STATEMENT OF BASIS

For the issuance of Air Permit # 0573-AOP-R16 AFIN: 70-00040

1. PERMITTING AUTHORITY:

Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, Arkansas 72118-5317

2. APPLICANT:

El Dorado Chemical Company
4500 North West Avenue
El Dorado, Arkansas 71730

3. PERMIT WRITER:

Joseph Hurt

4. NAICS DESCRIPTION AND CODE:

NAICS Description:	Nitrogenous Fertilizer Manufacturing
NAICS Code:	325311

5. SUBMITTALS:

1/31/2013

6. REVIEWER'S NOTES:

EDCC submitted a prevention of significant deterioration (PSD) modification application to expand the facility. The PSD application included the following process equipment modifications:

1. Installation of a new DM Weatherly Nitric Acid Plant # 2 (SN-59);
2. Installation of a new cooling tower (SN-60) to support DM Weatherly Nitric Acid Plant #2,East Nitric Acid Plant, West Nitric Acid Plant , the NACSAC plant, and the Mixed Acid Plant; the existing cooling tower for the East and West Nitric Acid Plants (SN-42) will be removed from service;
3. Installation of three (3) new weak nitric acid storage tanks, which will be added to Nitric Acid Vent Collection System (SN-10);
4. Installation of a used Ammonia Plant and ancillary equipment (SN-49 through SN-51, and SN-54);
5. Installation of a new Ammonia Plant Cooling Tower (SN-52);

6. Installation of a new Ammonia Plant Ammonia Vent Flare (SN-53);
7. Installation of a new Ammonia Plant Process SSM Flare (SN-56) and a new Ammonia Storage Flare (SN-57);
8. Installation of a new ammonia storage tank, which will be added to the Ammonia Storage/Distribution (SN-32);
9. Installation of a new Ammonia Rail and Truck Loading (SN-58);
10. Installation of a new Start-up Boiler (SN-61);
11. Installation of a new ammonium nitrate neutralizer and chemical steam scrubber (SN-63);
12. Installation of a new E2 Ammonium Nitrate Brinks Scrubber (SN-05), which will control the existing emissions routed to SN-05 plus those from the E2 Ammonium Nitrate Prill Tower Fan (SN-06); the Pease Anthony Scrubber that had been in line with the existing SN-05 Brinks scrubber will be removed;
13. Installation of a new KT Ammonium Nitrate Brinks Scrubber (SN-14);
14. Installation of two (2) ammonium nitrate storage tanks, two (2) ammonium nitrate mix tanks, and a pH adjustment tank;
15. Installation of a new ammonium nitrate (solid prills) warehouse and associated handling equipment;
16. Installation of a new Nitric Acid Concentration (NACSAC) Plant (SN-47);
17. Removal of SN-06, as the emissions will now be routed to SN-05;
18. Removal of the two (2) existing boilers (SN-16A and SN-16B);
19. Removal of the UHDE Direct (Strong) Nitric Acid Plant (SN-22);
20. Removal of the DSN Plant Cooling Tower (SN-39); and
21. Removal of the KT Plant Cooling Tower (SN-43).

The total permitted emission increases include 1.4 tpy of SO_2, 179.4 tpy of VOC, 102.1 tpy of CO, 88.4 tpy of $PM_{2.5}$, 0.07 tpy of Lead, 2,481,140 tpy of CO_2e, 4,143.7 tpy of N_2O, 0.07 tpy of Arsenic, 0.07 tpy of Cadmium, 0.40 tpy of Formaldehyde, 7.23 tpy of Hexane, 0.07 tpy of Mercury, 143.19 tpy of Methanol, and 446.27 tpy of Ammonia. The total permitted emission decreases include 213.9 tpy of PM, 239.7 tpy of PM_{10}, 1,689.9 tpy of NO_x, and 55.79 tpy of Nitric Acid.

7. COMPLIANCE STATUS:

The following summarizes the current compliance of the facility including active/pending enforcement actions and recent compliance activities and issues.

The facility was last inspected on February 28, 2012. The facility was found to be operating out of compliance in regards to the NO_x CEMS associated with SN-22 quarterly excess emission report. The facility reported 13,348 minutes of monitor downtime, which equals 10.18% of the quarter. It was noted that 10,456 minutes of the reported downtime were due to emissions exceeding the span of the monitor during startup events of the plant.

8. PSD APPLICABILITY:

a) Did the facility undergo PSD review in this permit (i.e., BACT, Modeling, etc.)? Y

b) Is the facility categorized as a major source for PSD? Y

- *Single pollutant ≥ 100 tpy and on the list of 28 or single pollutant ≥ 250 tpy and not on list, or*
- *CO_2e potential to emit ≥ 100,000 tpy and ≥100 tpy/≥250tpy of combined GHGs?*

If yes, explain why this permit modification is not PSD.

DM Weatherly Nitric Acid Plant # 2 (SN-59)

Nitrogen Oxides (NO_x)

Step 1: Identify All Control Technologies

The following processes are options for controlling NO_x emissions from the type of nitric acid manufacturing facility to be installed at EDCC.

- Uhde EnviNO_x
- Dry absorption
- SCONOX^{TM}
- Hydrogen peroxide injection to the absorption column
- Molecular sieve adsorption
- Selective catalytic reduction (SCR)
- Non-selective catalytic reduction (NSCR)
- Urea scrubbing
- Refrigerated extended absorption
- Caustic scrubbing
- Ammonia scrubbing

A search of the RBLC and other published sources was conducted to identify candidate control technologies for controlling NO_x emissions from nitric acid plants. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	NO_x Emission Limit
EPA Report (1991)[1]	First Chemical Corporation Pascagoula, Mississippi	Extended Absorption w/ SCR	Unknown	<60 ppm 0.57 lb/ton

Reference	Facility Name/Location	Control Technology	Date Issued	NO_x Emission Limit
RBLC ID: LA-0108	Arcadian Fertilizer LP Geismar, Louisiana	NSCR	January 1997	~132 ppm 2.14 lb/ton (Primary)[2] 3.0 lb/ton (Secondary)
RBLC ID: OK-0034	Terra Nitrogen Woodward, Oklahoma	SCR	February 1998	~200 ppm 3.0 lb/ton
Operating Permit	Terra Nitrogen Verdigris, Oklahoma	SCR	Unknown	~200 ppm 3.0 lb/ton
Operating Permit	El Dorado Nitrogen El Dorado, Texas	Extended Absorption w/ SCR	1999	~20 ppm 0.3 lb/ton[3]
Operating Permit	KOCH Nitrogen Enid, Oklahoma	Extended Absorption w/ NSCR	Unknown	~79 ppm 1.1 lb/ton
RBLC ID: WA-0318	Agrium U.S., Inc. Kennewick, Washington	NSCR + SCR (Plant 7) H_2O_2 Injection (Plant 9)	August 2004	~40 ppm/0.524 lb/ton ~20 ppm/0.3 lb/ton[3]
RBLC ID: GA-0109	PCS Nitrogen Fertilizer Augusta, Georgia	NSCR	May 2005	~200 ppm 3.0 lb/ton
Operating Permit	Coffeyville Resources Nitrogen Fertilizers, LLC Coffeyville, Kansas	Extended Absorption w/ SCR	August 2007	~45 ppm 0.6 lb/ton
US District Court/EPA Compliance Order	Royster Clark/Agrium North Bend, Ohio	Extended Absorption w/ SCR	February 2007	~40 ppm 0.6 lb/ton
RBLC ID: WA-0318	Agrium U.S., Inc. Kennewick, Washington	NSCR + SCR (Plant 7) H_2O_2 Injection (Plant 9)	July 2008	~40 ppm/0.524 lb/ton ~40 ppm/0.6 lb/ton[4]
RBLC ID: OK-0134	Pryor Chemical Company Pryor, OK	Extended Absorption w/NSCR	February 2009	1.6 lb/ton (2 units) 2.5 lb/ton (1 unit)
RBLC ID: ID-0017	Southeast Idaho Energy American Falls, ID	SCR	February 2009	1.12 lb/ton

Reference	Facility Name/Location	Control Technology	Date Issued	NO_x Emission Limit
RBLC ID: IA-0105	Iowa Fertilizer Company Wever, IA	Uhde EnviNO$_x$	October 2012	5 ppm

[1] Alternative Control Techniques Document – Nitric and Adipic Acid Manufacturing Plants, EPA-450/3-91-026, EPA, Research Triangle Park, N.C. (Dec. 1991) – included in Attachment B
[2] Primary limit taken to attain compliance with NAAQS
[3] Interim limit subject to results of innovative technology review of proposed hydrogen peroxide injection process
[4] Revised limit based on final results of innovative technology review of hydrogen peroxide injection process

Step 2: Eliminate Technically Infeasible Options

As part of the BACT analysis, the control technologies identified as part of Step 1 are reviewed for their technical feasibility. A control technology is considered to be technically feasible if it has been previously installed and is in practice at a similar source and/or process and is operating successfully.
The NO_x emission control technologies listed below are not feasible for BACT-level emission control for nitric acid plants. A brief statement addressing the feasibility of each option is provided. A more detailed discussion of these options is included in Section 2.3 of the Technical Supplement Document (TSD) issued by the Washington State Department of Ecology (WSDE) for the Agrium facility located in Kennewick, Washington. For the Uhde EnviNO$_x$ technology, the technical feasibility issue is further addressed below.

Dry absorption

The only dry absorption technology that is available is the Pahlman Process. The Pahlman Process uses a proprietary formulation of manganese dioxide to absorb NO_x and SO_2 in the form of manganese nitrate and manganese sulfate. The manganese nitrate is regenerated to manganese dioxide in a proprietary process. Demonstration projects using a skid-mounted pilot unit showed a NO_x reduction of over 95%. There have been no commercial applications yet in any industrial sector, thus dry NO_x absorption is considered to be technically infeasible.

SCONOX^{TM}

The SCONOX^{TM} NO_x control process consists of passing the exhaust combustion gases across a solid reactant surface. SCONOX^{TM} reduces NO_x by reacting it with potassium carbonate, and reducing the resulting potassium nitrate with hydrogen to form N_2. SCONOX^{TM} has been applied in practice only to small-to-medium sized electricity-generating gas turbines. EPA Region I describes the system's applicability as limited to natural gas-fired combined cycle turbines using water injection. The emission characterization from a nitric acid plant is dissimilar to sources where SCONOX^{TM} applications are currently in use. Because SCONOX^{TM} is currently limited to a different application, as well as the dissimilar nature of emission streams, it is considered technically infeasible.

Hydrogen Peroxide Injection

Hydrogen peroxide injection was initially listed in the RBLC as an experimental system proposed by Agrium under the innovative control technology review guidelines. The hydrogen peroxide injection system developed for the Kennewick facility was a proprietary, site specific design. Because the hydrogen peroxide injection system is not commercially available, it is considered to be technically infeasible for NO_x control purposes at EDCC.

Molecular sieve adsorption

Molecular sieve adsorption consists of adsorbing NO_x from a chilled tail gas exhaust stream onto selective adsorbent resin beads, desorbing the NO_x at a higher concentration than it had been in the original exhaust stream into a heated tail gas stream, and recycling the NO_x to the nitric acid process. There have not been any applications to full-size nitric acid plants, and research on this technology has been abandoned. Therefore, molecular sieve adsorption is considered technically infeasible.

Urea scrubbing

Urea scrubbing is a chemical scrubbing technology for NO_x reduction. Currently, urea scrubbing for NO_x reduction has not been demonstrated in practice. As a result, urea scrubbing is considered to be technically infeasible.

Currently, the following NO_x control technologies are considered to be technically feasible for nitric acid plants. These findings are consistent with the EPA's findings (with the exception of caustic scrubbing/ammonia scrubbing) in its published document Alternative Control Techniques Document – Nitric and Adipic Acid Manufacturing Plants, which states that *"Three control techniques are predominantly used to reduce the level of NO_x emissions in the tail gas [of nitric acid plants in the United States]: (1) extended absorption, (2) non-selective catalytic reduction (NSCR), and (3) selective catalytic reduction (SCR)."*

- Refrigerated extended absorption
- Caustic scrubbing/ammonia scrubbing
- Non-selective catalytic reduction
- Selective catalytic reduction
- Uhde EnviNO_x

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Based on the BACT emission levels listed in the RBLC and the additional information provided herein, the NO_x control efficiencies for the candidate NO_x control options can be ranked as follows:

- Uhde EnviNO_x or refrigerated extended absorption with a SCR
- NSCR unit with a SCR unit

- SCR unit only
- NSCR unit only

Uhde EnviNO$_x$: This control equipment, in the first step of its Variant 2 process, uses an iron zeolite catalyst bed with ammonia to remove NO$_x$. Uhde promotional literature claims that NO$_x$ emissions consistently below 5 parts per million (ppm) have been demonstrated using its Variant 2 process. One facility was identified with the Uhde EnviNOx system as BACT to control NO$_x$ emissions. The Uhde EnviNO$_x$ system that was permitted as part of the Iowa Fertilizer Company PSD permit and ultimately was listed in the RACT/BACT/LAER Clearinghouse claims a NO$_x$ limit of 5 ppm, which correlates to 0.054 lb NO$_x$/ton acid on a 30-day rolling averaging period, exclusive of emissions related to startup, shutdown, and malfunction (SSM).

Refrigerated extended absorption with SCR: This control option involves extended absorption equipment followed by an add-on SCR unit to control NO$_x$ emissions. Four facilities were identified with extended absorption equipment and a SCR unit as BACT for the control of NO$_x$ emissions. According to the RBLC/other information sources, BACT limits for the four facilities range from 0.3 lb/ton acid produced to 0.6 lb/ton acid produced. However, based on EDCC's design engineer's review, it is believed that a control system utilizing extended absorption with a SCR unit at DMW2 can feasibly achieve a BACT limit of 5 ppm$_v$.

NSCR with SCR: This control option includes a NSCR unit followed by a SCR unit to control NO$_x$ emissions. One facility was identified as having this BACT control configuration and was required to achieve a NO$_x$ emission rate of 0.524 lb/ton acid produced.

It should be noted that NSCR is no longer favored as BACT for NOx reduction at nitric acid plants. NSCR systems were considered BACT for NOx in the 1970s and early 1980s when many nitric acid plants were built. NSCR systems are energy intensive (requiring significant hydrocarbon usage) and were designed around the general heat balance for the specific nitric acid plant. Due to the high temperature environment within the NSCR, some nitric acid plants fitted with this technology are achieving very low NOx emissions. (BREF - Inorganic Chemicals: Ammonia, Acids and Fertilizers, Section 3.4.8).

However, as NSCRs are integrated into the nitric acid plant heat balance, they are not simply add-on technologies for existing and or new nitric acid plants. The BREF document states (page 131) that, "*... the application [of NSCR] in existing plants will demand major adjustments, making the installation of an NSCR less feasible*". In addition, due to the significant hydrocarbon usage, NSCR systems create significant CO_2 emissions. At the time NSCR systems were considered BACT for NO$_x$, CO_2 emissions were not regulated and simply not a concern. In summary, the BREF document does not consider NSCR BACT for NO$_x$ due to cross-media effects, namely the additional consumption of natural gas/methane (hydrocarbons), which will give rise to more CO_2 emissions, and methane slip, as well as unreacted ammonia.

Refrigerated extended absorption with NSCR: This control option involves extended absorption equipment followed by an add-on NSCR unit to control NO$_x$ emissions. Two facilities were identified as having this BACT control configuration with the minimum being required to achieve a NO_x emission rate of 1.1 lb/ton acid produced.

SCR or NSCR: This control option involves the installation of a stand-alone NSCR unit or SCR unit to control NO_x emissions. Three facilities were identified with either a NSCR unit or SCR unit as BACT for the control of NO_x emissions. According to the RBLC/other information sources, these facilities were required to achieve a NO_x emission rate of 3.0 lb/ton acid produced. One facility, located in Geismar, Louisiana, was required to achieve a NO_x emission rate of 2.14 lb/ton acid produced. As noted in the table in Step 1, this facility was required to achieve additional NO_x reductions beyond similarly controlled units to demonstrate compliance with the NAAQS.

Refrigerated extended absorption: Refrigerated extended absorption may be considered to be a NO_x control process or simply a mechanism for improving nitric acid yield. Because of EDCC's DM Weatherly design, which employs extended absorption, the practical limit for the NO_x concentration is close to that attainable when utilizing refrigerated extended absorption. Therefore, in this condition refrigerated extended absorption (with an SCR) is no more effective as a pollutant reduction technology as the DM Weatherly extended absorption design (with an SCR).

Caustic scrubbing/ammonia scrubbing: Caustic and ammonia scrubbing have a lower potential for NO_x removal from a nitric acid plant than those discussed above.

Step 4: Evaluate Most Effective Controls and Document Results

According to the RBLC/other information sources, the most effective NO_x control technology(s) is the Uhde EnviNO_x system or extended absorption with SCR unit at 5 ppm_v on a 30-day average, excluding SSM related emissions. The second best technology ranked in terms of effectiveness is a NSCR unit followed by a SCR unit at 0.524 lb/ton acid produced. The next most effective control technologies, in order, are SCR or NSCR, extended absorption, and caustic scrubbing/ammonia scrubbing at a NO_x emission rate of 2.14 lb/ton of 100% acid produced or above.

The Uhde EnviNO_x system is considered technically feasible to control NO_x emissions from a nitric acid plant to a 5 ppm_v level. This statement based on Uhde promotional literature and information from Uhde controlled nitric acid plants outside the United States. An EnviNOx system has not been installed, nor is one currently operating at a nitric acid plant in the United States. As indicated previously, one permit for a nitric acid plant utilizing this technology has been issued in the United States to date (i.e., to the Iowa Fertilizer Company), and that plant has not yet been constructed. In addition, to the best of Weatherly, Inc.'s knowledge the Uhde EnviNO_x system has never been installed on a Weatherly, Inc. designed nitric acid plant.

Relative to the SCR unit, the SCR catalyst vendors have supplied designs and have provided guarantees that the 5 ppm_v limit can be achieved under the conditions specified on the Weatherly, Inc. data sheets, provided the following criteria are met:

- The NO_2/NO_x ratio is 50% or less. This ratio governs the rate of reaction of NO_x to N_2 and H_2O; higher ratios of NO_2/NO_x (i.e., > 50%) decrease the reaction rate.
- Near perfect mixing and distribution of the ammonia and tail gas mixture across the catalyst bed is maintained. To achieve catalytic reduction of NO_x to a low level of 5 ppm_v, the key is to ensure there is excess ammonia mixed with the NO_x at the catalyst site. If the mixture of ammonia and NO_x is not homogenous and not evenly distributed over the catalyst bed, then some of the NO_x will slip by unconverted. The catalyst vendor requires <15% [RMS] maldistribution and an NH_3/NO_X maldistribution of < 2% absolute.
- Maximum inlet NO_X concentration of 1,000 ppm.
- The CEMS measurement technology is sufficient to accurately measure NO_X in the range of 0-5 ppm_v.

The vendor will guarantee the catalyst performance at nominal and maximum flow rates and NO_X content as specified. Based on the design engineer's review, EDCC believes that the technology is feasible and available, but like the Uhde EnviNO_X system, has not yet been demonstrated in a Weatherly, Inc. designed plant. In addition, the plant will be required to operate between 770 tpd and 1,265 tpd in response to fluctuating market conditions. Although the 5 ppm_v limit is considered technically achievable to ensure compliance over the long term, as well as the entire range of operating rates, it is noted here that the vendor claims significant uncertainty exists relative to an acceptable BACT compliance margin due to the potential for:

- Non-homogenous mixture of NO_x and ammonia feed to the SCR unit. The mixer is designed for the nominal operating rate, and as you deviate from that rate, the mixing efficiency will decrease.
- Catalyst deactivation and/or fouling over time. Although catalyst has a 60 month life, fouling in some areas can occur resulting in reduced efficiency. As the catalyst approaches its end of life, NO_x reduction performance will drop off.
- The range of the operating rates of the absorption tower (770-1,265 tpd). The ratio of NO_2/NO_x exit the absorber can vary with production rate. This variability will negatively impact the reaction rate in the SCR unit and reduce control efficiency.
- The NO_x concentration to the inlet gas to the SCR unit. The NO_X concentration is directly dependent on the operation of the absorber columns and the concentration of nitric acid being made. There are a number of variables that impact the absorption efficiency including operating pressure, cooling water temperature, quantity of excess oxygen, and inlet gas temperature. Operating pressure has one of the largest impacts on absorption efficiency. In the Weatherly, Inc. design, this pressure is not directly controlled but is a function of the discharge of the air compressor. Change in ambient conditions results in changes in compressor discharge pressure, which changes column pressure. This change in column pressure can result in variation of the NO_x concentration in the inlet gas to the SCR unit. For a given air flow rate (this also sets the production rate), the absorber pressure is set by the compressor operation.
- NO_x to bypass the reduction catalyst. The SCR catalyst is supplied in multiple forms, either as honeycomb or as a bulk bed of pellets. Each type of installation has the

> potential for bypassing. The NO_x laden gas is forced through the catalyst bed, and gaskets are used to seal off those areas between the catalyst and the vessel walls. However, during the course of operation, the gasket material can degrade, thereby creating the potential for bypassing. A Weatherly, Inc. designed plant requires change out of the ammonia to NO_x converter catalyst every ninety days, as the catalyst is consumed during the reaction. This means that every ninety days or less, the SCR vessel will cycle from ambient conditions to 520 ^oF, which results in thermal growth and potential wear on the gaskets and other mechanisms used to eliminate bypassing.

Uncertainty also exists in the context of ancillary emissions. Ammonia is used as a reactant in the SCR unit to support NO_x reduction. To account for a proper excess amount of ammonia that is introduced to the control system to complete the reduction reaction, ammonia slip has been included in the PSD permit with limits of 2.64 lb/hr and 11.54 ton/yr. The ammonia limits were calculated based on a design based factor for ammonia slip of 10 ppm_v, or 0.5 $lbNH_3$/ton of 100% nitric acid produced. As the BACT limit for NO_x is decreased to the 5 ppm_v level, the potential exists for increased ammonia slip. For that reason, the catalyst vendors have stated that up to a 20 ppm_v ammonia slip could occur, especially during periods of SSM.

Step 5: Select BACT

To achieve the most effective NO_x control levels at DMW2, EDCC is proposing extended absorption with a SCR unit. EDCC is proposing a BACT limit of 5 ppm_v on a rolling 30-day average basis, exclusive of emissions related to SSM. This is equivalent to the lowest permitted limits found (based on application of Uhde $EnviNO_x$ control technology). Additional BACT limits for this source include 100 ppm_v on a 3-hour average, inclusive of emissions related to SSM, and 6 ppm_v on a rolling 12-month average, inclusive of emissions related to SSM.

The concentrations for NO_x converted to mass rates are 33.78 lb/hr (3-hour average inclusive of SSM), 3.38 lb/hr (30-day rolling average excluding SSM), 26.35 lb/hr (30-day rolling average including SSM), and 17.76 tpy (rolling 12-month average). The corresponding production based limits are 0.64 lb/ton (3-hour average including SSM), 0.064 lb/ton (30-day rolling average excluding SSM), 0.5 lb/ton (30-day rolling average including SSM), and 0.078 lb/ton (rolling 12-month average including SSM).

EDCC also proposes a BACT limit of 0% for opacity.

CO_2e Emissions from the DM Weatherly Nitric Acid Plant No. 2

N_2O emissions from nitric acid manufacturing are a byproduct of the process stream and are therefore characterized as "industrial process" emissions. Ammonia oxidation is the source of N_2O emissions from nitric acid production. The amount of N_2O formed depends on combustion conditions in the oxidizing unit, catalyst compositions, catalyst age, and burner design.

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

There are two basic types of nitric acid plants. They are single pressure and dual pressure. Common to North America, single pressure plants apply a single pressure throughout the reaction and absorption stages. The pressure in a single pressure plant can be low (at atmospheric pressure), Medium (400 to 800 kPa, or 4 to 8 atm), or high (800 to 1,000 kPa or 8 to 14 atm). Newer, small process units tend to use the high-pressure process, which helps to ensure efficient absorption. Dual pressure plants which were developed in Europe typically use low pressure for the reaction stage and high pressure for the absorption stage. The relatively low pressure in the ammonia oxidation stage helps to efficiently produce Nitric Oxide (NO) and extend the primary catalyst life. Compressing gases under high pressure during the absorption phase enhances that process as well. Dual pressure plants tend to use "medium pressures (about 4 atm) for ammonia conversion and high pressure (8 to 14 atm) for absorption. The pressure of the plants may have an impact on the effectiveness of some of the controls listed below. The amount of N_2O formed during the nitric acid production process depends on the combustion conditions (temperature and pressure), primary catalyst composition and age, and the burner design.

Nitric Acid Plants typically rely on three main types of N_2O control, and they are based on the location of the control within the production process. They are Primary, Secondary, and Tertiary.

Primary Controls

Primary controls reduce the amount of N_2O formed in the ammonia oxidation step. This can be accomplished by modifying the catalyst used in the oxidation process and/or modifying the operating conditions of the oxidation process. Primary controls suppress the formation of N_2O during the oxidation process. One control technique used is the extension of the NH_3 oxidation reactor, which extends the residence time from one to three seconds. Another primary control technique is to modify the ammonia oxidation gauze. This can be accomplished by utilizing an improved platinum catalyst or an alternative oxidation catalyst that is not platinum based.

Secondary Controls

Secondary controls reduce the N_2O upon formation in the ammonia oxidation process. Secondary control consists of an additional catalyst located immediately downstream of the ammonia oxidation catalyst. Placing this pelletized catalyst directly in the ammonia burner causes the N_2O to decompose to N_2 and O_2. The use of this control has shown no impact on ammonia conversion. The average lifetime of this catalyst is four years.

Tertiary Controls

Tertiary controls reduce N_2O by installing a catalytic reactor downstream of the ammonia oxidation reactor and either upstream or downstream of the tail gas expansion unit following ammonia oxidation. There are two main types of tertiary controls. They are catalytic reduction and catalytic decomposition.

Nonselective Catalytic Reduction (NSCR) is a common control technology for NO_x compounds within nitric acid facilities. Facilities that utilize NSCR have integrated the NSCR into the overall energy balance of the system. NSCR systems consume large quantities of hydrocarbons, such as natural gas, propane and butane to create the oxidation environment. The excess heat from the NSCR is used within the plant design. As such, existing nitric acid plants would not install NSCR systems unless the excess heat was integrated into the plant design. The NSCR reduces NO_x and inadvertently N_2O due to the extreme oxidation temperature and residence time.

Catalytic decomposition as a tertiary control can be high or low temperature, does not require any additional reducing agents, and does not form any undesirable byproducts from the reaction. A catalyst is used to drive the decomposition. The catalyst can be placed upstream or downstream of a Selective Catalytic Reduction (SCR) unit (depending on the design and selected catalyst) since it is stable in the presence of NO_x and ammonia. There are some types of N_2O abatement catalysts that have improved performance when NO_x is present in the exhaust gas, while other N_2O catalysts have improved performance when there is no or little NO_x.

Note that SCR could also be considered as an example of a tertiary control. SCR has shown to have a slight unintentional impact on N_2O emissions (+/- <5%). However, a SCR would not be installed specifically for N_2O abatement.

Step 2: Eliminate Technically Infeasible Options

Any control technologies that are not feasible should be identified and eliminated. Technical infeasibility can be demonstrated by clear physical, chemical, or other engineering principles which preclude the technology from being adaptable to this source. Due to their widespread application and use, all four of the N_2O control types listed in Step 1 are technically feasible for this Nitric Acid Plant.

However, although each technology is "technically feasible", secondary controls on a high pressure plant are not ideal and will not reduce N_2O to the levels achieved by a tertiary system. The pressure drop associated with the secondary catalyst bed directly following the platinum gauze can be significant on high pressure plants, thus negatively impacting the process and decreasing conversion efficiency and ultimate nitric acid formation. To avoid this excessive pressure drop, the secondary catalyst bed depth must be reduced, thus decreasing the residence time of the air passing through the catalyst and dramatically decreasing the N_2O removal efficiency. So although secondary control is technically feasible, the use of secondary control for this high pressure plant will not be a viable option based on the high level of N_2O destruction efficiency desired to meet BACT requirements.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

First Ranking: Tertiary Catalytic Reduction is the most effective N_2O control. Tertiary Catalytic Reduction consistently demonstrates greater than 90% reduction of N_2O emissions.

Second Ranking: Secondary Catalytic Reduction typically reduces up to 90% of the N_2O. However, based on the high pressure design of the EDCC NAP, secondary N_2O abatement would likely not exceed 70%.

Third Ranking: Primary reduction controls generally achieve an N_2O reduction efficiency of less than 70%.

Step 4: Evaluate Most Effective Controls and Document Results

The most effective control for N_2O in a high pressure Nitric Acid Plant is tertiary catalytic reduction. When compared to secondary catalytic reduction, tertiary catalytic reduction is more expensive. However, tertiary catalytic reduction on average has a reduction efficiency ten percent greater than that of secondary catalytic reduction.

Step 5: Select BACT

EDCC has chosen to use tertiary catalytic reduction as the BACT for the proposed Nitric Acid Plant. Tertiary catalytic reduction is the most expensive control technology of the evaluated technologies; however, it is also a proven control technology that provides the best available reduction. EDCC decided to use tertiary catalytic reduction as the selected control technology based on its superior N_2O reduction efficiency and the lack of pressure drop across the tertiary system compared to that of a secondary system. The equipment chosen by EDCC for the Nitric Acid plant is expected have an average N_2O control efficiency of 95% over the life of the primary gauze. Additionally, GHGs are significantly reduced by utilizing a portion of the reaction energy recovered in the heat exchanger train to reheat the tail gas to provide power for the air compressor by driving a hot gas expander.

The facility is proposing a 30 ppm_v (3-hr average) BACT limit for N_2O. The concentration for N_2O converted to an hourly mass rate is 20.6 lb/hr (3-hr average). The corresponding production based limits are 0.39 lb/ton (3-hour average) for N_2O. After reviewing the information submitted by the facility, the Department is assigning BACT limits for this source regarding the CO_2e emissions. The Department identified the Iowa Fertilizer Company as having additional BACT limits, and these limits will be assigned to EDCC.

The limits assigned are 98% destruction efficiency (DRE) for N_2O, 90.04 tons of N_2O per rolling 12-month period, and 27,911.28 tons of CO_2e per rolling 12 months of CO_2e.

Ammonia Plant Primary Reformer (SN-49)

Nitrogen Oxides (NO_X)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use for the control of NO_x emissions from hydrogen reformers at both ammonia plants and located in the refinery industry. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	NO_x Emission Limit
RBLC ID: IA-0105	Iowa Fertilizer Company Wever, IA Ammonia Plant Primary Reformer	SCR	October 2012	9 ppmv 0.0124 lb/MMBtu 30-day rolling average
RBLC ID: OK-0134	Pryor Chemical Company Pryor, OK Ammonia Plant Primary Reformer	Low NO_X Burners/ Good Combustion	February 2009	0.12 lb/MMBtu
RBLC ID: TX-0288	Air Liquide Freeport, TX Steam Methane Reformer	SCR	June 2001	8.5 lb/hr 0.030 lb/MMBtu 3-hour average
RBLC ID: LA-0211	Marathon Petroleum Garyville, LA Hydrogen Reformer Flue Gas Vent	SCR	December 2006	0.0125 lb/MMBtu annual average
RBLC ID: PA-0231	United Refinery Company Warren, PA Hydrogen Reformer Unit	Low NO_X Burners	October 2003	0.04 lb/MMBtu
RBLC ID: OH-0329	BP North America Toledo, OH Reformer Heater	Low NO_X Burners	August 2009	0.045 lb/MMBtu 40 ppm 24-hr rolling average

Reference	Facility Name/Location	Control Technology	Date Issued	NO_x Emission Limit
RBLC ID: CA-1121	Chevron Products Los Angeles, CA Heater	Low NO_X Burners/SCR	July 2003	5 ppmvd 3-hour average
RBLC ID: NM-0050	Navajo Refining Company Artesia, NM Steam Methane Reformer Heater	SCR	December 2007	0.0125 lb/MMBtu 3-hour rolling average

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for NO_X emissions at primary reformers, the following are feasible control options:

- Selective Catalytic Reduction (SCR)
- Low NO_X Burners and Flue Gas Recirculation

Step 3: Rank Remaining Control Technologies by Control Effectiveness

The most effective control technology for the reduction of NO_X emissions at primary reformers is Selective Catalytic Reduction. Typical control efficiencies range from 90% to 95%.

Step 4: Evaluate Most Effective Controls and Document Results

According to the RBLC/other information sources, the most effective NO_x control technology is an SCR unit. All but 3 entries in the RBLC specified low NO_x burners as meeting the BACT requirement for the control of NO_x emissions from natural gas-fired combustion devices.

The reformer permitted at the Chevron Plant (CA-1121) is not in operation in an ammonia manufacturing plant. The reformer at Chevron utilizes catalytic reforming, whereas, the reformer at EDCC will be a steam methane reformer. Therefore, the two reformers are not comparable. Note also that in the Iowa Fertilizer Plant permit, information states that only natural gas will be used as fuel to the reformer. At EDCC, the primary reformer will fire natural gas and purge gas from the ammonia manufacturing process. This purge gas contains up to 5% ammonia, which could be converted to NO_x in the combustion reaction. Considering that statement, the NO_x BACT limit proposed for SN-49, which is the same as that for the Iowa facility, could be considered more conservative.

Step 5: Select BACT

EDCC has selected an SCR unit as BACT for NO_X emissions at the ammonia plant primary reformer. EDCC proposes a BACT limit of 0.0124 lb NO_x/MMBtu per hour heat input at the primary reformer based on a 3-hour averaging period, and 44.75 tons per rolling 12-month period.

EDCC also proposes a BACT limit of 0% for opacity.

Carbon Monoxide (CO)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use for the control of CO emissions from reformers at ammonia plants as well as reformers located in the refinery industry. There were seven entries with listed control technologies for CO emissions from reformers. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	CO Emission Limit
RBLC ID: IA-0105	Iowa Fertilizer Company Wever, IA Ammonia Plant Primary Reformer	Good Combustion Practices	October 2012	0.0194 lb/MMBtu
RBLC ID: LA-0236	CF Industries Donaldsonville, LA Ammonia Plant Primary Reformers	Good Combustion Practices	August 2009	0.05 lb/ton produced
RBLC ID: OK-0134	Pryor Chemical Company Pryor, OK Ammonia Plant Primary Reformer	Good Combustion Practices	February 2009	0.083 lb/MMBtu
RBLC ID: TX-0288	Air Liquide Freeport, TX Steam Methane Reformer	Good Combustion Practices	January 2005	0.03 lb/MMBtu
RBLC ID: LA-0211	Marathon Petroleum Garyville, LA Hydrogen Reformer Flue Gas Vent	Good Combustion Practices	December 2006	0.04 lb/MMBtu (30-day avg)

Reference	Facility Name/Location	Control Technology	Date Issued	CO Emission Limit
RBLC ID: PA-0231	United Refinery Company Warren, PA Hydrogen Reformer Unit	Good Combustion Practices	October 2003	0.09 lb/MMBtu
RBLC ID: OH-0329	BP North America Toledo, OH Reformer Heater	Good Combustion Practices	August 2009	0.04 lb/MMBtu

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for CO emissions at primary reformers, good combustion practices was identified as the only feasible control option. Efficient combustion includes tuning of the burners within the reformer to achieve the maximum combustion efficiency, which reduces the amount of carbon exiting the stack. This option also includes proper tuning of process control systems to ensure that temperature, natural gas usage, and oxygen levels within the combustion zone remain within appropriate ranges.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Proper and efficient combustion at the reformer is the only remaining feasible control technology. As stated above, this efficient combustion would consist of conducting preventive steps to ensure that the proper fuel to air ratios are maintained, and that fuels with excess carbon content are not introduced into the combustion device.

Step 4: Evaluate Most Effective Controls and Document Results

Good and efficient combustion of the primary reformer is the only utilized and most effective for the control of CO emissions. All seven entries in the RBLC also identified good combustion practices as the only control for CO emissions.

Step 5: Select BACT

EDCC has selected good and efficient combustion as BACT for CO emissions at the ammonia plant primary reformer. EDCC proposes a BACT limit of 0.0194 lb CO/MMBtu per hour heat input at the primary reformer, on a 3-hour average basis, and 70.02 tons per rolling 12-month period.

Volatile Organic Compounds (VOC)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use for the control of VOC emissions from reformers at ammonia plants as well as reformers located in the refinery industry. There were six entries with listed control technologies for VOC emissions from reformers. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	VOC Emission Limit
RBLC ID: IA-0105	Iowa Fertilizer Company Wever, IA Ammonia Plant Primary Reformer	Good Combustion Practices	October 2012	0.0014 lb/MMBtu
RBLC ID: OK-0134	Pryor Chemical Company Pryor, OK Ammonia Plant Primary Reformer	Good Combustion Practices	February 2009	0.006 lb/MMBtu
RBLC ID: TX-0288	Air Liquide Freeport, TX Steam Methane Reformer	Good Combustion Practices	January 2005	0.006 lb/MMBtu
RBLC ID: LA-0211	Marathon Petroleum Garyville, LA Hydrogen Reformer Flue Gas Vent	Good Combustion Practices	December 2006	0.0015 lb/MMBtu
RBLC ID: PA-0231	United Refinery Company Warren, PA Hydrogen Reformer Unit	Good Combustion Practices	October 2003	0.003 lb/MMBtu
RBLC ID: OH-0329	BP North America Toledo, OH Reformer Heater	Good Combustion Practices	August 2009	0.005 lb/MMBtu

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for VOC emissions at primary reformers, good combustion practices was identified as the only feasible control option. Efficient combustion includes tuning of the burners within the reformer to achieve the maximum combustion efficiency, which reduces the amount of carbon exiting the stack. This option also includes proper tuning of process control systems to ensure that temperature, natural gas usage, and oxygen levels within the combustion zone remain within appropriate ranges.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Proper and efficient combustion at the reformer is the only remaining feasible control technology. As stated above, this efficient combustion would consist of conducting preventive steps to ensure that the proper fuel to air ratios are maintained, and that fuels with excess carbon content are not introduced into the combustion device.

Step 4: Evaluate Most Effective Controls and Document Results

Good and efficient combustion of the primary reformer is the only utilized and most effective for the control of VOC emissions. All six entries in the RBLC also identified good combustion practices as the only control for VOC emissions.

Step 5: Select BACT

EDCC has selected good and efficient combustion as BACT for VOC emissions at the ammonia plant primary reformer. EDCC proposes a BACT limit of 0.0014 lb VOC/MMBtu per hour heat input at the primary reformer, on a 3-hour average basis, and 5.05 tons per rolling 12-month period.

Sulfur Dioxide (SO_2)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use for the control of SO_2 emissions from reformers at ammonia plants as well as reformers located in the refinery industry. There were five entries for SO_2 emissions from reformers. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	SO_2 Emission Limit
RBLC ID: OK-0134	Pryor Chemical Company Pryor, OK Ammonia Plant Primary Reformer	When firing pipeline natural gas, ≤ 5 grains sulfur/100 SCF	February 2009	0.2 lb/MMBtu (3-hour average)

Reference	Facility Name/Location	Control Technology	Date Issued	SO_2 Emission Limit
RBLC ID: TX-0288	Air Liquide Freeport, TX Steam Methane Reformer	Use low sulfur fuel, <5 grains sulfur/100 DSCF	January 2005	0.02 lb/hr
RBLC ID: LA-0211	Marathon Petroleum Garyville, LA Hydrogen Reformer Flue Gas Vent	Use low sulfur fuel	December 2006	25 ppmv (annual average)
RBLC ID: PA-0231	United Refinery Company Warren, PA Hydrogen Reformer Unit	Good Combustion Practices	October 2003	9.22 lb/hr (0.027 lb/MMBtu)
RBLC ID: OH-0329	BP North America Toledo, OH Reformer Heater	None	August 2009	0.04 lb/MMBtu

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for SO_2 emissions at primary reformers, good combustion practices and the use of low sulfur fuel were identified as the only feasible control options.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Proper and efficient combustion and the use of low sulfur fuel at the reformer is the only feasible control option.

Step 4: Evaluate Most Effective Controls and Document Results

Good and efficient combustion and the use of low sulfur fuel are the only utilized and most effective control options for SO_2 emissions.

Step 5: Select BACT

EDCC has selected good and efficient combustion and the use of low sulfur fuel as BACT for the primary reformer. EDCC proposes a BACT limit of 0.00074 lb SO_2/MMBtu per hour heat input at the primary reformer, on a 3-hour average basis, and 0.44 tons per rolling 12-month period. This BACT limit will apply for all natural gas combustion SO_2 limits. This limit is based on the sulfur content of the natural gas supplied to the facility. The facility was provided information from their natural gas supplier that the natural gas supplied to EDCC will not contain any odorants. The annual BACT limit is based on a maximum of 50 ppb sulfur content after the fuel gas desulfurization unit.

CO_2e Emissions from the Primary Reformer

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

The following have been proposed as potential CO_2 emission control technologies for the primary reformer.

- Carbon capture and sequestration
- Chemical scrubbing
- Energy efficiency design and operation

Carbon capture and sequestration (CCS) has the potential to reduce and potentially eliminate direct CO_2 emissions from the flue gas from the primary reformer. This method of control requires the capture, pressurization, transportation, and injection within the subsurface for geologic storage. A membrane-based CO_2 capture system would use permeable or semi-permeable materials to selectively separate CO_2 from the flue gas. Typical solvents for post-combustion capture include mono-ethanolamine. Industry-wide efforts to improve solvent reactivity, reduce thermal degradation, and most importantly reduce the energy consumed for solvent regeneration are in the research phase.

After capture, the CO_2 gas must be pressurized, transported and sequestered. Geologic formations such as oil and gas reservoirs, un-mineable coal seams and underground saline formations are potential operations for long-term storage. Beneficial re-use (e.g., enhanced oil recovery or carbonation) is a potential alternative to strict storage. Large-scale sources of CO_2 are imposed on this background of potential basins and reservoirs. With the continued exploration and growth in the oil and gas industry, it is expected that additional CO_2 capacity will be required to support this growth for enhanced oil recovery (EOR) and EOR will become a more common method of CO_2 beneficial reuse.

Amine scrubbing is a chemical scrubbing technology for CO_2 removal in the flue gas. Monoethanolamine is the predominant scrubbing solvent used for CO_2 removal. Currently, amine scrubbing is used on a limited basis primarily in the utility sector. Moreover, amine scrubbing is capital and energy intensive. There are no current installations of amine scrubbers on any ammonia production plants in the United States.

The following energy efficiency alternatives are considered such that the natural gas usage required to produce the equivalent amount of steam would be reduced without impacting the process. However, a reduction in natural gas usage is a direct correlation to CO_2 emissions from the primary reformer.

> Burner tuning
>
> The primary goal is to achieve the maximum efficiency of the burner(s), such that combustion efficiency is increased. Burner tuning is the first step in achieving combustion efficiency and may have a direct impact on the formation and generation of CO_2 by minimizing the unburned carbon in the flue gas.
>
> Combustion control
>
> Combustion efficiency can be monitored and controlled through feedback loops that monitor temperature and/or oxygen levels within the system. Theoretically, once the burner(s) is/are tuned within the ideal set points the combustion efficiency is controlled and monitored via these parameters. Consequently, facilities are able to maintain a more transparent and accurate understanding of the corresponding burner(s) performance.
>
> High efficiency design
>
> Convection section heat recovery can raise the overall thermal efficiency through generation of high pressure steam or through preheat of process streams. The recovery of heat through generation of high pressure steam, which can then be used in the plant to power steam turbine drives for compressors, pumps, and fans, could reduce the amount of supplemental fuel firing needed to generate the steam needed to power these drives.

Step 2: Eliminate Technically Infeasible Options

As part of the BACT analysis, the control technologies identified as part of Step 1 are reviewed for their technical feasibility. Both CCS and energy efficiency design would be considered to be technically feasible.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Currently, the technically feasible CO_2 options for the primary reformer are CCS and potential implementation of energy efficiency measures including burner tuning, combustion control and high efficiency heat recovery.

Step 4: Evaluate Most Effective Controls and Document Results

Currently, the technically feasible CO_2 reduction options for the primary reformer that may be implemented are as follows:

- Combustion control
- CCS
- High efficiency heat recovery

CCS is being used in pilot-scale projects and is not currently in use in large-scale applications. There has been progress in the development of a proprietary solvent, which facilitates the absorption of the lower concentrations of CO_2 from the flue gas. However, implementation of CCS using this type of solvent is anticipated to result in higher capital and operating costs. In addition, the technology still remains unproven on a full-scale basis. Furthermore, there is not currently a nearby CO_2 storage reservoir, thus increasing the capital costs of pipeline construction and lifecycle costs associated with the maintenance and operability of the system. Additionally, where practicable when reviewing the technical feasibility of CCS, enhanced oil recovery has become a viable option.

However, information gathered from the National Piping Mapping System shows that currently there are no enhanced oil recovery lines or CO_2 lines to accept facility discharge. Although technically feasible, the distance to the closest point of CO_2 injection is greater than 100 miles from the facility. A CCS project would require the design and construction of a new pipeline system. Highlighted below are some major components of what comprises a pipeline construction project of this magnitude:

- A significant amount of capital and construction cost
- Multi-agency permits (rights-of-way, various local construction permits)
- Potential state line crossings
- A project schedule that can take several years to execute and be ready to accommodate the CO_2 from LSB's process.

Therefore, because the cost impact resulting from the direct (capital, construction, etc.) and indirect costs (multi-agency coordination, project schedule, etc.) would significantly impact the facility's economic competitiveness, CCS is not currently a viable BACT option for the primary reformer.

Although high efficiency heat recovery is technically feasible, there are several factors that preclude it from being implemented as BACT, including the following:

- The radiant section fuel firing would decrease
- The auxiliary boiler and convection section fuel firing would increase by a corresponding amount
- All of the burners would need to be replaced
- Combustion air preheater would need to be added

- Forced draft fan would be added
- Combustion air ducting would be added
- Stack gas temperature and overall thermal efficiency would not improve and it is expected that the amount of CO_2 emissions would not be reduced

Step 5: Select BACT

BACT for GHG control for the primary reformer is expected to incorporate elements of combustion control that reduce CO_2 emissions, yet do not impact the process. Prior to implementation, LSB will develop a work plan outlining the energy efficiency design elements. Once these final design elements are put into practice, LSB, where practicable will maintain a continuous record of set points that directly correlate to fuel usage and CO_2 emissions from the primary reformer.

The facility has proposed a BACT limit of 0.00022 lb/MMBtu for N_2O, 0.0022 lb/MMBtu for Methane, and 117 lb/MMBtu for CO_2. These rates equal 0.18 lb/hr for N_2O, 1.82 lb/hr for Methane, and 96,643.5 lb/hr for CO_2. All short-term limits are based on a 3-hour averaging period. The annual BACT limit for CO_2e is 423,714.2 tpy on a rolling 12-month basis.

Ammonia Plant Condensate Steam Stripper (SN-50)

Volatile Organic Compounds (VOC)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC was conducted to identify technologies currently in use for the control of VOC emissions from condensate steam strippers at ammonia plants. At this time, there is no listed control technology for the control of VOC emissions at an ammonia condensate steam stripper. In cases where an industrial process has removed VOC emissions from a process stream, they may choose to route the volatile gas to an incineration device. In the case of the proposed steam stripper at EDCC, the amount of volatile gas coming off of the unreacted steam is a low concentration and is therefore infeasible to route to combustion.

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for VOC emissions at steam strippers at ammonia plants, there are no controls listed in the RBLC. In the case of the proposed steam stripper at EDCC, the amount of volatile gas coming off of the unreacted steam is a low concentration and is therefore infeasible to route to combustion.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

There is no feasible control for VOC emissions at the ammonia plant condensate steam stripper at EDCC.

Step 4: Evaluate Most Effective Controls and Document Results

There is no feasible control for VOC emissions at the ammonia plant condensate steam stripper at EDCC.

Step 5: Select BACT

EDCC has selected proper operation of the condensate steam stripper as BACT for VOC emissions at the ammonia plant. EDCC proposes a BACT limit of 0.1 lb VOC/ton of ammonia produced at the ammonia plant condensate steam stripper, and 5.83 lb/hr VOC, on a 24-hr average, and 25.55 tons per rolling 12-month period.

CO_2e Emissions from the Ammonia Plant Condensate Steam Stripper

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

The condensate flash tank is a non-combustion process; therefore CO_2 control technologies are currently limited to good operating practices and CCS. Good operating practice in the ammonia industry is considered to be downstream use of a byproduct, such as utilizing CO_2 from the condensate flash tank as part of urea production. However, LSB does not currently have a urea plant, where CO_2 can be "reused" as part of the process.

Step 2: Eliminate Technically Infeasible Options

As part of the BACT analysis, the control technologies identified as part of Step 1 are reviewed for their technical feasibility. A control technology is considered to be technically feasible if it has been previously installed and is in practice at a similar source and/or process operating successfully.

CCS is being used in pilot-scale projects and is not currently in use in large-scale applications. Although there continues to be the development of proprietary solvents which facilitates the absorption of CO_2, CCS technologies are not yet commercially available for process sources. Furthermore, there is not currently a nearby CO_2 storage reservoir to utilize for the CO_2 captured from the condensate flash tank. Additionally, there are no nearby industries that could utilize the CO_2 for carbonation. Therefore, CCS is considered to be technically infeasible.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Based on the existing and near-term facility infrastructure, there are no technically feasible control options for CO_2 control.

Step 4: Evaluate Most Effective Controls and Document Results

Because there are currently no technically feasible control options, this step of the BACT process is not required.

Step 5: Select BACT

The BACT limits for this source include 6.8 lb CO_2/ton of NH_3 production on a 24-hr average, 396.64 lb/hr CO_2 on a 24-hr average, and 1,737.4 tons of CO_2e per rolling 12 months.

Ammonia Plant CO_2 Regenerator (SN-51)

Carbon Monoxide (CO)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use for the control of CO emissions from CO_2 regenerators at ammonia plants. There was one entry with listed control technologies for CO emissions from regenerators. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	CO Emission Limit
RBLC ID: IA-0105	Iowa Fertilizer Company Wever, IA Ammonia Plant Primary Reformer	Good Operational Practices	October 2012	0.02 lb/ton ammonia produced

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for CO emissions at CO_2 regenerators, good operational practices was identified as the only feasible control option. This includes proper tuning of process control systems to ensure that CO_2 removal efficiencies and MDEA levels are allowing for proper emission minimization.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Proper operation at the CO_2 regenerator is the only feasible control option. As stated above, this would consist of conducting preventive steps to ensure that the proper column operation is maintained ensuring CO_2 removal efficiency and thus CO minimization.

Step 4: Evaluate Most Effective Controls and Document Results

Proper and efficiency operation of the CO_2 regenerator is the most effective control measure.

Step 5: Select BACT

EDCC has selected good and efficient operation as BACT for CO emissions at the CO_2 regenerator at the ammonia plant. The BACT limits for this source include 0.02 lb CO/ton of NH_3 production on a 3-hr average, 1.17 lb/hr CO on a 3-hr average, and 5.11 tons of CO per rolling 12 months.

Volatile Organic Compounds (VOC)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use for the control of VOC emissions from CO_2 regenerators at ammonia plants. There was one entry with listed control technologies for VOC emissions from regenerators. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	VOC Emission Limit
RBLC ID: IA-0105	Iowa Fertilizer Company Wever, IA Ammonia Plant Primary Reformer	Good Operational Practices	October 2012	0.106 lb/ton ammonia produced

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for VOC emissions at CO_2 regenerators, good operational practices was identified as the only feasible control option. This includes proper tuning of process control systems to ensure that CO_2 removal efficiencies and MDEA levels are allowing for proper emission minimization.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Proper operation at the CO_2 regenerator is the only feasible control option. As stated above, this would consist of conducting preventive steps to ensure that the proper column operation is maintained ensuring CO_2 removal efficiency and thus VOC minimization.

Step 4: Evaluate Most Effective Controls and Document Results

Proper and efficiency operation of the CO_2 regenerator is the most effective control measure.

Step 5: Select BACT

EDCC has selected good and efficient operation as BACT for VOC emissions at the CO_2 regenerator at the ammonia plant. The BACT limits for this source include 0.106 lb VOC/ton of NH_3 production on a 3-hr average, 33.64 lb/hr VOC on a 3-hr average, and 147.35 tons of VOC per rolling 12 months.

CO_2e Emissions from the Ammonia Plant CO_2 Regenerator

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

The regenerator is a noncombustible process; therefore CO_2 control technologies are currently limited to good operating practices and CCS. Good operating practices in the ammonia industry are considered to be the downstream use of a by-product, such as utilizing CO_2 from the regenerator as part of urea production. However, LSB does not currently have a urea plant where CO_2 can be "reused" as part of the process.

Step 2: Eliminate Technically Infeasible Options

As part of the BACT analysis, the control technologies identified as part of Step 1 are reviewed for their technical feasibility. A control technology is considered to be technically feasible if it has been previously installed and is in practice at a similar source and/or process and is operating successfully.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Based on the existing and near-term facility infrastructure, there are no technically feasible control options for CO_2 control.

Step 4: Evaluate Most Effective Controls and Document Results

Because there are currently no technically feasible control options, this step of the BACT process is not required.

Step 5: Select BACT

Because there are currently no technically feasible control options, this step of the BACT process is not required. The BACT limits for this source include 2,507.5 lb CO_2/ton of NH_3 production on a 3-hr average, 146,262.6 lb/hr CO_2 on a 3-hr average, and 640,669.2 tons of CO_2/CO_2e per rolling 12 months.

Ammonia Plant Ammonia Vent Flare (SN-53)

Nitrogen Oxides (NO_x)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use to control emissions from ammonia plant vents. Process gas emissions from these vents include NH_3 and CH_4. There were no entries with listed control technologies for emissions from ammonia plant vents in the RBLC. In cases of high levels of NH_3 and CH_4 concentrations in a waste gas, the primary solution is to flare the waste gas.

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for process gas vents, the two primary options are waste gas flares and the use of no controls. In the case of the ammonia plant vents at EDCC, both are feasible options.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

The most effective option for reducing high levels of NH_3 and CH_4 emissions is the use of a waste gas flare. In the case of EDCC, the components of the waste gas stream are predominantly NH_3 and CH_4. Therefore, the byproducts are CO_2 and water along with any combustion byproducts, including NO_x.

Step 4: Evaluate Most Effective Controls and Document Results

Due to the high levels of NH_3 and CH_4 emissions that are only released over short periods of time (i.e., during a synthesis loop depressurization for shut-down or maintenance or during an emergency), the flare is an effective control. Additionally, during the periods when there are no depressurization related releases, the flare is a minimal contributor to total emissions and does not require a significant amount of continuous maintenance.

Step 5: Select BACT

EDCC has selected a waste gas flare as BACT to control emissions at the Ammonia Plant Ammonia Vent. The system will significantly reduce the NH_3 and CH_4 emissions that would otherwise be emitted from the source. Due to the sporadic nature of flaring operations, a production-based BACT emission limit is not feasible. EDCC proposes a BACT limit of 792.1 lb/hr of NO_x emissions. Annual emissions shall not exceed 6.9 ton/yr.

EDCC is proposing a BACT limit for opacity of 0%.

Carbon Monoxide (CO)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use to control emissions from ammonia plant vents. Process gas emissions from these vents include NH_3 and CH_4. There were no entries with listed control technologies for emissions from ammonia plant vents in the RBLC. In cases of high levels of NH_3 and CH_4 concentrations in a waste gas, the primary solution is to flare the waste gas.

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for process gas vents, the two primary options are waste gas flares and the use of no controls. In the case of the ammonia plant vents at EDCC, both are feasible options.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

The most effective option for reducing high levels of NH_3 and CH_4 emissions is the use of a waste gas flare. In the case of EDCC, the components of the waste gas stream are predominantly NH_3 and CH_4. Therefore, the byproducts are CO_2 and water along with any combustion byproducts, including CO.

Step 4: Evaluate Most Effective Controls and Document Results

Due to the high levels of NH_3 and CH_4 emissions that are only released over short periods of time (i.e., during a synthesis loop depressurization for shut-down or maintenance or during an emergency), the flare is an effective control. Additionally, during the periods when there are no depressurization related releases, the flare is a minimal contributor to total emissions and does not require a significant amount of continuous maintenance.

Step 5: Select BACT

EDCC has selected a waste gas flare as BACT to control emissions at the Ammonia Plant Ammonia Vent. The system will significantly reduce the NH_3 and CH_4 emissions that would otherwise be emitted from the source. Due to the sporadic nature of flaring operations, a production-based BACT emission limit is not feasible. EDCC proposes a BACT limit of 0.1 lb/hr of CO emissions. Annual emissions shall not exceed 0.4 ton/yr.

Volatile Organic Compounds (VOC)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use to control emissions from ammonia plant vents. Process gas emissions from these vents include NH_3 and CH_4. There were no entries with listed control technologies for emissions from ammonia plant vents in the RBLC. In cases of high levels of NH_3 and CH_4 concentrations in a waste gas, the primary solution is to flare the waste gas.

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for process gas vents, the two primary options are waste gas flares and the use of no controls. In the case of the ammonia plant vents at EDCC, both are feasible options.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

The most effective option for reducing high levels of NH_3 and CH_4 emissions is the use of a waste gas flare. In the case of EDCC, the components of the waste gas stream are predominantly NH_3 and CH_4. Therefore, the byproducts are CO_2 and water along with any combustion byproducts, including VOC.

Step 4: Evaluate Most Effective Controls and Document Results

Due to the high levels of NH_3 and CH_4 emissions that are only released over short periods of time (i.e., during a synthesis loop depressurization for shut-down or maintenance or during an emergency), the flare is an effective control. Additionally, during the periods when there are no depressurization related releases, the flare is a minimal contributor to total emissions and does not require a significant amount of continuous maintenance.

Step 5: Select BACT

EDCC has selected a waste gas flare as BACT to control emissions at the Ammonia Plant Ammonia Vent. The system will significantly reduce the NH_3 and CH_4 emissions that would otherwise be emitted from the source. Due to the sporadic nature of flaring operations, a production-based BACT emission limit is not feasible. EDCC proposes a BACT limit of 0.1 lb/hr of VOC emissions. Annual emissions shall not exceed 0.1 ton/yr.

Sulfur Dioxide (SO_2)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use to control emissions from ammonia plant vents. Process gas emissions from these vents include NH_3 and CH_4. There were no entries with listed control technologies for emissions from ammonia plant vents in the RBLC. In cases of high levels of NH_3 and CH_4 concentrations in a waste gas, the primary solution is to flare the waste gas.

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for process gas vents, the two primary options are waste gas flares and the use of no controls. In the case of the ammonia plant vents at EDCC, both are feasible options.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

The most effective option for reducing high levels of NH_3 and CH_4 emissions is the use of a waste gas flare. In the case of EDCC, the components of the waste gas stream are predominantly NH_3 and CH4. Therefore, the byproducts are CO_2 and water along with any combustion byproducts, including SO_2.

Step 4: Evaluate Most Effective Controls and Document Results

Due to the high levels of NH_3 and CH_4 emissions that are only released over short periods of time (i.e., during a synthesis loop depressurization for shut-down or maintenance or during an emergency), the flare is an effective control. Additionally, during the periods when there are no depressurization related releases, the flare is a minimal contributor to total emissions and does not require a significant amount of continuous maintenance.

Step 5: Select BACT

EDCC has selected a waste gas flare as BACT to control emissions at the Ammonia Plant Ammonia Vent. The system will significantly reduce the NH_3 and CH_4 emissions that would otherwise be emitted from the source. Due to the sporadic nature of flaring operations, a production-based BACT emission limit is not feasible. EDCC proposes a BACT limit of 0.1 lb/hr of SO_2 emissions. Annual emissions shall not exceed 0.1 ton/yr.

Ammonia Plant Startup Heater (SN-54)

Nitrogen Oxides (NO_x)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use for the control of NO_x emissions from heaters across all process types. There were seven entries with listed control technologies for NO_x emissions from small (<100 MMBtu/hr) heaters. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	NO_x Emission Limit
RBLC ID: IA-0105	Iowa Fertilizer Company Wever, IA 110.12 MMBtu/hr Startup Heater	Good Combustion Practices	October 2012	0.119 lb/MMBtu
RBLC ID: LA-0231	Lake Charles Cogeneration Lake Charles, LA 35 MMBtu/hr Startup Preheater 56.9 MMBtu/hr Startup Heater	Good Combustion Practices	June 2009	0.096 lb/MMBtu
RBLC ID: LA-0262	Cornerstone Chemical Jefferson Par., La. 61 MMBtu/hr Startup Heater	Good Engineering Practice	October 2012	0.17 lb/MMBtu
RBLC ID: CA-1212	City of Palmdale Hybrid Power Project 40 MMBtu/hr Auxiliary Heater	None	February 2013	9 ppm
RBLC ID: CA-1211	Pacific Gas & Elec. Colusa Generating Station 10 MMBtu/hr Heater	None	March 2011	30 ppm
RBLC ID: CA-1191	City of Victorville Hybrid Power Project San Bernardino, CA 40 MMBtu/hr Heater	None	March 2010	9 ppm

Reference	Facility Name/Location	Control Technology	Date Issued	NO_x Emission Limit
RBLC ID: ID-0017	Southeast Idaho Energy Power, ID 25 MMBtu/hr Heater	Good Combustion Practices	February 2009	None

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search, good combustion and engineering practices is the only control option utilized in the control of NO_x emissions from process heaters. Efficient combustion includes maintaining the burners within the heater to achieve the maximum combustion efficiency, which reduces the amount of carbon exiting the unit. This option also includes proper tuning of process control systems to ensure that temperature, natural gas usage, and oxygen levels within the combustion zone remain within appropriate ranges.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Proper and efficient combustion at the heater is the only feasible control technology. As stated above, this efficient combustion would consist of conducting preventive steps to ensure that the proper fuel to air ratios are maintained, and that fuels with excess carbon content are not introduced into the combustion device.

Step 4: Evaluate Most Effective Controls and Document Results

Good and efficient combustion of the startup heater is the only utilized and most effective for the control of NO_x emissions. All seven entries in the RBLC also identified good combustion practices as the only control for NO_x emissions.

Step 5: Select BACT

EDCC has selected the use of low-NO_x burners and good and efficient combustion as BACT for NO_x emissions at the startup heater. The BACT limits for this source include 0.06 lb NO_x/MMBtu per hour heat input at the startup heater on a 3-hr average, 2.28 lb/hr NO_x on a 3-hr average, and 0.57 tons of NO_x per rolling 12 months.

EDCC is proposing a BACT limit for opacity of 0%.

Carbon Monoxide (CO)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use for the control of CO emissions from heaters across all process types. There were six entries with listed control technologies for CO emissions from small (<100 MMBtu/hr) heaters. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	CO Emission Limit
RBLC ID: IA-0105	Iowa Fertilizer Company Wever, IA 110.12 MMBtu/hr Startup Heater	Good Combustion Practices	October 2012	0.0194 lb/MMBtu
RBLC ID: CA-1212	City of Palmdale Hybrid Power Project 40 MMBtu/hr Auxiliary Heater	None	February 2013	50 ppm
RBLC ID: CA-1211	Pacific Gas & Elec. Colusa Generating Station 10 MMBtu/hr Heater	None	March 2011	100 ppm
RBLC ID: CA-1191	City of Victorville Hybrid Power Project San Bernardino, CA 40 MMBtu/hr Heater	None	March 2010	50 ppm
RBLC ID: LA-0231	Lake Charles Cogeneration Lake Charles, LA 35 MMBtu/hr Startup Preheater 56.9 MMBtu/hr Startup Heater	Good Combustion Practices	June 2009	0.081 lb/MMBtu
RBLC ID: ID-0017	Southeast Idaho Energy Power, ID 25 MMBtu/hr Heater	Good Combustion Practices	February 2009	None

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search, good combustion and engineering practices is the only control option utilized in the control of CO emissions from process heaters. Efficient combustion includes maintaining the burners within the heater to achieve the maximum combustion efficiency, which reduces the amount of carbon exiting the unit. This option also includes proper tuning of process control systems to ensure that temperature, natural gas usage, and oxygen levels within the combustion zone remain within appropriate ranges.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Proper and efficient combustion at the startup heater is the only feasible control technology. As stated above, this efficient combustion would consist of conducting preventive steps to ensure that the proper fuel to air ratios are maintained, and that fuels with excess carbon content are not introduced into the combustion device.

Step 4: Evaluate Most Effective Controls and Document Results

Good and efficient combustion of the startup heater is the only utilized and most effective for the control of CO emissions. All six entries in the RBLC also identified good combustion practices as the only control for CO emissions.

Step 5: Select BACT

EDCC has selected good and efficient combustion as BACT for CO emissions at the startup heater. The BACT limits for these sources include 0.01 lb CO/MMBtu per hour heat input at the heater on a 3-hr average, 0.38 lb/hr CO on a 3-hr average, and 0.10 tons of CO per rolling 12 months.

Volatile Organic Compounds (VOC)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use for the control of VOC emissions from heaters across all process types. There were ten entries with listed control technologies for VOC emissions from small (<100 MMBtu/hr) boilers/heaters. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	VOC Emission Limit
RBLC ID: IA-0105	Iowa Fertilizer Company Wever, IA Startup Heater	Good Combustion Practices	October 2012	0.0014 lb/MMBtu
RBLC ID: CA-1211	Pacific Gas & Elec. Colusa Generating Station 10 MMBtu/hr Heater	None	March 2011	0.0027 lb/MMBtu
FL-0335	Klauser Holding Suwannee, FL 46 MMBtu/hr Boiler	Good Combustion Practices	September 2012	0.0030 lb/MMBtu
NJ-0079	CPV Shore Middlesex, NJ 91.6 MMBtu/hr Boiler	Use of Natural Gas	April 2013	0.0015 lb/MMBtu
OH-0350	Republic Steel Lorain, OH 65 MMBtu/hr Boiler	Proper Burner Design and Good Combustion Practices	July 2012	0.0054 lb/MMBtu
SC-0113	Pyramax Ceramics Allendale, SC 5 MMBtu/hr Boilers	Good Combustion Practices Use of Natural Gas and Propane	February 2012	None
LA-0246	Valero Refining St. Charles, LA 99 MMBtu/hr Boiler	Good Combustion Practices and Use of Gaseous Fuels	December 2010	0.0054 lb/MMBtu

Reference	Facility Name/Location	Control Technology	Date Issued	VOC Emission Limit
NV-0050	MGM Mirage Las Vegas, NV 41.64 MMBtu/hr Boilers 4.2 MMBtu/hr Boilers	Use of Natural Gas and Good Combustion Practices	November 2009	0.0024 lb/MMBtu 0.0048 lb/MMBtu
NV-0049	Harrah's Las Vegas, NV 8.4 MMBtu/hr Boiler 14.34 MMBtu/hr Boiler 16.8 MMBtu/hr Boiler 31.4 MMBtu/hr Boiler	Operate Per Manufacturer Specifications	August 2009	All 0.0054 lb/MMBtu
RBLC ID: LA-0231	Lake Charles Cogeneration Lake Charles, LA 35 MMBtu/hr Startup Preheater 56.9 MMBtu/hr Startup Heater	Good Combustion Practices	June 2009	None

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for VOC emissions from process heaters, good combustion practices was identified as the only feasible control option. Efficient combustion includes tuning of the burners within the heater to achieve the maximum combustion efficiency, which reduces the amount of carbon exiting the stack. This option also includes proper tuning of process control systems to ensure that temperature, natural gas usage, and oxygen levels within the combustion zone remain within appropriate ranges.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Proper and efficient combustion in the heaters is the only remaining feasible control technology. As stated above, this efficient combustion would consist of conducting preventive steps to ensure that the proper fuel to air ratios are maintained, and that fuels with excess carbon content are not introduced into the combustion device.

Step 4: Evaluate Most Effective Controls and Document Results

Good and efficient combustion in the heaters is the only utilized and most effective for the control of VOC emissions. All three entries in the RBLC also identified good combustion practices as the only control for VOC emissions.

Step 5: Select BACT

EDCC has selected good and efficient combustion as BACT for VOC emissions at the ammonia plant start-up heater. The BACT limits for these sources include 0.002 lb VOC/MMBtu per hour heat input at the startup heater on a 3-hr average, 0.08 lb/hr VOC on a 3-hr average, and 0.019 tons of VOC per rolling 12 months.

Sulfur Dioxide (SO_2)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A four year search of the RBLC was conducted to identify technologies currently in use for the control of SO_2 emissions from heaters across all process types. There were eight entries with listed control technologies for SO_2 emissions from small (<100 MMBtu/hr) boilers/heaters. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	SO_2 Emission Limit
FL-0335	Klauser Holding Suwannee, FL 46 MMBtu/hr Boiler	Fuel Monitoring	September 2012	2 gr of sulfur/dscf
NJ-0079	CPV Shore Middlesex, NJ 91.6 MMBtu/hr Boiler	Use of Natural Gas	April 2013	0.002 lb/MMBtu
OH-0350	Republic Steel Lorain, OH 65 MMBtu/hr Boiler	None	July 2012	0.6 lb/MMSCF
SC-0113	Pyramax Ceramics Allendale, SC 5 MMBtu/hr Boilers	Use of Natural Gas	February 2012	None
LA-0246	Valero Refining St. Charles, LA 99 MMBtu/hr Boiler	Use of Natural or Refinery Gas with annual average H_2S content <100ppv	December 2010	0.025 lb/MMBtu

Reference	Facility Name/Location	Control Technology	Date Issued	SO_2 Emission Limit
NV-0050	MGM Mirage Las Vegas, NV 41.64 MMBtu/hr Boilers 4.2 MMBtu/hr Boilers	Use of Natural Gas and Good Combustion Practices	November 2009	0.0007 lb/MMBtu 0.0024 lb/MMBtu
NV-0049	Harrah's Las Vegas, NV 8.4 MMBtu/hr Boiler 14.34 MMBtu/hr Boiler 16.8 MMBtu/hr Boiler 31.4 MMBtu/hr Boiler	Use of Natural Gas and Good Combustion Practices	August 2009	0.0006 lb/MMBtu 0.0006 lb/MMBtu 0.0042 lb/MMBtu 0.0006 lb/MMBtu
LA-0231	Lake Charles Cogeneration Lake Charles, LA 56.9 MMBtu/hr Startup Heaters 35 MMBtu/hr Startup Preheaters	Use of Natural	June 2009	0.0006 lb/MMBtu 0.0006 lb/MMBtu

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for SO_2 emissions at process heaters, good combustion practices and the use of low sulfur natural gas were identified as the only feasible control options.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Proper and efficient combustion and the use of low sulfur natural gas at the startup heater is the only feasible control option.

Step 4: Evaluate Most Effective Controls and Document Results

Good and efficient combustion and the use of low sulfur natural gas are the only utilized and most effective control options for SO_2 emissions.

Step 5: Select BACT

EDCC has selected good and efficient combustion and the use of low sulfur fuel as BACT for the startup heater. The BACT limits for these sources include 0.00074 lb SO_2/MMBtu per hour heat input at the startup heater on a 3-hr average, 0.028 lb/hr SO_2 on a 3-hr average, and 0.0070 tons of SO_2 per rolling 12 months.

CO_2e Emissions from the Ammonia Plant Startup Heater

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

The following have been proposed as potential CO_2 emission control technologies for the start-up heater:

- Carbon capture and sequestration
- Energy efficiency design and operation
- Alternative fuels.

Alternative Fuels

The potential on-site reduction in CO_2 emissions that may be realized by switching from a traditional fossil fuel to a biomass fuel is based on the specific emission factor for the fuel as related to its caloric value. Currently, pure biomass fuels include animal meal, landfill gas, sawdust, waste wood products, and sewage sludge.

Step 2: Eliminate Technically Infeasible Options

As part of the BACT analysis, the control technologies identified as part of Step 1 are reviewed for their technical feasibility. A control technology is considered to be technically feasible if it has been previously installed and is in practice at a similar source and/or process and is operating successfully.

Carbon Capture and Sequestration

The technical infeasibility of CCS relative to combustion sources and the EDCC site has been previously described above. Therefore, it is not described again within this section.

Alternative Fuels

It is anticipated that the start-up heater will utilize natural gas as fuel. Currently, natural gas is the lowest GHG-emitting fossil fuel that could be used to provide the required steam production at the facility. In addition, natural gas is the feedstock for the ammonia process. As a result, natural gas as a low-GHG emitting fossil fuel and readily available process feedstock within the facility essentially renders alternative fuels technically infeasible for the start-up heater.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

The technically feasible CO_2 option for the start-up heater is to fire only natural gas. The most recent RBLC entry identified for CO_2 has a BACT limit at 117 lb CO_2/MMBtu.

Step 4: Evaluate Most Effective Controls and Document Results

The technically feasible CO_2 reduction option for the start-up heater that may be implemented to achieve a BACT emission rate of 117 lb CO_2/MMBtu is firing only natural gas. Based on the design specifications developed for the start-up heater, it is expected that the CO_2 emissions for this unit will be consistent with the aforementioned BACT limit and therefore it is not necessary to further evaluate the environmental, energy or economic impacts of the technology.

Step 5: Select BACT

In summary, BACT for GHG control for the start-up heater is anticipated to include firing only natural gas and inherent design specifications to meet the aforementioned limit. CO_2 emissions from the start-up heater may not exceed 117 lb MMBtu/hr based on three 1-hour stationary source testing runs utilizing USEPA Method 3A. Methane BACT limits for the start-up heater may not exceed 0.0022 lb/MMBtu based on three 1-hour stationary source testing runs utilizing USEPA Method 18. Also, the N_2O emissions from the start-up heater may not exceed 0.00022 lb/MMBtu based on three 1-hour stationary source testing runs utilizing USEPA Method 320. In addition, the total CO_2e emissions of 1,115.3 tons per 12-month rolling averaging period shall not be exceeded.

Ammonia Plant Process SSM Flare (SN-56) & Ammonia Storage Flare (SN-57)

Nitrogen Oxides (NO_x)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use for the control of NO_x emissions from ammonia plant vents. There were no entries with listed control technologies for emissions from ammonia plant vents in the RBLC. In cases of high levels of CO, CO_2, NH_3, and CH_4 concentrations in a waste gas, the primary solution is to flare the waste gas.

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for process gas vents, the two primary options are waste gas flares and the use of no controls. In the case of the ammonia plant vents at EDCC, both are feasible options.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

The most effective option for reducing high levels of NH_3 and CH_4 emissions is the use of a waste gas flare. In the case of EDCC, the components of the waste gas stream are predominantly

CO, CO_2, NH_3, and CH_4. Therefore, the byproducts are CO_2 and water along with any combustion byproducts, including NO_X.

Step 4: Evaluate Most Effective Controls and Document Results

Due to the high levels of CO, CO_2, NH_3, and CH_4 emissions that are only released over short periods of time; i.e., during /startups, shutdowns, and as otherwise needed for maintenance purposes (SSM), the flare is an effective control. Additionally, during the periods when there are no SSM related releases, the flare is a minimal contributor to total emissions and does not require a significant amount of continuous maintenance.

Step 5: Select BACT

EDCC has selected a waste gas flare as BACT to control SSM related emissions at the Ammonia Plant and for Ammonia Storage. Due to the sporadic nature of flaring operations, a production-based BACT emission limit is not feasible. EDCC has proposed NO_X emissions for SN-56 and SN-57 of 0.1 and 10.1 lb/hr, respectively. Annual emissions for SN-56 and SN-57 shall not exceed 0.5 ton/yr and 43.9 ton/yr, respectively.

EDCC is proposing a BACT limit for opacity of 0%.

Sulfur Dioxide (SO_2)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use to control emissions from ammonia plant vents. Process gas emissions from these vents include CO, CO_2, NH_3, and CH_4. There were no entries with listed control technologies for emissions from ammonia plant vents in the RBLC. In cases of high levels of CO, CO_2, NH_3, and CH_4 concentrations in a waste gas, the primary solution is to flare the waste gas.

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for process gas vents, the two primary options are waste gas flares and the use of no controls. In the case of the ammonia plant vents at EDCC, both are feasible options.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

The most effective option for reducing high levels of NH_3 and CH_4 emissions is the use of a waste gas flare. In the case of EDCC, the components of the waste gas stream are predominantly

CO, CO_2, NH_3, and CH_4. Therefore, the byproducts are CO_2 and water along with any combustion byproducts, including SO_2.

Step 4: Evaluate Most Effective Controls and Document Results

Due to the high levels of CO, CO_2, NH_3, and CH_4 emissions that are only released over short periods of time; i.e., during /startups, shutdowns, and as otherwise needed for maintenance purposes (SSM), the flare is an effective control. Additionally, during the periods when there are no SSM related releases, the flare is a minimal contributor to total emissions and does not require a significant amount of continuous maintenance.

Step 5: Select BACT

EDCC has selected a waste gas flare as BACT to control SSM related emissions at the Ammonia Plant and for Ammonia Storage. Due to the sporadic nature of flaring operations, a production-based BACT emission limit is not feasible. EDCC has proposed SO_2 emissions for SN-56 and SN-57 of 0.1 and 0.1 lb/hr, respectively. Annual emissions for SN-56 and SN-57 shall not exceed 0.1 ton/yr and 0.1 ton/yr, respectively.

Volatile Organic Compounds (VOC)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use to control emissions from ammonia plant vents. Process gas emissions from these vents include CO, CO_2, NH_3, and CH_4. There were no entries with listed control technologies for emissions from ammonia plant vents in the RBLC. In cases of high levels of CO, CO_2, NH_3, and CH_4 concentrations in a waste gas, the primary solution is to flare the waste gas.

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for process gas vents, the two primary options are waste gas flares and the use of no controls. In the case of the ammonia plant vents at EDCC, both are feasible options.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

The most effective option for reducing high levels of NH_3 and CH_4 emissions is the use of a waste gas flare. In the case of EDCC, the components of the waste gas stream are predominantly CO, CO_2, NH_3, and CH_4. Therefore, the byproducts are CO_2 and water along with any combustion byproducts, including VOC.

Step 4: Evaluate Most Effective Controls and Document Results

Due to the high levels of CO, CO_2, NH_3, and CH_4 emissions that are only released over short periods of time; i.e., during /startups, shutdowns, and as otherwise needed for maintenance purposes (SSM), the flare is an effective control. Additionally, during the periods when there are no SSM related releases, the flare is a minimal contributor to total emissions and does not require a significant amount of continuous maintenance.

Step 5: Select BACT

EDCC has selected a waste gas flare as BACT to control SSM related emissions at the Ammonia Plant and for Ammonia Storage. Due to the sporadic nature of flaring operations, a production-based BACT emission limit is not feasible. EDCC has proposed VOC emissions for SN-56 and SN-57 of 0.1 and 0.1 lb/hr, respectively. Annual emissions for SN-56 and SN-57 shall not exceed 0.1 ton/yr and 0.1 ton/yr, respectively.

Carbon Monoxide (CO)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A search of the RBLC and other published sources was conducted to identify technologies currently in use to control emissions from ammonia plant vents. Process gas emissions from these vents include CO, CO_2, NH_3, and CH_4. There were no entries with listed control technologies for emissions from ammonia plant vents in the RBLC. In cases of high levels of CO, CO_2, NH_3, and CH_4 concentrations in a waste gas, the primary solution is to flare the waste gas.

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for process gas vents, the two primary options are waste gas flares and the use of no controls. In the case of the ammonia plant vents at EDCC, both are feasible options.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

The most effective option for reducing high levels of NH_3 and CH_4 emissions is the use of a waste gas flare. In the case of EDCC, the components of the waste gas stream are predominantly CO, CO_2, NH_3, and CH_4. Therefore, the byproducts are CO_2 and water along with any combustion byproducts, including CO.

Step 4: Evaluate Most Effective Controls and Document Results

Due to the high levels of CO, CO_2, NH_3, and CH_4 emissions that are only released over short periods of time; i.e., during /startups, shutdowns, and as otherwise needed for maintenance purposes (SSM), the flare is an effective control. Additionally, during the periods when there are no SSM related releases, the flare is a minimal contributor to total emissions and does not require a significant amount of continuous maintenance.

Step 5: Select BACT

EDCC has selected a waste gas flare as BACT to control SSM related emissions at the Ammonia Plant and for Ammonia Storage. Due to the sporadic nature of flaring operations, a production-based BACT emission limit is not feasible. EDCC has proposed CO emissions for SN-56 and SN-57 of 156.1 and 0.1 lb/hr, respectively. Annual emissions for SN-56 and SN-57 shall not exceed 39.4 ton/yr and 0.1 ton/yr, respectively.

Start-up Boiler (SN-61)

Nitrogen Oxides (NO_x)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A four year search of the RBLC was conducted to identify technologies currently in use for the control of NO_x emissions from boilers across all process types. There were eight entries with listed control technologies for NO_x emissions from natural gas-fired boilers. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	NO_x Emission Limit
RBLC ID: IA-0105	Iowa Fertilizer Company Wever, IA Auxiliary Boiler	Low NO_x Burner	October 2012	0.0125 lb/MMBtu
RBLC ID: CA-1212	City of Palmdale Hybrid Power Project Auxiliary Boiler	None	February 2013	9 ppm
RBLC ID: CA-1206	APMC Stockton Stockton Cogen Auxiliary Boiler	None	September 2011	7 ppm 0.0085 lb/MMBtu
RBLC ID: OH-0336	Campbell Soup Co. Henry, OH Natural Gas Boilers	None	December 2010	0.04 lb/MMBtu

Reference	Facility Name/Location	Control Technology	Date Issued	NO_x Emission Limit
RBLC ID: MI-0389	Consumers Energy Karn Complex 220 MMBtu/hr Boiler	Low NO_x Burner	December 2009	0.018 lb/MMBtu 30-day rolling average
RBLC ID: NV-0050	MGM Mirage Clark Co., NV 42 MMBtu/hr Boilers (3)	Low NO_x Burner	November 2009	0.011 lb/MMBtu
RBLC ID: OH-0310	American Municipal Power Meigs Co., OH 150 MMBtu/hr Boiler	None	October 2009	0.14 lb/MMBtu
RBLC ID: NV-0049	Harrah's Operating Co.	Low NO_x Burner	August 2009	0.03 lb/MMBtu

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search, ultra low NO_x burners or low NO_x burners, combined with good combustion and engineering practices, are the only control options utilized in the control of NO_x emissions from process boilers. Efficient combustion includes maintaining the burners within the boiler to achieve the maximum combustion efficiency, which reduces the amount of carbon exiting the unit. This option also includes proper tuning of process control systems to ensure that temperature, natural gas usage, and oxygen levels within the combustion zone remain within appropriate ranges.

While the ultra low-NO_x burners available for the proposed startup boiler at EDCC provide increased NO_x reduction (i.e., capable of achieving a 9 ppm NO_x emission rate), their associated turndown rate is low (i.e., 4:1) compared to the low NO_x combustion efficient burners with flue gas recirculation proposed for EDCC's Start-Up Boiler, which has a turndown rate of 10:1. The turndown rate represents the maximum firing rate of the burners compared to the lowest controllable firing rate at which the boiler can operate. A higher turndown rate indicates greater combustion control under a wider range of operating conditions. This translates to better emission control as the firing rate at the boiler is increased/decreased to respond to variable plant startup conditions. The startup boiler, as intended for operation at EDCC, must be able to vary its firing rate over a broader range to respond to changing plant startup related conditions. Because the ultra low NO_x burners cannot be adjusted efficiently during low firing rate conditions, the ultra low NO_x burners are not considered technically feasible for the operational application at EDCC.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Use of low NO_x burners with flue gas recirculation at the boiler is the only feasible control technology. As stated above, this efficient combustion would consist of conducting preventive steps to ensure that the proper fuel to air ratios are maintained, and that fuels with excess carbon content are not introduced into the combustion device.

Step 4: Evaluate Most Effective Controls and Document Results

Flue gas recirculation and low NO_x burner are the most effective controls for NO_x emissions at the startup boiler.

Step 5: Select BACT

EDCC has selected low NO_x, combustion efficient burners with flue gas recirculation as BACT for NO_x emissions at the startup boiler. The BACT limits for this source include 0.018 lb NO_x/MMBtu per hour heat input at the startup boiler on a 3-hr average, 4.32 lb/hr NO_x on a 3-hr average, and under Operating Scenario 1, 18.92 tons of NO_x per rolling 12 months. Under Operating Scenario 2, the annual limit will reduce to 5.68 tons of NO_x per rolling 12 months. The facility proposed two (2) operating scenarios for this boiler. One operating scenario was listed with the boiler operating at maximum capacity annually, and the other as a high turndown rate (10:1) boiler. The facility based their BACT analysis on operating the boiler with a high turndown rate, and chose limits based on this fact. Therefore, the other operating scenario is not feasible with a high turndown rate boiler. Not operating the boiler at a high turndown rate would constituent a change in the method of operation for the unit.

EDCC is proposing a BACT limit for opacity of 0%.

Carbon Monoxide (CO)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A four year search of the RBLC was conducted to identify technologies currently in use for the control of CO emissions from boilers across all process types. There were five entries with listed control technologies for CO emissions from natural gas-fired boilers. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	CO Emission Limit
RBLC ID: CA-1212	City of Palmdale Hybrid Power Project Auxiliary Boiler	None	February 2013	50 ppm
RBLC ID: OH-0336	Campbell Soup Co. Henry, OH Natural Gas Boilers	None	December 2010	0.075 lb/MMBtu

Reference	Facility Name/Location	Control Technology	Date Issued	CO Emission Limit
RBLC ID: MI-0389	Consumers Energy Karn Complex 220 MMBtu/hr Boiler	Good Combustion Practices	December 2009	0.035 lb/MMBtu
RBLC ID: NV-0050	MGM Mirage Clark Co., NV	Good Combustion Practices	November 2009	0.019 lb/MMBtu
RBLC ID: OH-0310	American Municipal Power Meigs Co., OH 150 MMBtu/hr Boiler	None	October 2009	0.084 lb/MMBtu

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search, good combustion and engineering practices is the only control option utilized in the control of CO emissions from process boilers. Efficient combustion includes maintaining the burners within the boiler to achieve the maximum combustion efficiency, which reduces the amount of carbon exiting the unit. This option also includes proper tuning of process control systems to ensure that temperature, natural gas usage, and oxygen levels within the combustion zone remain within appropriate ranges.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Proper and efficient combustion at the startup boiler is the only feasible control technology. As stated above, this efficient combustion would consist of conducting preventive steps to ensure that the proper fuel to air ratios are maintained, and that fuels with excess carbon content are not introduced into the combustion device.

Step 4: Evaluate Most Effective Controls and Document Results

Good and efficient combustion of the startup boiler is the only utilized and most effective for the control of CO emissions. All five entries in the RBLC also identified good combustion practices as the only control for CO emissions.

Step 5: Select BACT

EDCC has selected good and efficient combustion as BACT for CO emissions at the startup boiler. The BACT limits for this source include 0.037 lb CO/MMBtu per hour heat input at the boiler on a 3-hr average basis, or 50 ppm_{vd}, 8.88 lb/hr CO on a 3-hr average, and under Operating Scenario 1, 38.89 tons of CO per rolling 12 months. Under Operating Scenario 2, the annual limit will be reduced to 11.67 tons of CO per rolling 12 months.

Volatile Organic Compounds (VOC)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A four year search of the RBLC was conducted to identify technologies currently in use for the control of VOC emissions from boilers across all process types. There were six entries with listed control technologies for VOC emissions from natural gas-fired boilers. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	VOC Emission Limit
RBLC ID: IA-0105	Iowa Fertilizer Company Wever, IA Auxiliary Boiler	Good Combustion Practices	October 2012	0.0014 lb/MMBtu
RBLC ID: OH-0336	Campbell Soup Co. Henry, OH Natural Gas Boilers	None	December 2010	0.0054 lb/MMBtu
RBLC ID: MI-0389	Consumers Energy Karn Complex 220 MMBtu/hr Boiler	Good Combustion Practices	December 2009	0.0013 lb/MMBtu
RBLC ID: NV-0050	MGM Mirage Clark Co., NV 42 MMBtu/hr Boilers (3)	Good Combustion Practices	November 2009	0.0024 lb/MMBtu
RBLC ID: OH-0310	American Municipal Power Meigs Co., OH 150 MMBtu/hr Boiler	None	October 2009	0.0055 lb/MMBtu
RBLC ID: NV-0049	Harrah's Operating Co.	None	August 2009	0.0054 lb/MMBtu

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for VOC emissions from natural gas-fired boilers, good combustion practices was identified as the only feasible control option. Efficient combustion includes tuning of the burners within the boiler to achieve the maximum combustion efficiency, which reduces the amount of carbon exiting the stack. This option also includes proper tuning of process control systems to ensure that temperature, natural gas usage, and oxygen levels within the combustion zone remain within appropriate ranges.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Proper and efficient combustion in the boiler is the only remaining feasible control technology. As stated above, this efficient combustion would consist of conducting preventive steps to ensure that the proper fuel to air ratios are maintained, and that fuels with excess carbon content are not introduced into the combustion device.

Step 4: Evaluate Most Effective Controls and Document Results

Good and efficient combustion of the boiler is the only utilized and most effective for the control of VOC emissions. All six entries in the RBLC also identified good combustion practices as the only control for VOC emissions.

Step 5: Select BACT

EDCC has selected good and efficient combustion as BACT for VOC emissions at the start-up boiler. The BACT limits for this source include 0.004 lb VOC/MMBtu per hour heat input at the startup boiler on a 3-hr average, 0.96 lb/hr VOC on a 3-hr average basis, and under Operating Scenario 1, 4.21 tons of VOC per rolling 12 months. Under Operating Scenario 2, the annual limit is reduced to 1.26 tons of VOC per rolling 12 months.

Sulfur Dioxide (SO_2)

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

A four year search of the RBLC was conducted to identify technologies currently in use for the control of SO_2 emissions from boilers across all process types. There were six entries with listed control technologies for SO_2 emissions from natural gas-fired boilers. The following table summarizes the results of the search.

Reference	Facility Name/Location	Control Technology	Date Issued	SO_2 Emission Limit
RBLC ID: OH-0336	Campbell Soup Co. Henry, OH Natural Gas Boilers	None	December 2010	0.0006 lb/MMBtu
RBLC ID: NV-0050	MGM Mirage Clark Co., NV Mandalay Bay	Good Combustion Practices	November 2009	0.0006 lb/MMBtu
RBLC ID: NV-0050	MGM Mirage Clark Co., NV City Center	Good Combustion Practices	November 2009	0.0007 lb/MMbtu

Reference	Facility Name/Location	Control Technology	Date Issued	SO_2 Emission Limit
RBLC ID: NV-0050	MGM Mirage Clark Co., NV City Center	Good Combustion Practices	November 2009	0.0024 lb/MMBtu
RBLC ID: NV-0050	MGM Mirage Clark Co., NV New York – New York	Good Combustion Practices	November 2009	0.0050 lb/MMBtu
RBLC ID: OH-0310	American Municipal Power Meigs Co., OH 150 MMBtu/hr Boiler	None	October 2009	0.0006 lb/MMBtu

Step 2: Eliminate Technically Infeasible Options

Based on the results of the RBLC search for SO_2 emissions at boilers, good combustion practices and the use of low sulfur fuel were identified as the only feasible control options.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Proper and efficient combustion and the use of low sulfur fuel at the startup boiler is the only feasible control option.

Step 4: Evaluate Most Effective Controls and Document Results

Good and efficient combustion and the use of low sulfur fuel are the only utilized and most effective control options for SO_2 emissions.

Step 5: Select BACT

EDCC has selected good and efficient combustion and the use of low sulfur fuel as BACT for the startup boiler. The BACT limits for this source include 0.00074 lb SO_2/MMBtu at the startup boiler on a 3-hr average basis, 0.18 lb/hr SO_2 on a 3-hr average basis, and under Operating Scenario 1, 0.77 tons of SO_2 per rolling 12 months. Under Operating Scenario 2, the annual limit is reduced to 0.23 tons of SO_2 per rolling 12 months.

CO_2e Emissions from the Start-up Boiler

Top-Down BACT Analysis

Step 1: Identify All Control Technologies

The following have been proposed as potential CO_2 emission control technologies for the start-up boiler:

- Carbon capture and sequestration
- Energy efficiency design and operation
- Blowdown heat recovery
- Condensate return system
- Cogeneration
- Alternative fuels

Carbon capture and sequestration as well as energy efficiency design and operation are previously described above. Therefore, they are not described again below with the other identified available CO_2 control technologies.

Blowdown Heat Recovery

Blowdown rates are site-specific and dependent on existing water quality as well as make-up water quality. Blowdown has energy that is wasted and typically not recovered. Waste heat from blowdown could be recovered via heat exchanger, a flash tank, or a flash tank in combination with a heat exchanger.

Condensate Return System

Hot condensate not returned to the boiler is wasted energy. A condensate return system may allow the plant to realize a reduction in water related treatment costs, decreased amount of make-up water needed, as well as discharge fees. The energy condensate is returned at a hot temperature (typically between 130 – 225 °F). Whereas makeup water typically has colder in-coming temperatures (typically between 50–60 °F), and therefore must be heated. A condensate return system must be a function of the specific boiler, water quality and condensate; but it is essentially a piping and distribution system.

Cogeneration

Cogeneration is the production of useful steam and electricity from a single plant. Use of cogeneration can provide energy efficiency from the previously wasted heat. Typically, thermal electrical generation is inefficient and therefore results in a loss of greater than 50% of waste heat. By recovering this energy for steam, and/or hot water production has the potential to increase the efficiency of the process by greater than 70%. Increasing the efficiency of the process results in a decrease in the amount of fuel required.

Alternative Fuels

The potential on-site reduction in CO_2 emissions that may be realized by switching from a traditional fossil fuel to a biomass fuel is based on the specific emission factor for the fuel as related to its caloric value. Currently, pure biomass fuels include animal meal, landfill gas, sawdust, waste wood products, and sewage sludge.

Step 2: Eliminate Technically Infeasible Options

As part of the BACT analysis, the control technologies identified as part of Step 1 are reviewed for their technical feasibility. A control technology is considered to be technically feasible if it has been previously installed and is in practice at a similar source and/or process and is operating successfully.

Carbon Capture and Sequestration

The technical infeasibility of CCS relative to combustion sources and the EDCC site has been previously described above. Therefore, it is not described again within this section.

Cogeneration

The start-up boiler is being installed for this project to supply process steam to the ammonia plant and NAP. Using the start-up boiler as a cogeneration unit may require several modifications that may impact the overall project and create potential changes such as, site reconfiguration, or process modifications. As a result, this technology would redefine the facility's use for the start-up boiler. Consequently, cogeneration is considered to be technically infeasible.

It is anticipated that the start-up boiler will utilize natural gas as fuel. Currently, natural gas is the lowest GHG-emitting fossil fuel that could be used to provide the required steam production at the facility. In addition, natural gas is the feedstock for the ammonia process. As a result, natural gas as a low-GHG emitting fossil fuel and readily available process feedstock within the facility essentially renders alternative fuels technically infeasible for the start-up boiler.

Step 3: Rank Remaining Control Technologies by Control Effectiveness

Currently, the technically feasible CO_2 option for the start-up boiler is the potential implementation of energy efficiency design and operation primarily focused on good combustion practices; and firing only natural gas. The most recent RBLC entry identified for CO_2 has a BACT limit at 117 lb CO_2/MMBtu.

Step 4: Evaluate Most Effective Controls and Document Results

Currently, the technically feasible CO_2 reduction option for the start-up boiler that may be implemented is energy efficiency design and operation including good combustion practices that will achieve a BACT emission rate of 117 lb CO_2/MMBtu firing only natural gas. Based on the current energy efficiency design that is being specified as part of this project, it is expected that the CO_2 emissions from the start-up boiler will be consistent with the aforementioned BACT limit and therefore it is not necessary to further evaluate environmental, energy or economic impacts of the technology.

Step 5: Select BACT

In summary, BACT for GHG control for the start-up boiler is anticipated to include firing only natural gas and inherent design specifications to meet the aforementioned limit. CO_2 emissions from the startup boiler may not exceed 117 lb MMBtu/hr based on three 1-hour stationary source testing runs utilizing USEPA Method 3A. Methane BACT limits for the startup boiler may not exceed 0.0022 lb/MMBtu based on three 1-hour stationary source testing runs utilizing USEPA Method 18. Also, the N_2O emissions from the start-up boiler may not exceed 0.00022 lb/MMBtu based on three 1-hour stationary source testing runs utilizing USEPA Method 320. In addition, under Operating Scenario 1 the total CO_2e emissions of 123,410.99 tons per 12-month rolling averaging period shall not be exceeded. Under Operating Scenario 2, the annual limit is reduced to 37,023.69 tons per 12-month rolling averaging period.

Ambient Air Impact Analysis

Significance Analysis

The significance analysis considers only the emissions associated with the proposed changes along with other creditable contemporaneous changes at the facility to determine if the proposed project's emissions will have a significant impact on the surrounding area. A "significant" impact occurs when the modeled ambient concentration resulting from the modeled emission rates exceeds an applicable Modeling Significance Level (MSL). The following table summarizes the applicable MSLs and Monitoring De Minimis Concentrations in micrograms per cubic meter ($\mu g/m^3$).

Pollutant	Averaging Period	Maximum-Modeled Concentration ($\mu g/m^3$)	Modeling Significance Level ($\mu g/m^3$)	Monitoring De Minimis Concentration ($\mu g/m^3$)
CO	1-Hour	1029	2,000	--
	8-Hour	335	500	575
SO_2	1-Hour	0.7	7.8	--
	3-Hour	0.4	25.0	--
NO_2	1-Hour	154	7.8	
	Annual	3.4	1.0	14

As shown above, the CO and SO_2 MSLs and Monitoring De Minimis Concentration are not exceeded by impacts from the proposed project. Since the modeled impacts do not exceed the MSL for CO or SO_2, a full impact analysis is not required for CO and SO_2.

The full impact modeling analysis also requires modeling to show that the emissions from the facility and surrounding existing sources will not cause or contribute to a violation of any applicable National Ambient Air Quality Standard (NAAQS) or PSD increment. A summary of the results of the NAAQS analysis is in the table below.

Pollutant	Averaging Period	Maximum Modeled Impact (μg/m^3)	Background Concentration (μg/m^3)	Total Impact (μg/m^3)	NAAQS (μg/m^3)
NO_2	1 - Hour	276	Ozone monitoring data from Shreveport, LA (Site ID #220150008) was used for the Tier 3 modeling methodology	171.0[a]	188
	Annual	55.1		55.1	100

a. The highest modeled concentration was 276 μg/m^3 occuring on Lion Oil's property (AFIN 70-00016). Lion Oil's property is fenced off, thus the air inside their property is not ambient air. When excluding Lion Oil's contribution to the NAAQS evaluation on their property, the total impact was 53 μg/m^3. The highest off-site impacts in the rest of the modeling area were predicted to be 171.0 μg/m^3. Therefore, there are no modeled NAAQS exceedances.

The following table shows the results of the PSD increment modeling.

Pollutant	Averaging Period	Maximum Predicted Increment Consumption (μg/m^3)	PSD Class II Increment (μg/m^3)	Percent of Class II Increment (%)
NO_2	Annual	16.4	25	65.6

This maximum concentration occurred approximately 7 kilometers to the south of EDCC. Directly surrounding EDCC's property boundary, the maximum annual concentration was 9.5 μg/m^3. Additionally, the maximum annual concentration is well below the Class II increment of 25 μg/m^3. Because increment consumption is determined by subtracting emissions occurring at the time of the baseline date from current emission rates and modeling the difference, the resulting concentrations would only decrease from what is reflected in the NAAQS analysis. Therefore, the NAAQS analysis for annual NO_2 emissions also demonstrates that the increment level of 25 μg/m^3 has not been exceeded. Although the 16.4 μg/m^3 concentration is above 50% of the increment, the expansion project at EDCC does not have an adverse effect on the industrial and economic development of the area. At the location of the maximum concentration, EDCC has a contribution of 0.2 μg/m^3, which is an insignificant impact on the increment. Additionally, the maximum impact that EDCC has on the increment (6.0 μg/m^3) is located on the EDCC property boundary and reflects 24% of the total increment. It is unlikely that any future growth will take place near or in close proximity to EDCC or a nearby existing facility property. Therefore, this project would not limit additional growth in the area. Because this project is an expansion and is not a new facility, alternative siting is not a viable option.

Additional Impact Analysis

An additional impact analysis is completed based on existing air quality, the quantity of emissions, and the sensitivity of local soils, vegetation, and visibility in the project's area of impact. The additional impact analysis consists of three parts: (1) growth, (2) soils and vegetation impacts, and (3) visibility impairment. Each of these analyses is presented in this section.

The purpose of the growth analysis is to predict the amount of new growth likely to occur to support the proposed project under review and to estimate the emissions that will result from the associated growth. First, an assessment is made regarding the amount of residential growth the proposed project will bring to the area. This depends on the size of the available work force, the number of new employees, and the availability of housing in the area. Associated commercial and industrial growth consists of new sources providing goods and services to the new employees and to the new source itself. Once these anticipated growth effects have been considered, an estimate of the air pollutant emissions that would likely result from the associated growth is made. The assessment of additional growth issues and the estimates of emissions increases are conducted based on several types of EPA guidance.

Analysis of the impact of air emissions on soils and vegetation is based on an inventory of the soils and vegetation types found in the impact area. This inventory includes all vegetation of any commercial or recreational significance. For most types of soil and vegetation, ambient concentrations of criteria pollutants below the secondary NAAQS do not result in harmful effects.

The visibility impairment analysis considers the impacts that occur within the impact area of the modified source. The visibility analysis considers issues similar to the Class I area visibility analysis requirements. The visibility impairment analysis consists of a determination of the visual quality of the area based on an evaluation of historical data.

Growth Analysis

The purpose of the growth analysis is to predict quantitatively the amount of new growth likely to occur to support the source or modification under review and to estimate the emissions that will result from the associated growth. First, an assessment is made regarding the amount of residential growth the modified source will bring to the area. This depends on the size of the available work force, the number of new employees, and the availability of housing in the area. Associated commercial and industrial growth consists of new sources providing goods and services to the new employees and to the modified source itself. Once these anticipated growth effects have been considered, an estimate of the air pollutant emissions that would likely result from the associated growth is made.

The expansion at EDCC will require the addition of process and construction equipment that will be necessary to facilitate the expansion. However, due to the location of the facility, it is expected to have a negligible effect on the local residential growth in the area. Due to the location of the facility, residential areas are not concentrated around EDCC and thus have no impact on air pollutant emissions in the area. Thus, the anticipated industrial, commercial, and residential growth in the local area due to this project is expected to be negligible.

Soil and Vegetation Analysis

Analysis of the impact of air emissions on soils and vegetation is based on an inventory of the soils and vegetation types found in the impact area. This inventory includes all vegetation of any commercial and recreational significance. For most types of soil and vegetation, ambient concentrations of criteria pollutants below the secondary NAAQS do not result in harmful effects.

EDCC is located on industrial property north of El Dorado, AR. Based on the United States Department of Agriculture (USDA) Soil Conservation Service general soil map for Union County, Arkansas, the primary soil types for the approximately 10,000 acres surrounding and including the facility are Sacul-Sawyer complex (45%) and Guyton silt loam (19.1 %).

The agricultural and livestock profile of Union County shows the area consisting primarily of forestland (88.2%), with the primary products being cattle, hay, and harvested timber. No sensitive aspects of the soil and vegetation in the El Dorado area have been identified that would be adversely affected by the proposed expansion at EDCC. Consequently, the secondary NAAQS, which establish the ambient concentrations levels below which no harmful effects to either soil or vegetation can be expected, are used as an indicator of potentially adverse impacts.

As demonstrated in the Ambient Air Impact section, the maximum ambient air impact from the proposed modification is below the NAAQS values. Therefore, any impact to the soil and vegetation as a result of the proposed modification is expected to be negligible.

Visibility Analysis

EPA prescribes the use of its *Workbook for Plume Visual Impact Screening and Analysis* for conducting a visibility impairment analysis. EPA outlines three levels of screening procedures. If the criteria for the first, most conservative, screening level are met, no further analysis is required.

The VISCREEN model is recommended for the first level (Level 1) screen. If predicted values from the VISCREEN model are greater than the standardized screening values, the emissions are judged to have the potential for visibility impairment. If the potential for visibility impairment is indicated, the next level analysis, Level 2 analysis, is required.

The VISCREEN model primarily considers NO_2 and particulate matter emission increases associated with a modification. For this application, the NO_2 and particulate matter emissions are being reduced when compared to currently permitted rates. VISCREEN does not consider or calculate visibility impacts due to ozone. Thus, a VISCREEN analysis is not required in association with this PSD application because there are no applicable emission increases.

To evaluate visibility for Class II areas, VISCREEN was utilized to determine if any visual impacts occur as a result of the project. As outlined in the VISCREEN summary, a location specific background visual range of 25 kilometers was used along with an assumed minimum distance of 50 kilometers and a maximum distance of 170 kilometers (reflecting the distance of the nearest Class I area). In addition to the particulate and NO_X emissions requested in the inputs, NO_2 emissions of 36.5 lb/hr (20% of the total NO_X) was assumed instead of the default 10% due to the nature of the project. The result was that no visual impacts were predicted due to the project.

Finally, it must be determined whether the proposed project has any impact on long and short range visibility impairment. As an initial screening method, the Federal Land Mangers' Air Quality Related Values Work Group released a Natural Resource Report in 2010 that outlined the requirements for determining how to address any potential visibility impacts. In this document, the group outlines the first tier screening method based on a source's annual emission rate and distance from a Class I area.

In the case of EDCC, the facility's proposed NO_x, SO_2, PM_{10}, and H_2SO_4 emissions total is 1,652 tons per year, and the nearest Class I area is located 170 kilometers to the northwest (Caney Creek Wilderness). Therefore, the ratio of emissions to distance for EDCC is 9.72. This is below the Federal Land Management and EPA allowable ratio of 10; therefore, further visibility analysis is not required.

PSD Class I Analysis

The nearest Class I area is the Caney Creek Wilderness, which is approximately 170 km from the mill. The results of the short-range analyses conducted as part of this application combined with the distance from the nearest Class I area make it reasonable to conclude that the proposed project will not exceed a Class I area Increment standard and will not adversely affect Class I area air quality related values.

9. GHG MAJOR SOURCE (TITLE V):

Indicate one:

☒ Facility is classified as a major source for GHG and the permit includes this designation

☐ Facility does not have the physical potential to be a major GHG source

☐ Facility has restrictions on GHG or throughput rates that limit facility to a minor GHG source. Describe these restrictions: ________________________________

10. SOURCE AND POLLUTANT SPECIFIC REGULATORY APPLICABILITY:

Source	Pollutant	Regulation (NSPS, NESHAP or PSD)
SN-41	PM_{10}	PSD
SN-49, SN-53, SN-54, SN-56, SN-57, & SN-61	SO_2 VOC CO NO_x GHG Opacity	
SN-50	VOC GHG	
SN-51	VOC CO GHG	
SN-59	NO_x GHG Opacity	
SN-61	NO_x	40 CFR Part 60, Subpart Db
SN-13	NO_x	40 CFR Part 60, Subpart G
SN-59	NO_x	40 CFR Part 60, Subpart Ga
SN-07	SO_2 and sulfuric acid mist	40 CFR Part 60, Subpart H
SN-65	There are no specific emission limits or pollutants identified, but the rules generally regulate HAPs	40 CFR Part 63, Subpart ZZZZ
SN-48, SN49, SN-54, & SN-61		40 CFR Part 63, Subpart DDDDD
SN-25[a]		40 CFR Part 63, Subpart CCCCCC

a. Upon completion of the Expansion Project, the facility will become a major source of HAPs. At that time, the facility will no longer be subject to 40 CFR Part 63, Subpart CCCCCC.

11. EMISSION CHANGES AND FEE CALCULATION:

See emission change and fee calculation spreadsheet in Appendix A.

12. NAAQS EVALUATIONS AND NON-CRITERIA POLLUTANTS:

a) NAAQS:

(i) List the reason for a NAAQS evaluation (i.e. what changes are being permitted that would require the evaluation) and pollutants affected. If a NAAQS evaluation is not required, indicate why not.

This is a PSD modification for SO_2, CO, and NO_2. The permittee agreed to NAAQS evaluations for the other criteria pollutants that did not trigger a PSD review.

(ii) If modeling was proposed and agreed to, list the results below:

Pollutant	Emission Rate (lb/hr)	NAAQS Standard ($\mu g/m^3$)	Averaging Time	Highest Concentration ($\mu g/m^3$)	% of NAAQS
PM_{10}	47.7	150	24-Hour	62.19045	41.5 %
SO_2	93.6	196	1-Hour	95.48135[a]	48.8 %
		1,310	3-Hour	38.20727	3.0 %
CO	184.0	40,000	1-Hour	983.43209	2.5 %
		10,000	8-Hour	321.98951	3.2 %
NO_x	997.9	188	1-Hour	171.0[b]	91 %[b]
		100	Annual	55.1	55.1 %
Pb	0.07	0.15	Rolling 3-month Period over 3 years (not to be exceeded in any 3 month period)	0.00678	4.6 %

a. First High

b. The highest modeled concentration was 276 $\mu g/m^3$ occuring on Lion Oil's property (AFIN 70-00016). Lion Oil's property is fenced off, thus the air inside their property is not ambient air. When excluding Lion Oil's contribution to the NAAQS evaluation on their property, the total impact was 53 $\mu g/m^3$. The highest off-site impacts in the rest of the modeling area were predicted to be 171.0 $\mu g/m^3$. Therefore, there are no modeled NAAQS exceedances.

b) Non-Criteria Pollutants:

1st Tier Screening (PAER)

Estimated hourly emissions from the following sources were compared to the Presumptively Acceptable Emission Rate (PAER) for each compound. The Department has deemed the PAER to be the product, in lb/hr, of 0.11 and the Threshold Limit Value (mg/m^3), as listed by the American Conference of Governmental Industrial Hygienists (ACGIH).

Pollutant	TLV (mg/m^3)	PAER (lb/hr) = 0.11 × TLV	Proposed lb/hr	Pass?
Arsenic	0.01	0.0011	0.07	No
Cadmium	0.01	0.0011	0.07	No
Formaldehyde	0.368[a]	0.04	0.14	No
Hexane	176	19.3	2.04	Yes
Mercury	0.01	0.0011	0.07	No
Methanol	262	28.8	32.69	No
HNO_3	5.15	0.56	4.01	No
H_2SO_4	0.2	0.022	2.89	No
NH_3	17.4	1.9	1,843.08	No
SO_3	1.0[b]	0.11	0.04	Yes

a. STEL value
b. Obtained from Texas' Effects Screening Level (ESL) document.

2nd Tier Screening (PAIL)

AERMOD air dispersion modeling was performed on the estimated hourly emissions from the following sources, in order to predict ambient concentrations beyond the property boundary. The Presumptively Acceptable Impact Level (PAIL) for each compound has been deemed by the Department to be one one-hundredth of the Threshold Limit Value as listed by the ACGIH.

Pollutant	PAIL (μg/m^3) = 1/100 of Threshold Limit Value	Modeled Concentration (μg/m^3)	Pass?
Arsenic	0.1	0.02818	Yes
Cadmium	0.1	0.02818	Yes

Pollutant	PAIL ($\mu g/m^3$) = 1/100 of Threshold Limit Value	Modeled Concentration ($\mu g/m^3$)	Pass?
Formaldehyde	15.0[a]	0.02911	Yes
Mercury	0.1	0.02818	Yes
Methanol	2620	33.75909	Yes
HNO_3	51.5	35.19325	Yes
H_2SO_4	2.0	0.59337[b]	Yes
NH_3	174	172.93678	Yes

a. ADEQ approved alternated PAIL.
b. Results from previous modeling. No H_2SO_4 emission increases due to this modification.

13. CALCULATIONS:

a. Pre-expansion project:

SN	Emission Factor Source	Emission Factor	Control Equipment	Control Equipment Efficiency	Comments
05	Testing	PM_{10} – 13.0 lb/hr, 0.96 lb of PM_{10} per ton of ammonium nitrate produced. With SN-17's exhaust routed to SN-05 21.6 lb/hr x (1-0.95) =1.1 lb/hr PM	Brinks Scrubber	-	97% particulate control efficiency. 95% particulate control efficiency is used in calculations as Brinks scrubber control efficiencies for the exhaust from SN-17 passing thru Brinks scrubber.
	Engineering Estimate	3.5 +5.0 = 8.5 lb/hr NH_3	Brinks Scrubber	-	-

SN	Emission Factor Source	Emission Factor	Control Equipment	Control Equipment Efficiency	Comments
06	Testing	PM_{10} – 67.0 lb/hr, 0.96 lb of PM_{10} per ton of ammonium nitrate produced.	-	-	Uncontrolled. Maximum prill production rate is 54 tons/hour.
07	NSPS limit	SO_2 – 92.0 lb/hr	Brinks Mist Eliminator	-	Remain the previous permitted limit
	Testing	H_2SO_4 – 0.123 lb/ton	Brinks Mist Eliminator	-	-
08	Testing	NO_X - 200.1 lb/hr Ammonia – 40.0 lb/hr	Refrigeration SCR	~98.5%	11.5 lb/ton x 17.4 ton/hr = 200.1 lb/hr
09	Testing	NO_X - 200.1 lb/hr Ammonia – 40.0 lb/hr	Refrigeration SCR	~98.5%	11.5 lb/ton x 17.4 ton/hr = 200.1 lb/hr
10	AP-42	NO_X - 10.0 lb/ton	best operation	-	-
	Highest lb/hr from Stack Test results of 2001-2004	HNO_3 – 0.389 x 1.25 x 40/8.5 = 2.3 lb/hr +1.1 lb/hr from car barn NO_X - 3.3 x 1.25 x 40/8.5 = 19.5 lb/hr	-	-	Maximum nitric acid production rate is 8.5 tons/hr, and maximum nitric acid blend production is 40 tons/hr. Stack test + 25% safety factor.
13	NSPS	3.0 lb/ton of acid	refrigerated absorption	-	-

SN	Emission Factor Source	Emission Factor	Control Equipment	Control Equipment Efficiency	Comments
14	Testing	PM_{10} - 44.2 lb/hr	none	-	Hourly emission rate increase as a result of a fail stack testing. 44.2 lb/hr is based on March 2, 2004 stack test data. Average + Std. Deviation = 36.18 + 8.0 38.5 tph of AN production maximum
15	Testing	PM_{10} – 17.0 lb/hr	none	-	38.5 tph of AN production maximum
	Testing	NH_3 – 18.0 lb/hr	none	-	38.5 tph of AN production maximum
16A & 16B	AP-42	PM_{10} – 7.6 lb/MMSCF SO_2 – 0.6 lb/MMSCF VOC – 5.5 lb/MMSCF CO – 84 lb/MMSCF NO_X - 280 lb/MMSCF	none	-	-
17	Testing	PM_{10} – 21.6 lb/hr	Pease-Anthony Scrubber	-	Routed to SN-05
	Testing	NH_3 – 5.0 lb/hr	Pease-Anthony Scrubber	-	Routed to SN-05
18	Process Knowledge	PM_{10} – 0.033 lb/ton	Baghouse	-	38.5 tph of AN production maximum

SN	Emission Factor Source	Emission Factor	Control Equipment	Control Equipment Efficiency	Comments
19	PM – 50,556 scfm x 011677 lb/mmft^3 x 60 min/hr x 1.2 NH$_3$ - 50,556 scfm x 25 ppm x 17.1 lb/lb-mol x lb-mol/385.2 ft^3 60min/hr x 1.2	-	-	-	
21	Testing	PM$_{10}$ – 0.1 lb/ton	Brinks Scrubber	-	38.5 tph of AN production maximum
	Testing	NH$_3$ – 1.0 lb/ton	Brinks Scrubber	-	38.5 tph of AN production maximum
25	TANKS3	VOC	none	-	-
26	TANKS3	NH$_3$	none	-	-
27	AP-42	PM$_{10}$ – 0.0001 lb/ton	none	-	-
28	AP-42	PM$_{10}$ – 0.0001 lb/ton	none	-	-
29	AP-42	HNO$_3$ – 0.53 lb/1000 gallons	none	-	-
30	AP-42 Section 5.2	H$_2$SO$_4$ – 0.0281 lb/1000 gallons	none	-	L_L = 12.46 x SPM/T =12.46 x 1.45 x 0.01 x 98.06/630
31	SOCMI	NH$_3$ – 0.5 lb/hr	none	-	-
32	SOCMI	NH$_3$ – 1.3 lb/hr	none	-	-

SN	Emission Factor Source	Emission Factor	Control Equipment	Control Equipment Efficiency	Comments
33	Process Knowledge	NO_X – 1.9 lb/hr	none	-	-
	Process Knowledge	HNO_3 – 1.8 lb/hr	none	-	-
34	Process Knowledge	PM_{10} – 0.7 lb/ton x 1.16 ton/hr	none	-	-
35	Process Knowledge	PM_{10} – 2.0 lb/hr	baghouse	99%	-
38	EF_{PM} = Total liquid drift (lb/1000 gal) x TDS Fraction (ppm) = 1.7 lb/1000 gal x 1,560 ppm PM10 = EF_{PM} x flowrate = 9,000 gpm x EF_{PM}			0.17 lb/1000 gal is design drift loss percent provided by AP-42. Table 13.4-1	
40	Engineering estimate	NH_3 – 1.6 lb/hr during loading			1.6 lb/hr per truck x 2 trucks per day
41	Stack testing	NH_3 – 10.0 lb/hr PM/PM10 – 3.3 lb/hr	Chemical steam scrubber	-	24-hr BACT limit is 13.7 lb/hr 30-day rolling BACT limit is 3.3 lb/hr

SN	Emission Factor Source	Emission Factor	Control Equipment	Control Equipment Efficiency	Comments
42	EF_{PM} = Total liquid drift (lb/1000 gal) x TDS Fraction (ppm) = 0.17 lb/1000 gal x 1,560 ppm PM10 = EF_{PM} x flowrate = 16,000 gpm x EF_{PM}	-	-	0.17 lb/1000 gal is design drift loss percent provided by manufacturer.	
43	EF_{PM} = Total liquid drift (lb/1000 gal) x TDS Fraction (ppm) = 1.7 lb/1000 gal x 1,560 ppm PM10 = EF_{PM} x flowrate = 2,000 gpm x EF_{PM}			1.7 lb/1000 gal is design drift loss percent provided by AP-42. Table 13.4-1	
44	Mass Balance for sulfur oxides and sulfuric acid. Stack test from similar plant plus a safety factor of 25%.	Scrubber	-	-	
46	3000 gpm x 0.000064 x 1,560 ppm = 0.2 lb/hr PM_{10}	-	-	0.0064% is design drift loss percent provided by manufacturer.	

SN	Emission Factor Source	Emission Factor	Control Equipment	Control Equipment Efficiency	Comments
13	NSPS EPA/DOJ Vendor Info	NO_2 (3-hr): 3.0 lb/ton NO_2 (3-hr): 1.0 lb/ton (excluding SSM) NO_2 (rolling 365-days): 0.6 lb/ton NH_3: 20 ppm	SCR	95%	After installation of SCR and Tail gas preheater
48	AP-42 Table 1.4-1 40 CFR Part 98 Subpart A Equation A-1	lb/MMscf: 84 CO 50 NO_x 7.6 PM 0.6 SO_2 5.5 VOC 0.0005 Lead kg/MMBtu: 53.2 CO_2 0.001 CH_4 0.0001 N_2O	--	--	20 MMBtu/hr natural gas fired preheater
65	AP-42	lb/hp-hr: 0.00668 CO 0.031 NO_x 0.00205 SO_2 0.0022 PM 0.00247 VOC	--	--	80 hp Emergency Water Pump 100 hours per year limit

b. Post-expansion project:

SN	Emission Factor Source (AP-42, testing, etc.)	Emission Factor (lb/ton, lb/hr, etc.)	Control Equipment	Control Equipment Efficiency	Comments
05	Vendor guarantee	PM_{10} – 2.5 lb/hr, 0.04 lb of PM_{10} per ton of ammonium nitrate produced.	Brinks Scrubber	-	Vendor guarantee of 0.085 mg/acf for all particulate matter
	Engineering Estimate	3.5 +5.0 = 8.5 lb/hr NH_3	Brinks Scrubber	65%	
06	-	-	-	-	Emissions routed to SN-05
07	NSPS limit	SO_2 – 92.0 lb/hr	Brinks Mist Eliminator	-	Remain the previous permitted limit
	Testing	H_2SO_4 – 0.123 lb/ton	Brinks Mist Eliminator	-	-
08 & 09	Testing	NO_X - 52.2 lb/hr Ammonia – 40.0 lb/hr	Refrigeration SCR	~98.5%	3.0 lb/ton for NO_x based on a global settlement agreement between LSB and EPA
10	Highest lb/hr from Stack Test results of 2001-2004	lb/hr: 19.5 NO_x 3.81 HNO_3	Scrubber	95%	Maximum nitric acid production rate is 8.5 tons/hr, maximum nitric acid blend production is 40 tons/hr, and 27,000 gal/hr HNO_3 loading
14	Vendor guarantee	Particulate matter: 0.085 mg/acf Or 1.12 lb/hr	Scrubber	-	Vendor guarantee of 0.085 mg/acf for all particulate matter. Based on 45.0 TPH of AN production

SN	Emission Factor Source (AP-42, testing, etc.)	Emission Factor (lb/ton, lb/hr, etc.)	Control Equipment	Control Equipment Efficiency	Comments
15	Vendor guarantee	Particulate matter: 0.085 mg/acf Or 0.73 lb/hr	Scrubber	-	Vendor guarantee of 0.085 mg/acf for all particulate matter. Based on 45.0 TPH of AN production
	Testing	NH_3 – 18.0 lb/hr	none	-	Based on 45.0 TPH of AN production
17	Testing	PM_{10} – 21.6 lb/hr NH_3 – 5.0 lb/hr	-	-	Routed to SN-05
18	Process Knowledge	PM_{10} – 0.033 lb/ton	Baghouse	-	Based on 45.0 TPH of AN production
19	PM – 50,556 scfm x 011677 lb/mmft^3 x 60 min/hr x 1.2 NH_3 - 50,556 scfm x 25 ppm x 17.1 lb/lb-mol x lb-mol/385.2 ft^3 60min/hr x 1.2	0.43 lb/hr PM 4.04 lb/hr NH_3	-	-	Maximum concentration of 25 ppm for Ammonia over a 1-hour average
21	Vendor guarantee	Particulate matter: 0.085 mg/acf Or 0.34 lb/hr	Brinks Scrubber	-	Vendor guarantee of 0.085 mg/acf for all particulate matter. Based on 45.0 TPH of AN production
	Testing	NH_3 – 1.0 lb/ton	Brinks Scrubber	-	Based on 45.0 TPH of AN production
25	TANKS	VOC	none	-	-
26	TANKS	NH_3	none	-	-
27	AP-42	PM – 0.02 lb/ton	none	-	Based on 45.0 TPH of AN production

SN	Emission Factor Source (AP-42, testing, etc.)	Emission Factor (lb/ton, lb/hr, etc.)	Control Equipment	Control Equipment Efficiency	Comments
28		Particle Size distribution PM_{10} – 0.4% $PM_{2.5}$ – 0.03%		-	Based on 60.0 TPH of AN production
29	-	-	-	-	Emissions are captured and routed to SN-10
30	AP-42 Section 5.2	H_2SO_4 – 0.0281 lb/1000 gallons	none	-	L_L = 12.46 x SPM/T =12.46 x 1.45 x 0.01 x 98.06/630
31	SOCMI	NH_3 – 0.44 lb/hr	none	-	-
32	SOCMI	NH_3 – 1.59 lb/hr	none	-	-
33	Process Knowledge	NO_X – 0.1 lb/hr	none	-	-
	Process Knowledge	HNO_3 – 0.01 lb/hr	none	-	-
34	Process Knowledge	PM_{10} – 0.7 lb/ton x 1.46 ton/hr	none	-	-
35	Process Knowledge	PM_{10} – 2.0 lb/hr	baghouse	99%	-
38	Manufacturer's Specifications	0.001% drift loss		0.00013 lb/1000 gal is design drift loss percent	Based on 1560 ppm TDS, and 9,000 gal/min flowrate
40	TANKS 4.0.9D	NH_3 – 0.22 lb/hr total			65,000,000 gallons annual throughput

SN	Emission Factor Source (AP-42, testing, etc.)	Emission Factor (lb/ton, lb/hr, etc.)	Control Equipment	Control Equipment Efficiency	Comments
41	Stack testing	NH_3 – 10.0 lb/hr PM/PM10 – 3.4 lb/hr	Chemical steam scrubber	-	24-hr BACT limit is 0.223 lb/ton 30-day rolling BACT limit is 0.054 lb/ton
44	Mass Balance for sulfur oxides and sulfuric acid. Stack test from similar plant plus a safety factor of 25%.	50 ppm_v NO_x 0.139 lb/hr HNO_3 1.45 lb/1000 gal H_2SO_4 1.45 lb/1000 gal SO_3	Scrubber	-	-
46	Manufacturer's Specifications	0.001% drift loss		0.00013 lb/1000 gal is design drift loss percent	Based on 1560 ppm TDS, and 3,000 gal/min flowrate
13	NSPS EPA/DOJ Vendor Info	NO_2 (3-hr): 3.0 lb/ton NO_2 (3-hr): 1.0 lb/ton (excluding SSM) NO_2 (rolling 365-days): 0.6 lb/ton NH_3: 20 ppm	SCR	95%	After installation of SCR and Tail gas preheater
47	Vendor design	100 ppm_v NO_x	--	--	125 TPD of Nitric Acid

SN	Emission Factor Source (AP-42, testing, etc.)	Emission Factor (lb/ton, lb/hr, etc.)	Control Equipment	Control Equipment Efficiency	Comments
48	AP-42 Table 1.4-1 40 CFR Part 98 Subpart A Equation A-1	lb/MMscf: 84 CO 50 NO_x 7.6 PM 0.75 SO_2 5.5 VOC 0.0005 Lead kg/MMBtu: 53.2 CO_2 0.001 CH_4 0.0001 N_2O	--	--	20 MMBtu/hr natural gas fired preheater Sulfur content based on natural gas supplier's tariff
49	Test Data BACT	lb/MMBtu: 0.0042 PM lb/MMBtu: 0.0194 CO 0.0124 NO_x 0.0014 VOC lb/MMscf: 0.75 SO_2 kg/MMBtu: 53.2 CO_2 0.001 CH_4 0.0001 N_2O	SCR	95%	1400 TPD Ammonia Production 511,000 TPY Ammonia Production
50	BACT	lb/ton: 0.1 VOC 6.8 CO_2	-	-	1400 TPD Ammonia Production 511,000 TPY Ammonia Production
51	BACT	lb/ton: 0.106 VOC 0.02 CO 1.26 GHG	-	-	
52	Manufacturer's Specifications	0.001% drift loss		0.00013 lb/1000 gal is design drift loss percent	Based on 1560 ppm TDS, and 60,000 gal/min flowrate

SN	Emission Factor Source (AP-42, testing, etc.)	Emission Factor (lb/ton, lb/hr, etc.)	Control Equipment	Control Equipment Efficiency	Comments
53	AP-42 BACT	lb/MMscf: 7.6 PM lb/MMscf: 84 CO 100 NO_x 0.75 SO_2 5.5 VOC kg/MMBtu: 53.2 CO_2 0.001 CH_4 0.0001 N_2O	Flare	99%	Ammonia flare for emergencies and SSM 50 hours for SSM 10 hours for emergencies
54	Vendor Specification BACT	Lb/MMBtu: 0.0075 PM lb/MMBtu: 0.02 CO 0.06 NO_x 0.005 VOC lb/MMscf: 0.75 SO_2 kg/MMBtu: 53.2 CO_2 0.001 CH_4 0.0001 N_2O	--	--	38 MMBtu/hr heater 500 hours per year
55	Emission Estimation Technique Manual for Synthetic Ammonia Manufacturing	15.42 lb/hr NH_3	--	--	Total Component Count can be found in the application

SN	Emission Factor Source (AP-42, testing, etc.)	Emission Factor (lb/ton, lb/hr, etc.)	Control Equipment	Control Equipment Efficiency	Comments
56	AP-42 BACT	lb/MMscf: 7.6 PM lb/MMscf: 84 CO 100 NO_x 0.75 SO_2 5.5 VOC kg/MMBtu: 53.2 CO_2 0.001 CH_4 0.0001 N_2O	Flare	98%	Ammonia Plant flare for SSM 500 hours for SSM
57	AP-42 BACT	lb/MMscf: 7.6 PM lb/MMscf: 84 CO 100 NO_x 0.75 SO_2 5.5 VOC kg/MMBtu: 53.2 CO_2 0.001 CH_4 0.0001 N_2O	Flare	98%	Ammonia Storage flare
58	Mass Balance based on loading losses	9.2 lb/hr NH_3			620 TPD Ammonia Loading 223,000 TPY Ammonia Loading

SN	Emission Factor Source (AP-42, testing, etc.)	Emission Factor (lb/ton, lb/hr, etc.)	Control Equipment	Control Equipment Efficiency	Comments
59	BACT	lb/ton: 0.64 (3-hr average including SSM) 0.065 (Rolling 30-day average excluding SSM) 0.5 (Rolling 30-day average including SSM) TPY: 17.76 per rolling 12 months (Including SSM)	SCR	95%+	1265 TPD Nitric Acid Production 461,725 TPY Nitric Acid Production
		lb/ton: 0.39 N_2O	Tertiary Abatement	98%	
	Vendor Specification	lb/ton: 0.05 NH_3	--	--	Ammonia Slippage from operation of the SCR
60	Manufacturer's Specifications	0.001% drift loss	--	0.00013 lb/1000 gal is design drift loss percent	Based on 1560 ppm TDS, and 60,000 gal/min flowrate

SN	Emission Factor Source (AP-42, testing, etc.)	Emission Factor (lb/ton, lb/hr, etc.)	Control Equipment	Control Equipment Efficiency	Comments
61	Vendor Specification BACT	Lb/MMBtu: 0.010 PM 0.010 PM_{10} 0.008 $PM_{2.5}$ lb/MMBtu: 0.037 CO 0.018 NO_x 0.004 VOC lb/MMscf: 0.75 SO_2 kg/MMBtu: 53.2 CO_2 0.001 CH_4 0.0001 N_2O	--	--	240 MMBtu/hr high turndown rate boiler 618.35 MMscf of natural gas limit annually
62	AP-42	Varies	--	--	--
63	Stack testing	NH_3 – 10.19 lb/hr PM/PM10 – 3.4 lb/hr	Chemical steam scrubber	-	24-hr BACT limit is 0.223 lb/ton 30-day rolling BACT limit is 0.054 lb/ton
64	AP-42	PM – 0.02 lb/ton Particle Size distribution PM_{10} – 0.4% $PM_{2.5}$ – 0.03%	Building Enclosure	90%	Based on 45.0 TPH of AN production
65	AP-42	lb/hp-hr: 0.00668 CO 0.031 NO_x 0.00205 SO_2 0.0022 PM 0.00247 VOC	--	--	80 hp Emergency Water Pump 100 hours per year limit

14. TESTING REQUIREMENTS:

The permit requires testing of the following sources.

a. Pre-expansion project:

SN	Pollutants	Test Method	Test Interval	Justification
10	NOx	7E	Every five years	Necessary for efficiency check on Venturi & Packed Tower Scrubber
10	HNO_3	Approved method	Every five years	Necessary for efficiency check on Venturi & Packed Tower Scrubber
07	SO_2	6C	Initial performance test	NSPS Requirement
05	PM_{10}	Approved method	Every five years to do an analysis. See Specific Condition 64.	Necessary to prove that PSD has not been triggered.
17	NH_3	Approved Method	Every five years or upon failure, pass two consecutive stack tests to go back to the five years cycle.	Necessary to prove that PSD has not been triggered.
14, 15, & 21	PM_{10}	Method 5 or 201A, and 202	Within 180 days of issuance of permit 0573-AOP-R12 and annually thereafter for SN-14 and SN-21. Annually for SN-15.	Necessary to prove that PSD has not been triggered.

SN	Pollutants	Test Method	Test Interval	Justification
15	NH_3	Approved method	Annually until 2 consecutive passes, then once every 5 years	Necessary to prove adherence to the non-criteria pollutant strategy.
21	NH_3	Approved method	Annually until 3 consecutive passes, then once every 3 years	Necessary to prove adherence to the non-criteria pollutant strategy.
44	SO_2 NO_x H_2SO_4 HNO_3	Approved method	Every five years	Necessary to prove adherence to the non-criteria pollutant strategy.
08 & 09	NH_3	CTM-027	Every five years	Verify emissions
13	N_2O	Method 320 or approved method	No later than March 28, 2013, and annually thereafter	Necessary to prove that PSD has not been triggered.

b. Post-expansion project:

SN	Pollutants	Test Method	Test Interval	Justification
10	NOx	7E	Every five years	Necessary for efficiency check on Venturi & Packed Tower Scrubber
10	HNO_3	Approved method	Every five years	Necessary for efficiency check on Venturi & Packed Tower Scrubber
07	SO_2	6C	Initial performance test	NSPS Requirement
05	PM_{10}	Approved method	Annually until 2 consecutive passes, then once every 5 years	Necessary to prove that PSD has not been triggered.

SN	Pollutants	Test Method	Test Interval	Justification
14, 15, & 21	PM, PM_{10}, $PM_{2.5}$	Method 5 or 201A, and 202	Annually until 2 consecutive passes, then once every 5 years	Necessary to prove that PSD has not been triggered.
15 & 21	NH_3	Approved method	Annually until 3 consecutive passes, then once every 3 years	Necessary to prove adherence to the non-criteria pollutant strategy.
44	SO_2 NO_x H_2SO_4 HNO_3	Approved method	Every five years	Necessary to prove adherence to the non-criteria pollutant strategy.
08 & 09	NH_3	CTM-027	Every five years	Verify emissions
59	NH_3	CTM-027	Annually until 2 consecutive passes, then once every 5 years	Necessary to prove adherence to the non-criteria pollutant strategy.
49	PM PM_{10} $PM_{2.5}$ SO_2 VOC CH_4 CO	Method 5 & 202 Method 201A & Method 202 Method 6C Method 25A Method 18 Method 10	Annually until 2 consecutive passes, then once every 5 years	Verify emissions
50	VOC CO_2	25A 3A	One Time Test	Verify emissions
50	Methanol	18 or 25A	Annually until 2 consecutive passes, then once every 5 years	Verify emissions
51	VOC CO NH_3	25A 10 320	One Time Test	Verify emissions

SN	Pollutants	Test Method	Test Interval	Justification
51	Methanol	18 or 25A	Annually until 2 consecutive passes, then once every 5 years	Verify emissions
61	PM PM_{10} $PM_{2.5}$ SO_2 VOC CO NO_x	Method 5 & 202 Method 201A & Method 202 6C 25A 10 7E	Annually until 2 consecutive passes, then once every 5 years	Verify emissions
27 & 28	Particle size distribution	Approved Method	One Time Test	Verify emission factor

15. MONITORING OR CEMS:

The permittee must monitor the following parameters with CEMS or other monitoring equipment (temperature, pressure differential, etc.)

SN	Parameter or Pollutant to be Monitored	Method (CEM, Pressure Gauge, etc.)	Frequency	Report (Y/N)
13	NO_x and N_2O	CEM	Continuously	Y
07	SO_2 emission rate	CEM	Continuously	Y
08 & 09	NO_x and N_2O	CEM	Continuously	Y
41	Ammonia and particulate emission rates	Daily sampling consisting of two 12-hour composite sample	Continuously	Y
59	NO_x and N_2O	CEM	Continuously	Y
49	NO_x, N_2O, and CO_2	CEM	Continuously	Y

16. RECORDKEEPING REQUIREMENTS:

The following are items (such as throughput, fuel usage, VOC content, etc.) that must be tracked and recorded.

a. Pre-expansion project:

SN	Recorded Item	Permit Limit	Frequency	Report (Y/N)
08 & 09	weak nitric acid production	304,775 tons/12 months	Monthly	Y
13	weak nitric acid production	140,000 tons/12 months	Monthly	Y
10	Scrubber parameter	hydrogen peroxide concentration	Daily	N
29	nitric acid shipped	200,000 tons/12 months	Monthly	Y
07	Sulfuric acid production	200,750 ton/12 months	Monthly	Y
	Sulfuric acid production	550 tons of 100% sulfuric acid per day	Daily	Y
07	Sulfuric acid emission limit	4.0 lb of SO_2 per ton of acid production, expressed as 100% H_2SO_4, and based on a 3-hr average.	Continuously and averaged every 3-hours	N
	Annual SO_2 Emissions (tpy on a calendar basis)	N/A	Annually	N
30	Sulfuric acid shipped	200,750 tons/12 months	Monthly	Y
All E2 Plant	Production	473,040 tons/12 months	Monthly	Y
05	Scrubber liquid flow rate for each scrubber Gas pressure drop across unit Scrubber liquid pH	225 gal/min (minimum) 2.5 in. H_2O (minimum) 0.5 – 4.5	Daily	N
15	Scrubber liquid flow rate pH Amperage	80 gal/min (minimum) 0.5 – 4.5 290 amp (minimum)	Daily	N

SN	Recorded Item	Permit Limit	Frequency	Report (Y/N)
17	Scrubber liquid flow rate (dual scrubber) pH Amperage	120 gal/min (minimum) 0.5 – 6.0 100 amp (minimum)	Daily	N
18	Baghouse Pressure Drop	0.5 – 8.0 in H_2O	Daily	N
21	Liquid Gas Pressure to Top Spray Nozzles Gas Pressure Drop Across Unit pH	80 – 100 psi_g 2.5 in H_2O (minimum) 0.5 – 4.5	Daily	N
All KT plant	production	252,000 tons/12 months	Monthly	Y
25	usage of gasoline	40,000 gallons/12 months	Monthly	Y
37	minimum gas pressure	10 in. H_2O (minimum)	When scrubber in operation	N
38	Total Dissolve solid	1,560 ppm	Weekly	N
40	Loading tonnage	no more than 468,660 tons	Monthly	N
41	BACT Limit	24-hour Average 0.223 lb/ton (13.7 lb/hr)	Daily	Y
		30-day Average 0.054 lb/ton (3.3 lb/hr)	Monthly	Y
46	Total Dissolve solid	1,560 ppm	Weekly	N
44	Amount of Oleum offload into the storage tank Percent strength of the Oleum Amount of mixed acid produced.	394,000 tons 30% 219,000 tons	Monthly	N

SN	Recorded Item	Permit Limit	Frequency	Report (Y/N)
	Scrubber liquid flow rate for each scrubber Gas pressure drop across unit Scrubber liquid pH	5.0 gal/min (minimum) 10 – 35 in. H_2O 0.5 – 4.5	Daily	N
65	Hours of operation	100 hours per calendar year	Monthly	Y
	Engine maintenance	Change oil and filter every 500 hours of operation, or annually, whichever comes first; Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first; and Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary.	As needed	N

b. Post-expansion project:

SN	Recorded Item	Permit Limit	Frequency	Report (Y/N)
08 & 09	weak nitric acid production	17.4 tons per hour	Hourly	Y
		304,775 tons/12 months	Monthly	Y
13	weak nitric acid production	16.7 tons per hour	Hourly	Y
		140,000 tons/12 months	Monthly	Y
38, 46, 52, 60	Total Dissolve solid	1,560 ppm	Weekly	N
59	weak nitric acid production	52.7 tons per hour	Hourly	Y
		461,725 tons/12 months	Monthly	Y
47	strong nitric acid production	5.2 tons per hour	Hourly	Y
47	strong nitric acid production	45,625 tons/12 months	Monthly	Y
10	Scrubber parameter	hydrogen peroxide concentration	Daily	N
07	Sulfuric acid production	200,750 ton/12 months	Monthly	Y

SN	Recorded Item	Permit Limit	Frequency	Report (Y/N)
	Sulfuric acid production	550 tons of 100% sulfuric acid per day	Daily	Y
	Sulfuric acid emission limit	4.0 lb of SO_2 per ton of acid production, expressed as 100% H_2SO_4, and based on a 3-hr average.	Continuously and averaged every 3-hours	N
	Annual SO_2 Emissions (tpy on a calendar basis)	N/A	Annually	N
30	Sulfuric acid shipped	200,750 tons/12 months	Monthly	Y
All E2 Plant	Production	60.0 tons per hour	Hourly	Y
		525,600 tons/12 months	Monthly	Y
05	Scrubber liquid flow rate for each scrubber Gas pressure drop across unit Scrubber liquid pH	225 gal/min (minimum) 2.5 in. H_2O (minimum) 0.5 – 6.0	Daily	N
41	BACT Limit	24-hour Average 0.223 lb/ton	Daily	Y
		30-day Average 0.054 lb/ton	Monthly	Y
All KT plant	Production	394,200 tons/12 months	Monthly	Y
14	AN production	45.0 tons per hour	Hourly	Y
15	Scrubber liquid flow rate Gas Pressure Drop Across Unit pH Exhaust Flow Rate	225 gal/min (minimum) 2.5 gal/min (minimum) 0.5 – 6.0 65,000 acfm (maximum)	Daily	N
18	Baghouse Pressure Drop	0.5 – 8.0 in H_2O	Daily	N

SN	Recorded Item	Permit Limit	Frequency	Report (Y/N)
21	Scrubber liquid flow rate Gas Pressure Drop Across Unit pH Exhaust Flow Rate	225 gal/min (minimum) 2.5 gal/min (minimum) 0.5 – 6.0 30,000 acfm (maximum)	Daily	N
63	PM emissions	24-hour Average 0.223 lb/ton	Daily	Y
		30-day Average 0.054 lb/ton	Monthly	Y
	AN production	62.5 tons per hour	Hourly	Y
		547,500 tons/12 months	Monthly	Y
49	NH_3 production	511,000 tons/12 months	Monthly	Y
	Natural gas usage	7,076.7 MMscf per 12 months	Monthly	Y
53	Natural gas usage	9.0 MMscf per 12 months	Monthly	Y
	Hours of operation	No more than 3 hours during any 24-hour period	Daily	Y
56	Natural gas usage	8.2 MMscf per 12 months	Monthly	Y
57		1.5 MMscf per 12 months	Monthly	Y
54	Natural gas usage	18.63 MMscf per 12 months	Monthly	Y
44	Amount of Oleum offload into the storage tank Percent strength of the Oleum Amount of mixed acid produced.	394,000 tons 30% 219,000 tons	Monthly	N
44	Scrubber liquid flow rate for each scrubber Gas pressure drop across unit Scrubber liquid pH	5.0 gal/min (minimum) 10 – 35 in. H_2O 0.5 – 4.5	Daily	N
61	Natural gas usage Operating Scenario #1	2,061.18 MMscf per 12 months	Monthly	Y

SN	Recorded Item	Permit Limit	Frequency	Report (Y/N)
	Natural gas usage Operating Scenario #2	618.35 MMscf per 12 months	Monthly	Y
25	usage of gasoline	40,000 gallons/12 months	Monthly	Y
29	nitric acid shipped	169 tons per hour	Hourly	Y
		250,000 tons/12 months	Monthly	Y
40	AN Loading tonnage	65,000,000 tons/12 months	Monthly	Y
58	Ammonia Loading	226,300 tons/12 months	Monthly	Y
65	Hours of operation	100 hours per calendar year	Monthly	Y
	Engine maintenance	Change oil and filter every 500 hours of operation, or annually, whichever comes first; Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first; and Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary.	As needed	N

17. OPACITY:

a. Pre-expansion project

SN	Opacity	Justification for limit	Compliance Mechanism
18, 35, & 48	5%	Department Guidance	Daily Observation
16A & 16B	5%	Department Guidance	Inspection
08 & 09	10%	Compliance assurance for SCR operation	Daily Observation
07 & 13	10%	NSPS limit	Daily Observation
21, 22, & 27	10%	Department Guidance	Daily Observation
14, 19, & 41	15%	Department Guidance	Daily Observation
05, 10, 15, 34 & 44	20%	Previous permit	Daily Observation

SN	Opacity	Justification for limit	Compliance Mechanism
06 & 28	25%	Previous permit	Daily Observation

b. Post-expansion project

SN	Opacity	Justification for limit	Compliance Mechanism
08 & 09	10%	Compliance assurance for SCR operation	Daily Observation
07 & 13	10%	NSPS limit	Daily Observation
48, 54, 61	5%	Department Guidance	Natural Gas Combustion
49, 53, 56, 57, 59,	0%	BACT limit	Daily Observation
05, 18, 35, 41, 47, 52, 60, 63	5%	Department Guidance	Daily Observation
21, 27, 28	10%	Department Guidance	Daily Observation
14, 19	15%	Department Guidance	Daily Observation
15, 34, 38, 44, 46, 65	20%	Previous permit	Daily Observation
28	25%	Previous permit	Daily Observation

18. DELETED CONDITIONS:

Former SC	Justification for removal
42 – 51	The UHDE Direct Strong Nitric Acid Plant (SN-22) and the DSN Plant Cooling Tower (SN-39) were destroyed when the reactor at SN-22 exploded on May 14, 2012.
PWC 7 & 8	The plantwide PM limit is no longer applicable. The facility triggered PSD review with this permitting action, and netted out of PSD by reducing PM emissions across the facility to a level below the limit established by PWC 7.
82 – 84	The emissions from the Ammonium Nitrate Prill Tower Fans (SN-06) will be routed to SN-05 for control before the start-up of the new expansion plant.
124 – 128	The two (2) existing boilers (SN-16A and SN-16B) will be removed before start-up of the new expansion plant.
13 – 16	The existing East and West Nitric Acid Plant Cooling Tower (SN-42) will be removed before start-up of the new expansion plant.
111 - 114	The existing KT Plant Cooling Tower (SN-43) will be removed before start-up of the new expansion plant.

19. GROUP A INSIGNIFICANT ACTIVITIES:

Criteria Pollutants and HAPs:

Source Name	Group A Category	Emissions (tpy)						
		PM/PM_{10}	SO_2	VOC	CO	NO_x	HAPs	
							Single	Total
Diesel Storage Tank (500 gal)	A-3			0.001			0.001	0.001
Diesel Storage Tank (500 gal)	A-3			0.001			0.001	0.001
Diesel Storage Tank (2,000 gal)	A-3			0.002			0.002	0.002
Diesel Storage Tank (2,000 gal)	A-3			0.002			0.002	0.002
Ammonia Flares	A-13	0.01		0.01	0.01	0.01	0.01	0.01
Sulfur Unloading/Storage	A-13							
Air Liquide Cooling Tower	A-13	1.0						
Ammonia Offloading	A-13							

Non-Criteria Pollutants:

Source Name	Group A Category	Emissions (tpy)						
		H_2S	NH_3	Reserved				
Ammonia Flares	A-13		0.1					
Sulfur Unloading/Storage	A-13	0.13						
Ammonia Offloading	A-13		0.44					

20. VOIDED, SUPERSEDED, OR SUBSUMED PERMITS:

List all active permits voided/superseded/subsumed by the issuance of this permit.

Permit #
0573-AOP-R15

21. CONCURRENCE BY:

The following supervisor concurs with the permitting decision.

Karen Cerney, P.E.

APPENDIX A – EMISSION CHANGES AND FEE CALCULATION

Fee Calculation for Major Source

Revised 06-24-13

Facility Name: El Dorado Chemical Company
Permit Number: 0573-AOP-R16
AFIN: 70-00040

$/ton factor	23.42	Annual Chargeable Emissions (tpy)	2336.28
Permit Type	Modification	Permit Fee $	1000

Minor Modification Fee $	500
Minimum Modification Fee $	1000
Renewal with Minor Modification $	500
Check if Facility Holds an Active Minor Source or Minor Source General Permit	☐
If Hold Active Permit, Amt of Last Annual Air Permit Invoice $	0
Total Permit Fee Chargeable Emissions (tpy)	-1332.52
Initial Title V Permit Fee Chargeable Emissions (tpy)	

HAPs not included in VOC or PM: *Chlorine, Hydrazine, HCl, HF, Methyl Chloroform, Methylene Chloride, Phosphine, Tetrachloroethylene, Titanium Tetrachloride*

Air Contaminants: *All air contaminants are chargeable unless they are included in other totals (e.g., H2SO4 in condensible PM, H2S in TRS, etc.)*

Pollutant (tpy)	Check if Chargeable Emission	Old Permit	New Permit	Change in Emissions	Permit Fee Chargeable Emissions	Annual Chargeable Emissions
PM		334.8	120.9	-213.9	-213.9	120.9
PM_{10}		334.8	95.1	-239.7		
SO_2		402	403.4	1.4	1.4	403.4
VOC		5.4	184.8	179.4	179.4	184.8
CO		59.6	161.7	102.1		
NO_X		2414.6	724.7	-1689.9	-1689.9	724.7
$PM_{2.5}$	☐	0.7	89.1	88.4		
Lead	☐	0	0.07	0.07		
CO_2e	☐	292384.3	2773524	2481140		
N_2O	☐	910	5053.7	4143.7		
Arsenic	☐	0	0.07	0.07		
Cadmium	☐	0	0.07	0.07		
Formaldehyde	☐	0	0.4	0.4		
Hexane	☐	1.2	8.43	7.23		
Mercury	☐	0	0.07	0.07		
Methanol	☐	0	143.19	143.19		
HNO_3	☑	67.7	11.91	-55.79	-55.79	11.91
H_2SO_4	☐	12.58	12.58	0		
NH_3	☑	444.3	890.57	446.27	446.27	890.57

Pollutant (tpy)	Check if Chargeable Emission	Old Permit	New Permit	Change in Emissions	Permit Fee Chargeable Emissions	Annual Chargeable Emissions
SO_3	☐	0.18	0.18	0		

Fee Calculation for Major Source

Revised 06-24-13

Facility Name: El Dorado Chemical Company
Permit Number: 0573-AOP-R16
AFIN: 70-00040

$/ton factor	23.42	Annual Chargeable Emissions (tpy)	3479.12
Permit Type	Modification	Permit Fee $	1000

Minor Modification Fee $	500
Minimum Modification Fee $	1000
Renewal with Minor Modification $	500
Check if Facility Holds an Active Minor Source or Minor Source General Permit	
If Hold Active Permit, Amt of Last Annual Air Permit Invoice $	0
Total Permit Fee Chargeable Emissions (tpy)	-189.68
Initial Title V Permit Fee Chargeable Emissions (tpy)	

HAPs not included in VOC or PM: *Chlorine, Hydrazine, HCl, HF, Methyl Chloroform, Methylene Chloride,*

Air Contaminants: *All air contaminants are chargeable unless they are included in other*

Pollutant (tpy)	Check if Chargeable Emission	Old Permit	New Permit	Change in Emissions	Permit Fee Chargeable Emissions	Annual Chargeable Emissions
PM		334.8	344.5	9.7	9.7	344.5
PM_{10}		334.8	327.4	-7.4		
SO_2		402	402.1	0.1	0.1	402.1
VOC		5.4	5.5	0.1	0.1	5.5
CO		59.6	59.7	0.1		
NO_X		2414.6	2271	-143.6	-143.6	2271
$PM_{2.5}$		0.7	0.7	0		
CO_2e		292384.3	292384.3	0		
N_2O (GHG)		910	910	0		
Hexane		1.2	1.2	0		
HNO_3		67.7	11.72	-55.98	-55.98	11.72
H_2SO_4		12.58	12.58	0		
NH_3		444.3	444.3	0	0	444.3
SO_3		0.18	0.18	0		