855	$10,151	$10,233
Insurance	$0	$10,955	$12,967	$17,943	$14,808	$22,864	$41,572	$41,572	$35,855	$35,855	$10,151	$10,233
Capital recovery factor	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11
Capital Recovery	$0	$120,510	$142,637	$197,378	$162,889	$251,507	$457,293	$457,293	$394,404	$394,404	$111,662	$112,566
Total Indirect Annual Costs	$53,817	$218.148	$248,322	$322,969	$275,938	$396,780	$677,397	$677,397	$591,640	$591,640	$206,083	$207,316
TOTAL ANNUAL COST	**$143,511**	**$327,798**	**$356,423**	**$445,862**	**$392,022**	**$495,772**	**$842,880**	**$842,880**	**$743,552**	**$743,552**	**$304,135**	**$306,401**

[c] All cost calculations equations are provided in Table B-10 Unless otherwise noted, equations are taken from U S Environmental Protection Agency, EPA Air Pollution Control Cost manual, Sixth Edition EPA/452/B-02-001, January 2002

[d] Interpolated from Table B-3 1

[e] The ductwork cost was estimated based on a percentage (4%) of the total cost quote from Durr for the entire system for the 30,000 scfm RTO+ The ductwork cost estimate was conservatively added to the basic equipment cost only for flows greater than 20,000 scfm

[f] Retrofit factor based on average of 1 3 - 1 5, based on information provided in OAQPS Manual, Section 6, Chapter 2, Page 2-49

[g] It is estimated that the scrubber would consume 183 gallons of water per day based on water consumed by a similar sized scrubber

[h] Hexcel pays a flat fee of $2427 84/month for sewer that would not be expected to increase

[i] *Electricity cost of $0 06/kW-hr* communicated from Bryan Wheeler of Hexcel to Miriam Hacker of Aspen Outlook, LLC on 03/20/17 via email communication Electricty cost based on Cost Control Manual Equation 2 10

Table B-4: Venturi Scrubber Annualized Cost Estimate for SO_2 Control

Table B-4.1 Vendor Estimated Venturi Scrubber Cost

Flow Rate (scfm)	Basic Equipment Cost [a]
17,000	$350,000
0	$0

[a] The basic equipment cost of a 2-stage unit, with a venturi scrubber upstream of a packed-bed scrubber able to acheive 98% removal efficiency was e-mailed on 03/31/17 from Pollution Control Systems to L Courtright (Aspen Outlook, LLC)

Table B-4.2. Hexcel Exhaust Flow Rate

Hexcel Line No.	Average [b] Flow Rate (scfm)	Average [b] Flow Rate (acfm)
2	254	750
3	2,208	6,000
4	2,096	6,000
5	4,952	11,600
6	4,065	8,200
7	6,046	9,900
8	49,022	80,700
10	49,022	80,700
11	41,381	66,250
12	41,381	66,250
13	62,321	108,341
14	62,321	108,341
15	124,368	108,341
16	124,368	108,341
PILOT	254	750
Matrix	7,140	10,000
112	NA	NA

[b] The average flow rate shown is the sum of flow rates per Hexcel line for point sources with non-negligible SO_2 emission rates presented in Table B-1 Point sources with negligible SO_2 emission rates were considered not technologically feasible to control with a scrubber

Table B-4.3. Annualized Venturi Scrubber Cost Per Hexcel Line [c]

Parameter	Hexcel Fiber Line No.														PILOT	Matrix
	2	3	4	5	6	7	8	10	11	12	13	14	15	16		
Direct Costs																
Purchased equipment costs																
Basic Equipment, Venturi scrubber, BE [d]	$5,224	$45,460	$43,152	$101,951	$83,694	$124,475	$1,009,273	$1,009,273	$851,966	$851,966	$1,283,088	$1,283,088	$2,560,512	$2,560,512	$5,224	$146,991
Ductwork [e]	not estimated	not estimated	not estimated	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800
Instrumentation	$522	$4,546	$4,315	$10,195	$8,369	$12,447	$100,927	$100,927	$85,197	$85,197	$128,309	$128,309	$256,051	$256,051	$522	$14,699
Sales taxes	$157	$1,364	$1,295	$3,059	$2,511	$3,734	$30,278	$30,278	$25,559	$25,559	$38,493	$38,493	$76,815	$76,815	$157	$4,410
Freight	$261	$2,273	$2,158	$5,098	$4,185	$6,224	$50,464	$50,464	$42,598	$42,598	$64,154	$64,154	$128,026	$128,026	$261	$7,350
Purchased Equipment Cost, PEC	$6,164	$53,643	$50,919	$120,302	$98,759	$146,880	$1,349,742 [b]	$1,349,742	$1,164,120	$1,164,120	$1,672,843	$1,672,843	$3,180,204	$3,180,204	$164,964	$332,249
Direct Installation Costs, DIC	$5,239 76	$45,596 66	$43,281 45	$102,256 54	$83,945 57	$124,848 40	$1,147,280 57	$1,147,280 57	$989,501 93	$989,501 93	$1,421,916 90	$1,421,916 90	$2,703,173 45	$2,703,173 45	$140,219 76	$282,411 70
Total Direct Costs, DC	$11,404 17	$99,239 79	$94,200 80	$222,558 36	$182,705 06	$271,728 87	$2,497,022 41	$2,497,022 41	$2,153,621 85	$2,153,621 85	$3,094,760 31	$3,094,760 31	$5,883,377 51	$5,883,377 51	$305,184 17	$614,660 76
Indirect Installation Costs																
Engineering	$616	$5,364	$5,092	$12,030	$9,876	$14,688	$134,974	$134,974	$116,412	$116,412	$167,284	$167,284	$318,020	$318,020	$16,496	$33,225
Construction & field expenses	$616	$5,364	$5,092	$12,030	$9,876	$14,688	$134,974	$134,974	$116,412	$116,412	$167,284	$167,284	$318,020	$318,020	$16,496	$33,225
Contractor fees	$616	$5,364	$5,092	$12,030	$9,876	$14,688	$134,974	$134,974	$116,412	$116,412	$167,284	$167,284	$318,020	$318,020	$16,496	$33,225
Start-up	$62	$536	$509	$1,203	$988	$1,469	$13,497	$13,497	$11,641	$11,641	$16,728	$16,728	$31,802	$31,802	$1,650	$3,322
Performance test	$62	$536	$509	$1,203	$988	$1,469	$13,497	$13,497	$11,641	$11,641	$16,728	$16,728	$31,802	$31,802	$1,650	$3,322
Contingencies	$185	$1,609	$1,528	$3,609	$2,963	$4,406	$40,492	$40,492	$34,924	$34,924	$50,185	$50,185	$95,406	$95,406	$4,949	$9,967
Total Indirect Costs, IC	$2,158	$18,775	$17,822	$42,106	$34,566	$51,408	$472,410	$472,410	$407,442	$407,442	$585,495	$585,495	$1,113,071	$1,113,071	$57,738	$116,287
TOTAL CAPITAL INVESTMENT [f] (2017$)	$18,986	$165,221	$156,832	$370,530	$304,179	$452,392	$4,157,205	$4,157,205	$3,585,489	$3,585,489	$5,152,358	$5,152,358	$9,795,029	$9,795,029	$508,090	$1,023,327

Table B-4.3. Annualized Venturi Scrubber Cost Per Hexcel Line [c]

Parameter	Hexcel Fiber Line No.														PILOT	Matrix
	2	3	4	5	6	7	8	10	11	12	13	14	15	16		
Direct Annual Costs																
Operating Labor																
Operator	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760
Supervisor	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614
Maintenance																
Labor	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320
Operating Materials																
Water [g]	$2	$18	$18	$36	$25	$30	$248	$248	$204	$204	$333	$333	$333	$333	$2	$31
Chemical [h]	$2,250	$18,000	$18,000	$34,800	$24,600	$29,700	$242,100	$242,100	$198,750	$198,750	$325,022	$325,022	$325,022	$325,022	$2,250	$30,000
Wastewater																
Wastewater Sewer Fee - Not Applicable [i]																
Sludge Disposal - Not Estimated																
Electricity																
Fan [j]	$702	$5,616	$5,616	$10,858	$7,676	$9,267	$75,541	$75,541	$62,014	$62,014	$101,414	$101,414	$101,414	$101,414	$702	$9,361
Total Direct Annual Cost	$92,648	$113,329	$113,329	$135,388	$121,995	$128,691	$407,583	$407,583	$350,662	$350,662	$516,463	$516,463	$516,463	$516,463	$92,648	$129,085
Indirect Annual Costs																
Overhead	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$195,213	$195,213	$195,213	$1,351	$18,018
Administrative charges	$380	$3,304	$3,137	$7,411	$6,084	$9,048	$83,144	$83,144	$71,710	$71,710	$103,047	$103,047	$195,901	$195,901	$10,162	$20,467
Property tax	$190	$1,652	$1,568	$3,705	$3,042	$4,524	$41,572	$41,572	$35,855	$35,855	$51,524	$51,524	$97,950	$97,950	$5,081	$10,233
Insurance	$190	$1,652	$1,568	$3,705	$3,042	$4,524	$41,572	$41,572	$35,855	$35,855	$51,524	$51,524	$97,950	$97,950	$5,081	$10,233
Capital recovery factor	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11
Capital Recovery	$2,089	$18,174	$17,251	$40,758	$33,460	$49,763	$457,293	$457,293	$394,404	$394,404	$566,759	$566,759	$1,077,453	$1,077,453	$55,890	$112,566
Total Indirect Annual Costs	$56,664	$78,600	$77,341	$109,396	$99,443	$121,675	$677,397	$677,397	$591,640	$591,640	$826,670	$968,067	$1,664,467	$1,664,467	$77,565	$171,518
TOTAL ANNUAL COST	**$149,313**	**$191,928**	**$190,670**	**$244,784**	**$221,438**	**$250,367**	**$1,084,980**	**$1,084,980**	**$942,302**	**$942,302**	**$1,343,133**	**$1,484,530**	**$2,180,930**	**$2,180,930**	**$170,213**	**$300,603**

[c] All cost calculations equations are provided in Table B-10 Unless otherwise noted, equations are taken from U S Environmental Protection Agency, EPA Air Pollution Control Cost manual, Sixth Edition EPA/452/B-02-001, January 2002

[d] Interpolated from Table B-4 1

[e] The ductwork cost was estimated based on a percentage (4%) of the total cost quote from Durr for the entire system for the 30,000 scfm RTO+ The ductwork cost estimate was conservatively added to the basic equipment cost only for flows greater than 20,000 scfm

[f] Retrofit factor based on average of 1 3 - 1 5, based on information provided in OAQPS Manual, Section 6, Chapter 2, Page 2-49

[g] It is estimated that the scrubber would consume 183 gallons of water per day based on water consumed by a similar sized scrubber

[h] Cost per acfm is estimated based 2011 estimate and increase for $2017

[i] Hexcel pays a flat fee of $2427 84/month for sewer that would not be expected to increase

[j] Electricity cost of $0 06/kW-hr communicated from Bryan Wheeler of Hexcel to Miriam Hacker of Aspen Outlook, LLC on 03/20/17 via email communication Electricty cost based on Cost Control Manual Equation 2 10

Table B-5: Venturi Scrubber Annualized Cost Estimate for NH_3 Control

Table B-5.1. Vendor Estimated Venturi Scrubber Cost

Flow Rate (scfm)	Basic Equipment Cost [a]
17,000	$350,000
0	$0

[a] The basic equipment cost of a 2-stage unit, with a venturi scrubber upstream of a packed-bed scrubber able to acheive 98% removal efficiency was e-mailed on 03/31/17 from Pollution Control Systems to L Courtright

Table B-5 2 Hexcel Exhaust Flow Rate

Hexcel Line No.	Average [b] Flow Rate (scfm)	Average [b] Flow Rate (acfm)
2	254	750
3	2,208	6,000
4	2,096	6,000
5	4,952	11,600
6	4,065	8,200
7	6,046	9,900
8	49,022	80,700
10	49,022	80,700
11	41,381	66,250
12	41,381	66,250
13	62,321	108,341
14	62,321	108,341
15	124,368	108,341
16	124,368	108,341
PILOT	254	750
Matrix	7,140	10,000
112	NA	NA

[b] The average flow rate shown is the sum of flow rates per Hexcel line for point sources with non-negligible SO_2 emission rates presented in Table B-1 Point sources with negligible SO_2 emission rates were considered not technologically feasible to control with a scrubber

Table B-5.3 Annualized Venturi Scrubber Cost Per Hexcel Line [c]

Parameter	Hexcel Fiber Line No														PILOT	Matrix
	2	3	4	5	6	7	8	10	11	12	13	14	15	16		
Direct Costs																
Purchased equipment costs																
Basic Equipment, Venturi scrubber, BE [d]	$5,224	_$45,460	$43,152	$101,951	$83,694	$124,475	$1,009,273	$1,009,273	$851,966	$851,966	$1,283,088	$1,283,088	$2,560,512	$2,560,512	$5,224	$146,991
Ductwork [e]	not estimated	not estimated	not estimated	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800
Instrumentation	$522	$4,546	$4,315	$10,195	$8,369	$12,447	$100,927	$100,927	$85,197	$85,197	$128,309	$128,309	$256,051	$256,051	$522	$14,699
Sales taxes	$157	$1,364	$1,295	$3,059	$2,511	$3,734	$30,278	$30,278	$25,559	$25,559	$38,493	$38,493	$76,815	$76,815	$157	$4,410
Freight	$261	$2,273	$2,158	$5,098	$4,185	$6,224	$50,464	$50,464	$42,598	$42,598	$64,154	$64,154	$128,026	$128,026	$261	$7,350
Purchased Equipment Cost, PEC	$6,164	$53,643	$50,919	$120,302	$98,759	$146,880	$1,349,742 [b]	$1,349,742	$1,164,120	$1,164,120	$1,672,843	$1,672,843	$3,180,204	$3,180,204	$164,964	$332,249
Direct Installation Costs, DIC	$5,239 76	$45,596 66	$43,281 45	$102,256 54	$83,945 57	$124,848 40	$1,147,280 57	$1,147,280 57	$989,501 93	$989,501 93	$1,421,916 90	$1,421,916 90	$2,703,173 45	$2,703,173 45	$140,219 76	$282,411 70
Total Direct Costs, DC	$11,404 17	$99,239 79	$94,200 80	$222,558 36	$182,705 06	$271,728 87	$2,497,022 41	$2,497,022 41	$2,153,621 85	$2,153,621 85	$3,094,760 31	$3,094,760 31	$5,883,377 51	$5,883,377 51	$305,184 17	$614,660 76
Indirect Installation Costs																
Engineering	$616	$5,364	$5,092	$12,030	$9,876	$14,688	$134,974	$134,974	$116,412	$116,412	$167,284	$167,284	$318,020	$318,020	$16,496	$33,225
Construction & field expenses	$616	$5,364	$5,092	$12,030	$9,876	$14,688	$134,974	$134,974	$116,412	$116,412	$167,284	$167,284	$318,020	$318,020	$16,496	$33,225
Contractor fees	$616	$5,364	$5,092	$12,030	$9,876	$14,688	$134,974	$134,974	$116,412	$116,412	$167,284	$167,284	$318,020	$318,020	$16,496	$33,225
Start-up	$62	$536	$509	$1,203	$988	$1,469	$13,497	$13,497	$11 641	$11,641	$16,728	$16,728	$31,802	$31,802	$1,650	$3,322
Performance test	$62	$536	$509	$1,203	$988	$1,469	$13,497	$13,497	$11 641	$11,641	$16,728	$16,728	$31,802	$31,802	$1,650	$3,322
Contingencies	$185	$1,609	$1,528	$3,609	$2,963	$4,406	$40,492	$40,492	$34,924	$34,924	$50,185	$50,185	$95,406	$95,406	$4,949	$9,967
Total Indirect Costs, IC	$2,158	$18,775	$17,822	$42,106	$34,566	$51,408	$472,410	$472,410	$407,442	$407,442	$585,495	$585,495	$1,113,071	$1,113,071	$57,738	$116,287
TOTAL CAPITAL INVESTMENT [f] (2017$)	$18,986	$165,221	$156,832	$370,530	$304,179	$452,392	$4,157,205	$4,157,205	$3,585,489	$3,585,489	$5,152,358	$5,152,358	$9,795,029	$9,795,029	$508,090	$1,023,327

Table B-5.3. Annualized Venturi Scrubber Cost Per Hexcel Line [c]

Parameter	Hexcel Fiber Line No.														PILOT	Matrix
	2	3	4	5	6	7	8	10	11	12	13	14	15	16		
Direct Annual Costs																
Operating Labor																
Operator	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760
Supervisor	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614
Maintenance																
Labor	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320
Operating Materials																
Water [g]	$2	$18	$18	$36	$25	$30	$248	$248	$204	$204	$333	$333	$333	$333	$2	$31
Chemical [h]	$2,250	$18,000	$18,000	$34,800	$24,600	$29,700	$242,100	$242,100	$198,750	$198,750	$325,022	$325,022	$325,022	$325,022	$2,250	$30,000
Wastewater																
Wastewater Sewer Fee - Not Applicable [i]																
Sludge Disposal - Not Estimated																
Electricity																
Fan [j]	$702	$5,616	$5,616	$10,858	$7,676	$9,267	$75,541	$75,541	$62,014	$62,014	$101,414	$101,414	$101,414	$101,414	$702	$9,361
Total Direct Annual Cost	$92,648	$113,329	$113,329	$135,388	$121,995	$128,691	$407,583	$407,583	$350,662	$350,662	$516,463	$516,463	$516,463	$516,463	$92,648	$129,085
Indirect Annual Costs																
Overhead	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$195,213	$195,213	$195,213	$1,351	$18,018
Administrative charges	$380	$3,304	$3,137	$7,411	$6,084	$9,048	$83,144	$83,144	$71,710	$71,710	$103,047	$103,047	$195,901	$195,901	$10,162	$20,467
Property tax	$190	$1,652	$1,568	$3,705	$3,042	$4,524	$41,572	$41,572	$35,855	$35,855	$51,524	$51,524	$97,950	$97,950	$5,081	$10,233
Insurance	$190	$1,652	$1,568	$3,705	$3,042	$4,524	$41,572	$41,572	$35,855	$35,855	$51,524	$51,524	$97,950	$97,950	$5,081	$10,233
Capital recovery factor	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11
Capital Recovery	$2,089	$18,174	$17,251	$40,758	$33,460	$49,763	$457,293	$457,293	$394,404	$394,404	$566,759	$566,759	$1,077,453	$1,077,453	$55,890	$112,566
Total Indirect Annual Costs	$56,664	$78,600	$77,341	$109,396	$99,443	$121,675	$677,397	$677,397	$591,640	$591,640	$826,670	$968,067	$1,664,467	$1,664,467	$77,565	$171,518
TOTAL ANNUAL COST	**$149,313**	**$191,928**	**$190,670**	**$244,784**	**$221,438**	**$250,367**	**$1,084,980**	**$1,084,980**	**$942,302**	**$942,302**	**$1,343,133**	**$1,484,530**	**$2,180,930**	**$2,180,930**	**$170,213**	**$300,603**

[c] All cost calculations equations are provided in Table B-10 Unless otherwise noted, equations are taken from U S Environmental Protection Agency, EPA Air Pollution Control Cost manual, Sixth Edition EPA/452/B-02-001, January 2002

[d] Interpolated from Table B-5 1

[e] The ductwork cost was estimated based on a percentage (4%) of the total cost quote from Durr for the entire system for the 30,000 scfm RTO+ The ductwork cost estimate was conservatively added to the basic equipment cost only for flows greater than 20,000 scfm

[f] Retrofit factor based on average of 1 3 - 1 5, based on information provided in OAQPS Manual, Section 6, Chapter 2, Page 2-49

[g] It is estimated that the scrubber would consume 183 gallons of water per day based on water consumed by a similar sized scrubber

[h] Cost per acfm is estimated based 2011 estimate and increase for $2017

[i] Hexcel pays a flat fee of $2427 84/month for sewer that would not be expected to increase

[j] Electricity cost of $0 06/kW-hr communicated from Bryan Wheeler of Hexcel to Miriam Hacker of Aspen Outlook, LLC on 03/20/17 via email communication Electricty cost based on Cost Control Manual Equation 2 10

Table B-6: Low NO_X Burner Annualized Cost Estimate for NO_X Control

Table B-6.1. 2011 Vendor Estimated Low NO_X Burner Costs

Capacity	Basic Equipment Cost [a]	Total Installed Cost [b]	$/MMBtu
750,000 BTU/hr	$31,475	$47,213	$62,950
2 7 MMBtu/hr	$47,213	$70,819	$26,229
13 MMBtu/hr	$70,819	$106,228	$8,171

[a] The uninstalled estimated cost of a 750,000 BTU/hr Ultra Low NOx Burner provided by Matthew McDonald (Hexcel) via Bryon Wheeler (Hexcel) to M Hacker (Aspen Outlook) on 03/27/2017
Higher MM BTU/hr capacity burners estimated as + 1 5% of the lower capacity cost
[b] Installed cost was interpolated at a rate of 1 5 times the uninstalled cost

Table B-6.2. Hexcel Burner Count

Hexcel Line No.	Equipment <=750,000 BTU/hr	Equipment > 0.75 MMBtu/hr and <=2.7 MMBtu/hr	Equipment > 2.7 MMBTU and <=13 MMBtu/hr
2	1	0	0
3	1	0	0
4	0	1	0
5	0	9	0
6	1	8	0
7	1	8	0
8	1	8	0
10	1	8	0
11	1	8	0
12	1	8	0
13	NA	NA	NA
14	NA	NA	NA
15	NA	NA	NA
16	NA	NA	NA
PILOT	1	0	0
Matrix	NA	NA	NA

Fiber Lines 13, 14, 15 and 16, and Matrix Towers have been designed with Low NOX burners and are therefore not part of this assessment

Table B-6.3. Annualized Low-NO_X Burner Cost Per Hexcel Line [c]

Parameter	Total Value	Hexcel Fiber Line No. 2	3	4	5	6	7	8	10	11	12	PILOT
Direct Costs												
Purchased equipment costs												
Total Purchased Equipment Cost (Burners) [d]	$2,990,125	$31,475	$31,475	$47,213	$424,913	$409,175	$409,175	$409,175	$409,175	$409,175	$409,175	$31,475
Installation Costs												
Total Direct Installation Cost [d]	$1,495,063	$15,738	$15,738	$23,606	$212,456	$204,588	$204,588	$204,588	$204,588	$204,588	$204,588	$15,738
Total Direct Costs (TDC)	$4,485,188	$47,213	$47,213	$70,819	$637,369	$613,763	$613,763	$613,763	$613,763	$613,763	$613,763	$47,213
Indirect Installation Costs												
Engineering	$299,013	$3,148	$3,148	$4,721	$42,491	$40,918	$40,918	$40,918	$40,918	$40,918	$40,918	$3,148
Construction & field expenses	$299,013	$3,148	$3,148	$4,721	$42,491	$40,918	$40,918	$40,918	$40,918	$40,918	$40,918	$3,148
Contractor fees	$299,013	$3,148	$3,148	$4,721	$42,491	$40,918	$40,918	$40,918	$40,918	$40,918	$40,918	$3,148
Start-up	$29,901	$315	$315	$472	$4,249	$4,092	$4,092	$4,092	$4,092	$4,092	$4,092	$315
Performance test	$29,901	$315	$315	$472	$4,249	$4,092	$4,092	$4,092	$4,092	$4,092	$4,092	$315
Contingencies	$89,704	$944	$944	$1,416	$12,747	$12,275	$12,275	$12,275	$12,275	$12,275	$12,275	$944
Total Indirect Costs, IC	$1,046,544	$11,016	$11,016	$16,524	$148,719	$143,211	$143,211	$143,211	$143,211	$143,211	$143,211	$11,016
TOTAL CAPITAL INVESTMENT [e] (2017$)	$7,744,424	$81,520	$81,520	$122,280	$1,100,523	$1,059,763	$1,059,763	$1,059,763	$1,059,763	$1,059,763	$1,059,763	$81,520

Table B-6.3. Annualized Low-NO_x Burner Cost Per Hexcel Line [c]

Parameter	Total Value	Hexcel Fiber Line No.										PILOT
		2	3	4	5	6	7	8	10	11	12	
<u>**Annual Cost Summary**</u>												
Total Direct Annual Cost												
Operation/Maintenance Cost [f]	$312,854	$4,740	$4,740	$4,740	$42,662	$42,662	$42,662	$42,662	$42,662	$42,662	$42,662	$4,740
<u>**Profit Loss**</u>												
Revenue Lost per 24-hour down time [g]	NA	$9,700	$28,030	$22,780	$28,690	$50,075	$67,720	$55,900	$114,465	$33,000	$33,000	NA
Days Required for Retrofit [g]		21	21	21	21	21	21	21	21	56	56	
Total Profit Lost	NA	$203,700	$588,630	$478,380	$602,490	$1,051,575	$1,422,120	$1,173,900	$2,403,765	$1,848,000	$1,848,000	NA
<u>**Indirect Annual Costs**</u>												
Labor Ratio [h]		0 9681	0 7914	0 7914	0 6625	0 7352	0 6970	0 2201	0 2201	0 2558	0 2558	0 9681
Overhead [i]	$85,234	$2,753	$2,251	$2,251	$16,958	$18,820	$17,840	$5,633	$5,633	$6,547	$6,547	$2,753
Administrative charges	$154,888	$1,630	$1,630	$2,446	$22,010	$21,195	$21,195	$21,195	$21,195	$21,195	$21,195	$1,630
Property tax	$77,444	$815	$815	$1,223	$11,005	$10,598	$10,598	$10,598	$10,598	$10,598	$10,598	$815
Insurance	$77,444	$815	$815	$1,223	$11,005	$10,598	$10,598	$10,598	$10,598	$10,598	$10,598	$815
Capital recovery factor		0 11	0 11	0 11	0.11	0.11	0 11	0 11	0 11	0 11	0 11	0 11
Capital Recovery	$851,887	$8,967	$8,967	$13,451	$121,058	$116,574	$116,574	$116,574	$116,574	$116,574	$116,574	$8,967
Total Indirect Annual Costs	$1,246,898	$14,981	$14,479	$20,593	$182,037	$177,784	$176,805	$164,597	$164,597	$165,512	$165,512	$14,981
TOTAL ANNUAL COST	**$13,180,312**	**$223,422**	**$607,849**	**$503,713**	**$827,188**	**$1,272,021**	**$1,641,587**	**$1,381,159**	**$2,611,024**	**$2,056,174**	**$2,056,174**	**$19,722**

Notes

[c] All cost calculations equations are provided in Table B-10 Unless otherwise noted, equations are taken from U S Environmental Protection Agency, EPA Air Pollution Control Cost manual, Sixth Edition EPA/452/B-02-001, January 2002

[d] Interpolated from Basic Equipment and Installed Cost from Table 1

[e] Retrofit factors are not mentioned for Low NOX burners in the OAQPS Manual Thus, the retrofit factor for a venturi scrubber is applied Retrofit factor based on average of 1 3 - 1 5, based on information provided in OAQPS Manual, Section 6, Chapter 2, Page 2-49

[f] EPA Technical Bulletin, Nitrogen Oxides (NOx) Why and How They Are Controlled, EPA/456/F-99-006R (http //epa gov/ttn/catc/dir1/fnoxdoc pdf), November 1999 Operational costs obtained from Table 14 - Costs of NOx Controls, multiplied by a ratio of 2017 capital costs to 1993 capital costs, to estimate 2011 operational costs

Maximum estimated 1993 Capital Cost ($/MMBtu)	$8,300	
Maximum estimated 1993 Operational Cost ($/MMBtu)	$1,500	
Estimated 2017 Operational Cost ($/MMBtu)	$4,740 21	= $26,229/$8,300 * $1,500 (mid-range (for 2 7 MMBtu/hr burner) estimated 2017 $/MMBtu was used for the calculation)

[g] Lost Revenue and days required for retrofit of FLs 2-7, 8 and 10 estimated by Hexcel 12/19/11 Lost Revenue and days required for retrofit of FLs 11 and12 estimated by Hexcel on 8/5/13, with 2 weeks of downtime estimated to replace each oven, and 4 ovens in each line

[h] Ratio of operation and Maintenance labor costs to total operation and maintenance costs from scrubber operations

[i] 60% * (Labor Ratio) * (Total Direct Annual Cost)

Table B-7: Ultra Low NO_x Burner Annualized Cost Estimate for NO_x Control

Table B-7.1. 2011 Vendor Estimated Ultra Low NO_x Burner Costs

Capacity	Basic Equipment Cost [a]	Total Installed Cost [b]	$/MMBtu
750,000 BTU/hr	$39,802	$59,703	$79,603
2 7 MMBtu/hr	$59,703	$89,554	$33,168
13 MMBtu/hr	$159,207	$238,810	$18,370

[a] The installed estimated cost is based on a 2011 estimate provided by Western Combustion Engineering, and adjusted for inflation at a rate of 3% over 6 years

See equation 2 2, EPA Control Cost Manual, Pg 2-11 ($FV = \$1 * (1+i)^n$)

[b] Uninstalled cost was interpolated at a rate of the installed cost divided by 1 5

Table B-7.2. Hexcel Burner Count

Hexcel Line No.	Equipment <=750,000 BTU/hr	Equipment > 0.75 MMBtu/hr and <=2.7 MMBtu/hr	Equipment > 2.7 MMBTU and <=13 MMBtu/hr
2	1	0	0
3	1	0	0
4	0	1	0
5	0	9	0
6	1	8	0
7	1	8	0
8	1	8	0
10	1	8	0
11	1	8	0
12	1	8	0
13	NA	NA	NA
14	NA	NA	NA
15	NA	NA	NA
16	NA	NA	NA
PILOT	1	0	0
Matrix	2	0	3

Fiber Lines 13, 14, 15 and 16, and Matrix Towers have been designed with Low NOX burners and are not part of this assessment

Table B-7.3. Annualized Ultra Low-NOX Burner Cost Per Hexcel Line [c]

Parameter	Total Value	Hexcel Fiber Line No.										
		2	3	4	5	6	7	8	10	11	12	PILOT
Direct Costs												
Purchased equipment costs												
Total Purchased Equipment Cost (Burners) [d]	$3,781,166	$39,802	$39,802	$59,703	$537,324	$517,423	$517,423	$517,423	$517,423	$517,423	$517,423	$39,802
Installation Costs												
Total Direct Installation Cost [d]	$1,890,583	$19,901	$19,901	$29,851	$268,662	$258,711	$258,711	$258,711	$258,711	$258,711	$258,711	$19,901
Total Direct Costs (TDC)	$5,671,748	$59,703	$59,703	$89,554	$805,985	$776,134	$776,134	$776,134	$776,134	$776,134	$776,134	$59,703
Indirect Installation Costs												
Engineering	$378,117	$3,980	$3,980	$5,970	$53,732	$51,742	$51,742	$51,742	$51,742	$51,742	$51,742	$3,980
Construction & field expenses	$378,117	$3,980	$3,980	$5,970	$53,732	$51,742	$51,742	$51,742	$51,742	$51,742	$51,742	$3,980
Contractor fees	$378,117	$3,980	$3,980	$5,970	$53,732	$51,742	$51,742	$51,742	$51,742	$51,742	$51,742	$3,980
Start-up	$37,812	$398	$398	$597	$5,373	$5,174	$5,174	$5,174	$5,174	$5,174	$5,174	$398
Performance test	$37,812	$398	$398	$597	$5,373	$5,174	$5,174	$5,174	$5,174	$5,174	$5,174	$398
Contingencies	$113,435	$1,194	$1,194	$1,791	$16,120	$15,523	$15,523	$15,523	$15,523	$15,523	$15,523	$1,194
Total Indirect Costs, IC	$1,323,408	$13,931	$13,931	$20,896	$188,063	$181,098	$181,098	$181,098	$181,098	$181,098	$181,098	$13,931
TOTAL CAPITAL INVESTMENT [e] (2017$)	$9,793,219	$103,087	$103,087	$154,630	$1,391,668	$1,340,125	$1,340,125	$1,340,125	$1,340,125	$1,340,125	$1,340,125	$103,087

Table B-7.3. Annualized Ultra Low-NOX Burner Cost Per Hexcel Line [c]

Parameter	Total Value	Hexcel Fiber Line No.										PILOT
		2	3	4	5	6	7	8	10	11	12	
Annual Cost Summary												
Total Direct Annual Cost												
Operation/Maintenance Cost [i]	$395,620	$5,994	$5,994	$5,994	$53,948	$53,948	$53,948	$53,948	$53,948	$53,948	$53,948	$5,994
Profit Loss												
Revenue Lost per 24-hour down time [g]	NA	$9,700	$28,030	$22,780	$28,690	$50,075	$67,720	$55,900	$114,465	$33,000	$33,000	NA
Days Required for Retrofit [g]		21	21	21	21	21	21	21	21	56	56	
Total Profit Lost	NA	$203,700	$588,630	$478,380	$602,490	$1,051,575	$1,422,120	$1,173,900	$2,403,765	$1,848,000	$1,848,000	NA
Indirect Annual Costs												
Labor Ratio [h]		0 9136	0 5692	0 5692	0 4060	0 4916	0 4447	0 0928	0 0928	0 1163	0 1163	0 1163
Overhead [i]	$64,362	$3,286	$2,047	$2,047	$13,141	$15,911	$14,394	$3,004	$3,004	$3,764	$3,764	$418
Administrative charges	$195,864	$2,062	$2,062	$3,093	$27,833	$26,802	$26,802	$26,802	$26,802	$26,802	$26,802	$2,062
Property tax	$97,932	$1,031	$1,031	$1,546	$13,917	$13,401	$13,401	$13,401	$13,401	$13,401	$13,401	$1,031
Insurance	$97,932	$1,031	$1,031	$1,546	$13,917	$13,401	$13,401	$13,401	$13,401	$13,401	$13,401	$1,031
Capital recovery factor		0 11	0 11	0 11	0.11	0 11	0 11	0 11	0 11	0 11	0 11	0 11
Capital Recovery	$1,077,254	$11,340	$11,340	$17,009	$153,083	$147,414	$147,414	$147,414	$147,414	$147,414	$147,414	$11,340
Total Indirect Annual Costs	$1,533,345	$18,749	$17,510	$25,242	$221,891	$216,930	$215,413	$204,023	$204,023	$204,783	$204,783	$15,881
TOTAL ANNUAL COST	**$13,549,525**	**$228,443**	**$612,134**	**$509,616**	**$878,329**	**$1,322,453**	**$1,691,481**	**$1,431,871**	**$2,661,736**	**$2,106,731**	**$2,106,731**	**$21,875**

Notes

[c] All cost calculations equations are provided in Table B-10 Unless otherwise noted, equations are taken from U S Environmental Protection Agency, EPA Air Pollution Control Cost manual, Sixth Edition EPA/452/B-02-001, January 2002

[d] Interpolated from Basic Equipment and Installed Cost from Table 1

[e] Retrofit factors are not mentioned for Low NOX burners in the OAQPS Manual Thus, the retrofit factor for a venturi scrubber is applied Retrofit factor based on average of 1 3 - 1 5, based on information provided in OAQPS Manual, Section 6, Chapter 2, Page 2-49

[f] EPA Technical Bulletin, Nitrogen Oxides (NOx) Why and How They Are Controlled, EPA/456/F-99-006R (http //epa gov/ttn/catc/dir1/fnoxdoc pdf), November 1999 Operational costs obtained from Table 14 - Costs of NOx Controls, multiplied by a ratio of 2017 capital costs to 1993 capital costs, to estimate 2017 operational costs

Maximum estimated 1993 Capital Cost ($/MMBtu)	$8,300	
Maximum estimated 1993 Operational Cost ($/MMBtu)	$1,500	
Estimated 2017 Operational Cost ($/MMBtu)	$5,994	= $33,168/$8,300 * $1,500 (mid-range (for 2 7 MMBtu/hr burner) estimated 2017 $/MMBtu was used for the calculation)

[g] Lost Revenue and days required for retrofit of FLs 2-7, 8 and 10 estimated by Hexcel 12/19/11 Lost Revenue and days required for retrofit of FLs 11 and12 estimated by Hexcel on 8/5/13, with 2 weeks of downtime estimated to replace each oven, and 4 ovens in each line

[h] Ratio of operation and Maintenance labor costs to total operation and maintenance costs from scrubber operations

[i] 60% * (Labor Ratio) * (Total Direct Annual Cost)

Table B-8: Regenerative Thermal Oxidizer (RTO) Annualized Cost Estimate

Table B-8.1. Vendor Estimated Regenerative Thermal Oxidizer Cost

Flow Rate (scfm)	Basic Equipment Cost [a]	Source
50,000	$1,389,500	
40,000	$1,191,000	
30,000	$992,500	Durr
20,000	$794,000	
6,650	$327,500	Anguil

[a] Cost of each 10,000 increase or decrease from 30,000 estimated at cost +/- 2%

[a] Cost Estimates provided by Anguil and Durr for variable systems, below

6650 scfm - Anguil total installed cost	$	613,900 00
Durr estimate for a 30580 scfm RTO, includes DFTO, RTO, baghouse, redundant RTO, heat recovery, stack ducting	$	3,970,000 00
Assume RTO, alone is 25% of total cost	$	992,500 00
Assume Ductwork is 4% of total cost	$	158,800 00

Table B-8.2. Hexcel Exhaust Flow Rate

Hexcel Line No.	Average [b] Flow Rate (scfm)	Average [b] Flow Rate (acfm)	VOC Emission Rate (lb/hr)
2	254	2,250	0 16
3	16,321	23,000	0 10
4	18,866	21,200	0 09
5	23,980	35,350	0.08
6	19,790	28,100	0.10
7	30,557	9,900	0 23
8	52,181	84,200	0 55
10	52,181	84,200	0 60
11	44,772	69,750	1 84
12	44,772	69,750	1 84
13	NA	NA	NA
14	NA	NA	NA
15	NA	NA	NA
16	NA	NA	NA
PILOT	7,030	8,900	0.01
Matrix	NA	NA	NA
112	NA	NA	NA

[b] The average flow rate shown is the sum of flow rates per Hexcel line for point sources with non-negligible VOC emission rates presented in Table B-1 Point sources with negligible VOC emission rates were considered not technologically feasible to control with an RTO

Fiber Lines 13, 14, 15 and 16, and Matrix Towers have been designed with RTOs and are therefore not part of this assessment

Table B-8.3. Annualized Regenerative Thermal Oxidizer Cost Per Hexcel Line [c]

Parameter	Hexcel Fiber Line No.										
	2	3	4	5	6	7	8	10	11	12	PILOT
<u>Direct Costs</u>											
Purchased equipment costs											
Basic Equipment, BE [d]	$245,478	$628,660	$689,340	$811,319	$711,389	$968,153	$1,483,850	$1,483,850	$1,307,166	$1,307,166	$407,074
Ductwork [e]	not estimated	not estimated	not estimated	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800	$158,800
Instrumentation	$24,548	$62,866	$68,934	$81,132	$71,139	$96,815	$148,385	$148,385	$130,717	$130,717	$40,707
Sales taxes	$7,364	$18,860	$20,680	$24,340	$21,342	$29,045	$44,516	$44,516	$39,215	$39,215	$12,212
Freight	$12,274	$31,433	$34,467	$40,566	$35,569	$48,408	$74,193	$74,193	$65,358	$65,358	$20,354
Purchased Equipment Cost, PEC	$289,664	$741,819	$813,421	$957,356	$839,439	$1,142,420	$1,909,743 b	$1,909,743	$1,701,256	$1,701,256	$639,147
Direct Installation Costs, DIC	$86,899 18	$222,545 68	$244,026 21	$287,206 93	$251,831 73	$342,726 01	$572,922 95	$572,922 95	$510,376 80	$510,376 80	$191,744 24
Total Direct Costs, DC	$376,563 12	$964,364 62	$1,057,446 90	$1,244,563.37	$1,091,270 82	$1,485,146 03	$2,482,666 12	$2,482,666 12	$2,211,632 82	$2,211,632 82	$830,891.72
<u>Indirect Installation Costs</u>											
Engineering	$28,966	$74,182	$81,342	$95,736	$83,944	$114,242	$190,974	$190,974	$170,126	$170,126	$63,915
Construction & field expenses	$14,483	$37,091	$40,671	$47,868	$41,972	$57,121	$95,487	$95,487	$85,063	$85,063	$31,957
Contractor fees	$28,966	$74,182	$81,342	$95,736	$83,944	$114,242	$190,974	$190,974	$170,126	$170,126	$63,915
Start-up	$5,793	$14,836	$16,268	$19,147	$16,789	$22,848	$38,195	$38,195	$34,025	$34,025	$12,783
Performance test	$2,897	$7,418	$8,134	$9,574	$8,394	$11,424	$19,097	$19,097	$17,013	$17,013	$6,391
Contingencies	$8,690	$22,255	$24,403	$28,721	$25,183	$34,273	$57,292	$57,292	$51,038	$51,038	$19,174
Total Indirect Costs, IC	$89,796	$229,964	$252,160	$296,780	$260,226	$354,150	$592,020	$592,020	$527,389	$527,389	$198,136
TOTAL CAPITAL INVESTMENT [f] (2017$)	$652,903	$1,672,060	$1,833,450	$2,157,881	$1,892,096	$2,575,015	$4,304,561	$4,304,561	$3,834,631	$3,834,631	$1,440,638

Table B-8.3. Annualized Regenerative Thermal Oxidizer Cost Per Hexcel Line [c]

Parameter	Hexcel Fiber Line No.										
	2	3	4	5	6	7	8	10	11	12	PILOT
Direct Annual Costs											
Operating Labor											
Operator	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760	$50,760
Supervisor	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614	$7,614
Maintenance											
Labor	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320	$31,320
Operating Materials											
Natural Gas [g]	$1,883	$140,419	$155,768	$174,377	$131,393	$191,068	$394,668	$394,668	$341,736	$341,736	$59,230
Electricity											
Fan	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Direct Annual Cost	$91,577	$230,113	$245,462	$264,071	$221,087	$280,762	$484,362	$484,362	$431,430	$431,430	$148,924
Indirect Annual Costs											
Overhead	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816	$53,816
Administrative charges	$13,058	$33,441	$36,669	$43,158	$37,842	$51,500	$86,091	$86,091	$76,693	$76,693	$28,813
Property tax	$6,529	$16,721	$18,335	$21,579	$18,921	$25,750	$43,046	$43,046	$38,346	$38,346	$14,406
Insurance	$6,529	$16,721	$18,335	$21,579	$18,921	$25,750	$43,046	$43,046	$38,346	$38,346	$14,406
Capital recovery factor	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11	0 11
Capital Recovery	$71,819	$183,927	$201,680	$237,367	$208,131	$283,252	$473,502	$473,502	$421,809	$421,809	$158,470
Total Indirect Annual Costs	$151,752	$304,625	$328,834	$377,499	$337,631	$440,069	$699,501	$699,501	$629,011	$629,011	$269,912
Profit Loss [h]											
Revenue Lost per 24-hour down time [h]	$9,700	$28,030	$22,780	$28,690	$50,075	$67,720	$55,900	$114,465	$33,000	$33,000	NA
Days Required for Retrofit [h]	42	42	42	42	42	42	42	42	42	42	
Total Profit Lost	$407,400	$1,177,260	$956,760	$1,204,980	$2,103,150	$2,844,240	$2,347,800	$4,807,530	$1,386,000	$1,386,000	NA
TOTAL ANNUAL COST	**$650,728**	**$1,711,998**	**$1,531,056**	**$1,846,550**	**$2,661,868**	**$3,565,071**	**$3,531,663**	**$5,991,393**	**$2,446,441**	**$2,446,441**	**$418,836**

[c] All cost calculations equations are provided in Table B-10 Unless otherwise noted, equations are taken from U S Environmental Protection Agency, EPA Air Pollution Control Cost manual, Sixth Edition EPA/452/B-02-001, January 2002

[d] Interpolated from Table B-8 1

[e] The ductwork cost was estimated based on a percentage (4%) of the total cost *quote from Durr for the entire* system for the 30,000 scfm RTO+ The ductwork cost estimate was conservatively added to the basic equipment cost only for flows greater than 20,000 scfm

[f] Retrofit factors are not mentioned for RTOs in the OAQPS Manual Thus, the retrofit factor for a venturi scrubber is applied Retrofit factor based on average of 1 3 - 1 5, based on information provided in *OAQPS Manual, Section 6*, Chapter 2, Page 2-49

[g] Natural Gas cost calculations provided in Table B-9 RTO Natural Gas Consumption and Emission Reductions

[h] Lost Revenue and days required for retrofit of FLs 2-7, 8 and 10 estimated by Hexcel 12/19/11 Lost Revenue and days required for retrofit of FLs 11 and12 estimated by Hexcel on 8/5/13 Hexcel estimates 1 month to 6 weeks of downtime per line to install the RTO

Table B-9: RTO Natural Gas Consumption

	Hexcel Fiber Line No.										
	2	3	4	5	6	7	8	10	11	12	PILOT
Waste Gas, Q_{wl}, scfm	254	16,321	18,866	23,980	19,790	30,557	52,181	52,181	44,772	44,772	7,030
VOC (as propane) Emission Concentration [a], volume fraction	9.20E-05	8.62E-07	6.85E-07	4.67E-07	7.51E-07	1.08E-06	1.54E-06	1.68E-06	5.99E-06	5.99E-06	1.76E-07
VOC Concentration in Waste Gas, ppm VOC	92.0	0.9	0.7	0.5	0.8	1.1	1.5	1.7	6.0	6.0	0.2
Process Gas Exhaust Temperature, F	427	239	294	450	550	611	404	404	393	393	268
Auxiliary Fuel Requirement [b], Q_{af}, scf/yr	369,129	27,533,092	30,542,739	34,191,526	25,763,393	37,464,336	77,385,851	77,385,851	67,007,035	67,007,035	11,613,702
Fuel Cost[c], $/yr	$1,883	$140,419	$155,768	$174,377	$131,393	$191,068	$394,668	$394,668	$341,736	$341,736	$59,230

[a] VOC Concentration in Process Exhaust Gas at the RTO Inlet

$$= \frac{\text{lb VOC/hr x 1 hr/60 min x 1 gmol VOC (as propane)/44.09 g x 453.6 g/lb x 1 kg/1000 g}}{\text{Waste gas flow (scf/min) x 1 kgmol/849.5 scf (at 68 °F)}}$$

[b] Auxilary Fuel as methane needed for combustion (scf/yr), assumed negligable heat contribution from VOC

$$= \frac{\text{Waste gas flow (scf/min) x 525,600 min/yr x 0.0751 lb/scf x 0.248 Btu/lb°F x (1600F - Process Gas Exhaust Temp °F) x (1-0.9 fraction of heat recovered)}}{\text{0.0480 lb methane/scf x 21,502 Btu/lb methane heat of combustion x 0.9 heat transfer efficiency}}$$

[c] Based on Natural Gas Fuel cost of $5/MMBtu. It is assumed that oxygen in the exhaust is sufficient for combusting VOC, and an additional air blower, and subsequent electricity cost is not required.

Table B-10: Cost Calculation Equations and References

Table B-10.1. Direct Cost Equations

Direct Costs	Equipment	Components	Equation	Reference
Purchased Equipment Cost (PEC)	All Equipment	Basic Equipment (BE)	N/A	Cost provided by vendor.
		Ductwork	N/A	Cost provided by vendor.
		Instrumentation	0.10 BE	EPA Control Cost Manual, Section 1
		Sales Tax	0.03 BE	EPA Control Cost Manual, Section 1
		Freight	0.05 BE	EPA Control Cost Manual, Section 1
Direct Installation Costs (DIC)	Baghouse	Foundation & supports	0.04 PEC	EPA Control Cost Manual, Section 6
		Handling & erection	0.50 PEC	EPA Control Cost Manual, Section 6
		Electrical	0.08 PEC	EPA Control Cost Manual, Section 6
		Piping	0.01 PEC	EPA Control Cost Manual, Section 6
		Insulation for ductwork	0.07 PEC	EPA Control Cost Manual, Section 6
		Painting	0.04 PEC	EPA Control Cost Manual, Section 6
		Total DIC	0.74 PEC	EPA Control Cost Manual, Section 6
	Scrubber	--	0.85 PEC	EPA Control Cost Manual, Section 5.2
	LNB, ULNB	--	N/A	Cost provided by vendor.
	RTO	--	0.03 PEC	EPA Control Cost Manual, Section 3.2
Total Direct Costs (DC)	All Equipment	--	PEC + DIC	EPA Control Cost Manual, Various Sections
Indirect Installation Costs (IC)	All Equipment	Engineering - Baghouse	0.20 PEC	EPA Control Cost Manual, Section 6
		Engineering - all else	0.10 PEC	EPA Control Cost Manual, Various Sections
		Construction & field expenses - Baghouse	0.20 PEC	EPA Control Cost Manual, Section 6
		Construction & field expenses - RTO	0.05 PEC	EPA Control Cost Manual, Section 3.2
		Construction & field expenses - all else	0.10 PEC	EPA Control Cost Manual, Various Sections
		Contractor fees	0.10 PEC	EPA Control Cost Manual, Various Sections
		Start-up - RTO	0.02 PEC	EPA Control Cost Manual, Section 3.2
		Start-up - all else	0.01 PEC	EPA Control Cost Manual, Various Sections
		Performance test	0.01 PEC	EPA Control Cost Manual, Various Sections
		Contingencies	0.03 PEC	EPA Control Cost Manual, Various Sections
Total Capital Investment (TCI)	All Equipment	--	(DC + IC) * 1.4 (retrofit factor)	EPA Cost Control Manual, Section 6, Chapter 2, Page 2-49 and Section 6, Chapter 3, Page 3-41.

Table B-10.2. Annual Cost Equations

Annual Costs	Equipment	Components	Equation	Reference
Direct Annual Costs	Baghouse, Scrubber, RTO	Operating Labor - Operator	2hr/shift* 3 shift/day*360 days/yr * $23.50/hr	EPA Control Cost Manual, Section 6
		Operating Labor - Supervisor	15% of operator	EPA Control Cost Manual, Section 6
		Maintenance - Labor	1hr/shift* 3 shift/day*360 days/yr * $29.00/hr	EPA Control Cost Manual, Section 6
	Baghouse	Electricity for fan, did not estimate compressed air cost	Equation 2.10	EPA Control Cost Manual, Pg. 2-32
		Bag Replacement, New Filters + Labor	Vendor estimated $1/acfm for filters + 24 person hrs/yr maintenance @ $29/hr	Cost provided by vendor.
		Waste disposal	$25/ton*lb PM/hr collected*8640 hr/yr * 1 tn/2000 lb	EPA Control Cost Manual, Section 1, Chapter 2
	Scrubber	Water	2.18 gal water/yr/acfm x $1.41/1000 gal fee	It is estimated that the scrubber would consume 183 gallons of water per day based on water consumed by a similar sized scrubber.
		Chemical	$3.00/yr/acfm	Cost estimated by vendor.
		Wastewater Sewer Fee	Not Applicable	Hexcel pays a flat fee of $2427.84/month for sewer that would not be expected to increase.
		Sludge Disposal	Not estimated	--
		Electricity - Fan	Equation 2.10	EPA Control Cost Manual, Pg. 2-32
	LNB, ULNB	Operation/Maintenance Cost	Ratio of 2017 costs to 1993 costs.	EPA Technical Bulletin, "Nitrogen Oxides (NOx) Why and How They Are Controlled", EPA/456/F-99-006R
	RTO	Natural Gas	"NG Cost For RTO" tab	Hexcel Fiber Lines
Indirect Annual Costs	All Equipment	Overhead	60% of sum of operating and maintenance labor	EPA Control Cost Manual, Section 1, Chapter 2
		Administrative charges	2% of TCI	EPA Control Cost Manual, Section 2, Chapter 1, Table 1.13
		Property tax	1% of TCI	EPA Control Cost Manual, Section 2, Chapter 1, Table 1.13
		Insurance	1% of TCI	EPA Control Cost Manual, Section 2, Chapter 1, Table 1.13
		Capital recovery factor	15 Years, 7% Interest	EPA Control Cost Manual, Section 1, Chapter 2, Appendix A, Table A.2
		Capital Recovery	CRF*TCI	EPA Control Cost Manual, Section 2, Chapter 1, Table 1.13

Attachment C

RBLC Tables

Table C-1. RBLC Search f[illegible]on Fiber Manufacturing

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	THROUGHPUT UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Normal Operation) Lines 7-10	electric	1760	tons of carbon fiber per year	Nitrogen Oxides (NOx)		17 9	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (SCR Bypass Mode)	electric	0		Nitrogen Oxides (NOx)		17 9	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Shutdown Mode) Lines 3-6		0		Nitrogen Oxides (NOx)	SCR	8 5	LB	OTHER CASE-BY-CASE
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Shutdown Mode) Lines 7-10		0		Nitrogen Oxides (NOx)		17 9	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon fiber Production (RTO Bypass Mode)		0		Nitrogen Oxides (NOx)		8.5	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Normal Operation) Lines 3-6	none	1760	tons of carbon fiber per year	Nitrogen Oxides (NOx)	SCR for Lines 3 - 6 No SCR on lines 7-10	8 5	LB	OTHER CASE-BY-CASE
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (SCR Bypass Mode)	electric	0		Particulate matter, filterable &lt, 10 Åµ (FPM10)		1 1	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Shutdown Mode) Lines 3-6		0		Particulate matter, filterable < 10 Åµ (FPM10)		3	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Shutdown Mode) Lines 7-10		0		Particulate matter, filterable &lt, 10 Åµ (FPM10)		2	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon fiber Production (RTO Bypass Mode)		0		Particulate matter, filterable &lt, 10 Åµ (FPM10)		2	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Normal Operation) Lines 7-10	electric	1760	tons of carbon fiber per year	Particulate matter, filterable (FPM)		1 1	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (SCR Bypass Mode)	electric	0		Particulate matter, filterable (FPM)		1 1	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Shutdown Mode) Lines 3-6		0		Particulate matter, filterable (FPM)		1 1	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Shutdown Mode) Lines 7-10		0		Particulate matter, filterable (FPM)		1 1	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon fiber Production (RTO Bypass Mode)		0		Particulate matter, filterable (FPM)		1 1	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Normal Operation) Lines 3-6	none	1760	tons of carbon fiber per year	Particulate matter, filterable (FPM)		0		BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Normal Operation) Lines 3-6	none	1760	tons of carbon fiber per year	Particulate matter, total &lt, 10 Åµ (TPM10)		0		BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Normal Operation) Lines 7-10	electric	1760	tons of carbon fiber per year	Volatile Organic Compounds (VOC)		1 7	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (SCR Bypass Mode)	electric	0		Volatile Organic Compounds (VOC)		1 7	LB/H	N/A
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Shutdown Mode) Lines 3-6		0		Volatile Organic Compounds (VOC)		7 1	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Shutdown Mode) Lines 7-10		0		Volatile Organic Compounds (VOC)		7 1	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon fiber Production (RTO Bypass Mode)		0		Volatile Organic Compounds (VOC)		8 6	LB	BACT-PSD
SGL AUTOMOTIVE CARBON FIBERS	4/13/2015	Carbon Fiber Production (Normal Operation) Lines 3-6	none	1760	tons of carbon fiber per year	Volatile Organic Compounds (VOC)		0		BACT-PSD
TORAY CARBON FIBER AMERICA, INC (CFA)	12/20/2007	BOILERS	NATURAL GAS	66 6	MMBTU/H each	Nitrogen Oxides (NOx)	LOW NOX BURNERS PLUS FLUE GAS RECIRCULATION (FGR)	0 024	LB/MMBTU	BACT-PSD
TORAY CARBON FIBER AMERICA, INC (CFA)	12/20/2007	CARBON FIBER MANUFACTURING PROCESS (CFA-3) WITH THERMAL OXIDIZER	NATURAL GAS			Nitrogen Oxides (NOx)	LOW NOX BURNERS AND GOOD OPERATING PRACTICES	57 6	LB/H	BACT-PSD
TORAY CARBON FIBER AMERICA, INC (CFA)	12/20/2007	BOILERS	NATURAL GAS	66 6	MMBTU/H each	Particulate Matter (PM)	NATURAL GAS-FIRED	0 0077	LB/MMBTU	BACT-PSD
TORAY CARBON FIBER AMERICA, INC (CFA)	12/20/2007	CARBON FIBER MANUFACTURING PROCESS (CFA-3) WITH THERMAL OXIDIZER	NATURAL GAS			Particulate Matter (PM)	NATURAL GAS, LOW NOX BURNERS, AND GOOD OPERATING PRACTICES	4 46	LB/H	BACT-PSD
TORAY CARBON FIBER AMERICA, INC (CFA)	12/20/2007	132,086 GALLON SOLVENT DELIVERY STORAGE TANK VENTED TO SCRUBBER				Volatile Organic Compounds (VOC)	SCRUBBER TA2-2	95	% REDUCTION	N/A
TORAY CARBON FIBER AMERICA, INC (CFA)	12/20/2007	211,338 GALLON ACRYLONITRILE DELIVERY STORAGE TANK VENTED TO SCRUBBER TA2-2				Volatile Organic Compounds (VOC)	SCRUBBER TA2-2	95	% REDUCTION	N/A

Table C-2. Search Results for Particulate Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
				Ovens				
KENWORTH TRUCK CO.	01/29/2008	DRYING OVENS AND FLASH TUNNES FOR CAB BOOTHS	4.58	MMBTU/H		0.551	LB/H	N/A
NUCOR STEEL LOUISIANA	05/24/2010	SLG-402 - SLAG MILL DRYER STACK	75.4	T/H	BACT is selected to be good combustion practices during the operation of the dryer	0.2	LB/H	BACT-PSD
NUCOR STEEL LOUISIANA	05/24/2010	PCI-101 - PCI Mill Vent	85.1	MMBTU/H	Fabric Filter	0.88	LB/H	BACT-PSD
				Dryers				
ADM CORN PROCESSING - CEDAR RAPIDS	06/29/2007	INDIRECT-FIRED DDGS DRYER	93.7	MMBTU/H		0.015	GR/DSCF	BACT-PSD
ADM CORN PROCESSING - CEDAR RAPIDS	06/29/2007	INDIRECT-FIRED DDGS DRYER	93.7	MMBTU/H		0.015	GR/DSCF	BACT-PSD
AVON PARK FACILITY/GARGILL JUICE NORTH AMERICA	03/29/2007	PEEL DRYER WITH WASTE HEAT RECOVERY	62.4	MMBTU/H		10	LB/H	BACT-PSD
AVON PARK FACILITY/GARGILL JUICE NORTH AMERICA	03/29/2007	PEEL DRYER WITH WASTE HEAT RECOVERY	62.4	MMBTU/H		10	LB/H	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	SMALL HEATERS AND DRYERS SN-05 THROUGH 19	0		COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE	5.2	X10^-4 LB/MMBTU	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	DRYERS, MGO COATING LINE	38	MMBTU/H	COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE	5.2	X10^-4 LB/MMBTU	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	SMALL HEATERS AND DRYERS SN-05 THROUGH 19	0		COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE	5.2	X10^-4 LB/MMBTU	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	DRYERS, MGO COATING LINE	38	MMBTU/H	COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE	5.2	X10^-4 LB/MMBTU	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	SMALL HEATERS AND DRYERS SN-05 THROUGH 19	0		COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE	5.2	X10^-4 LB/MMBTU	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	DRYERS, MGO COATING LINE	38	MMBTU/H	COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE	5.2	X10^-4 LB/MMBTU	BACT-PSD
CARBO CERAMICS INC. - MILLEN FACILITY	04/06/2012	SPRAY DRYER	47	MMBTU/H	BAGHOUSE	0.02	GR/DSCF	BACT-PSD
CARBO CERAMICS INC. - MILLEN FACILITY	04/06/2012	SPRAY DRYER	47	MMBTU/H	BAGHOUSE	0.0075	GR/DSCF	BACT-PSD
CARBO CERAMICS INC. - MILLEN FACILITY	04/06/2012	SPRAY DRYER	47	MMBTU/H	BAGHOUSE	0.01	GR/DSCF	BACT-PSD
DEGUSSA ENGINEERED CARBONS LP	11/29/2007	CARBON BLACK DRYER UNITS 1 AND 2				6.8	LB/H	BACT-PSD
DUPONT DELISLE FACILITY	03/21/2011	Line 2 Ore Dryer (AB-202)	30	MMBTU/H	replacing baghouses with reverse jet wet scrubber	0.011	GR/DSCF	BACT-PSD
DUPONT DELISLE FACILITY	03/21/2011	Line 1 Oxygen Preheater (AH-102)	20	MMBTU/H	BACT is good combustion.	0.0026	GR/DSCF	BACT-PSD

Table C-2. Search Results for Particulate Control Devices Install[illegible]Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
DUPONT DELISLE FACILITY	03/21/2011	Line 2 Oxygen Preheater (AH-202)	20	MMBTU/H	BACT is good combustion.	0.0026	GR/DSCF	BACT-PSD
DUPONT DELISLE FACILITY	03/21/2011	Line 2 Ore Dryer (AB-202)	30	MMBTU/H	replacing baghouses with reverse jet wet scrubber	0.0085	GR/DSCF	BACT-PSD
DUPONT DELISLE FACILITY	03/21/2011	Line 1 Oxygen Preheater (AH-102)	20	MMBTU/H	BACT is good combustion.	0 0025	GR/DSCF	BACT-PSD
DUPONT DELISLE FACILITY	03/21/2011	Line 2 Oxygen Preheater (AH-202)	20	MMBTU/H	BACT is good combustion.	0.0025	GR/DSCF	BACT-PSD
DUPONT DELISLE FACILITY	03/21/2011	Line 2 Ore Dryer (AB-202)	30	MMBTU/H	Replacing baghouses with a reverse jet wet scrubber	0.011	GR/DSCF	BACT-PSD
DUPONT DELISLE FACILITY	03/21/2011	Line 1 Oxygen Preheater (AH-102)	20	MMBTU/H	BACT is good combustion	0.0026	GR/DSCF	BACT-PSD
DUPONT DELISLE FACILITY	03/21/2011	Line 2 Oxygen Preheater (AH-202)	20	MMBTU/H	BACT is good combustion	0.0026	GR/DSCF	BACT-PSD
ENDICOTT CLAY PRODUCTS	04/08/2008	PLANT 3, DRYER 1	8.84	T/H		1.65	LB/H	BACT-PSD
FLAKEBOARD AMERICA LIMITED - BENNETTSVILLE MDF	12/22/2009	FACE PRIMARY DRYER	45	MMBTU/H	GOOD COMBUSTION PRACTICES AND NATURAL GAS AS FUEL	0		BACT-PSD
FLAKEBOARD AMERICA LIMITED - BENNETTSVILLE MDF	12/22/2009	CORE PRIMARY DRYER	45	MMBTU/H	GOOD COMBUSTION PRACTICES AND NATURAL GAS AS FUEL	0		BACT-PSD
GP ALLENDALE LP	11/25/2008	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 18)	20 89	MMBTU/H		0.15	LB/H	BACT-PSD
GP ALLENDALE LP	11/25/2008	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 18)	20.89	MMBTU/H		0.15	LB/H	BACT-PSD
GP CLARENDON LP	02/10/2009	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 17)	20 89	MMBTU/H		0.15	LB/H	BACT-PSD
GP CLARENDON LP	02/10/2009	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 17)	20.89	MMBTU/H		0.15	LB/H	BACT-PSD
GRAIN PROCESSING CORPORATION	12/08/2015	CORN GLUTEN FREE, GLUTEN, MALTODEXTRIN DRYERS	93	MMBTU/H	WET SCRUBBER FOLLOWED BY THERMAL OXIDIZER FOR GLUTEN AND CGF DRYERS WET SCRUBBER IN SERIES WITH ESP	0.01	GR/DSCF	BACT-PSD
GRAIN PROCESSING CORPORATION	12/08/2015	CORN GLUTEN FREE, GLUTEN, MALTODEXTRIN DRYERS	93	MMBTU/H	WET SCRUBBER FOLLOWED BY THERMAL OXIDIZER (CGF AND GLUTEN DRYERS) MALTODEXTRIN DRYER - WET SCUBBER IN SERIES WITH WET ESP	0.01	GR/DSCF	BACT-PSD
HOMELAND ENERGY SOLUTIONS, LLC	08/26/2011	Two DDGS Dryers A & B/DDGS Cooling Drum/Distillation Equipment	250	MMBTU/H	Multicones, Thermal Oxidizer and DDGS Cooling Drum Baghouse	0.0064	GR/DSCF	BACT-PSD
HOMELAND ENERGY SOLUTIONS, LLC	08/26/2011	Two DDGS Dryers C & D/DDGS Cooling Drum/Distillation Equipment	250	MMBTU/H	multiclones, thermal oxidizer and DDGS cooling drum baghouse	0.0094	GR/DSCF	BACT-PSD

Table C-2. Search Results for Particulate Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
HOMELAND ENERGY SOLUTIONS, LLC	08/26/2011	Two DDGS Dryers A &amp, B/DDGS Cooling Drum/Distillation Equipment	250	MMBTU/H	Multiclones/ Thermal Oxidizer / DDGS Cooling Drum Baghouse	0.0064	GR/DSCF	BACT-PSD
HOMELAND ENERGY SOLUTIONS, LLC	08/26/2011	Two DDGS Dryers C & D/DDGS Cooling Drum/Distillation Equipment	250	MMBTU/H	multiclones, thermal oxidizer and DDGS cooling drum baghouse	0.0094	GR/DSCF	BACT-PSD
LAKE CHARLES CHEMICAL COMPLEX ALUMINA UNIT	05/23/2014	Spray Dryer #3 Dust Collector Vent Stack (EQT 1004)	137	MM BTU/HR	Fabric filter to limit PM10 emissions to 0.02 gr/dscf. Regarding products of combustion, BACT is the exclusive use of natural gas as fuel.	13.38	LB/HR	BACT-PSD
LAKE CHARLES CHEMICAL COMPLEX ALUMINA UNIT	05/23/2014	Spray Dryer #4 Dust Collector Vent Stack (EQT 1005)	98	MM BTU/HR	Fabric filter to limit PM10 emissions to 0.02 gr/dscf Regarding products of combustion, BACT is the exclusive use of natural gas as fuel.	9.71	LB/HR	BACT-PSD
LAKE CHARLES CHEMICAL COMPLEX ALUMINA UNIT	05/23/2014	Spray Dryer #3 Dust Collector Vent Stack (EQT 1004)	137	MM BTU/HR	Fabric filter to limit PM2.5 emissions to 0.02 gr/dscf. Regarding products of combustion, BACT is the exclusive use of natural gas as fuel.	13.38	LB/HR	BACT-PSD
LAKE CHARLES CHEMICAL COMPLEX ALUMINA UNIT	05/23/2014	Spray Dryer #4 Dust Collector Vent Stack (EQT 1005)	98	MM BTU/HR	Fabric filter to limit PM2.5 emissions to 0.02 gr/dscf. Regarding products of combustion, BACT is the exclusive use of natural gas as fuel.	9.71	LB/HR	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 1 Post-Dryer (S31)	7 7	MMBTU/H		0.0076	LB/MMBTU	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 2 Post - Dryer (S32)	7.7	MMBTU/H		0.0076	LB/MMBTU	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 3 Post - Dryer (S33)	7.7	MMBTU/H		0.0076	LB/MMBTU	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 4 Post - Dryer (S34)	7.7	MMBTU/H		0.0076	LB/MMBTU	BACT-PSD
NUCOR STEEL LOUISIANA	05/24/2010	SLG-402 - SLAG MILL DRYER STACK	75 4	T/H	BACT is selected to be good combustion practices during the operation of the dryer	0 2	LB/H	BACT-PSD
OHIO RIVER CLEAN FUELS, LLC	11/20/2008	GAS FIRED HEATERS (3)	4	MMBTU/H		0 09	LB/H	BACT-PSD
OHIO RIVER CLEAN FUELS, LLC	11/20/2008	F-T CATALYST ROTARY DRYER	22564	SCF/H	GOOD COMBUSTION PRACTICES	0.18	LB/H	BACT-PSD
OHIO RIVER CLEAN FUELS, LLC	11/20/2008	COAL OR BIOMASS DRYING LINES (10)	31	MMBTU/H	PULSE JET BAGHOUSE	0.6	LB/H	BACT-PSD
PYRAMAX CERAMICS, LLC - KING'S M U FACILITY	01/27/2012	SPRAY DRYERS/PETTETIZERS	75	MMBTU/H	FABRIC BAGHOUSE	0.01	GR/DSCF	BACT-PSD
PYRAMAX CERAMICS, LLC - KING'S M:U FACILITY	01/27/2012	SPRAY DRYERS/PETTETIZERS	75	MMBTU/H	FABRIC BAGHOUSE	0.01	GR/DSCF	BACT-PSD
PYRAMAX CERAMICS, LLC - KING'S M:U FACILITY	01/27/2012	SPRAY DRYERS/PETTETIZERS	75	MMBTU/H	FABRIC BAGHOUSE	0.006	GR/DSCF	BACT-PSD
SAGOLA MILL	01/31/2008	NATURAL GAS THERMAL OIL HEATER			GOOD COMBUSTION PRACTICES	0.17	LB/H	BACT-PSD

Table C-2. Search Results for Particulate Control Devices Installe[illegible] Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
SOUTHWEST IOWA RENEWABLE ENERGY	04/19/2007	DDGS DRYERS + DISTILLATION	60	T/H	THERMAL OXIDIZER	9.28	LB/H	BACT-PSD
TATE & LYLE INDGREDIENTS AMERICAS, INC.	09/19/2008	STARCH DRYER (DIRECT-FIRED)	25	MMBTU/H	WET SCRUBBER	0.0086	GR/DSCF	BACT-PSD
TATE & LYLE INDGREDIENTS AMERICAS, INC.	09/19/2008	STARCH DRYER (DIRECT-FIRED)	25	MMBTU/H	WET SCRUBBER	0.0086	GR/DSCF	BACT-PSD
TOLEDO SUPPLIER PARK- PAINT SHOP	05/03/2007	PAINT SLUDGE DRYER	7.5	MMBTU/H	CONTROL DEVICE NOT NAMED BUT 98% CONTROL REQUIRED	1.72	LB/H	BACT-PSD
U.S. STEEL CORP - KEETAC	12/06/2011	GRATE KILN - DOWN DRAFT DRYING ZONE 1	450	T/PELLETS/H	DRY ELECTROSTATIC PRECIPITATOR	10.5	LB/H	BACT-PSD
U.S. STEEL CORP - KEETAC	12/06/2011	GRATE KILN - DOWN DRAFT DRYING ZONE 1	450	T/PELLETS/H	DRY ELECTROSTATIC PRECIPITATORS	21	LB/H	BACT-PSD
U.S. STEEL CORP - KEETAC	12/06/2011	GRATE KILN - DOWN DRAFT DRYING ZONE 1	450	T/PELLETS/H	DRY ELECTROSTATIC PRECIPITATOR	21	LB/H	BACT-PSD
				Burners				
DUKE ENERGY HANGING ROCK ENERGY	12/18/2012	Turbines (4) (model GE 7FA) Duct Burners Off	172	MW	Burning natural gas in an efficient combustion turbine	15	LB/H	BACT-PSD
DUKE ENERGY HANGING ROCK ENERGY	12/18/2012	Turbines (4) (model GE 7FA) Duct Burners On	172	MW	Burning natural gas in an efficient combustion turbine	19.9	LB/H	BACT-PSD
HESS NEWARK ENERGY CENTER	11/01/2012	Boiler less than 100 MMBtu/hr	51.9	mmcubic ft/year	use of natural gas a clean fuel	0.22	LB/H	N/A
HESS NEWARK ENERGY CENTER	11/01/2012	Boiler less than 100 MMBtu/hr	51.9	mmcubic ft/year	use of natural gas a clean fuel	0.33	LB/H	BACT-PSD
HESS NEWARK ENERGY CENTER	11/01/2012	Boiler less than 100 MMBtu/hr	51.9	mmcubic ft/year	use of natural gas a clean fuel	0.33	LB/H	N/A
HESS NEWARK ENERGY CENTER	11/01/2012	Combined cylce turbine with duct burner	39463	mmcubic ft/year*	Use of natural gas a clean burning fuel	13.2	LB/H	BACT-PSD
HESS NEWARK ENERGY CENTER	11/01/2012	Combined cylce turbine with duct burner	39463	mmcubic ft/year*	Use of natural gas a clean burning fuel	13.2	LB/H	N/A
HESS NEWARK ENERGY CENTER	11/01/2012	Combined cylce turbine with duct burner	39463	mmcubic ft/year*	Use of natural gas a clean burning fuel	7.9	LB/H	N/A
HESS NEWARK ENERGY CENTER	11/01/2012	Combined Cycle Combustion Turbine	39463	MMCubic ft/yr	Good combustion Practices and use of natural gas a clean burning fuel	6.6	LB/H	N/A
HESS NEWARK ENERGY CENTER	11/01/2012	Combined Cycle Combustion Turbine	39463	MMCubic ft/yr	Use of natural gas a clean burning fuel	11	LB/H	BACT-PSD
HESS NEWARK ENERGY CENTER	11/01/2012	Combined Cycle Combustion Turbine	39463	MMCubic ft/yr	Use of Natural Gas a clean burning fuel	11	LB/H	N/A
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Fuel pre-heater (EUFUELHTR)	3.7	MMBTU/H	Good combustion practices.	0.007	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Fuel pre-heater (EUFUELHTR)	3.7	MMBTU/H	Good combustion practices	0.0075	LB/MMBTU	BACT-PSD

Table C-2. Search Results for Particulate Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Fuel pre-heater (EUFUELHTR)	3.7	MMBTU/H	Good combustion pracitces.	0.0075	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Auxiliary Boiler A (EUAUXBOILERA)	55	MMBTU/H	Good combustion practices	0.0018	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Auxiliary Boiler A (EUAUXBOILERA)	55	MMBTU/H	Good combustion practices	0.007	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Auxiliary Boiler A (EUAUXBOILERA)	55	MMBTU/H	Good combustion practices	0 007	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Auxiliary Boiler B (EUAUXBOILERB)	95	MMBTU/H	Good combustion practices	0.0018	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Auxiliary Boiler B (EUAUXBOILERB)	95	MMBTU/H	Good combustion practices	0.007	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Auxiliary Boiler B (EUAUXBOILERB)	95	MMBTU/H	Good combustion practices	0.007	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Emergency Engine--natural gas (EUNGENGINE)	1000	kW	Good combustion practices	0.0001	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Emergency Engine--natural gas (EUNGENGINE)	1000	kW	Good combustion practices	0.01	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Emergency Engine--natural gas (EUNGENGINE)	1000	kW	Good combustion practices	0.01	LB/MMBTU	BACT-PSD
INDIANA GASIFICATION, LLC	06/27/2012	FIVE (5) GASIFIER PREHEAT BURNERS	35	MMBTU/H, EACH	USE OF CLEAN BURNING GASEOUS FUEL. SHALL USE ONLY NATURAL GAS OR SNG.	0.0007	LB/MMBTU	BACT-PSD
INDIANA GASIFICATION, LLC	06/27/2012	FIVE (5) GASIFIER PREHEAT BURNERS	35	MMBTU/H, EACH	USE OF CLEAN BURNING GASEOUS FUEL. SHALL USE ONLY NATURAL GAS OR SNG.	0.0007	LB/MMBTU	BACT-PSD
INDIANA GASIFICATION, LLC	06/27/2012	FIVE (5) GASIFIER PREHEAT BURNERS	35	MMBTU/H, EACH	USE OF CLEAN BURNING GASEOUS FUEL. SHALL USE ONLY NATURAL GAS OR SNG.	0 0007	LB/MMBTU	BACT-PSD
INDIANA GASIFICATION, LLC	06/27/2012	REGENERATIVE THERMAL OXIDIZER (RTO) ON THE ACID GAS REMOVAL UNIT VENTS (AGR)	38.8	MMBTU/H, EACH	USE OF CLEAN BURNING GASEOUS FUEL AND GOOD COMBUSTION PRACTICES	0 29	LB/H	BACT-PSD
INDIANA GASIFICATION, LLC	06/27/2012	REGENERATIVE THERMAL OXIDIZER (RTO) ON THE ACID GAS REMOVAL UNIT VENTS (AGR)	38.8	MMBTU/H, EACH	USE OF CLEAN BURNING GASEOUS FUEL AND GOOD COMBUSTION PRACTICES	0.29	LB/H	BACT-PSD
INDIANA GASIFICATION, LLC	06/27/2012	REGENERATIVE THERMAL OXIDIZER (RTO) ON THE ACID GAS REMOVAL UNIT VENTS (AGR)	38 8	MMBTU/H, EACH	USE OF CLEAN BURNING GASEOUS FUEL AND GOOD COMBUSTION PRACTICES	0.29	LB/H	BACT-PSD
INTERNATIONAL STATION POWER PLANT	12/20/2010	Sigma Thermal Auxiliary Heater (1)	12.5	MMBTU/H	Good Combustion Practices	7.6	LB/MMSCF	BACT-PSD
INTERNATIONAL STATION POWER PLANT	12/20/2010	Sigma Thermal Auxiliary Heater (1)	12.5	MMBTU/H	Good Combustion Practices	7.6	LB/MMSCF	BACT-PSD

Table C-2. Search Results for Particulate Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
INTERNATIONAL STATION POWER PLANT	12/20/2010	Sigma Thermal Auxiliary Heater (1)	12.5	MMBTU/H	Good Combustion Practices	7.6	LB/MMSCF	BACT-PSD
INTERNATIONAL STATION POWER PLANT	12/20/2010	Duct Burners (4)	140	MMBTU/H	Good Combustion Practices	7 6	LB/MMSCF	BACT-PSD
INTERNATIONAL STATION POWER PLANT	12/20/2010	Duct Burners (4)	140	MMBTU/H	Good Combustion Practices	7 6	LB/MMSCF	BACT-PSD
INTERNATIONAL STATION POWER PLANT	12/20/2010	Duct Burners (4)	140	MMBTU/H	Good Combustion Practices	7.6	LB/MMSCF	BACT-PSD
INTERNATIONAL STATION POWER PLANT	12/20/2010	GE LM6000PF-25 Turbines (4)	59900	hp ISO	Good Combustion Practices	0.0066	LB/MMBTU	BACT-PSD
INTERNATIONAL STATION POWER PLANT	12/20/2010	GE LM6000PF-25 Turbines (4)	59900	hp ISO	Good Combustion Practices	0 0066	LB/MMBTU	BACT-PSD
INTERNATIONAL STATION POWER PLANT	12/20/2010	GE LM6000PF-25 Turbines (4)	59900	hp ISO	Good Combustion Practices	0.0066	LB/MMBTU	BACT-PSD
KLEEN ENERGY SYSTEMS, LLC	02/25/2008	SIEMENS SGT6-5000F COMBUSTION TURBINE #1 AND #2 (NATURAL GAS FIRED) WITH 445 MMBTU/HR NATURAL GAS DUCT BURNER	2.1	MMCF/H		11	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	ACID GAS FLARE	0.27	MMBTU/H	GOOD DESIGN AND MONITORING TO ENSURE THE PRESENCE OF A FLAME AT THE FLARE TIP AT ALL THE TIME	0.01	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	SHIFT REACTOR STARTUP HEATER	34.2	MMBTU/H	GOOD DESIGN AND PROPER OPERATION	0.25	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	GASIFIER STARTUP PREHEATER BURNERS (5)	35	MMBTU/H	GOOD DESIGN AND PROPER OPERATION	0.03	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	THERMAL OXIDIZERS (2)	40.9	MMBTU/H	NO ADDITIONAL CONTROL	0.3	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	METHANATION STARTUP HEATERS	56.9	MMBTU/H	GOOD DESIGN AND PROPER OPERATION	0 42	LB/H	BACT-PSD
MEDICAL AREA TOTAL ENERGY PLANT	07/01/2016	Combustion Turbine with Duct Burner	203 4	MMBTU/H		0.02	LB/MMBTU	BACT-PSD
MEDICAL AREA TOTAL ENERGY PLANT	07/01/2016	Combustion Turbine with Duct Burner	203.4	MMBTU/H		0.02	LB/MMBTU	BACT-PSD
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	4000	h/yr	COMPLIANCE BY STACK TESTING	18 3	LB/H	BACT-PSD
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	4000	h/yr	USE OF NATURAL GAS A CLEAN BURNING FUEL	10.4	LB/H	BACT-PSD

Table C-2. Search Results for Particulate Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	4000	h/yr	COMPLIANCE BY STACK TESTING	18 3	LB/H	BACT-PSD
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	AUXILIARY BOILER	4000	H/YR	USE OF NATURAL GAS A CLEAN BURNING FUEL	0 181	LB/H	BACT-PSD
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	AUXILIARY BOILER	4000	H/YR	USE OF NATURAL GAS A CLEAN BURNING FUEL	0.488	LB/H	BACT-PSD
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	AUXILIARY BOILER	4000	H/YR	USE OF NATURAL GAS A CLEAN BURNING FUEL	0.488	LB/H	BACT-PSD
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	8040	H/YR	USE OF NATURAL GAS A CLEAN BURNING FUEL	4.4	LB/H	BACT-PSD
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	8040	H/YR	USE OF NATURAL GAS A CLEAN BURNING FUEL	11.7	LB/H	BACT-PSD
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	8040	H/YR	USE OF NATURAL GAS A CLEAN BURNING FUEL	11.7	LB/H	BACT-PSD
MOUNDSVILLE COMBINED CYCLE POWER PLANT	11/21/2014	Auxiliary Boiler	100	mmBtu/hr	Use of Natural Gas & Good Combustion Practices	0.5	LB/H	BACT-PSD
NUCOR STEEL	02/08/2010	GALVANIZING LINE BURNERS (83 TOTAL)	0			7.6	LB/MMCF OF NAT GAS*	OTHER CASE-BY-CASE
NUCOR STEEL - BERKELEY	05/05/2008	VACUUM DEGASSER BOILER	50 21	MMBTU/H	GOOD COMBUSTION PRACTICES PER MANUFACTURER'S GUIDANCE	0.0076	LB/MMBTU	BACT-PSD
NUCOR STEEL - BERKELEY	05/05/2008	TUNNEL FURNACE BURNERS	58	MMBTU/H	NATURAL GAS COMBUSTION WITH GOOD COMBUSTION PRACTICES PER MANUFACTURER'S GUIDANCE	0 0076	LB/MMBTU	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	Auxillary Boiler	99	MMBtu/H	Clean burning fuel, only burning natural gas	0.79	LB/H	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Mitsubishi, without duct burners	47917	MMSCF/rolling 12-MO	clean burning fuel, only natural gas	11 3	LB/H	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Mitsubishi, with duct burners	47917	MMSCF/rolling 12-MO	clean burning fuel, only natural gas	10.1	LB/H	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Siemens, with duct burners	51560	MMSCF/rolling 12-MO	clean burning fuel, only natural gas	14	LB/H	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Siemens, without duct burners	515600	MMSCF/rolling 12-months	clean burning fuel, only natural gas	13 3	LB/H	BACT-PSD

Table C-2. Search Results for Particulate Control Devices Install[illegible]Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	0		Use of clean burning fuel like natural gas	12	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	0		Use of natural gas a clean burning fuel	22.6	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	0		Use of natural gas a clean burning fuel	22.6	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Auxiliary Boiler firing natural gas	687	MMCFT/YR	Use of natural gas a clean burning	0.26	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Auxiliary Boiler firing natural gas	687	MMCFT/YR	use of natural gas a clean burning fuel	0 4	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Auxiliary Boiler firing natural gas	687	MMCFT/YR	use of natural gas a clean burning fuel	0 4	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	Combined Cycle Combustion Turbine -Siemens turbine without Duct Burner	33691	MMCF/YR	Use of Natural Gas as a clean burning fuel	10.5	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	Combined Cycle Combustion Turbine -Siemens turbine without Duct Burner	33691	MMCF/YR	USE OF NATURAL GAS A CLEAN BURNING FUEL	13	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	Combined Cycle Combustion Turbine -Siemens turbine without Duct Burner	33691	MMCF/YR	USE OF NATURAL GAS A CLEAN BURNING FUEL	13	LB/H	OTHER CASE-BY-CASE
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITH DUCT BURNER - SIEMENS	33691	MMCF/YR	Use of natural gas a clean burning fuel	10.6	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITH DUCT BURNER - SIEMENS	33691	MMCF/YR	Use of natural gas a clean burning fuel	14	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITH DUCT BURNER - SIEMENS	33691	MMCF/YR	Use of natural gas a clean burning fuel	14	LB/H	OTHER CASE-BY-CASE
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITH DUCT BURNER - GENERAL ELECTRIC	33691	MMCF/YR	Use of natural gas only as a clean burning fuel	14.6	LB/H	OTHER CASE-BY-CASE
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITH DUCT BURNER - GENERAL ELECTRIC	33691	MMCF/YR	Use of natural gas only as a clean burning fuel	14.6	LB/H	BACT-PSD

Table C-2. Search Results for Particulate Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITH DUCT BURNER - GENERAL ELECTRIC	33691	MMCF/YR	Use of Natural Gas a clean burning fuel	9.8	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITHOUT DUCT BURNER - GENERAL ELECTRIC	33691	MMCF/YR	Use of Natural Gas as a clean burning fuel	8 7	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITHOUT DUCT BURNER - GENERAL ELECTRIC	33691	MMCF/YR	Use of Natural Gas as a clean burning fuel	12.7	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITHOUT DUCT BURNER - GENERAL ELECTRIC	33691	MMCF/YR	Use of natural gas as a clean burning fuel	12.7	LB/H	OTHER CASE-BY-CASE
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	28169501	MMBTU/YR	USE OF NATURAL GAS A CLEAN BURNING FUEL	4.7	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	28169501	MMBTU/YR	Use of natural gas a clean burning fuel	14.4	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	28169501	MMBTU/YR	Use of natural gas a clean burning fuel	14.4	LB/H	BACT-PSD
RENAISSANCE POWER LLC	11/01/2013	EU-HEATERSC: Natural gas-fired fuel heater used for heating natural gas prior to combustion in the CTGs. Misc. boilers, furnaces, and heaters	20	MMBTU/H	Good combustion practices	0.009	LB/MMBTU	BACT-PSD
RENAISSANCE POWER LLC	11/01/2013	EU-HEATERSC: Natural gas-fired fuel heater used for heating natural gas prior to combustion in the CTGs Misc boilers, furnaces, and heaters	20	MMBTU/H	Good combustion practices	0.009	LB/MMBTU	BACT-PSD
RENAISSANCE POWER LLC	11/01/2013	EU-HEATERSC: Natural gas-fired fuel heater used for heating natural gas prior to combustion in the CTGs. Misc. boilers, furnaces, and heaters	20	MMBTU/H	Good combustion practices	0.009	LB/MMBTU	BACT-PSD
RENAISSANCE POWER LLC	11/01/2013	FG-AUXBOILER1-2; Two (2) natural gas-fired auxiliary boilers.	40	MMBTU/H	Good combustion practices.	0.005	LB/MMBTU	BACT-PSD
RENAISSANCE POWER LLC	11/01/2013	FG-AUXBOILER1-2, Two (2) natural gas-fired auxiliary boilers	40	MMBTU/H	Good combustion practices.	0.005	LB/MMBTU	BACT-PSD

Table C-2. Search Results for Particulate Control Devices Installe[illegible]atural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
RENAISSANCE POWER LLC	11/01/2013	FG-AUXBOILER1-2; Two (2) natural gas-fired auxiliary boilers.	40	MMBTU/H	Good combustion practices.	0.005	LB/MMBTU	BACT-PSD
SALEM HARBOR STATION REDEVELOPMENT	01/30/2014	Auxiliary Boiler	80	MMBTU/H		0.005	LB/MMBTU	BACT-PSD
SALEM HARBOR STATION REDEVELOPMENT	01/30/2014	Auxiliary Boiler	80	MMBTU/H		0.005	LB/MMBTU	BACT-PSD
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	DEW POINT HEATER	15	MMBTU/H		0.008	LB/MMBTU	OTHER CASE-BY-CASE
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	AUXILIARY BOILER (REPOWER)	106000	MMBTU		0.008	LB/MMBTU	OTHER CASE-BY-CASE
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	Combined Cycle Combustion Turbine AND DUCT BURNER (3)	2538000	MMBTU/H		0 0088	LB/MMBTU	OTHER CASE-BY-CASE
TROUTDALE ENERGY CENTER, LLC	03/05/2014	Auxiliary boiler	39.8	MMBTU/H	Good combustion practices; Utilize only natural gas.	0		BACT-PSD
WEST DEPTFORD ENERGY STATION	07/18/2014	Combined Cycle Combustion Turbine without Duct Burner	20282	MMCF/YR	Use of natural gas a clean burning fuel	6	LB/H	BACT-PSD
WEST DEPTFORD ENERGY STATION	07/18/2014	Combined Cycle Combustion Turbine without Duct Burner	20282	MMCF/YR	Use of natural gas a clean burning fuel	10	LB/H	BACT-PSD
WEST DEPTFORD ENERGY STATION	07/18/2014	Combined Cycle Combustion Turbine without Duct Burner	20282	MMCF/YR	Use of natural gas a clean burning fuel	10	LB/H	BACT-PSD
WEST DEPTFORD ENERGY STATION	07/18/2014	Combined Cycle Combustion Turbine with Duct Burner	20282	MMCF/YR	Use of Natural gas a clean burning fuel	15.1	LB/H	BACT-PSD
WEST DEPTFORD ENERGY STATION	07/18/2014	Combined Cycle Combustion Turbine with Duct Burner	20282	MMCF/YR	Use of Natural gas a clean burning fuel	21.55	LB/H	BACT-PSD
WEST DEPTFORD ENERGY STATION	07/18/2014	Combined Cycle Combustion Turbine with Duct Burner	20282	MMCF/YR	Use of Natural Gas a clean burning fuel	21.55	LB/H	BACT-PSD
WOODBRIDGE ENERGY CENTER	07/25/2012	Commercial/Institutional size boilers less than 100 MMBtu/hr	2000	hours/year	use of Natural gas	0.17	LB/H	OTHER CASE-BY-CASE
WOODBRIDGE ENERGY CENTER	07/25/2012	Commercial/Institutional size boilers less than 100 MMBtu/hr	2000	hours/year		0.46	LB/H	OTHER CASE-BY-CASE
WOODBRIDGE ENERGY CENTER	07/25/2012	Commercial/Institutional size boilers less than 100 MMBtu/hr	2000	hours/year	Use of Natural gas	0.46	LB/H	OTHER CASE-BY-CASE
WOODBRIDGE ENERGY CENTER	07/25/2012	Combined Cycle Combustion Turbine with Duct Burner	40297.6	mmcubic ft/year	Good Combustion Practices and use of Natural gas,a clean burning fuel.	8.2	LB/H	OTHER CASE-BY-CASE
WOODBRIDGE ENERGY CENTER	07/25/2012	Combined Cycle Combustion Turbine with Duct Burner	40297.6	mmcubic ft/year	Good Combustion Practices and use of Natural gas,a clean burning fuel.	19.1	LB/H	BACT-PSD

Table C-2. Search Results for Particulate Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
WOODBRIDGE ENERGY CENTER	07/25/2012	Combined Cycle Combustion Turbine with Duct Burner	40297.6	mmcubic ft/year	Good Combustion Practices and use of Natural gas,a clean burning fuel	19.1	LB/H	OTHER CASE-BY-CASE
WOODBRIDGE ENERGY CENTER	07/25/2012	Combined Cycle Combustion Turbine w/o duct burner	40297.6	mmcubic ft/year	use of natural gas only which is a clean burning fuel	4.8	LB/H	OTHER CASE-BY-CASE
WOODBRIDGE ENERGY CENTER	07/25/2012	Combined Cycle Combustion Turbine w/o duct burner	40297.6	mmcubic ft/year	Use of Natural gas,a clean burning fuel	12.1	LB/H	OTHER CASE-BY-CASE
WOODBRIDGE ENERGY CENTER	07/25/2012	Combined Cycle Combustion Turbine w/o duct burner	40297.6	mmcubic ft/year	use of natural gas only which is a clean burning fuel	12.1	LB/H	OTHER CASE-BY-CASE

Table C-3. Search Results for SOx Control Devices Installed o[illegible]ural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
Ovens								
NUCOR STEEL LOUISIANA	05/24/2010	SLG-402 - SLAG MILL DRYER STACK	75.4	T/H	BACT is to purchase natural gas containing no more than 2000 gr of Sulfur as Hydrogen Sulfide per MM scf.	0.02	LB/H	BACT-PSD
NUCOR STEEL LOUISIANA	05/24/2010	PCI-101 - PCI Mill Vent	85.1	MMBTU/H	purchase natural gas containing no more than 2000 grains of Sulfur per MM scf	0.06	LB/H	BACT-PSD
Dryers								
ADM CORN PROCESSING - CEDAR RAPIDS	06/29/2007	INDIRECT-FIRED DDGS DRYER	93.7	MMBTU/H		6	PPMVD	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	SMALL HEATERS AND DRYERS SN-05 THROUGH 19	0		COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE	5.88	X10^-4 LB/MMBTU	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	DRYERS, MGO COATING LINE	38	MMBTU/H	COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE	5.88	X10^-4 LB/MMBTU	BACT-PSD
DEGUSSA ENGINEERED CARBONS LP	11/29/2007	CARBON BLACK DRYER UNITS 1 AND 2			FEEDSTOCK OIL WITH NO MORE THAN 3% SULFUR CONTENT. FEEDSTOCK TESTING FOR SULFUR CONTENT, DAILY RECORDS.	290.4	LB/H	BACT-PSD
GP ALLENDALE LP	11/25/2008	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 18)	20.89	MMBTU/H		0.01	LB/H	BACT-PSD
GP CLARENDON LP	02/10/2009	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 17)	20.89	MMBTU/H		0.01	LB/H	BACT-PSD
GRAIN PROCESSING CORPORATION	12/08/2015	CORN GLUTEN FREE, GLUTEN, MALTODEXTRIN DRYERS	93	MMBTU/H	WET SCRUBBERS FOR ALL DRYERS	10	PPMV	BACT-PSD
HOMELAND ENERGY SOLUTIONS, LLC	08/26/2011	Two DDGS Dryers A & B/DDGS Cooling Drum/Distillation Equipment	250	MMBTU/H		0.02	LB/MMBTU	BACT-PSD
HOMELAND ENERGY SOLUTIONS, LLC	08/26/2011	Two DDGS Dryers C & D/DDGS Cooling Drum/Distillation Equipment	250	MMBTU/H		0.02	LB/MMBTU	BACT-PSD
LAKE CHARLES CHEMICAL COMPLEX ALUMINA UNIT	05/23/2014	Spray Dryer #3 Dust Collector Vent Stack (EQT 1004)	137	MM BTU/HR	Use of natural gas with a sulfur content of no more than 0.005 gr/scf (annual average)	8.06	LB/HR	BACT-PSD
LAKE CHARLES CHEMICAL COMPLEX ALUMINA UNIT	05/23/2014	Spray Dryer #4 Dust Collector Vent Stack (EQT 1005)	98	MM BTU/HR	Use of natural gas with a sulfur content of no more than 0.005 gr/scf (annual average)	5.81	LB/HR	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 1 Post-Dryer (S31)	7.7	MMBTU/H		0.0006	LB/MMBTU	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 2 Post - Dryer (S32)	7.7	MMBTU/H		0.0006	LB/MMBTU	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 3 Post - Dryer (S33)	7.7	MMBTU/H		0.0006	LB/MMBTU	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 4 Post - Dryer (S34)	7.7	MMBTU/H		0.0006	LB/MMBTU	BACT-PSD
NUCOR STEEL LOUISIANA	05/24/2010	SLG-402 - SLAG MILL DRYER STACK	75.4	T/H	BACT is to purchase natural gas containing no more than 2000 gr of Sulfur as Hydrogen Sulfide per MM scf.	0.02	LB/H	BACT-PSD
OHIO RIVER CLEAN FUELS, LLC	11/20/2008	GAS FIRED HEATERS (3)	4	MMBTU/H	GOOD COMBUSTION PRACTICES	0.01	LB/H	BACT-PSD

Table C-3. Search Results for SOx Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
OHIO RIVER CLEAN FUELS, LLC	11/20/2008	F-T CATALYST ROTARY DRYER	22564	SCF/H	GOOD COMBUSTION PRACTICES	0.02	LB/H	BACT-PSD
OHIO RIVER CLEAN FUELS, LLC	11/20/2008	COAL OR BIOMASS DRYING LINES (10)	31	MMBTU/H		0.24	LB/H	BACT-PSD
TATE & LYLE INDGREDIENTS AMERICAS, INC.	09/19/2008	STARCH DRYER (DIRECT-FIRED)	25	MMBTU/H	WET SCRUBBER	0.0001	LB/MMBTU	BACT-PSD
Burners								
DUKE ENERGY HANGING ROCK ENERGY	12/18/2012	Turbines (4) (model GE 7FA) Duct Burners Off	172	MW	Burning natural gas in an efficient combustion turbine burning low sulfur fuel	1.2	LB/H	BACT-PSD
DUKE ENERGY HANGING ROCK ENERGY	12/18/2012	Turbines (4) (model GE 7FA) Duct Burners On	172	MW	Burning natural gas in an efficient combustion turbine burning low sulfur fuel	1.52	LB/H	BACT-PSD
HESS NEWARK ENERGY CENTER	11/01/2012	Boiler less than 100 MMBtu/hr	51.9	mmcubic ft/year	use of natural gas a clean fuel and a low sulfur fuel	0.08	LB/H	N/A
HESS NEWARK ENERGY CENTER	11/01/2012	Combined cylce turbine with duct burner	39463	mmcubic ft/year*	Use of natural gas, a clean low sulfur fuel	2.5	LB/H	N/A
HESS NEWARK ENERGY CENTER	11/01/2012	Combined Cycle Combustion Turbine	39463	MMCubic ft/yr	Use of natural gas a clean low sulfur fuel	2.8	LB/H	N/A
INDIANA GASIFICATION, LLC	06/27/2012	FIVE (5) GASIFIER PREHEAT BURNERS	35	MMBTU/H, EACH	USE OF CLEAN BURNING GASEOUS FUEL	0.0006	LB/MMBTU	BACT-PSD
KLEEN ENERGY SYSTEMS, LLC	02/25/2008	SIEMENS SGT6-5000F COMBUSTION TURBINE #1 AND #2 (NATURAL GAS FIRED) WITH 445 MMBTU/HR NATURAL GAS DUCT BURNER	2.1	MMCF/H		4 9	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	ACID GAS FLARE	0.27	MMBTU/H	NO ADDITIONAL CONTROL	0.01	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	SHIFT REACTOR STARTUP HEATER	34.2	MMBTU/H	FUELED BY NATURAL GAS OR SUBSTITUTE NATURAL GAS (SNG)	0.02	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	GASIFIER STARTUP PREHEATER BURNERS (5)	35	MMBTU/H	FUELED BY NATURAL GAS OR SUBSTITUTE NATURAL GAS (SNG)	0.02	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	THERMAL OXIDIZERS (2)	40.9	MMBTU/H	NO ADDITIONAL CONTROL	22.92	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	METHANATION STARTUP HEATERS	56.9	MMBTU/H	FUELED BY NATURAL GAS OR SUBSTITUTE NATURAL GAS (SNG)	0.03	LB/H	BACT-PSD
MEDICAL AREA TOTAL ENERGY PLANT	07/01/2016	Combustion Turbine with Duct Burner	203.4	MMBTU/H	clean fuels - using natural gas as primary fuel and ultra low sulfur diesel as backup fuel.	0.6	PPMVD@15% O2	OTHER CASE-BY-CASE
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	4000	h/yr	USE OF NATURAL GAS A LOW SULFUR FUEL CLEAN FUEL	6.64	LB/H	OTHER CASE-BY-CASE
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	AUXILIARY BOILER	4000	H/YR	USE OF NATURAL GAS A CLEAN BURNING LOW SULFUR FUEL	0.128	LB/H	OTHER CASE-BY-CASE
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	8040	H/YR	USE OF NATURAL GAS A CLEAN BURNING LOW SULFUR FUEL	5.62		OTHER CASE-BY-CASE
NUCOR STEEL - BERKELEY	05/05/2008	VACUUM DEGASSER BOILER	50.21	MMBTU/H	NATURAL GAS COMBUSTION WITH GOOD COMBUSTION PRACTICES PER MANUFACTURER'S GUIDANCE	0.0006	LB/MMBTU	BACT-PSD

Table C-3. Search Results for SOx Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
NUCOR STEEL - BERKELEY	05/05/2008	TUNNEL FURNACE BURNERS	58	MMBTU/H	NATURAL GAS COMBUSTION WITH GOOD COMBUSTION PRACTICES PER MANUFACTURER'S GUIDANCE	0.0006	LB/MMBTU	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Mitsubishi, without duct burners	47917	MMSCF/rolling 12-MO	low sulfur fuel, only burning natural gas with 0.5 GR/100 SCF	0.0014	LB/MMBTU	N/A
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Mitsubishi, with duct burners	47917	MMSCF/rolling 12-MO	low sulfur fuel, only burning natural gas with 0.5 GR/100 SCF	0 0014	LB/MMBTU	N/A
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Siemens, with duct burners	51560	MMSCF/rolling 12-MO	low sulfur fuel, only burning natural gas with 0 5 GR/100 SCF	0.0014	LB/MMBTU	N/A
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Siemens, without duct burners	515600	MMSCF/rolling 12-months	low sulfur fuel, only burning natrual gas with GR/100 SCF	0 0014	LB/MMBTU	N/A
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	0		use of natural gas a low sulfur fuel	10.3	LB/H	OTHER CASE-BY-CASE
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Auxiliary Boiler firing natural gas	687	MMCFT/YR	Use of natural gas a low sulfur fuel	0 12	LB/H	OTHER CASE-BY-CASE
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	Combined Cycle Combustion Turbine - Siemens turbine without Duct Burner	33691	MMCF/YR	USE OF NATURAL GAS A CLEAN BURNING FUEL	5	LB/H	OTHER CASE-BY-CASE
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITH DUCT BURNER - SIEMENS	33691	MMCF/YR	Use of natural gas a clean burning fuel	5.1	LB/H	OTHER CASE-BY-CASE
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITH DUCT BURNER - GENERAL ELECTRIC	33691	MMCF/YR	Use of natural gas only as a clean burning fuel	5.2	LB/H	OTHER CASE-BY-CASE
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITHOUT DUCT BURNER - GENERAL ELECTRIC	33691	MMCF/YR	Use of Natural gas a low sulfur fuel	4.9	LB/H	OTHER CASE-BY-CASE
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	28169501	MMBTU/YR	Use of natural gas which is low sulfur fuel	8.5	LB/H	OTHER CASE-BY-CASE
SALEM HARBOR STATION REDEVELOPMENT	01/30/2014	Auxiliary Boiler	80	MMBTU/H		0.9	PPMVD@3% O2	OTHER CASE-BY-CASE
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	DEW POINT HEATER	15	MMBTU/H		0.003	LB/MMBTU	OTHER CASE-BY-CASE
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	AUXILIARY BOILER (REPOWER)	106000	MMBTU		0.003	LB/MMBTU	OTHER CASE-BY-CASE

Table C-3. Search Results for SOx Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	Combined Cycle Combustion Turbine AND DUCT BURNER (3)	2538000	MMBTU/H		0.0024	LB/MMBTU	OTHER CASE-BY-CASE
WEST DEPTFORD ENERGY STATION	07/18/2014	Combined Cycle Combustion Turbine without Duct Burner	20282	MMCF/YR	Use of natural gas a clean burning fuel	4 94	LB/H	BACT-PSD
WEST DEPTFORD ENERGY STATION	07/18/2014	Combined Cycle Combustion Turbine with Duct Burner	20282	MMCF/YR	Use of natural gas a clean burning fuel	6.56	LB/H	BACT-PSD
WOODBRIDGE ENERGY CENTER	07/25/2012	Commercial/Institutional size boilers less than 100 MMBtu/hr	2000	hours/year	Use of natural gas	0.162	LB/H	OTHER CASE-BY-CASE
WOODBRIDGE ENERGY CENTER	07/25/2012	Combined Cycle Combustion Turbine with Duct Burner	40297.6	mmcubic ft/year	Good Combustion Practices and use of Natural gas,a clean burning fuel.	4.9	LB/H	OTHER CASE-BY-CASE
WOODBRIDGE ENERGY CENTER	07/25/2012	Combined Cycle Combustion Turbine w/o duct burner	40297 6	mmcubic ft/year	Use of only natural gas a clean burning fuel	4.1	LB/H	OTHER CASE-BY-CASE

Table C-4. Search Results for NOx Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
Ovens								
NC COMMUNICATION TECH	01/06/2007	DRYER OR OVEN, DIRECT OR INDIRECT	5.4	MMBTU/H	LOW NOX -BURNER	18	PPMVD@3%O2	BACT-PSD
NUCOR STEEL LOUISIANA	05/24/2010	PCI-101 - PCI Mill Vent	85.1	MMBTU/H	Good combustion practices	5.07	LB/H	BACT-PSD
NUCOR STEEL LOUISIANA	05/24/2010	SLG-402 - SLAG MILL DRYER STACK	75.4	T/H	LOW NOX FUEL COMBUSTION	1.34	LB/H	BACT-PSD
VOLKSWAGEN GROUP OF AMERICA, CHATTANOOGA OPERATIONS	12/03/2012	CLEARCOAT DRYING OVENS THERMAL OXIDIZER (2)	6.82	MMBTU/H	LOW-NOX BURNERS	3.1	LB/H	BACT-PSD
VOLKSWAGEN GROUP OF AMERICA, CHATTANOOGA OPERATIONS	10/10/2008	CLEARCOAT DRYING OVENS THERMAL OXIDIZERS (2)	8.19	MMBTU/H	LOW NOX BURNERS	0		BACT-PSD
VOLKSWAGEN GROUP OF AMERICA, CHATTANOOGA OPERATIONS	10/10/2008	DRYING OVENS	6.47	MMBTU/H	LOW-NOX BURNERS OR EQUIVALENT CONTROL	0.05	LB/MMBTU	BACT-PSD
VOLKSWAGEN GROUP OF AMERICA, CHATTANOOGA OPERATIONS	10/10/2008	E-COAT DRYING OVEN THERMAL OXIDIZERS (2)	8.87	MMBTU/H	LOW-NOX BURNER	0.05	LB/MMBTU	BACT-PSD
VOLKSWAGEN GROUP OF AMERICA, CHATTANOOGA OPERATIONS	12/03/2012	E-COAT DRYING OVEN THERMAL OXIDIZERS (2)	6.82	MMBTU/H	LOW NOX BURNERS	2.52	LB/H	BACT-PSD
Dryers								
ALLOYS PLANT	10/09/2015	TWO 4.44 MMBTU/HR STRIP DRYERS	4.44	MMBTU/H	LOW NOX BURNER	0.07	LB/MMBTU	OTHER CASE-BY-CASE
ALLOYS PLANT	10/09/2015	TWO 1.37 MMBTU/HR STRIP DRYERS	1.37	MMBTU/H	LOW NOX BURNER	0.07	LB/MMBTU	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	SMALL HEATERS AND DRYERS SN-05 THROUGH 19	0		LOW NOX BURNERS COMBUSTION OF CLEAN FUEL GOOD COMBUSTION PRACTICES	0.08	LB/MMBTU	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	DRYERS, MGO COATING LINE	38	MMBTU/H	LOW NOX BURNERS COMBUSTION OF CLEAN FUEL GOOD COMBUSTION PRACTICES	0.1	LB/MMBTU	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	SMALL HEATERS AND DRYERS SN-05 THROUGH 19	0		GOOD OPERATING PRACTICES	0.0002	LB/MMBTU	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	DRYERS, MGO COATING LINE	38	MMBTU/H	GOOD OPERATING PRACTICES	0.0002	LB/MMBTU	BACT-PSD
CARBO CERAMICS INC. - MILLEN FACILITY	04/06/2012	SPRAY DRYER	47	MMBTU/H	GOOD COMBUSTION TECHNIQUES. TEST METHOD 7 OR 7E	8.3	LB/H	BACT-PSD

Table C-4. Search Results for NOx Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
DEGUSSA ENGINEERED CARBONS LP	11/29/2007	CARBON BLACK DRYER UNITS 1 AND 2				56	LB/H	BACT-PSD
FLAKEBOARD AMERICA LIMITED - BENNETTSVILLE MDF	12/22/2009	FACE PRIMARY DRYER	45	MMBTU/H	LOW-NOX BURNERS	0		BACT-PSD
FLAKEBOARD AMERICA LIMITED - BENNETTSVILLE MDF	12/22/2009	CORE PRIMARY DRYER	45	MMBTU/H	LOW-NOX BURNERS	0		BACT-PSD
GERDAU AMERISTEEL WILTON	05/29/2007	NORTH LADLE DRYER	5	MMBTU/H	GOOD COMBUSTION PRACTICES	100	LB/MMCF	BACT-PSD
GERDAU AMERISTEEL WILTON	05/29/2007	SOUTH LADLE DRYERS AND PREHEATERS	5	MMBTU/H	GOOD COMBUSTION CONTROLS	100	LB/MMCF	BACT-PSD
GERDAU AMERISTEEL WILTON	05/29/2007	NORTHWEST LADLE DRYERS	5	MMBTU/H	GOOD COMBUSTION CONTROLS	100	LB/MMCF	BACT-PSD
GP ALLENDALE LP	11/25/2008	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 18)	20 89	MMBTU/H		1.99	LB/H	BACT-PSD
GP CLARENDON LP	02/10/2009	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 17)	20.89	MMBTU/H		1 99	LB/H	BACT-PSD
GRAIN PROCESSING CORPORATION	11/23/2011	GLUTEN DRYER NO. 2	30	MMBTU/H	LOW-NOX BURNERS AND FLUE GAS REIRCULATION	0.06	LB/MMBTU	OTHER CASE-BY-CASE
GRAIN PROCESSING CORPORATION	12/08/2015	CORN GLUTEN FREE, GLUTEN, MALTODEXTRIN DRYERS	93	MMBTU/H	LOW NOX BURNERS WITH FLUE GAS RECIRCULATION. STEAM INJECTION FOR GERM DRYER	0.047	LB/MMBTU	BACT-PSD
LAKE CHARLES CHEMICAL COMPLEX ALUMINA UNIT	05/23/2014	Spray Dryer #3 Dust Collector Vent Stack (EQT 1004)	137	MM BTU/HR	Low NOx burners	5.2	LB/HR	BACT-PSD
LAKE CHARLES CHEMICAL COMPLEX ALUMINA UNIT	05/23/2014	Spray Dryer #4 Dust Collector Vent Stack (EQT 1005)	98	MM BTU/HR	Low NOx burners	3.74	LB/HR	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 1 Post-Dryer (S31)	7.7	MMBTU/H		0.06	LB/MMBTU	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 2 Post - Dryer (S32)	7.7	MMBTU/H		0.06	LB/MMBTU	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 3 Post - Dryer (S33)	7.7	MMBTU/H		0.06	LB/MMBTU	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 4 Post - Dryer (S34)	7.7	MMBTU/H		0.06	LB/MMBTU	BACT-PSD
NC COMMUNICATION TECH	01/06/2007	DRYER OR OVEN, DIRECT OR INDIRECT	5 4	MMBTU/H	LOW NOX -BURNER	18	PPMVD@3%O2	BACT-PSD
NUCOR STEEL LOUISIANA	05/24/2010	SLG-402 - SLAG MILL DRYER STACK	75 4	T/H	LOW NOX FUEL COMBUSTION	1.34	LB/H	BACT-PSD

Table C-4. Search Results for NOx Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
OHIO RIVER CLEAN FUELS, LLC	11/20/2008	GAS FIRED HEATERS (3)	4	MMBTU/H	GOOD COMBUSTION PRACTICES	1.13	LB/H	BACT-PSD
OHIO RIVER CLEAN FUELS, LLC	11/20/2008	F-T CATALYST ROTARY DRYER	22564	SCF/H	GOOD COMBUSTION PRACTICES	2.26	LB/H	BACT-PSD
OHIO RIVER CLEAN FUELS, LLC	11/20/2008	COAL OR BIOMASS DRYING LINES (10)	31	MMBTU/H	LOW NOX BURNERS	1.32	LB/H	BACT-PSD
PYRAMAX CERAMICS, LLC - KING'S M:U FACILITY	01/27/2012	SPRAY DRYERS/PETTETIZERS	75	MMBTU/H	LOW NOX BURNERS AND GOOD COMBUSTION TECHNOLGY/PRACTICE	2.25	LB/H EA	BACT-PSD
SAGOLA MILL	01/31/2008	NATURAL GAS THERMAL OIL HEATER			GOOD COMBUSTION PRACTICES	2.83	LB/H	BACT-PSD
STEEL DYNAMICS, INC. (SDI) - ENGINEERED BAR **	03/12/2010	PREHEATERS/DRYERS	0		LOW NOX BURNERS	0.1	LB/MMBTU OF NOX	OTHER CASE-BY-CASE
TATE & LYLE INDGREDIENTS AMERICAS, INC.	09/19/2008	STARCH DRYER (DIRECT-FIRED)	25	MMBTU/H		0.04	LB/MMBTU	BACT-PSD
Burners								
AUBURNDALE CITRUS FACILITY	06/12/2008	COGEN SYSTEM TURBINE NO. 1 W/EXISTING DUCT BURNER #1	62.7	MMBTU/H	DRY LOW NOX BURNERS	25	PPMVD	BACT-PSD
AUBURNDALE CITRUS FACILITY	06/12/2008	COGEN SYSTEM TURBINE #2 W/EXISTING DUCT BURNER #2	62 7	MMBTU/H	DRY LOW NOX BURNERS	25	PPMVD	BACT-PSD
DUKE ENERGY HANGING ROCK ENERGY	12/18/2012	Turbines (4) (model GE 7FA) Duct Burners Off	172	MW	Dry Low NOx burners and Selective Catalytic Reduction	21.1	LB/H	BACT-PSD
DUKE ENERGY HANGING ROCK ENERGY	12/18/2012	Turbines (4) (model GE 7FA) Duct Burners On	172	MW	Dry Low NOx burners and Selective Catalytic Reduction	27.6	LB/H	BACT-PSD
GROSSMONT HOSPITAL	11/06/2012	Two 29.4 MMBtu/hr Boilers with low NOx burners	0		Low NOx burners	9	PPMVD@3% O2	OTHER CASE-BY-CASE
HESS NEWARK ENERGY CENTER	11/01/2012	Boiler less than 100 MMBtu/hr	51.9	mmcubic ft/year	Low NOx burners and flue gas recirculation	0.01	LB/MMBTU	LAER
HESS NEWARK ENERGY CENTER	11/01/2012	Combined cylce turbine with duct burner	39463	mmcubic ft/year*	Selelctive catalytic reduction (SCR) system	2	PPMVD	LAER
HESS NEWARK ENERGY CENTER	11/01/2012	Combined Cycle Combustion Turbine	39463	MMCubic ft/yr	Selective Catalytic Reduction (SCR) System and use of natural gas a clean burning fuel	0.75	LB/H	LAER
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Fuel pre-heater (EUFUELHTR)	3.7	MMBTU/H	Good combustion practices.	0.55	LB/H	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Auxiliary Boiler A (EUAUXBOILERA)	55	MMBTU/H	Low NOx burners and good combustion practices	0.05	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Auxiliary Boiler B (EUAUXBOILERB)	95	MMBTU/H	Dry low NOx burners, flue gas recirculation and good combustion practices.	0.05	LB/MMBTU	BACT-PSD

Table C-4. Search Results for NOx Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Emergency Engine--natural gas (EUNGENGINE)	1000	kW	Good combustion practices	2	G/HP-H	BACT-PSD
INDIANA GASIFICATION, LLC	06/27/2012	FIVE (5) GASIFIER PREHEAT BURNERS	35	MMBTU/H, EACH	GOOD COMBUSTION PRACTICES	0.1	LB/MMBTU	BACT-PSD
INDIANA GASIFICATION, LLC	06/27/2012	REGENERATIVE THERMAL OXIDIZER (RTO) ON THE ACID GAS REMOVAL UNIT VENTS (AGR)	38 8	MMBTU/H, EACH	LOW NOX PERFORMANCE WITH NATURAL GAS INJECTION SYSTEM	1.98	LB/H	BACT-PSD
INTERNATIONAL STATION POWER PLANT	12/20/2010	Sigma Thermal Auxiliary Heater (1)	12.5	MMBTU/H	Low NOx Burners and Flue Gas Recirculation	32	LB/MMSCF	BACT-PSD
INTERNATIONAL STATION POWER PLANT	12/20/2010	Duct Burners (4)	140	MMBTU/H	Selective Catalytic Reduction	5	PPMDV	BACT-PSD
INTERNATIONAL STATION POWER PLANT	12/20/2010	GE LM6000PF-25 Turbines (4)	59900	hp ISO	Selective Catalytic Reduction and Dry Low NOx Combustion	5	PPMDV	BACT-PSD
KLEEN ENERGY SYSTEMS, LLC	02/25/2008	SIEMENS SGT6-5000F COMBUSTION TURBINE #1 AND #2 (NATURAL GAS FIRED) WITH 445 MMBTU/HR NATURAL GAS DUCT BURNER	2.1	MMCF/H	LOW NOX BURNER AND SELECTIVE CATALYTIC REDUCTION	15.5	LB/H	LAER
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	ACID GAS FLARE	0.27	MMBTU/H	NO ADDITIONAL CONTROL	0.05	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	SHIFT REACTOR STARTUP HEATER	34 2	MMBTU/H	GOOD DESIGN AND PROPER OPERATION	3.35	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	GASIFIER STARTUP PREHEATER BURNERS (5)	35	MMBTU/H	GOOD DESIGN AND PROPER OPERATION	3.85	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	THERMAL OXIDIZERS (2)	40 9	MMBTU/H	NO ADDITIONAL CONTROL	2.45	LB/H	BACT-PSD
LAKE CHARLES GASIFICATION FACILITY	06/22/2009	METHANATION STARTUP HEATERS	56 9	MMBTU/H	GOOD DESIGN AND PROPER OPERATION	5.58	LB/H	BACT-PSD
MEDICAL AREA TOTAL ENERGY PLANT	07/01/2016	Combustion Turbine with Duct Burner	203.4	MMBTU/H	Dry Low NOx Combustor & Selective Catalytic Reduction	2	PPMVD@15% O2	OTHER CASE-BY-CASE
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	4000	h/yr	SELECTIVE CATALYTIC REDUCTION AND DRY LOW NOX	2	PPMVD@15%O2	LAER
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	AUXILIARY BOILER	4000	H/YR	Low NOx burners and Flue Gas Recirculation (FGR) and use of natural gas a clean burning fuel	0 975	LB/H	LAER
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	8040	H/YR	Selective Catalytic Reduction System and Dry Low NOx	2	PPMVD@15%O2	LAER
MOUNDSVILLE COMBINED CYCLE POWER PLANT	11/21/2014	Auxiliary Boiler	100	mmBtu/hr	Ultra Low-NOx Burners, Flue-Gas Recirculation, & Good Combustion Practices	2	LB/H	BACT-PSD
NUCOR STEEL - BERKELEY	05/05/2008	VACUUM DEGASSER BOILER	50.21	MMBTU/H	ULTRA-LOW NOX NATURAL GAS FIRED BURNERS	0.035	LB/MMBTU	BACT-PSD
NUCOR STEEL - BERKELEY	05/05/2008	TUNNEL FURNACE BURNERS	58	MMBTU/H	LOW NOX BURNERS	0.1	LB/MMBTU	BACT-PSD

Table C-4. Search Results for NOx Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
OREGON CLEAN ENERGY CENTER	06/18/2013	Auxiliary Boiler	99	MMBtu/H	low NOx burners and flue gas recirculation	1.98	LB/H	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Mitsubishi, without duct burners	47917	MMSCF/rolling 12-MO	selective catalytic reduction (SCR); dry low NOx combustors; lean fuel technology	22.6	LB/H	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Mitsubishi, with duct burners	47917	MMSCF/rolling 12-MO	selective catalytic reduction (SCR); dry low NOx combustors; lean fuel technology	20.8	LB/H	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Siemens, with duct burners	51560	MMSCF/rolling 12-MO	selective catalytic reduction (SCR); dry low NOx combustors; lean fuel technology	21	LB/H	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Siemens, without duct burners	515600	MMSCF/rolling 12-months	selective catalytic reduction (SCR); dry low NOx combustors; lean fuel technology	22	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	0		SCR and use of natural gas a clean burning fuel	2	PPMVD@15%O2	LAER
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Auxiliary Boiler firing natural gas	687	MMCFT/YR	low NOx burners and flue gas recirculation (FGR)	0.8	LB/H	LAER
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	Combined Cycle Combustion Turbine - Siemens turbine without Duct Burner	33691	MMCF/YR	Selective Catalytic Reduction and Dry Low NOx	2	PPMVD@ 15% O2	LAER
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITH DUCT BURNER - SIEMENS	33691	MMCF/YR	Selective Catalytic Reduction System (SCR)	2	PPMVD	LAER
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITH DUCT BURNER - GENERAL ELECTRIC	33691	MMCF/YR	Selective Catalytic Reduction Systems(SCR) and Dry Low NOx	2	PPMVD@15%O2	LAER
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITHOUT DUCT BURNER - GENERAL ELECTRIC	33691	MMCF/YR	Selective Catalytic Reduction System (SCR) and Dry Low NOx	2	PPMVD@15%O2	LAER
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	28169501	MMBTU/YR	SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM	2	PPMVD@15%O2	LAER
RENAISSANCE POWER LLC	11/01/2013	EU-HEATERSC: Natural gas-fired fuel heater used for heating natural gas prior to combustion in the CTGs Misc. boilers, furnaces, and heaters	20	MMBTU/H	Good combustion practices	0.15	LB/MMBTU	BACT-PSD

Table C-4. Search Results for NOx Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
RENAISSANCE POWER LLC	11/01/2013	FG-AUXBOILER1-2; Two (2) natural gas-fired auxiliary boilers.	40	MMBTU/H	Good combustion practices.	0 035	LB/MMBTU	BACT-PSD
SALEM HARBOR STATION REDEVELOPMENT	01/30/2014	Auxiliary Boiler	80	MMBTU/H	ultra low NOx burners	0 011	LB/MMBTU	LAER
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	DEW POINT HEATER	15	MMBTU/H		0 085	LB/MMBTU	OTHER CASE-BY-CASE
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	AUXILIARY BOILER (REPOWER)	106000	MMBTU		0.036	LB/MMBTU	OTHER CASE-BY-CASE
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	Combined Cycle Combustion Turbine AND DUCT BURNER (3)	2538000	MMBTU/H	SCR	2	PPM	OTHER CASE-BY-CASE
TROUTDALE ENERGY CENTER, LLC	03/05/2014	Auxiliary boiler	39 8	MMBTU/H	Utilize Low-NOx burners and FGR.	0.035	LB/MMBTU	BACT-PSD
WEST DEPTFORD ENERGY STATION	07/18/2014	Combined Cycle Combustion Turbine without Duct Burner	20282	MMCF/YR	Selective Catalytic Reduction System (SCR) and use of natural gas a clean burning fuel	2	PPMVD@15%O2	LAER
WEST DEPTFORD ENERGY STATION	07/18/2014	Combined Cycle Combustion Turbine with Duct Burner	20282	MMCF/YR	Selective Catalytic reduction (SCR) and use of natural gas a clean burning fuel	23	LB/H	LAER
WOODBRIDGE ENERGY CENTER	07/25/2012	Commercial/Institutional size boilers less than 100 MMBtu/hr	2000	hours/year	Low NOx burners	0.01	LB/MMBTU	LAER
WOODBRIDGE ENERGY CENTER	07/25/2012	Combined Cycle Combustion Turbine with Duct Burner	40297 6	mmcubic ft/year	Low NOx burners and Selective Catalytic Reduction System	19.8	LB/H	LAER
WOODBRIDGE ENERGY CENTER	07/25/2012	Combined Cycle Combustion Turbine w/o duct burner	40297.6	mmcubic ft/year	DLN combustion system with SCR on each of the two combustion turbines and use of only natural gas as fuel.	2	PPMVD	LAER

Table C-5. Search Results for VOC Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
Ovens								
ALLEN FOODS, INC.	01/08/2013	BUN OVEN (048)	8.4	MMBTU/H	CATALYTIC OXIDIZER	4.3	LB/H	OTHER CASE-BY-CASE
ALLEN FOODS, INC.	01/08/2013	BREAD OVEN (028)	10.08	MMBTU/H	CATALYTIC OXYDIZER	4.3	LB/H	OTHER CASE-BY-CASE
HEXCEL CORPORATION	11/25/2009	PURGE CURE OVENS 26, 27, 28			2 REGENERATIVE THERMAL OXIDIZERS.	300	T	BACT-PSD
KENWORTH TRUCK CO.	01/29/2008	DRYING OVENS AND FLASH TUNNES FOR CAB BOOTHS	4.58	MMBTU/H		9.63	LB/H	BACT-PSD
NEWCO METALS, INC.	01/08/2016	THERMAL SCRAP PRE-TREATMENT OVEN EU-01 THROUGH EU-03	2	MMBTU/H	TWO AFTERBURNERS PER OVEN OPERATING IN SERIES	0.4	LB/T OF SCRAP	OTHER CASE-BY-CASE
NUCOR STEEL LOUISIANA	05/24/2010	SLG-402 - SLAG MILL DRYER STACK	75.4	T/H	GOOD COMBUSTION PRACTICES	0.15	LB/H	BACT-PSD
NUCOR STEEL LOUISIANA	05/24/2010	PCI-101 - PCI Mill Vent	85.1	MMBTU/H	good combustion practices	0.56	LB/H	BACT-PSD
PERFECTION BAKERIES, INC.	06/30/2016	BREAD BAKING LINE EU01, OVEN EU02, PROOF BOX EU03	66.88	MMBTU/H		70	T/12CONSECT MON PERD	OTHER CASE-BY-CASE
SUBARU OF INDIANA AUTOMOTIVE, INC.	12/23/2014	PAINT HEATERS, OVENS	50	MMBTU/H		0.005	LB/MMBTU	BACT-PSD
SUBARU OF INDIANA AUTOTMOTIVE, INC.	10/4/2012	ED CURING OVEN	6	MMBTU/H	CATALYTIC INCINERATOR	90	% DESTRUCTION	BACT-PSD
Dryers								
ADM CORN PROCESSING - CEDAR RAPIDS	06/29/2007	INDIRECT-FIRED DDGS DRYER	93.7	MMBTU/H	ROUTE PROCESS OFF-GASSES THROUGH THE DRYERS COMBUSTION CHAMBER.	98	% REDUCTION	BACT-PSD
ALLOYS PLANT	10/09/2015	TWO 4.44 MMBTU/HR STRIP DRYERS	4.44	MMBTU/H		0.006	LB/MMBTU	OTHER CASE-BY-CASE

Table C-5. Search Results for VOC Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
ALLOYS PLANT	10/09/2015	TWO 1 37 MMBTU/HR STRIP DRYERS	1 37	MMBTU/H	GCP	0.006	LB/MMBTU	BACT-PSD
AVON PARK FACILITY/GARGILL JUICE NORTH AMERICA	03/29/2007	PEEL DRYER WITH WASTE HEAT RECOVERY	62.4	MMBTU/H	PROCESS IMPROVEMENTS (I.E. CENTRIFUGES, ETC) TO RECOVER MORE CITRUS OIL.	85	%	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	SMALL HEATERS AND DRYERS SN-05 THROUGH 19	0		COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE	0.0054	LB/MMBTU	BACT-PSD
BIG RIVER STEEL LLC	09/18/2013	DRYERS, MGO COATING LINE	38	MMBTU/H	COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE	0 0054	LB/MMBTU	BACT-PSD
CARBO CERAMICS INC. - MILLEN FACILITY	04/06/2012	SPRAY DRYER	47	MMBTU/H		6.82	T/YR	BACT-PSD
CUSTOM BLENDERS INDIANA, INC.	07/09/2014	DRYER	10	MMBTU/H		1.75	LB/TON RAW MATERIAL	OTHER CASE-BY-CASE
DEGUSSA ENGINEERED CARBONS LP	11/29/2007	CARBON BLACK DRYER UNITS 1 AND 2				19.5	LB/H	BACT-PSD
FLAKEBOARD AMERICA LIMITED - BENNETTSVILLE MDF	12/22/2009	FACE PRIMARY DRYER	45	MMBTU/H	GOOD COMBUSTION PRACTICES AND NATURAL GAS AS FUEL	0		BACT-PSD
FLAKEBOARD AMERICA LIMITED - BENNETTSVILLE MDF	12/22/2009	CORE PRIMARY DRYER	45	MMBTU/H	GOOD COMBUSTION PRACTICES AND NATURAL GAS AS FUEL	0		BACT-PSD
GP ALLENDALE LP	11/25/2008	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 18)	20.89	MMBTU/H		0.11	LB/H	BACT-PSD
GP CLARENDON LP	02/10/2009	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 17)	20.89	MMBTU/H		0.11	LB/H	BACT-PSD
GRAIN PROCESSING CORPORATION	09/13/2013	STARCH DRYER	30	MMBTU/H		7.7	LB/H	BACT-PSD
GRAIN PROCESSING CORPORATION	09/13/2013	STARCH DRYER	30	MMBTU/H		7.7	LB/H	BACT-PSD

Table C-5. Search Results for VOC Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
GRAIN PROCESSING CORPORATION	12/08/2015	CORN GLUTEN FREE, GLUTEN, MALTODEXTRIN DRYERS	93	MMBTU/H	THERMAL OXIDIZERS - GERM DRYERS, CGF DRYERS, GLUTEN DRYER MALTODEXTRIN DRYER - WET SCRUBBER	10	PPMV	BACT-PSD
LAKE CHARLES CHEMICAL COMPLEX ALUMINA UNIT	05/23/2014	Spray Dryer #3 Dust Collector Vent Stack (EQT 1004)	137	MM BTU/HR	Limiting the ethanol content of the spray dryer slurry feed streams to no more than 450 parts per million by weight (ppmw) (12 month rolling average)	147.41	LB/HR	BACT-PSD
LAKE CHARLES CHEMICAL COMPLEX ALUMINA UNIT	05/23/2014	Spray Dryer #4 Dust Collector Vent Stack (EQT 1005)	98	MM BTU/HR	Limiting the ethanol content of the spray dryer slurry feed streams to no more than 450 parts per million by weight (ppmw) (12 month rolling average)	98.75	LB/HR	BACT-PSD
METAL TECHNOLOGIES AUBURN, LLC	08/19/2015	NATURAL GAS-FIRED THERMAL CHIP DRYER	15	TONS OF METAL CHIPS AND MACHINING OIL PER HOUR	THERMAL OXIDIZER	98	% OVERALL CONTROL	OTHER CASE-BY-CASE
MGPI OF INDIANA	05/11/2015	DDG DRYER (EU-39)	45	MMBTU/H	RTO	1.91	LB/H	OTHER CASE-BY-CASE
MOUNT VERNON MILL	03/25/2010	Line 1 Post-Dryer (S31)	7 7	MMBTU/H		0.0055	LB/MMBTU	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 2 Post - Dryer (S32)	7 7	MMBTU/H		0.0055	LB.MMBTU	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 3 Post - Dryer (S33)	7.7	MMBTU/H		0.0055	LB/MMBTU	BACT-PSD
MOUNT VERNON MILL	03/25/2010	Line 4 Post - Dryer (S34)	7.7	MMBTU/H		0 0055	LB/MMBTU	BACT-PSD
NATURALLY RECYCLED PROTEINS OF INDIANA, LLC	08/19/2011	ONE (1) NATURAL GAS DRYER EP1	15	MMBTU/H		7.11	LB/H	OTHER CASE-BY-CASE
NATURALLY RECYCLED PROTEINS OF INDIANA, LLC	08/19/2011	ONE (1) NATURAL GAS DRYER EP2	15	MMBTU/H		7.11	LB/H	OTHER CASE-BY-CASE
NUCOR STEEL LOUISIANA	05/24/2010	SLG-402 - SLAG MILL DRYER STACK	75 4	T/H	GOOD COMBUSTION PRACTICES	0.15	LB/H	BACT-PSD
OHIO RIVER CLEAN FUELS, LLC	11/20/2008	GAS FIRED HEATERS (3)	4	MMBTU/H	GOOD COMBUSTION PRACTICES	0.06	LB/H	BACT-PSD

Table C-5. Search Results for VOC Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
OHIO RIVER CLEAN FUELS, LLC	11/20/2008	F-T CATALYST ROTARY DRYER	22564	SCF/H	GOOD COMBUSTION PRACTICES	0.12	LB/H	BACT-PSD
OHIO RIVER CLEAN FUELS, LLC	11/20/2008	COAL OR BIOMASS DRYING LINES (10)	31	MMBTU/H		0.15	LB/H	BACT-PSD
PYRAMAX CERAMICS, LLC - KING'S M:U FACILITY	01/27/2012	SPRAY DRYERS/PETTETIZERS	75	MMBTU/H	Use of Natural Gas and propane as fuel	11.78	LB/H	BACT-PSD
SAGOLA MILL	01/31/2008	NATURAL GAS THERMAL OIL HEATER			GOOD COMBUSTION PRACTICES.	0.129	LB/H	BACT-PSD
SOUTHWEST IOWA RENEWABLE ENERGY	04/19/2007	DDGS DRYERS + DISTILLATION	60	T/H	THERMAL OXIDIZER 18 MMBTU/HR	5.11	LB/H	BACT-PSD
TATE & LYLE INDGREDIENTS AMERICAS, INC.	09/19/2008	STARCH DRYER (DIRECT-FIRED)	25	MMBTU/H	WET SCRUBBER	0 005	LB/MMBTU	BACT-PSD
TOLEDO SUPPLIER PARK- PAINT SHOP	05/03/2007	PAINT SLUDGE DRYER	7.5	MMBTU/H	THERMAL OXIDIZER, 7.5MMBTU/H	0.01	LB/H	LAER
				Burners				
DUKE ENERGY HANGING ROCK ENERGY	12/18/2012	Turbines (4) (model GE 7FA) Duct Burners Off	172	MW	Using efficient combustion technology	3.2	LB/H	BACT-PSD
DUKE ENERGY HANGING ROCK ENERGY	12/18/2012	Turbines (4) (model GE 7FA) Duct Burners On	172	MW	Using efficient combustion technology	7.3	LB/H	BACT-PSD
HESS NEWARK ENERGY CENTER	11/01/2012	Boiler less than 100 MMBtu/hr	51.9	mmcubic ft/year	use of natural gas a clean fuel	0.27	LB/H	LAER
HESS NEWARK ENERGY CENTER	11/01/2012	Combined cylce turbine with duct burner	39463	mmcubic ft/year*	Oxidation catalyst	1	PPMVD	LAER
HESS NEWARK ENERGY CENTER	11/01/2012	Combined Cycle Combustion Turbine	39463	MMCubic ft/yr	Oxidation Catalyst and Good combustion Practices and use of natural gas a clean burning fuel	2.9	LB/H	LAER
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Fuel pre-heater (EUFUELHTR)	3.7	MMBTU/H	Good combustion practices	0.03	LB/H	BACT-PSD

Table C-5. Search Results for VOC Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Auxiliary Boiler A (EUAUXBOILERA)	55	MMBTU/H	Good combustion control	0.008	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Auxiliary Boiler B (EUAUXBOILERB)	95	MMBTU/H	Good combustion practices	0 008	LB/MMBTU	BACT-PSD
HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	12/04/2013	Emergency Engine--natural gas (EUNGENGINE)	1000	kW	Oxidation catalyst and good combustion practices	0.5	G/HP-H	BACT-PSD
KLEEN ENERGY SYSTEMS, LLC	02/25/2008	SIEMENS SGT6-5000F COMBUSTION TURBINE #1 AND #2 (NATURAL GAS FIRED) WITH 445 MMBTU/HR NATURAL GAS DUCT BURNER	2.1	MMCF/H	SOME REDUCTIONS OF VOC ARE GAINED FROM CO CATALYST BUT ARE NOT GUARANTEED. EMISSION RATES DO NOT INCORPORATE THIS POTENTIAL REDUCTION.	10	LB/H	BACT-PSD
MEDICAL AREA TOTAL ENERGY PLANT	07/01/2016	Combustion Turbine with Duct Burner	203.4	MMBTU/H	Oxidation Catalyst	1.7	PPMVD@15% O2	OTHER CASE-BY-CASE
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	4000	h/yr	Oxidation Catalyst and good combustion practices	2	PPMVD@15%O2	LAER
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	AUXILIARY BOILER	4000	H/YR	USE OF NATURAL GAS A CLEAN BURNING FUEL AND GOOD COMBUSTION PRACTICES	0.488	LB/H	LAER
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	8040	H/YR	Oxidation catalyst and good combustion practices	1	PPMVD@15%O2	LAER
MOUNDSVILLE COMBINED CYCLE POWER PLANT	11/21/2014	Auxiliary Boiler	100	mmBtu/hr	Use of Natural Gas & Good Combustion Practices	0.6	LB/H	BACT-PSD
NUCOR STEEL - BERKELEY	05/05/2008	VACUUM DEGASSER BOILER	50.21	MMBTU/H	NATURAL GAS COMBUSTION WITH GOOD COMBUSTION PRACTICES PER MANUFACTURER'S GUIDANCE	0 0026	LB/MMBTU	BACT-PSD
NUCOR STEEL - BERKELEY	05/05/2008	TUNNEL FURNACE BURNERS	58	MMBTU/H	NATURAL GAS COMBUSTION WITH GOOD COMBUSTION PRACTICES PER MANUFACTURER'S GUIDANCE	0.0055	LB/MMBTU	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	Auxillary Boiler	99	MMBtu/H	Good combustion practices and using combustion optimization technologies	0.59	LB/H	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Mitsubishi, without duct burners	47917	MMSCF/rolling 12-MO	oxidation catalyst	7.9	LB/H	BACT-PSD

Table C-5. Search Results for VOC Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Mitsubishi, with duct burners	47917	MMSCF/rolling 12-MO	oxidation catalyst	7.3	LB/H	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Siemens, with duct burners	51560	MMSCF/rolling 12-MO	oxidation catalyst	5 9	LB/H	BACT-PSD
OREGON CLEAN ENERGY CENTER	06/18/2013	2 Combined Cycle Combustion Turbines-Siemens, without duct burners	515600	MMSCF/rolling 12-months	oxidation catalyst	3.9	LB/H	BACT-PSD
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	0		Oxidation Catalyst and good combustion practices	2	PPMVD	LAER
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Auxiliary Boiler firing natural gas	687	MMCFT/YR	Use of good combustion practices and use of natural gas a clean burning fuel	0.32	LB/H	LAER
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	Combined Cycle Combustion Turbine - Siemens turbine without Duct Burner	33691	MMCF/YR	Good Combustion Practices and use of Natural gas as a clean burning fuel	1	PPMVD@ 15%O2	LAER
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITH DUCT BURNER - SIEMENS	33691	MMCF/YR	Oxidation catalyst and pollution prevention (use of natural gas a clean burning fuel)	2	PPMVD	LAER
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITH DUCT BURNER - GENERAL ELECTRIC	33691	MMCF/YR	CO Oxidation Catalyst and good combustion practices and use natural gas only as a clean burning fuel	2	PPMVD@15%O2	LAER
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/07/2014	COMBINED CYCLE COMBUSTION TURBINE WITHOUT DUCT BURNER - GENERAL ELECTRIC	33691	MMCF/YR	Oxidation Catalyst and use of natural gas a clean burning fuel	1	PPMVD@15%O2	LAER
PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	28169501	MMBTU/YR	OXIDATION CATALYST AND GOOD COMBUSTION PRACTICES	1	PPMVD@15%O2	LAER
RENAISSANCE POWER LLC	11/01/2013	EU-HEATERSC: Natural gas-fired fuel heater used for heating natural gas prior to combustion in the CTGs. Misc. boilers, furnaces, and heaters	20	MMBTU/H	Good combustion practices	0.05	LB/MMBTU	BACT-PSD
RENAISSANCE POWER LLC	11/01/2013	FG-AUXBOILER1-2; Two (2) natural gas-fired auxiliary boilers.	40	MMBTU/H	Good combustion practices.	0 005	LB/MMBTU	BACT-PSD

Table C-5. Search Results for VOC Control Devices Installed o[illegible]ural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
SALEM HARBOR STATION REDEVELOPMENT	01/30/2014	Auxiliary Boiler	80	MMBTU/H	oxidation catalyst	11.8	PPMVD@3% O2	OTHER CASE-BY-CASE
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	DEW POINT HEATER	15	MMBTU/H		0.006	LB/MMBTU	OTHER CASE-BY-CASE
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	AUXILIARY BOILER (REPOWER)	106000	MMBTU		0.005	LB/MMBTU	OTHER CASE-BY-CASE
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	Combined Cycle Combustion Turbine AND DUCT BURNER (3)	2538000	MMBTU/H	Oxidation Catalyst	1	PPM	OTHER CASE-BY-CASE
TROUTDALE ENERGY CENTER, LLC	03/05/2014	Auxiliary boiler	39 8	MMBTU/H	Utilize Low-NOx burners and FGR.	0 005	LB/MMBTU	BACT-PSD
WEST DEPTFORD ENERGY STATION	07/18/2014	Combined Cycle Combustion Turbine without Duct Burner	20282	MMCF/YR	Oxidation catalysts and use of Natural gas a clean burning fuel	0.7	PPMVD215%O2	LAER
WEST DEPTFORD ENERGY STATION	07/18/2014	Combined Cycle Combustion Turbine with Duct Burner	20282	MMCF/YR	Oxidation catalyst and use of natural gas a clean burning fuel	1	PPMVD@15%O2	LAER
WOODBRIDGE ENERGY CENTER	07/25/2012	Commercial/Institutional size boilers less than 100 MMBtu/hr	2000	hours/year	Use of Natural Gas	0.14	LB/H	LAER
WOODBRIDGE ENERGY CENTER	07/25/2012	Combined Cycle Combustion Turbine with Duct Burner	40297.6	mmcubic ft/year	oxidation Catalyst and Good Combustion Practices and use of Clean fuel (Natural gas)	2	PPMVD	LAER
WOODBRIDGE ENERGY CENTER	07/25/2012	Combined Cycle Combustion Turbine w/o duct burner	40297.6	mmcubic ft/year	Oxidation catalyst and good combustion practices, use of natural gas a clean burning fuel	2.9	LB/H	LAER

Table C-6. Search Results for Ammonia Control Devices Installed on Natural Gas Fired Ovens, Dryers, and Burners (<300 MMBtu/hr)

FACILITY NAME	PERMIT ISSUANCE DATE	PROCESS NAME	THROUGHPUT	THROUGHPUT UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	CASE-BY-CASE BASIS
				Burners				
DUKE ENERGY HANGING ROCK ENERGY	12/18/2012	Turbines (4) (model GE 7FA) Duct Burners Off	172	MW		28	LB/H	N/A
DUKE ENERGY HANGING ROCK ENERGY	12/18/2012	Turbines (4) (model GE 7FA) Duct Burners On	172	MW		31.7	LB/H	N/A
KLEEN ENERGY SYSTEMS, LLC	02/25/2008	SIEMENS SGT6-5000F COMBUSTION TURBINE #1 AND #2 (NATURAL GAS FIRED) WITH 445 MMBTU/HR NATURAL GAS DUCT BURNER	2.1	MMCF/H	AMMONIA SLIP EMISSIONS AS A RESULT OF INSTALLATION OF SCR FOR NOX CONTROL	2	PPM @ 15 % O2	BACT-PSD
MEDICAL AREA TOTAL ENERGY PLANT	07/01/2016	Combustion Turbine with Duct Burner	203.4	MMBTU/H		2	PPMVD@15% O2	OTHER CASE-BY-CASE
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	4000	h/yr	USE OF NATURAL GAS A CLEAN BURNING FUEL	27.4	LB/H	OTHER CASE-BY-CASE
MIDDLESEX ENERGY CENTER, LLC	07/19/2016	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	8040	H/YR	USE OF NATURAL GAS A CLEAN BURNING FUEL	5	PPMVD@15%O2	BACT-PSD
SUNBURY GENERATION LP/SUNBURY SES	04/01/2013	Combined Cycle Combustion Turbine AND DUCT BURNER (3)	2538000	MMBTU/H		5	PPMVD	OTHER CASE-BY-CASE

Attachment D

May 29, 2015 Letter to UDAQ RE: Supplemental Responses – BACT for Oxidation Ovens of Proposed New Fiberlines 15 and 16 Modification of AO DAQE-AN113860023-15 to Add Carbon Fiber Lines 15 and 16

HEXCEL

Via email: nmeli@utah.gov

May 29, 2015

Mr. Nando Meli
Environmental Engineer
Utah Department of Air Quality
Division of Air Quality
P.O. Box 144820
Salt Lake City, Utah 84114-482

RE: Supplemental Responses – BACT for Oxidation Ovens of Proposed New Carbon Fiberlines 15 and 16
Modification of AO DAQE-AN113860023-15 to Add Carbon Fiber Lines 15 and 16
UDAQ Project No. N113860024
Hexcel Corporation's West Valley City Plant

Dear Mr. Meli:

Per your email request on May 8, 2015 and subsequent discussions on May 12, 2015, Hexcel would like to submit this supplemental response providing justification for Best Available Control Technology (BACT) for the oxidation ovens. On January 20, 2015, Hexcel submitted a Notice of Intent (NOI) to the Utah Department of Air Quality (UDAQ) to construct and operate two new carbon fiber lines (Fiber Lines #15 and #16). As a part of the NOI review process, on May 12, 2015, UDAQ requested that Hexcel provide justification why 9 ppm of the oxides of nitrogen (NO_X) emission level is not the BACT for the oxidation ovens. This letter provides supplemental information on the January 2015 submitted BACT (i.e., Low NOx Burners [LNB]) determination for the oxidation ovens as well as justification for economical infeasibility for installing ultra-low NOx burners (ULNB), which may reduce NO_x emissions to 9 ppm level.

BACKGROUND

The first step in carbon fiber manufacturing is stabilization with oxidation ovens fired by natural gas. Natural gas combustion emissions from the oxidation ovens are routed to separate stacks designed to capture and vent the combustion emissions while process emissions from the stabilization process itself are routed to Regenerative Thermal Oxidizer (RTO)/baghouse control system. In the January 2015 NOI, Hexcel proposed to install four (4) low temperature oxidation ovens per fiberline, each with two (2) heated zones per oven for a total of eight (8) zones at a rated capacity of 1.35 MMBtu/hr. In Table G-1 of the January 2015 NOI, Hexcel proposed the following BACT for the oxidation ovens.

Table G-1 of January 2015 NOI Application: Summary of Selected BACT for Ox-Ovens

Process	Pollutants	Proposed BACT
Oxidizer Ovens (4 ovens for Fiberline 15, 4 ovens for Fiberline 16); Two Stacks Per Oven (Stack Ids 15-01A – 15-04B for Line 15 and 16-01A – 16-04B for Line 16) Combustion Emissions Only		
Eight (8) - 1.35 MMBtu/hr Oxidation Ovens	NO_X,	Low NO_X Burners
	VOC, PM_{10}, $PM_{2.5}$,SO_2	Burning of Natural Gas Only
	CO	Good Combustion Practices Burning of Natural Gas Only

As shown above, Hexcel proposed to minimize NO_X emissions by installing LNB and emissions from the oxidation ovens were calculated and approved by UDAQ using a LNB controlled emission factor of 50 lb NO_x/MMscf[1]. Implementation of LNB technology has been shown to reduce NO_X emissions by 50% compared with standard burners[2].

UDAQ has already reviewed and approved all the emission calculations, air quality impact analyses, and offset requirements.[3] NO_x emissions from the oxidation ovens were calculated using a LNB controlled emission factor (as previously stated). Air quality impacts and offset requirements have been determined using LNB.

Page G-6 of the January 2015 NOI application provided justification for the BACT:

"Since there is no precedent established for incorporating further add-on controls on these combustion units and proposed emissions and heat ratings are very low, a full five step – top down BACT evaluation is not conducted for the combustion ovens. Firing of natural gas only and installation of low NO_X burners in the ovens is determined to be BACT for the oxidizer ovens."

Page G-5 of the January 2015 NOI application also listed following justification. However, this variation of LNB, which is commonly known as ULNB, was not selected as a BACT for the oxidation ovens.

"A LNB provides a stable flame that has several different zones. There are many variations on the LNB theme of reducing NO_X that can produce more than 80% Destruction Removal Efficiency (DRE). Emission rates of NO_X have been shown to be met as low as 9 ppm_v. This can be one of the least expensive pollution prevention technologies that results in a high DRE.[4]"

Above justification may have caused some confusion whether the selected LNB can meet the 9 ppm level or not. As a part of the NOI review process, on May 12, 2015, UDAQ requested Hexcel to provide justification why 9 ppm of NO_x emission level is not the BACT for the oxidation ovens. This letter provides supplemental information on selected BACT (i.e., LNB) for the oxidation ovens as well as justification for economical infeasibility for installing ULNB, which may reduce NO_x emissions to 9 ppm level.

An ULNB incorporates an LNB with an additional system such as flue gas recirculation to further reduce NO_X. ULNBs provide a stable flame that has several different zones. Remainder of this letter discusses why ULNB is not a feasible option for the oxidation ovens.

BACT FOR THE OXIDATION OVENS

In order to evaluate whether it is feasible to install ULNB to achieve a 9 ppm emission level, Hexcel performed a detailed economic feasibility analysis. This analysis was performed using the United States Environmental Protection Agency (U.S. EPA) memorandum dated December 1, 1987 for a "top-down" BACT analysis.[5] Attachment A provides a detailed analysis of the feasibility of installing ULNB on the oxidation ovens of the proposed carbon fiberlines 15 and 16. A summary of the analysis is provided below in Table 1.

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1 U.S. EPA AP-42 Tables 1.4-1 and 1.4-2.

2 AP-42 Table 1.4-1 – Emission Factors for Nitrogen Oxides (NO_X) and Carbon Monoxide (CO) from Natural Gas Combustion. Comparison of uncontrolled emissions from a small boiler (100 lb/10^6 scf) to controlled Low-NO_X burner emissions from a small boiler (50 lb/10^6 scf). [1-50/100 = 50%]

3 May 2015 - draft Source Plant Review for the proposed fiberlines.

4 OAQPS, Technical Bulletin, Nitrogen Oxides (NOx) Why and How are They Controlled, EPA/456/F-99-006R (http://www.epa.gov/ttn/catc/dir1/fnoxdoc.pdf); November 1999

5 U.S. EPA, Office of Air and Radiation. Memorandum from J.C. Potter to the Regional Administrators. Washington, D.C. December 1, 1987.

Table 1. ULNB Cost Analysis Summary for NO_X Control for All Oxidation Ovens of Fiberlines 15 and 16

Capital Cost	
Total Capital Investment	$1,407,000
Annual Cost	
Total Direct Annual Cost	$46,710
Total Indirect Annual Cost	$214,309
Total Cost ULNB	
Total Annual Cost	$261,019
Total Tons Pollutants Removed	5.45
Total Cost/Ton Pollutants Removed	$47,890

Based on the economic impacts, the cost effectiveness of ULNB is estimated to be approximately $47,890 per ton of NO_x removed. The costs associated with ULNB are excessive, and will result in an undue economic burden to Hexcel. Therefore, ULNB is not considered as the top BACT option for the oxidation ovens for the proposed carbon fiberlines 15 and 16. **Therefore, LNB remains as the selected BACT for the oxidation ovens and there are no changes to the January 2015 submitted BACT determination for the oxidation ovens.**

Please note that 2.73 tons of NO_x removed per line (or 5.45 tons total for both lines) is based on the final approved NO_x emission rates for the oxidation ovens. The NOI contained a total of 2 tons of NO_x from the oxidation ovens per fiberline controlled by LNB, which was calculated using estimated natural gas throughput of 80.15 MMscf for the oxidation ovens for each fiberline and an emission factor of 50 lb NO_x/MMscf for small (< 100 MMBtu) boilers with LNB. This emission factor was based on U.S. EPA AP-42 Table 1.4-1. Uncontrolled NO_x emissions of 4.01 tpy for the oxidation ovens at each line can be calculated using an emission factor of 100 lb NO_x/MMscf (US EPA AP-42 Table 1.4-1. Similarly, ULNB controlled emission rates of 1.28 tpy can be calculated using 32 lb NO_x/MMscf emission factor or a total of 2.73 tons NO_x removed by ULNB per line (4.01 – (32*80.15)/2000) = 2.73 tons per line or 5.45 tons for both lines).[6]

Please note that Hexcel provided a similar methodology for economic infeasibility of installing LNB or ULNB on all the existing older carbon fiberlines as a part of $PM_{2.5}$ State Implementation Plan (SIP) development. NO_x combustion emissions from the oxidation ovens of the newer carbon fiberlines 13 and 14 and proposed carbon fiberlines 15 and 16 are controlled by LNB not ULNB. ULNB has been determined to be an economically infeasible control options for all the fiberlines. Approval order for recently constructed carbon fiberlines 13 and 14 also provided similar justification and used LNB controlled emission rates for the oxidation ovens. As well as to best of our knowledge, there is no vendor who would provide us guarantee at 9 ppm emission level from the oxidation ovens.

The January 2015 air quality impact analysis of NO_x for the carbon fiberlines 15 and 16 is based on LNB controlled oxidation ovens at 50 lb of NO_x/MMscf emission factor, which is not at a 9 ppm emission level or with ULNB control. In order to demonstrate compliance with the applicable 1-hour NO_2 National Ambient Air Quality Standards (NAAQS), Hexcel will spend more than $1 MM to increase the heights of various carbon fiberline legacy stacks based on the 50 lb NO_x/MMscf emission factor. If these ovens were to provide 9 ppm emission level, Hexcel would have used 32 lb of NO_x/MMscf emission factor and thus would have avoided this additional expenditure of raising stack heights. Additionally, if Hexcel were to have used a ULNB controlled emission rate in the NOI application, it would have reduced the offset obligations, and corresponding expense, for the proposed project.

[6] Hexcel's SIP Responses to UDAQ on August 7, 2013.

CONCLUSIONS

1. Approved NO_x emission rates for the oxidation ovens of the proposed carbon fiberlines 15 and 16 are based on an emission factor of 50 lb of NOx/MMscf, which is a controlled emission factor with LNB not ULNB.
2. The January 2015 submitted and approved NO_x emission calculations, air quality modeling analysis for 1-hour NAAQS compliance, and offset requirements are all based on LNB controlled emission rates not ULNB or 9 ppm level emission rate.
3. As discussed in this supplemental response letter, ULNB is an economically infeasible control option for the oxidation ovens and this determination is also consistent with all the previous SIP submittals and approvals by UDAQ. To best of our knowledge, there is no control technology vendor who could provide us a guarantee of 9 ppm emission level from the oxidation ovens.
4. As discussed in the NOI and supplemental responses, LNB continues to represent the BACT for oxidation ovens.
5. Therefore, there are no changes to the January 2015 BACT determination for the oxidation ovens. Previously submitted BACT determination for the oxidation ovens is still representative of the top BACT option for the oxidation ovens.

If you have any questions or comments about the information presented in this letter, please do not hesitate to call me at (801) 508-8583 or Vineet Masuraha of Trinity Consultants at (949) 567-9880.

Sincerely,

Bryan Wheeler
Environmental Engineer
Hexcel Corporation

Cc: Vineet Masuraha, Trinity Consultants, Inc.

Attachment A. Economic Infeasibility Justification for ULNB for Oxidation Ovens

Table A: Ultra Low NO_X Burner Annualized Cost Estimate for NO_X Control

Table A.1. 2015 Vendor Estimated Ultra Low NOx Burner Costs

Capacity	Basic Equipment Cost[a]	Total Installed Cost[a]	$/MMBtu
750,000 BTU/hr	$18,375	$52,500	$70,000
2.7 MMBtu/hr	$26,250	$78,750	$29,167
13 MMBtu/hr	$73,500	$210,000	$16,154

[a] The basic equipment and installed cost of a Low NO_x Burner from Western Combustion Engineering on 11/28/11 Costs have been adjusted for 2015 using CPI of 1 0
http //www bls gov/data/inflation_calculator htm

Table A.2. Hexcel Burner Count

Hexcel Line No.	Equipment <=750,000 BTU/hr	Equipment > 0.75 MMBtu/hr and <=2.7 MMBtu/hr	Equipment > 2.7 MMBTU and <=13 MMBtu/hr
15	0	8	0
16	0	8	0

Table A.3. Annualized Ultra Low-NO_X Burner Cost Per Proposed New Carbon Fiberline[b]

Parameter	Equation[b]	Total Value	Hexcel Line No. 15	16
Direct Costs				
Purchased equipment costs				
Total Purchased Equipment Cost (Burners)	PEC[c]	$420,000	$210,000	$210,000
Installation Costs				
Total Direct Installation Cost	DIC[c]	$840,000	$420,000	$420,000
Total Direct Costs (TDC)	PEC + DIC	$1,260,000	$630,000	$630,000
Indirect Installation Costs				
Engineering	0 10 PEC	$42,000	$21,000	$21,000
Construction & field expenses	0 10 PEC	$42,000	$21,000	$21,000
Contractor fees	0 10 PEC	$42,000	$21,000	$21,000
Start-up	0 01 PEC	$4,200	$2,100	$2,100
Performance test	0 01 PEC	$4,200	$2,100	$2,100
Contingencies	0 03 PEC	$12,600	$6,300	$6,300
Total Indirect Costs, IC	0 35 PEC	$147,000	$73,500	$73,500
TOTAL CAPITAL INVESTMENT (2015$)	(DC + IC)	$1,407,000	$703,500	$703,500
Annual Cost Summary				
Total Direct Annual Cost				
Operation/Maintenance Cost[d]	DAC	$46,710	$23,355	$23,355
Indirect Annual Costs				
	Labor Ratio[e]		0 1163	0.1163
Overhead	60% of sum of operating and maintenance labo	$3,259	$1,629	$1,629
Administrative charges	2% of TCI	$28,140	$14,070	$14,070
Property tax	1% of TCI	$14,070	$7,035	$7,035
Insurance	1% of TCI	$14,070	$7,035	$7,035
Capital recovery factor	15 Years, 7% Interest		0 11	0 11
Capital Recovery[f]	CRF*TCI	$154,770	$77,385	$77,385
Total Indirect Annual Costs	Total	$214,309	$107,154	$107,154
TOTAL ANNUAL COST		$261,019	$130,509	$130,509
Pollutant Removed		5.45	2.73	2.73
Cost per ton of NO_X Removed		$47,890	$47,890	$47,890

Notes:

[b] Unless otherwise noted, equations are taken from U S Environmental Protection Agency, EPA Air Pollution Control Cost manual, Sixth Edition EPA/452/B-02-001, January 2002

[c] Email correspondence between Chris Paul (Western Combustion Engineering) and John Falcetti (Trinity) on November 28, 2011

[d] EPA Technical Bulletin, Nitrogen Oxides (NOx) Why and How They Are Controlled, EPA/456/F-99-006R (http //epa gov/ttn/catc/dir1/fnoxdoc pdf), November 1999 Operational costs obtained from Table 14 - Costs of NOx Controls, multiplied by a ratio of 2011 capital costs to 1993 capital costs, to estimate 2011 operational costs

Maximum estimated 1993 Capital Cost ($/MMBtu)	$8,300	
Maximum estimated 1993 Operational Cost ($/MMBtu)	$1,500	
Estimated 2015 Operational Cost ($/MMBtu)	$2,919 37	= $16,154/$8,300 * $1,500 (mid-range (for 13 MMBtu/hr burner) estimated 2015 $/MMBtu was used for the calculation)

[e] Ratio of operation and Maintenance labor costs to total operation and maintenance costs from a similar control device listed in OAQPS manu

[f] Office of Air Quality Planning and Standards (OAQPS), EPA Air Pollution Control Cost Manual, Sixth Edition, Sec 6, Chpt 2, Table 2 9, EPA 452-B-02-001 (http //www epa gov/ttn/catc/products html#cccinfo), Mussatti and Hemmer, July 2002

Attachment E

April 30, 2014 Letter to UDAQ RE: PM2.5 SIP RACT-Responses to Request for Additional Information

April 30, 2014

Ms. Camron Harry

Utah Department of Air Quality
Division of Air Quality
P.O. Box 144820
Salt Lake City, Utah 84114-482

RE: *$PM_{2.5}$ SIP RACT – Responses to Request for Additional Information*
Hexcel Corporation's West Valley City Plant

This letter is to serve as the Hexcel facility's response to the Utah Department of Air Quality's (UDAQ's) letter regarding "$PM_{2.5}$ State Implementation Plan (SIP) Process - Next Steps" dated March 13, 2014.

As mentioned in UDAQ's letter, a D.C. Circuit Court of Appeals ruling found that the Environmental Protection Agency (EPA) erred in requiring states to develop their SIPs based on Subpart I, Part D, Title I of the Clean Air Act (CAA). Rather the SIP is required to be implemented in accordance with Subpart 4 of CAA which pertains specifically to $PM_{2.5}$. In subsequent rule making EPA required states, such as Utah, to incorporate elements of its $PM_{2.5}$ SIP into Subpart 4 as moderate-area attainment status. Elements of Subpart 4 of the $PM_{2.5}$ SIP are necessary to be demonstrated by UDAQ no later than December 31, 2014.

Accordingly, UDAQ is requesting additional information from sources to implement the SIP for adopting and implementing Reasonable Achievable Control Measures (RACM/RACT). The two Reasonably Available Control Technology (RACT) related issues UDAQ has requested include: 1) start-up/shutdown emission controls; and 2) the expeditious implementation of RACT. To address these comments, UDAQ is requesting a response by May 1st, 2014. The enclosed letter contains Hexcel's response to UDAQ's request.

Background

On December 4, 2013, the Utah Air Quality Board adopted Sections 11, 12, and 13 of the Salt Lake $PM_{2.5}$ SIP into the Utah Administrative Code. In Section 12 of UDAQ's $PM_{2.5}$ SIP, the Hexcel facility located at 6800 West 5400 South, West Valley City, Salt Lake County, Utah is a listed source, with RACT/Best Available Control Technology (BACT) listed conditions. Specifically, UDAQ's $PM_{2.5}$ SIP states the following for Hexcel in Part H.12 for the Salt Lake non-attainment area.

Hexcel Corporation: Salt Lake Operations

i. The following limits shall not be exceeded for Fiber Lines 2-8, 10-16, the Pilot Plant, and Matrix Operations:

A. 4.42 MMscf of natural gas consumed per day.

B. 0.061 MM pounds of carbon fiber produced per day.

C. Compliance with each limit shall be determined by the following methods:

I. Natural gas consumption shall be determined by examination of natural gas billing records for the plant.

II. Fiber production shall be determined by examination of plant production records.

III. Records of consumption and production shall be kept on a daily basis for all periods when the plant is in operation.

As detailed in the following paragraphs, Hexcel performed the following analysis for its RACT submittal.

Hexcel's RACT Submittal

Hexcel submitted a RACT $PM_{2.5}$ Analysis to UDAQ on January 12, 2012, and an addendum on August 7, 2013. In this analysis, all potential control technologies where evaluated for technical feasibility and cost effectiveness for each emission unit. In addition to direct $PM_{2.5}$, the following potential precursors were addressed in the RACT $PM_{2.5}$ Analysis submitted to UDAQ:

- Sulfur Dioxide (SO_2);
- Oxides of Nitrogen (NO_x);
- Volatile Organic Compounds (VOCs);
- Carbon Monoxide (CO);
- Ammonia (NH_3); and
- Particulate Matter with diameter less than 10 microns (PM_{10}).

The following methods were utilized to identify potential control technologies for these pollutants:

- Researching the RACT/BACT/Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC) database[1],
- Reviewing RACT and BACT implemented by other regulatory agencies and located in $PM_{2.5}$ non-attainment areas,
- Applying previous engineering experience,
- Reviewing and discussions with air pollution control equipment vendors, and/or
- Reviewing available literature.

This RACT analysis demonstrated that no additional controls beyond existing controls were technically and economically feasible for the emission sources as part of the $PM_{2.5}$ SIP. This RACT analysis identified controls for the Hexcel West Valley City facility.

UDAQ's PM2.5 SIP Requests

UDAQ's March 13, 2014 letter specifically requires the following requests be addressed to meet Subpart 4 of Title I Part D of the CAA.

1. *A recommendation for startup/shutdown controls for RACT-listed equipment at your facility. The limits can be process-based or numeric-based. As part of your response, provide documentation that the recommended control is the best available control of start-up/shutdown emissions from each applicable point source.*

2. *Identification of the earliest date that the RACT controls required by the SIP can be implemented. Supporting information that addresses all stages of construction, including*

[1] U.S. EPA Technology Transfer Network Clean Air Technology Center – RACT/BACT/LAER Clearinghouse, http://cfpub.epa.gov/rblc/index.cfm?action=Search.BasicSearch&lang=en

planning, acquisition, installation and implementation must support the identified RACT implementation date.

The following sections provides Hexcel's response to UDAQ's requests.

Startup/Shutdown Emissions Controls for RACT Listed Equipment

Plant operations are divided into two manufacturing processes: carbon fiber and composites (pre-preg) manufacturing operations. The RACT analysis listed all the equipment associated with these operations. As a part of this request, an evaluation of the start-up/shutdown emission controls has been provided for Hexcel's processes including Fiber Lines 2, 3, 4, 5-7, 8, 10, 11, 12, 13, and 14 and pre-preg operations which manufacture solvated resins and perform solvated resin impregnation. Hexcel's response has been developed to answer each of the questions in UDAQ's March 13, 2014 letter and follow the guidance provided by Ms. Camron Harry in our conference call on April 2, 2014.

The following analysis provides a description of the available controls, best operational practices, and Hexcel's procedures including those above and beyond the Approval Order (AO) requirements to eliminate or prevent emissions during startup/shutdown. The startup/shutdown emissions from miscellaneous sources such as, boilers, matrix incinerators, HVAC systems, and emergency generators are not included in this response as they are less than 5 tons per year annually and are not applicable.

To characterize startup for the carbon fiber lines, it is Hexcel's standard operating procedure to not start processing product until desired operating conditions have been achieved. Therefore, for the fiber line operations, the startup sequence begins prior to the input or while passing of polyacrylonitrile (PAN) through the first oxidation oven. For the pre-preg operations the procedure is the desired operating condition is achieved prior to passing prep-preg through the system. Similarly, shutdown of the system is conducted at a time which no product is running through the fiber lines or pre-preg processes. Therefore, during start-up and shutdown of the carbon fiber lines, small amounts of process related emissions are expected but are accounted for as "normal process emissions" not startup emissions. All of these emissions have already been accounted as part of Hexcel's normal emissions and are permitted as a part of facility-wide process or natural gas emission/consumption limits. Hexcel currently accounts for emissions during startup/shutdown of equipment and accounts for them on the monthly Approval Order emission estimates as well as reports them to UDAQ when it submits the required formal emissions inventory. The following table summarizes emissions during start-up/shutdown from each of the processes.

Table 1 - Start-up/Shutdown (S/S) Emissions

Process[2]	Combustion or Process Emissions	S/S Emissions	RACT Control	Startup/Shutdown Procedure	Excess Emissions
Oxidation Ovens 5-7, 8, 10, 11, and 12	Combustion	Natural Gas Emissions	NG Combustion and Good Operating Practices	Bring ovens to temperature prior to introducing PAN or while PAN is being introduced to Oxidation oven 1 /discontinue PAN throughput prior to reducing temperature	No Except Malfunction
	Process	None			

[2] Fiber Lines 2, 3 and 4 are electric; therefore, not included.

Process[2]	Combustion or Process Emissions	S/S Emissions	RACT Control	Startup/Shutdown Procedure	Excess Emissions
Oxidation Ovens 13 and 14	Combustion	Natural Gas Emissions	Low NOx Burners	Bring ovens to temperature prior to introducing PAN or while PAN is being introduced to Oxidation oven 1/discontinue PAN throughput prior to reducing temperature	No Except Malfunction
	Process	None			
Low-Temperature Furnaces 5-7, 8, 10, 11, and 12	Combustion	Natural Gas Emissions	Fume Incinerator	Bring Fume Incinerators to temperature specification prior to fiber passing through them	No Except Malfunction
	Process	None			
Low-Temperature Furnaces 13 and 14	Combustion	Natural Gas Emissions	RTO	Bring RTO to temperature specification prior to fiber passing through furnace	No Except Malfunction
	Process	None			
High-Temperature Furnaces 5-7, 8, 10, 11, and 12	Combustion	Natural Gas Emissions	Burner Boxes	Ignite Burner Boxes prior to fiber passing through furnace	No Except Malfunction
	Process	None			
High-Temperature Furnaces 13 and 14	Combustion	Natural Gas Emissions	RTO	Bring RTO to temperature specification prior to fiber passing through furnace	No Except Malfunction
	Process	None			
Fiber Lines 13 and 14	Combustion	Natural Gas	RTO	Bring RTO to temperature specification prior to fiber passing through furnace	No Except Malfunction
Surface Treatment Equipment	Process	Ammonia, Water Vapor	Good Operating Practices	Emissions are captured in hood upon fiber passing through surface treatment.	No Except Malfunction
Sizing Application & Drying Equipment for Two (2) Lines	Process	Xylene, Water Vapor	Good Operating Practices	Emissions are captured in hood upon fiber passing through surface treatment.	No Except Malfunction
Pre-preg	Combustion	Natural Gas	Thermal Oxidizers	Thermal oxidizer tower must be brought to temperature prior to operation of the pre-preg process	No Except Malfunction
	Process	None			

A detailed description startup procedures and controls for each Fiber Line process is in the following section.

Fiber Lines Startup Procedures and Controls

Fiber Lines Oxidation Ovens

The fiber line process is a continuous process, which polyacrylonitrile (PAN) fibers are converted into carbon fiber. The initial step of the fiber line process is stabilization (i.e., oxidation) in which PAN is pulled off spools and fed into a series of moderate temperature (225°C - 300°C) ovens. The four oxidation ovens on Fiber Lines 5-7, 8, 10, -14 are gas fired and equipped with low NO_x burners, whereas Fiber Lines 2, 3, and 4 are electric. Fiber Lines 13 and 14 are gas fired and will be also equipped with low NO_x burners.

During startup, the ovens are brought to temperature prior to initiating PAN to pass through the process. It is critical for optimal processing of PAN for all systems to be at normal operating conditions to result in a desired fiber product. To compress the time of startup, Hexcel brings the four oxidation ovens to temperature in sequence within 2 hours while introducing PAN to oxidation oven 1. The NO_x generated during start-up of the gas fired ovens will be minimal as most of the NO_x in this process is thermally generated. During start-up of a cold oven, NO_x emissions tend to be lower because of lower oven temperatures and excess ambient air.[3] CO emissions are also not typically higher than normal operations upon startup because the residence time in Hexcel's ovens are adequate to keep it to a minimum. Hexcel's procedure during startup of gas fired Oxidation Ovens to prevent excess emissions is as follows:

> Bring four Oxidation Ovens to temperature in sequence. Each oven is brought to temperature specification prior to PAN being passed through it or while PAN is being introduced to oxidation oven 1.

Therefore emissions are anticipated to be similar or less than normal operations or emissions . Emissions are accounted for with the natural gas startup.

Low Temperature Carbonization Furnace

The second step of the carbon fiber process is carbonization. This step is broken into two phases. The first phase, tar removal, occurs within a furnace through which the fiber continuously passes, commonly called the low temperature furnace. The tar removal step takes place in an electrically heated furnace at temperatures ranging from 300°C - 800°C. The tar removal phase not only removes unwanted elements from the molecular structure, but also plays a key role in further aligning the polymer chain. Process emissions generated from the tar removal phase are primarily HCN, other VOCs and particulates. The emissions from the low temperature carbonization furnaces are controlled by a dedicated fume incinerator for Fiber Lines 2, 3, 4, 5-7, 8, 10, 11 and 12. Fiber Lines 13 and 14 are controlled by a Regenerative Thermal Oxidizer (RTO) and baghouse. The following is a description of the low temperature carbonization furnace startup procedures specific to the fiber lines at the Hexcel facility.

Fiber Lines 2, 3, 4, and 5

Fume incinerators are used for the abatement of emissions from the low temperature ovens on Fiber Lines 2, 3, 4, and 5. During startup of the fiber lines, Hexcel maintains an internal procedure to bring the fume incinerator online and brought to temperature prior to fiber passing through the low temperature ovens. The fume incinerators are maintained above the following temperature prior to starting the fiber line process:

> A minimum temperature of 1,400 °F;

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[3] Controlling Emissions During Cold Furnace Start-up, February 2007, Chemical Engineering Progress (CEP), Copy Right of American Institute of chemical Engineers (AIChE). Reprinted by John Zink Company,

Fiber Lines 6, 7, 8, 10, 11, and 12

Fume incinerators are used for the abatement of emissions from the low temperature ovens on Fiber Lines 6, 7, 8, 10, 11 and 12. Hexcel's internal procedure is to bring the fume incinerator online and brought to temperature prior to fiber passing through the low temperature furnance. The following parameters for the incinerator are maintained within the indicated ranges prior to starting the fiber line process:

- Meet permitted temperature limits of 1,400 °F minimum and 1,700 °F maximum;
- Percent excess O_2 is 6% minimum.

The fume incinerators on Fiber Lines 2, 3, 4 and 5 maintain a residence time of 0.5 seconds and the fume incinerators on Fiber Lines 6, 7, 8, 10, 11 and 12 are operated with a minimum residence time of 1.0 second at the maximum temperature and flow rate as addressed in Hexcel's Approval Order (AO). Since the residence time is a design basis of the fume incinerators and is a calculated value, it is not verified upon each startup.

Fiber Lines 13 and 14

Fiber lines 13 and 14 are currently under construction. These fiber lines will be controlled by an RTO followed by a baghouse. Upon installation, the RTO and baghouse dedicated to these lines for the control of emissions from oxidation ovens and low temperature and high temperature furnaces will be operational prior to fiber passing through the ovens. The RTO will utilize natural gas for start-up until there is sufficient solvents for combustion, at which time it switches over to solvents. Specifically, the following parameters will be verified on the RTO and baghouse prior to starting the fiber line processes:

- RTO: Read excess O_2 between 0 and 10%.
- Baghouse: 0.5 inches of water pressure drop.[4]

In summary, Hexcel's internal procedures require the fume incinerators be brought on-line and at permitted temperature prior to initiating operation of Fiber Lines 2, 3 ,4 ,5 – 7, 8, 10, 11, and 12. Similarly with Fiber lines 13 and 14 the associated RTO and baghouse will made operational with use of natural gas to bring it to temperature prior to initiating the fiber line process. Therefore, there will be no excess emissions during startup because emissions from natural gas combustion will not be any greater than normal operations or emissions already permitted by UDAQ.

High Temperature Carbonization Furnaces

The second phase of the carbonization process is a high temperature furnace which fiber is passed through a furnace at 1,200°C to 1,450°C. The high temperature phase is necessary to promote crystalline structure growth of molecules and to remove the non-carbon components from the polymer rings. This phase of carbonization evolves primarily HCN, other VOC emissions and particulates. A burner box is dedicated to each high temperature furnace on Fiber Lines 2, 3, 4, 5-7, 8, and 10 - 14. Emissions will be routed to a dedicated RTO and baghouse for Fiber Lines 13 and 14. Hexcel maintains the following procedures for startup of the High Temperature Carbonization Furnace on Fiber Lines 2, 3, 4, 5-7, 8, and 10 - 14:

- Ignite the burner box dedicated to the fiber line prior to passing fiber through the high temperature furnace.

Additionally, for Fiber Lines 13 and 14 which are controlled by an RTO and baghouse Hexcel maintains a procedure for startup as follows:

[4] Note; A baghouse pressure drop of 0.5 inches of water can be maintained. However, when bags are replaced in the baghouse, a cake needs to form on the bags prior to achieving the 0.5 inches of pressure drop. Consequently, the 0.5 inches of water will not be achieved upon the initial startup with new bags.

- Start operations of the RTO with natural gas prior to passing fiber through the oxidation ovens, and low and high temperature furnaces on Fiber Lines 13 and 14.

As a result of Hexcel's procedures to ignite the burner boxes and start the RTO and baghouse prior to fiber being passed through high temperature carbonization furnaces, there will be no excess emissions because emissions from natural gas during start-up of the fiber lines will be similar or less than normal operations or emissions already permitted by UDAQ.

Surface Treatment Equipment and Ammonium Bicarbonate/RO Water Mix Rooms

Good operating practices are employed by Hexcel for the startup of Surface Treatment Equipment and Ammonium Bicarbonate/RO Water mix rooms for both startup and normal operations. There are no control equipment for these operations. It does not have any add-on controls. Based on good operating procedures, there is not anticipated to be any excess emissions during to startup of these processes compared to normal operations.

Fiber Lines Shutdown Procedures

For shut down, Hexcel follows an internal procedure to discontinue passing fiber through the process prior to control devices being shut down. The shutdown procedures for the previously discussed processes in the fiber lines include shutting off or cooling down process equipment prior to pollution control equipment. Specifically the following is conducted:

- PAN fiber throughput will discontinue.
- Oxidation ovens will be shut down. Natural gas will discontinue being fed to oxidation ovens in Fiber Lines 5-7, 8, and 10 - 14 and electric will be shut off to oxidation ovens in Fiber Lines 2, 3, and 4.
- Low temperature furnaces will discontinue fiber passing through them prior to the fume incinerator being cooled down for Fiber Lines 2, 3, 4, 5-7, 8, and 10 - 14.
- High temperature furnaces will discontinue fiber passing through them prior to the flame being distinguished in the burner box on fiber lines 2, 3, 4, 5-7, 8, and 10 - 14.
- Good operating practices are employed by Hexcel for the shutdown from Surface Treatment Equipment and Ammonium Bicarbonate/RO Water mix rooms. Consequently, excess emissions are not anticipated from shutdown operations compared to normal operations.
- The Fiber Lines 13 and 14 will discontinue fiber passing through them at the same time the RTO will be shut off. The baghouse will be turned off after discontinuing fiber passing through process.

Since pollution control equipment will shut down after or at the same time as fiber line processes, Hexcel anticipates no excess emissions because there is no difference in emissions during shutdown as with normal operations.

Pre-Preg Process Startup Procedure and Controls

The Hexcel facility has three solvent coating towers equipped with thermal oxidizers and resin mixing equipment in Building #2478. The products manufactured with the towers are woven fabrics (fiberglass, carbon, Kevlar, quartz, etc.) that have been coated and impregnated with a variety of engineered thermosetting resins (epoxies, polyesters, polyimides, etc.). Once fabrics have been impregnated with resin they are referred to as pre-pregs. The solvent coating operation consists of two distinct phases, the manufacture of solvated formulary resins and application of the manufactured resins to the woven fabrics. Solvated resin manufacture consists of combining formulary resins with solvents in portable mix operations. The mixers are ventilated to the tower. The solvated resin impregnation is accomplished by pumping the mixed resin into a dip tank located at the bottom of each solvent coater tower. The woven fabric is introduced and immersed in the dip tank. Once through the dip tank the resin impregnated fabric is passed through a vertically heated oven (referred to as the tower) that evaporates the solvent from the resin. The solvent handling and drying assembly are enclosed and under negative pressure. This ensures capture of all evaporated solvent in the tower where they are directed to a thermal oxidizer.

Upon startup, the thermal oxidizer is fueled by natural gas to bring the drying oven to temperature. Once in operation the thermal oxidizer is fueled by both natural gas and solvent fumes. Since the thermal oxidizing towers are an integral part of the process for solvated resin impregnation, it must be brought to temperature prior to operation. The thermal oxidizer incinerators are to be maintained above the following specifications prior to starting the solvent coating process:

- A minimum temperature of 1,450 °F.

Since the tower must be brought to temperature prior to operation of the pre-preg process, there is no difference emissions during the startup of the pre-preg process from normal operations.

Maintenance

To ensure that Hexcel's process operations and control devices are maintained to minimize emissions during start-up/shut down Hexcel implements rigorous maintenance practices, follows regulatory standards, and adheres to ISO 14001 procedures. A description of these maintenance practices are described in the following sections.

Hexcel maintains the following daily inspections to ensure abatement equipment is operating properly. These practices are above and beyond established regulatory requirements.

- Visual confirmation of a flame in fume incinerators.
- Visual confirmation of a flame in burner boxes.
- Temperature readings are observed and recorded.
- O_2 levels are monitored and recorded.

Signs and labels of operating parameters are included on all the abatement equipment readouts. Additionally, an environmental compliance tag is attached to abatement equipment notifying observers if anything is out of specification. In the event of parameters being observed out of range, the Environmental Engineer and Maintenance Department are to be notified immediately.

As required by Hexcel's AO, the following maintenance is conducted on instruments of the fume incinerators and RTO.

Fume Incinerators

Hexcel performs the following calibrations associated with the fume incinerators:

Every 180 days:

- Thermocouples calibrated in accordance with 40 CR 60, Appendix A, Method 2, paragraph 6.3 and 10.31 or use a K type thermocouple; [5]and

[5] Condition II.B.1.g of AO - DAQE-AN111860021-13

> O_2 Monitors calibrated in accordance with manufacture's standard.[6]

RTO

Upon startup of Fiber Lines 13 and 14, Hexcel will calibrate the following instruments associated with the RTOs:

> Every 180 days O_2 Monitors will be calibrated in accordance with manufacture's standard.[7]
> At least annually, baghouse pressure drop monitoring devices will be calibrated according to manufacturer's standards.[8]

Oxidation Ovens

Hexcel maintains the burners on the oxidation ovens which includes inspection and cleaning to ensure good combustion practices are employed. Maintenance is performed periodically and tracked in the facility's maintenance work order system.

Additionally, Hexcel's natural gas fired oxidation ovens are subject to the requirements of 40 CFR 63, Subpart DDDDD (Boiler Maximum Achievable Control Technology [MACT]).

The applicable ovens are subject to the following work practice standards and requirements, which ensures Hexcel maintains good combustion practices[9]:

1. Natural gas fired process heaters rated greater than 5 MMBTU/hr but less than 10 MMBTU/hr require tune-ups every 2 years to demonstrate continuous compliance.
2. Natural gas fired process heaters rated less than or equal to 5 MMBTU/hr require tune-ups every 5 years.
3. A Compliance Report will be submitted every 2 years covering the 2 year period from January 1 to December 31. The initial compliance report will be postmarked/submitted by January 31st, 2016. Subsequent compliance reports will be postmarked/submitted every 2 years by January 31st following the end of the reporting period.
4. An existing process heater located at a major source facility must have a one-time energy assessment performed by a qualified energy assessor. An energy assessment completed on or after January 1, 2008, that meets or is amended to meet the energy assessment requirements in Table 3 of the regulation, satisfies the energy assessment requirement.
5. Hexcel maintains Boiler MACT work practice standards, reports and maintenance records for a minimum of 5 years.

ISO 14001 Environmental Management System Procedures - ECRs

As a part of ISO 14001 procedures, Hexcel has implemented and maintains a rigorous system of training, inspections and reporting at the Facility that ensures compliance with the all the applicable emission standards and limits.

The environmental engineer and staff ensure that all employees are properly trained to do the required monitoring to maintain compliance with the facility AO and other environmental requirements. The staff environmental engineer requires that at least one employee conduct daily inspections of all operations. During these inspections, the employee will observe any opacity events, as well as other non-conforming environmental conditions, and report them.

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[6] Conditions IIB.3.d, II.B.4.a, and IIB.5.b of AO - DAQE-AN111860021-13
[7] Conditions II.B.6.a and II.B.7.a of AO - DAQE-AN111860021-13
[8] Condition II.B.6.b of AO - DAQE-AN111860021-13
[9] 40 CFR 63, Subpart DDDDD

To complement these inspections, Hexcel maintains an Environmental Control Record (ECR) system. The ECR system helps Hexcel to efficiently identify, respond and correct any deviations or non-normal emissions events as well as other environmental incidents. A thorough investigation will be conducted for each concern or nonconformance in order to determine viability of concern or any impacts. Appropriate actions will be identified, taken, and documented on the ECR form to mitigate all concerns or impacts resulting from each nonconformance.

The ECR system essentially is a Nonconformance and Corrective/Preventative Action Plan that is part of their overall Environmental Management System Procedure. Please note that the ECR itself does not constitute an excess emission event. The ECR is just an internal procedure to track all deviations and corrective actions. Once an ECR is initiated, the Environmental Engineer determines whether to notify UDAQ with an Unavoidable Breakdown or Permit Exceedance report or not.

Timeline for Implementation of RACT

The Hexcel facility is not required to install additional controls as part of the RACT on Fiber Lines 2-8 and 10-14. Therefore, RACT requirements are not associated with a timeline per SIP Section IX.H.12 (i). Based on the discussion with Cameron Harry of UDAQ, Hexcel is not required to identify the earliest date that the RACT controls required by the SIP can to be implemented.

Hexcel is in the process of preparing an application for the addition of Fiber lines 15 and 16. UDAQ requested Hexcel provide an estimate of timing for submittal of the application and commencement of construction of Fiber lines 15 and 16. Accordingly, Hexcel anticipates the following timelines for these actions:

- Submittal of the application – Third quarter 2014
- Commencement of Construction – First quarter 2015

Hexcel intends to meet the requirements of Section IX.H.12 (i) upon startup of Fiber lines 15 and 16.

Hexcel appreciates the opportunity to work with UDAQ in the implementation of its PM2.5 SIP and will be available to answer any further questions or provide information required.

If you have any questions or comments about the information presented in this letter, please do not hesitate to call me at (801) 508-8011.

Sincerely,

Shannon Storrud
Environmental Engineer
Hexcel Corporation

Attachment F

AO Requirement Summary

April 25, 2017

General Provisions

I.1 AO modifications must be reviewed and approved.

I.2 All required records must be made available and kept for five (5) years.

I.3 At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any equipment approved under this AO including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source. All maintenance performed on equipment authorized by this AO shall be recorded.

I.4 All definition, terms, abbreviations and references conform to those in UAC R307 and 40 CFR.

I.5 Limits contained within the AO may not be exceeded without prior approval.

I.6 Requirements of UAC R307-107. General Requirements: Breakdowns must be met.

I.7 Requirements of UAC R307-150 Series. Emission Inventories must be met.

Special Provisions

II.A Approved installations consist of the equipment listed in Section II.A.

II.B Requirements and Limitations

II.B.1 Source Wide

II.B.1.a This is a notification requirement associated with the installation of a new 15.9 MMBTU/hr incinerator in Building 2478.

II.B.1.b This is a notification requirements associated with the installations of Fiber Lines #15 in Building 2489 and #16 in Building 2490.

II.B.1.c Visible emissions from all emission points shall not exceed a 10% opacity limit. Opacity observations of emissions from stationary source shall be conducted according to 40 CFR 60, Appendix A, Method 9.

II.B.1.d The following limits shall not be exceeded:

1. 1,525,480 decatherms of natural gas consumed per rolling 12-month period.
2. 16,760,000 pounds of carbon fibers produced from the fiber lines per rolling 12-month period.
3. The total use rate for maintenance and testing per emergency generator engine shall not exceed 65 hours per rolling 12-month period.

II.B.1.d.1 Compliance with each limitation shall be determined on a rolling 12-month total. No later than 20 days after the end of each month, a new 12-month total shall be calculated using data from the previous 12 months. Records of consumption, production, and generator engine hours shall be kept on a monthly basis, for all periods when the plant is in operation. Records of consumption, production and generator engine hours including rolling 12-month totals shall be made available upon request. Natural gas consumption shall be determined by examination of the natural gas billing records for the plant. Graphite production shall be determined by examination of plant production records. Emergency generator engine hours of operation shall be determined by examination of maintenance records, which shall be kept on site.

II.B.1.e Diesel-fueled power generator engines shall be used for electricity producing operation only during the periods when electric power from the public utilities is interrupted, for regular maintenance of the generators, or during periodic maintenance of the company owned electrical substation.

II.B.1.f The residence time within the various furnaces or fume incinerators shall be demonstrated using the following equation:

$$R = Vol/Q$$

Where,
R = residence time in seconds,
Vol = inside volume of the incinerator (ft3)
Q = maximum exhaust gas flow rate (ft/s)

II.B.1.g Fume incinerator temperatures shall be monitored with temperature sensing equipment that is capable of continuous measurement and readout of the combustion temperature. The readout shall be located such that an inspector/operator can at any time safely read the output. The measurement shall be accurate within ± 25°F at operating temperature. The measurement need not be continuously recorded. All instruments shall be calibrated against a primary standard at least once every 180 days. The calibration procedure shall be in accordance with 40 CFR 60, Appendix A. Method 2, paragraph 6.3 and 10.31, or use a type "K" thermocouple.

II.B.1.h Unless otherwise indicated, all carbon fiber production thermal-oxidation fume incinerators shall be operated at the following parameters:

A. At a minimum temperature of 1,400 °F
B. At a minimum residence time of 0.5 seconds

II.B.1.h Unless otherwise indicated, all solvent-coating fume incinerators shall be operated at the following parameters:

A. At a minimum temperature of 1,400 °F
B. At a minimum residence time of 0.5 seconds

II.B.1.j All high-temperature carbon fiber furnaces shall utilize a dedicated burner box at each furnace entrance. Each burner box shall be equipped with pilot lights to ensure that combustion occurs.

II.B.1.k Except for in Graphite Fiber Lines 13, 14, 15, and 16, emissions from all low-temperature carbonization furnaces shall be routed to, and combusted within a dedicated fume incinerator in each case before being discharged to the atmosphere.

II.B.1.l Emissions from all solvent coating towers shall be routed to, and combusted within a thermal oxidization fume incinerator in each case before being discharged to the atmosphere.

II.B.1.m HAP emissions from all solvated-resin mixing vessels vapor collection systems, and portable container cleaning vapor collection systems shall be routed to, and combusted within a thermal-oxidization fume incinerator, dual chambered regenerative thermal oxidizer, or flare device in each case before being discharged to the atmosphere.

II.B.1.n The fume incinerator exhaust stacks need not be constructed to accommodate gravimetric stack testing. However, if the Director determines a stack test is necessary, whatever modifications needed to meet 40 CFR 60, Appendix A, Method I, and to provide OSHA approvable access to the test location shall be retrofitted to the emission point.

II.B.1.o All effluent stack/vents for process emissions from carbon fiber production shall have wire mesh filters to control broken carbon filaments, except those stacks vented to the fume incinerators, high-temperature furnace outlet stacks, end chamber stacks on the oxidation ovens and surface treatment stacks.

II.B.1.p Hexcel shall comply with all applicable requirements of UAC R307-309 for PM_{10} nonattainment areas (Salt Lake County) for Fugitive Emission and Fugitive Dust sources. To be in compliance, Hexcel must operate in accordance with the most current version ofR307- 309.

II.B.1.q The in-plant access roads and parking lots shall be paved, except for power supply right-of way access roads, and shall be periodically swept or sprayed clean as dry conditions warrant or as determined necessary by the Director. Records of cleaning paved roads shall be made available to the Director or the Director's representative upon request.

II.B.1.r The owner/operator shall use only natural gas as primary fuel for all fuel burning HVAC units, burner boxes, solvent coating - drying towers, miscellaneous ovens, and boilers. Process off gas may be used to supplement the operation of any of these devices in which such fuel would be compatible. This condition does not apply to steam, or electrically powered units.

II.B.1.s The owner/operator shall use vapor recovery system off-gas as primary fuel, and natural gas as supplemental fuel for all thermal oxidation fume incinerators attached to the solvent coating - drying towers.

II.B.1.t The sulfur content of any fuel oil or diesel burned shall not exceed:

0.0015 percent by weight for diesel fuels consumed in any equipment.

The sulfur content shall be determined by ASTM Method D-4294-89 or approved equivalent. Certification of diesel fuels shall be determined either by Hexcel's own testing or test reports from the fuel marketer.

II.B.1.u Hexcel shall comply with all applicable requirements of UAC R307-325, and R307-335 for VOC sources located in Davis and Salt Lake Counties, and ozone and PM$_{2.5}$ nonattainment areas, or any of the applicable requirements of 40 CFR 63.8055 whichever is most stringent. To be in compliance, this facility must operate in accordance with the most current version of UAC R307-325 and R307-335 or the applicable section(s), if renumbered.

II.B.1.v The emissions from all plant-wide operations shall not exceed:

162.67 tons per rolling 12-month period for VOCs
102.42 tons per rolling 12-month period for Hydrogen Cyanide
486.12 tons per rolling 12-month period for Methylene Chloride
13.78 tons per rolling 12-month period for the combined Xylene, Toluene, and Dimethylformamide.

II.B.1.v.1 Compliance with each limitation shall be determined on a rolling 12-month total. No later than 20 days after the end of each month, a new 12-month total shall be calculated using data from the previous 12 months. [R307-401-8]

II.B.1.v.2 The VOC or HAP emissions shall be determined by maintaining a record of VOC or HAP emitting materials used each month. The record shall include the following data for each material used:

A. Name of the VOC, or HAPs emitting material, such as: paint, adhesive, solvent, thinner, reducers, chemical compounds, toxics, isocyanates, etc.
B. Density of each material used (pounds per gallon)
C. Percent by weight of all VOC, or HAP in each material used
D. Gallons of each VOC, or HAP emitting material used
E. The amount of VOC, or HAP emitted monthly by each material used shall be calculated by the following procedure:

VOC =% VOC by Weight *1100* x [Density (lb / gal)] x Gal Consumed x 1 ton 12000 pounds
HAP=% HAP by Weight 1100 x [Density (lb / gal)] x Gal Consumed x 1 ton 12000 pounds

F. The amount of VOC, or HAP emitted monthly from all materials used.
G. The amount of VOCs, or HAPs reclaimed for the month shall be similarly quantified and subtracted from the quantities calculated above to provide the monthly total VOC, or HAP emissions.
H. VOC emissions from the fuel burning devices (products of incomplete combustion generated by the boilers, curing ovens, generators, and etc.) are included in the above total.

II.B.2 Building 2478 (Solvent Coating and Resin Preparation and Handling)

II.B.2.a The approved installations/processes for the resin preparation and handling shall consist of the following:

Cleaning of the resin mixers shall be done using Butyrolactone (BLO), or M-Pyrol (NMP) aqueous based solvent, Dimethylformamide (DMF), Methyl Ethyl Ketone, or Acetone. Waste contaminated wiping materials shall be placed in a covered container and disposed in a manner that prevents volatilized solvent from being emitted into the atmosphere. Portable containers shall be cleaned using the solvent-jet cleaning device, or by hand. The solvent-jet cleaning device will be attached to the vapor collection system when using a HAP solvent for cleaning.

II.B.2.b Water based epoxy resin coating may be used on fiber lines in addition to the solvent based coating used on tower solvent coating (listed for informational purposes only).

II.B.2.c The combined burner natural gas input of the Tower 3 RTO system shall be limited to 10.0 MMBtu/hr or less. Natural gas consumption shall be monitored with metering equipment that is capable of continuous measurement and readout of the natural gas consumption of the RTO system. The readouts shall be located such that an inspector/operator can at any time safely read the output. The measurements shall be accurate within ± 5 % of full scale (0 to 10% scale) at operating conditions. The measurements shall be recorded every hour. All instruments shall be calibrated as per manufacturer's standard at least once every 180 days.

Compliance with the natural gas limitation shall be determined on a calendar day averaging period. A calendar day is from midnight to midnight. Natural gas consumption shall be determined by examination of the natural gas meter records for Tower 3. Records of consumption shall be kept on a monthly basis, for all periods when the incinerator is in operation.

II.B.3 Building 2479 (Carbon Fiber Lines 6 & 7)

II.B.3.a The following operating parameters for the incinerator shall be maintained within the indicated ranges:

1. The incinerator shall be operated with a minimum residence time of 1.0 second at the maximum temperature and flow rate.
2. Temperature- 1,400°F minimum to 1,700°F maximum
3. Percent excess O_2 - 6% minimum on Fiberline 7

II.B.3.b Each tank, except the sizing-mixing tank, shall have submerged fill to prevent volatilization during filling of the tank. Each of these tanks shall contain sizing, or pre-discharge water (prior to filling with the intended material).

II.B.3.c The finishing area shall have a steam heated drum for aqueous based sizing drying and the water based wash baths:

1. Ammonium bicarbonate wash bath
2. Water wash baths
3. Sizing application bath

II.B.3.d The Fiber Line #7 fume incinerator exhaust stack shall be monitored with oxygen content sensing equipment that is capable of continuous measurement and readout of the oxygen content within the stack. The readout shall be located such that an inspector/operator can at any time safely read the output. The measurement shall be accurate within ± 5% of full scale (0 to 10% scale) at operating conditions. The measurement need not be continuously recorded. All instruments shall be calibrated as per manufacturer's standard at least once every 180 days.

II.B.3.e The sizing process on lines #6 and #7 shall use only aqueous base sizing solution.

II.B.4 Building 2480 (Carbon Fiber Line 8) & Building 2481 (Carbon Fiber Line 10)

II.B.4.a These fume incinerators exhaust stacks shall be monitored with oxygen content sensing equipment that is capable of continuous measurement and readout of the oxygen content within the stack. The readouts shall be located such that an inspector/operator can at any time safely read the output. The measurements shall be accurate within± *5* % of full scale (0 to 10% scale) at operating conditions. The measurements need not be continuously recorded. All instruments shall be calibrated as per manufacturer's standard at least once every 180 days.

II.B.4.b The following operating parameters for the incinerators shall be maintained within the indicated ranges:

1. The incinerators shall be operated with a minimum residence time of 1.0 second at the maximum temperature and flow rate.
2. Temperature- 1,400°F minimum to 1,700°F maximum
3. Percent excess 0_2 - 6 % minimum

II.B.5 Building 2482 (Carbon Fiber Line 11) & 2483 (Carbon Fiber Line 12)

II.B.5.a These fume incinerators exhaust stacks shall be monitored with oxygen content sensing equipment that is capable of continuous measurement and readout of the oxygen content within the stack. The readouts shall be located such that an inspector/operator can at any time safely read the output. The measurements shall be accurate within ± *5* % of full scale (0 to 10% scale) at operating conditions. The measurements need not be continuously recorded. All instruments shall be calibrated as per manufacturer's standard at least once every 180 days

II.B.5.b The following operating parameters for the incinerators shall be maintained within the indicated ranges:

1. The incinerators shall be operated with a minimum residence time of 1.0 second at the maximum temperature and flow rate.
2. Temperature- 1,400°F minimum to 1,700°F maximum
3. Percent excess 0_2 - 6 % minimum

II.B.6 Building 2484 (Carbon Fiber Line 13) and Building 2485 (Carbon Fiber Line 14)

II.B.6.a The RTO exhaust stacks shall be monitored with oxygen content sensing equipment that is capable of continuous measurement and readout of the oxygen content within the stack. The readouts shall be located such that an inspector/operator can at any time safely read the output. The measurements shall be accurate within ± 5 % of full scale (0 to 10% scale) at operating conditions. The measurements need not be continuously recorded. All instruments shall be calibrated as per manufacturer's standard at least once every 180 days.

II.B.6.b The baghouse pressure drop monitoring devices will be calibrated at a frequency in accordance with the manufacturer's specifications, other written procedures that provide an adequate assurance that the device is calibrated accurately, or at least annually, whichever is more frequent, and will be accurate to within one of the following:

1. +/- 0.5 inches water gauge pressure (+/- 125 pascals); or
2. +/- 0.5% of span

II.B.7 Building 2489 (Carbon Fiber Line 15) and Building 2490 (Carbon Fiber Line 16)

II.B.7.a The RTO exhaust stacks shall be monitored with oxygen content sensing equipment that is capable of continuous measurement and readout of the oxygen content within the stack. The readouts shall be located such that an inspector/operator can at any time safely read the output. The measurements shall be accurate within ± 5 % of full scale (0 to 10% scale) at operating conditions. The measurements need not be continuously recorded. All instruments shall be calibrated as per manufacturer's standard at least once every 180 days.

II.B.7.b The baghouse pressure drop monitoring devices will be calibrated at a frequency in accordance with the manufacturer's specifications, other written procedures that provide an adequate assurance that the device is calibrated accurately, or at least annually, whichever is more frequent, and will be accurate to within one of the following:

1. +/- 0.5 inches water gauge pressure (+/- 125 pascals); or
2. +/- 0.5% of span

II.B.8 Building 8162 (Research & Development Facility)

II.B.8.a This fume incinerator exhaust stacks shall be monitored with oxygen content sensing equipment that is capable of continuous measurement and readout of the oxygen content within the stack. The readouts shall be located such that an inspector/operator can at any time safely read the output. The measurements shall be accurate within ± 5 % of full scale (0 to l0% scale) at operating conditions. The measurements need not be continuously recorded. All instruments shall be calibrated as per manufacturer's standard at least once every 180 days.

II.B.8.b The following operating parameters for the incinerators shall be maintained within the indicated ranges:

1. The incinerators shall be operated with a minimum residence time of 1.0 second at the maximum temperature and flow rate.
2. Temperature- 1,400°F minimum to 1,700°F maximum
3. Percent excess O_2 - 6 % minimum

II.B.8.c The R&D facility shall be used only for new fiber products development, new manufacturing processes development, and specialty materials production.

II.B.8.d Any surface treatment or sizing performed on the fibers produced in the R&D facility shall be water based, except for the use of no more than 200 lb of VOC solvents per year. If the 200 lb quantity should ever be exceeded, the emissions shall be directed to an approved emissions control device.

Section III: APPLICABLE FEDERAL REQUIREMENTS

In addition to the requirements of this AO, all applicable provisions of the following federal programs have been found to apply to this installation. This AO in no way releases the owner or operator from any liability for compliance with all other applicable federal, state, and local regulations including UAC R307.

NSPS (Part 60), A: General Provisions
NSPS (Part 60), 1111: Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
MACT (Part 63), A: General Provisions
MACT (Part 63), SS: National Emission Standards for Closed Vent Systems, Control Devices, Recovery Devices and Routing to a Fuel Gas System or a Process
MACT (Part 63), ZZZZ: NESHAPs for Stationary Reciprocating Internal Combustion Engines
MACT (Part 63), HHHHH: NESHAPs: Miscellaneous Coating Manufacturing
Title V (Part 70) Major Source