PERMIT REVIEW SUMMARY

Permit Writer: Philip Morris Date: July 6, 2016

Company Name: CF Industries Nitrogen LLC

Facility Location: 4612 Highway 49 East

Yazoo City, Mississippi

Source Number: 3020-00010

County: Yazoo

FACILITY DESCRIPTION

CF Industries Nitrogen LLC (CF) owns and operates a nitrogen fertilizer manufacturing complex (primary SIC 2873) at 4612 Highway 49 East, Yazoo City, Yazoo County, Mississippi. The complex is capable of producing Ammonia, Nitric Acid, Prilled Ammonium Nitrate, Ammonium Nitrate Solution, Urea, Urea-ammonium Nitrate Solution and Liquid Carbon Dioxide. Raw materials used at CF are natural gas, air, ammonia and nitric acid. The facility operates under Title V Permit No. 3020-00010, issued December 15, 2006 (modified October 23, 2007 and January 20, 2009); re-issued November 13, 2013 (modified February 21, 2014 and June 23, 2014). The facility is a Major Source under the Prevention of Significant Deterioration (PSD) regulations, and is regulated by PSD Permits issued January 11, 2006 (Low Density Ammonium Nitrate Modification) and September 21, 2004 (Low Density Ammonium Nitrate Modification and Calcium Nitrate/Ammonium Nitrate Project).

The currently permitted emissions sources at the facility include one ammonia plant, four nitric acid plants, one ammonium nitrate plant, one urea facility, one cogeneration facility (turbine/generator set with heat recovery steam generator), two auxiliary boilers, several reciprocating internal combustion engines (RICE), several cooling towers, and other miscellaneous process vents. The turbine is subject to the New Source Performance Standards (NSPS), Subpart GG for stationary gas turbines. The four nitric acid plants are subject to NSPS, Subpart G for nitric acid plants. The RICE engines are subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart ZZZZ for stationary reciprocating internal combustion engines. Some of these engines are also subject to NSPS, Subpart IIII or JJJJ for stationary internal combustion engines. The Cogeneration Facility’s Coen burner is subject to NSPS, Subpart Dc for steam generating units. In addition, facility air emission sources are subject to Mississippi air quality regulations and construction permits. The Auxiliary Boilers No.1 and No.2, Kellogg Startup Heater and Primary Reformer are subject to the provisions of NESHAP, Subpart DDDDD.

PERMIT ACTION DESCRIPTION

CF has requested the following modifications of the air construction permit issued on September 27, 2012, for the 2012 Ammonia Plant Turnaround Projects.

* Correct emissions estimates to include the firing of Low Pressure Purge gas in the Primary Reformer (AD-005).
* Remove the fuel firing limits on AD-005, which were established to avoid triggering PSD for NOx on the 2012 Ammonia Plant Turnaround Projects.
* Remove the limitation on Carbon Dioxide Equivalent (CO2e) for the Carbon Dioxide Vent (AD-001), Primary Reformer (AD-005) and Urea Plant, which was established to avoid triggering PSD for Green House Gases (GHG) on the 2012 Ammonia Plant Turnaround Projects.
* Establish new emission and fuel firing limits on the Primary Reformer (AD-005) and establish a production limit on the Ammonia Plant. The permit modification will also establish monitoring and recordkeeping requirements associated with the new limitations.

The following paragraphs outline the basis for the above permit modifications.

Low Pressure Purge Gas Firing

CF has indicated that the purge gas flow used in the permit application for the 2012 Ammonia Plant Turnaround Projects was in error. Baseline emission calculations for the period, October 21, 2009 to October 20, 2011, included only the High Pressure Purge flow, instead of the sum of the High Pressure Purge and the Low Pressure Purge. Adding the Low Pressure Purge increased the baseline total purge gas flow from 1,469.8 MMscf to 1,661.1 MMscf. This change resulted in approximately 30 tpy more calculated baseline NOx emissions, which also corresponds to a comparable increase in the potential emissions for the 2012 project. The correction is reflected in the revised PSD applicability analysis in the Emission Summary section of this document.

NOx PSD Avoidance Limits

The 2012 Ammonia Plant Turnaround Projects consisted of a number of debottleneck, optimization and maintenance projects that were projected to increase ammonia plant production capacity by approximately 37 tons per day. Said production capacity increase was projected to also increase potential emissions of criteria pollutants through increased fuel gas firing in the Primary Reformer. The following list summarizes the projects that were implemented during the Turnaround.

* Ammonia Converter Upgrade
* Primary Reformer Upgrade
* Cooling Tower Improvements
* Auxiliary Boiler Burner Retrofit
* Increased Steam Flow to 103JAT (Steam Turbine)
* Process Air Improvements
* Refrigeration Compressor Turbine Upgrade
* Replacement of Mixed Feed & Process Air Preheat Coils
* Package Refrigeration System for Atmospheric Ammonia Storage Tank

To avoid a significant increase in NOx emissions associated with the 2012 Ammonia Plant Turnaround Projects, CF requested the following fuel firing limits on the Primary Reformer (AD-005).

Primary and Tunnel Burners

* Natural Gas Firing 5,885,444 MMBtu/year
* Purge Gas Firing 483,490 MMBtu/year

Auxiliary Boiler and Superheat Burners (natural gas) 919,324 MMBtu/year

CF has requested the removal of the above fuel firing limits through the application of NOx emission reductions realized as a result of the 2008 Reformer Ultra Low-NOx Burner Replacement Project. CF has requested to go through “netting” in accordance with PSD procedures, and use the emissions decrease from the 2008 Burner Project to offset the emissions increase from the 2012 Ammonia Plant Turnaround Projects. The burners were installed in 2008 and construction was certified complete in 2012, which makes the Burner Replacement Project “contemporaneous” with the 2012 Ammonia Plant Turnaround Projects. From a PSD netting perspective, the burner replacement represents a creditable emissions decrease in that it was accomplished through a physical change, which occurred during the contemporaneous period that was demonstrated through subsequent stack testing and made federally enforceable through a significant modification of the facility’s Title V Operating Permit in 2008. The netting analysis is contained in the Emission Summary section below.

It should be noted that the PSD applicability evaluation for this project has been limited to emissions from the Ammonia Plant. CF (formerly Terra) has represented that all of the increased ammonia production capacity associated with the 2012 Ammonia Plant Turnaround Projects will be consumed in the production of urea. They have indicated that none of the additional capacity can be used to produce nitric acid since the Nitric Acid Plants are bottlenecked by the design capacity of the Nitric Acid Plant air compressors. Attachment A of the Permit Review Summary for the 2012 Permit to Construct contains production data and compressor specification sheets, that were provided to demonstrate that the units are operating at their rated design capacity.

GHG PSD Avoidance Limits

GHG emissions associated with the 2012 Ammonia Plant Turnaround Projects were above the significance threshold specified in Step 2 of EPA's Greenhouse Gas Tailoring Rule, so CF accepted a limit on CO2e to avoid triggering PSD review. In light of the recent vacature of Step 2 of EPA's Greenhouse Gas Tailoring Rule, CF has requested the GHG PSD avoidance limit established in the 2012 permit be removed.

**Background:** Through the promulgation of Step 2 of the Greenhouse Gas Tailoring Rule on June 3, 2010, EPA established major source PSD and Title V permitting thresholds for greenhouse gas (GHG) emissions, requiring sources to obtain a permit based solely on their potential to emit GHGs. Step 2 also established a PSD permitting significance level threshold for GHG emissions for modifications at PSD major sources that result in an increase in GHG emissions above the significance level, regardless of the effect on emissions of other pollutants. On April 10, 2015, the U.S. Court of Appeals for the District of Columbia Circuit's (D.C. Circuit) vacated Step 2 of the Greenhouse Gas Tailoring Rule. Accordingly, sources will no longer be required to obtain a PSD or Title V permit solely on the basis of GHG emissions. Mississippi approved a revision to its State Implementation Plan and to its “Regulations for the Prevention of Significant Deterioration of Air Quality”, 11 Miss. Admin. Code Pt. 2, Ch. 5, on April 28, 2016 to reflect the court ruling.

New Limitations, Monitoring and Recordkeeping Requirements

To ensure that the NOx reductions from the 2008 Reformer Ultra Low-NOx Burner Replacement Project are practically enforceable and creditable for netting, Primary Reformer (AD-005) NOx emissions are being limited to 173.31 lb/hr and to 759.10 tpy. These limits reflect the Reformer’s potential NOx emission rate based on the unit’s design heat input rate and the emission factors for the ultra low-NOx burners, post-2008 replacement project.

*(****Note:*** *The ultra low-NOx burners were only installed in the arch and tunnel sections of the Reformer. The Auxiliary Boiler and Superheat burners also vent into the same stack and are not equipped with low-NOx burners. Accordingly, it was not practical to establish a lb/MMBtu NOx emission limit to demonstrate compliance with ultra low-NOx burner manufacturer’s mass per unit heat input performance guarantee.)*

Total heat input to the Reformer will be limited to 9,022,800 MMBtu/yr, which corresponds to the unit’s post-2008 burner replacement design heat input capacity and reflects the corrected purge gas firing rates. Total ammonia plant production will also be limited to the post-2012 Ammonia Plant Turnaround potential of 620,500 tons per year of ammonia.

Compliance with the Reformer NOx emission limits will be demonstrated by annual stack testing. CF shall maintain records of operating data and supporting calculations to demonstrate compliance with Reformer total heat input and ammonia plant production limits.

**EMISSION SUMMARY**

A comparison between baseline actual emissions to post-project potential emissions for the 2012 Ammonia Plant Turnaround Projects is summarized in the table that follows.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pollutant | Baseline Actual Emissions (tons/yr) 1,2 | Post-2012 Turnaround Potential Emissions(tons/yr) | Project Increase(tons/yr) | PSD Significance Threshold(tons/yr) | Netting Triggered? |
| PM | 17.05 | 23.98 | 6.93 | 25 | No |
| PM10 | 17.05 | 23.98 | 6.93 | 15 | No |
| PM2.5 | 17.05 | 23.98 | 6.93 | 10 | No |
| SO2 | 1.41 | 1.84 | 0.44 | 40 | No |
| NOx  | 514.26 | 759.10 | 244.85 | 40 | Yes |
| CO | 139.94 | 213.22 | 73.28 | 100 | No |
| VOC | 47.92 | 56.78 | 8.85 | 40 | No |
| Lead | 1.57E-03 | 2.06E-03 | 4.88E-04 | 0.6 | No |

1 Baseline emissions are based on actual plant operations that occurred during the 24-month period from October 21, 2009 to October 20, 2011.

2 Baseline emissions have been corrected to reflect emissions from firing low pressure purge gas, which was omitted from the original 2012 permit application.

Net Emissions Increase Evaluation

|  |  |  |
| --- | --- | --- |
| Emission Point | Project Description | NOx Emissions Increase (tons/yr) |
| AD-005 | 2012 Ammonia Plant Turnaround Projects  | 244.85 |
|  |  |  |
| Contemporaneous Increases/Decreases 1 |  |
| AD-005 | 2008 Reformer Ultra Low-NOx Burner Replacement 2,3,4 | - 291.20 |
|  | Project Net Emissions Increase | - 46.31 |
|  | PSD NOx Significance Threshold | 40 |
|  | PSD Review Required (Yes/No)? | No |

1 40 CFR 52.21(b)(3) defines the contemporaneous period to begin the date five (5) years before construction commences and ends the date the increase from the particular change occurs. The 2012 Turnaround was scheduled to begin October 1, 2012 and Terra certified completion of construction on October 29, 2012. Accordingly, the contemporaneous period for the 2012 Ammonia Plant Turnaround Projects is October 1, 2007 through October 29, 2012.

2 The 2008 Reformer Ultra Low-NOx Burner Replacement Project consisted of replacing 180 existing burners in the arch and tunnel sections of the Reformer (rated at 3 MMBtu/hr each) with 180 new ultra low-NOx burners (rated at 4 MMBtu/hr each). Although the project resulted in a 33% increase in design heat input capacity, the project resulted in a net NOx emissions decrease based on the burner manufacturer’s NOx emission performance guarantee of 0.04 lb/MMBtu vs the pre-project emission rate of 0.27 lb/MMBtu (ref. AP-42, Table 1.4-1), which corresponds to an 85% reduction in the mass emissions per unit of heat input.

3 The NOx emission decrease for the 2008 Reformer Ultra Low-NOx Burner Replacement Project was determined based on a comparison of pre-project baseline actual emissions (occurring between January 1, 2004 and December 31, 2005) and post-project potential emissions. CF revised the original 2008 PSD applicability determination for the burner replacement to be consistent with the calculation methodology utilized in the 2012 Ammonia Plant Turnaround Projects analysis and to incorporate emissions from the firing of low pressure purge gas. A copy of the revised analysis, documenting the NOx emissions decrease associated with the burner replacement, is included herein as Attachment A.

4 Since the 2008 Reformer Ultra Low-NOx Burner Replacement Project resulted in a net emissions decrease, the requirement to obtain an air construction permit was not triggered. Therefore, the facility’s Title V Operating Permit was modified, via a significant modification, to make the modification federally enforceable.

**PUBLIC PARTICIPATION**

The 30-day public notice period began on July 11, 2016, with the publication of a notice in the Clarion Ledger and ends August 10, 2016.

**RECOMMENDATION**

The staff has preliminarily decided to recommend issuance of the permit to the Mississippi Environmental Quality Permit Board as shown in the draft permit. However, the staff recommendation to the Board will be made only after a thorough consideration of all public comments.

ATTACHMENT A

2008 Reformer Ultra Low-NOx Burner Replacement Project

Revised PSD Applicability Determination

(excerpt from CF’s January, 2016 Permit Modification Application)