TECHNICAL EVALUATION
&
PRELIMINARY DETERMINATION

PROJECT

Draft Permit No. 0570005-023-AC
Best Available Retrofit Technology (BART)

CF Industries

Hillsborough County, Florida

APPLICANT

CF Industries, Inc.
Post Office Drawer L
Plant City, Florida 33564

PERMITTING AUTHORITY

Air Permitting South Section
Bureau of Air Regulation
Division of Air Resource Management
Florida Department of Environmental Protection

December 24, 2007

1. GENERAL PROJECT INFORMATION

Facility Description and Location

The applicant, CF Industries, Inc. (CFI), operates a phosphate fertilizer manufacturing complex in Plant City, Florida. The facility is located at 10608 Paul Buchman Highway, Plant City, Hillsborough County. The project site is located about 70 kilometers from the Chassahowitzka National Wildlife Refuge, a Class I Area. The UTM coordinates of this facility are Zone 17; 388.0 km E; 3116.0 km N.

The following figures show the location of Plant City, near Lakeland, Florida as well as aerial photographs of the facility including the plant equipment, phosphogypsum stacks, and process/cooling ponds.

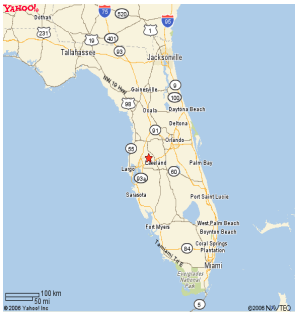

Figure 1. Plant City

Figure 2. Aerial and Satellite Views of the CF Industries Plant City Fertilizer Complex

The Standard Industrial Classification (SIC) code for this type of plant is SIC No. 2874.

CFI converts liquid sulfur, imported by ship and rail from out-of-state gas and oil processing plants, and water into sulfuric acid (H_2SO_4). Locally mined phosphate rock (fluorapatite) and (H_2SO_4) are mixed, forming phosphoric acid (H_3PO_4) and gypsum ($CaSO_4$). (H_3PO_4) is reacted with anhydrous ammonia in a two-step process to produce granules of Diammonium Phosphate (DAP) or Monoammonium Phosphate (MAP), the most-used phosphate fertilizer products. DAP and MAP are shipped from the Plant City facility by rail and truck.

The facility includes: four sulfuric acid plants (SAP); two phosphoric acid plants (PAP), four MAP/DAP plants; molten sulfur storage and handling operations; product storage and shipping operations; and ancillary equipment.

Regulatory Categories

This project is subject to the applicable environmental laws in Section 403 of the Florida Statutes (F.S.). The Florida Statutes authorize the Department of Environmental Protection (Department) to establish rules regarding air quality in the Florida Administrative Code (F.A.C.). The facility is classified according to the following major regulatory categories.

- The facility is a major source of hazardous air pollutants (HAP).
- The facility does not operate units subject to the acid rain provisions of the Clean Air Act (CAA).
- The facility is a Title V major source of air pollution in accordance with Chapter 213, F.A.C.
- The facility is a major stationary source pursuant to Rule 62-212.400, F.A.C. for the Prevention of Significant Deterioration (PSD) of Air Quality.
- The facility operates Best Available Retrofit Technology (BART) eligible units subject to Rule 62-296.340, F.A.C.

Project Description

CFI submitted an application for the Plant City facility to satisfy the requirements of Rule 62-296.340 (BART), F.A.C., which addresses the following BART-eligible emissions units (EU).

Table 1. BART Eligible Emissions Units at the CFI Plant City Facility

EU No.	Emissions Unit Description
002	Sulfuric Acid Plant A
003	Sulfuric Acid Plant B
007	Sulfuric Acid Plant C
008	Sulfuric Acid Plant D
010	Diammonium Phosphate/Monoammonium Phosphate Plant A
011	Diammonium Phosphate/Monoammonium Phosphate Plant X
012	Diammonium Phosphate/Monoammonium Phosphate Plant Y
013	Diammonium Phosphate/Monoammonium Phosphate Plant Z
015	Shipping Baghouse A
018	Shipping Baghouse B

This Technical Evaluation and Preliminary Determination details the project, provides the top-down BART analysis, and identifies the preliminary BART determinations.

Processing Schedule

February 2, 2007: Department received the BART application for an air pollution construction permit.

March 1, 2007: Department requested additional information.

July 12, 2007: Department received additional information.

August 10, 2007: Department requested additional information.

September 10, 2007: Department received additional information; application complete.

December 5, 2007: CFI waived processing clock until December 24, 2007.

December 24, 2007 Department distributed draft BART permit and associated documents.

2. APPLICABLE BART REGULATIONS

Regulatory Authority

This project is subject to the applicable regulatory requirements in the following Chapters of the F.A.C.: 62-4 (Permitting Requirements); 62-204 (Ambient Air Quality Requirements, PSD Increments, and Federal Regulations Adopted by Reference); 62-210 (Permits Required, Public Notice, Reports, Stack Height Policy, Circumvention, Excess Emissions, and Forms); 62-212 (Preconstruction Review, PSD Review and BACT, and Non-attainment Area Review and LAER); 62-296 (Emission Limiting Standards); and 62-297 (Test Methods and Procedures, Continuous Monitoring Specifications, and Alternate Sampling Procedures). It is also subject to the applicable provisions in Title 40 of the Code of Federal Regulations (CFR) as adopted in Chapter 62-204 and 62-296, F.A.C.

Specifically, this project is subject to Rule 62-296.340 (BART), F.A.C. , which requires a BART determination for each BART-eligible source as defined in 40 CFR 51.301. The Department previously identified all BART-eligible sources through a series of notifications, workshops, and rule making efforts. The state rule implements the federal provisions of Appendix Y in 40 CFR Part 51, "Guidelines for BART Determinations Under the Regional Haze Rule".

Affected Pollutants

In accordance with Appendix Y in 40 CFR 51, the affected visibility-impairing pollutants include the following: nitrogen oxides (NO_X), particulate matter (PM) and sulfur dioxide (SO_2). Although ammoniated nitrates and sulfates are among the key species contributing to regional haze, BART does not directly address or require a review of ammonia (NH_3) as a visibility-impairing pollutant.

With respect to particulate emissions, Rule 62-210.200, F.A.C. defines PM as, "… all finely divided solid or liquid material, other than uncombined water, emitted to the atmosphere as measured by applicable reference methods, or an equivalent or alternative method …" Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers is defined as PM_{10} and particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers is defined as $PM_{2.5}$. Emissions of PM, PM_{10} and $PM_{2.5}$ are all regulated pollutants. For the existing emissions units and air pollution control equipment, the control strategy specified in the BART determinations directly reduces PM emissions, which serves as a surrogate to also reduce PM_{10} and $PM_{2.5}$ emissions.

BART Definition

Pursuant to 40 CFR 51.301, *Best Available Retrofit Technology (BART)* means, "… an emission limitation based on the degree of reduction achievable through the application of the best system of continuous emission reduction for each pollutant which is emitted by ... [a BART-eligible source]. The emission limitation must be established, on a case-by case basis, taking into consideration the technology available, the costs of compliance, the energy and non-air quality environmental impacts of compliance, any pollution control equipment in use or in existence at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology." In accordance with Rule 62-296.340(3), F.A.C., the Department shall determine BART for each affected source in an air construction permit.

BART Analysis Procedure

There are five basic steps in the case-by-case BART analysis:

Step 1. Identify all available retrofit control technologies. A comprehensive list of available technologies for analysis must be identified that includes the most stringent option and a reasonable set of available options. It is not necessary to list all permutations of available control levels that exist for a given technology. The list is complete if it includes the maximum level of control each technology is capable of achieving.

Step 2. Eliminate technically infeasible options. Control technologies are technically feasible if either (1) they have been installed and operated successfully for the type of source under review under similar conditions, or (2) the technology could be applied to the source under review. "Availability" and "applicability" are two key concepts in determining whether a technology could be applied. A technology is considered "available" if the source owner may obtain it through commercial channels, or it is otherwise available within the common sense meaning of the term. An available technology is "applicable" if it can reasonably be installed and operated on the source type under consideration. A technology that is available and applicable is technically feasible.

Step 3. Evaluate control effectiveness of remaining control technologies. There are two key issues in this process, including (1) expressing the degree of control in consistent terms to ensure an "apples-to-apples" comparison of emissions performance levels among options, and (2) giving appropriate treatment and consideration of control techniques that can operate over a wide range of emission performance levels.

Step 4. Evaluate the impacts and document the results. The evaluation will consider the costs of compliance, energy impacts, non-air quality environmental impacts, and remaining useful life.

Step 5. Evaluate visibility impacts. Use CALPUFF or other appropriate dispersion model to determine the visibility improvement expected at a Class I area from the potential BART control technology applied to the source. Note that if the most stringent BART control option available is selected, it is not necessary to conduct an air quality modeling analysis for the purpose of determining its visibility impacts.

BART Determination: In making a final BART determination, the following will be considered: (1) technically feasible options; (2) the average and incremental costs of each option; (3) the energy and non-air quality environmental impacts of each option; (4) the remaining useful life; and (5) the modeled visibility impacts. A justification for selecting a technology as the "best" level of control must be provided and include an explanation of these factors that led to the BART determination. When a BART determination is made for two regulated pollutants on the same source, if the result is two different BART technologies that do not work well together, it may be reasonable to substitute a different technology or combination of technologies.

Summary of Applicant's Initial Modeling Analysis

The CF Industries Plant City BART analysis methodology was based on an air modeling protocol, revised January 2007. The modeling protocol was reviewed by the Department and is based on guidance from the VISTAS (Visibility Improvement State and Tribal Association of the Southeast) common modeling protocol, Version 3.2. Further, the Department determined the protocol to be the basis for the modeling methodologies used for this BART analysis.

The BART-eligible emission units for the CF facility are subject to the visibility impairment analysis as dictated by the modeling protocol. The analysis includes visibility impairment at all PSD Class I areas within 300 km of the Plant City facility. These Class I areas are the Chassahowitzka National Wildlife Refuge (CNWR), the Everglades National Park (ENP), the Okefenokee National Wildlife Refuge (ONWR) and the St. Marks National Wildlife Refuge (SNWR). These Class I areas are 70, 261, 263 and 273 kilometers (km) away from CF Industries Plant City respectively.

The CALPUFF modeling system (Version 5.756) was used to predict the maximum visibility impairment. The Department provided the applicant with 4-km "CALPUFF-ready" CALMET meteorological data for the period 2001-2003. Class I receptor locations were obtained from the National Park Service (NPS) and a Lambert Conformal Conic (LCC) coordinate system was used. Modeling results are based on the 8th highest 24-hour average impairment value in one year, for 3 years.

The applicant performed initial modeling to determine if the Plant City facility contributes to visibility impairment. Modeled concentrations were then compared to the visibility impairment threshold of 0.5 deciviews (dv), based on the final BART federal regulation 70 FR 39118. A deciview is a standard visibility index. The Interagency Monitoring of Protected Visual Environments (IMPROVE) states that the deciview scale is linear to humanly-perceived changes in visual air quality. A dv near zero is considered a "pristine" atmosphere. Deciviews increase with visibility impairment. This initial analysis concluded that the Plant City facility contributes to visibility impairment at the CNWR only and therefore, all BART-eligible sources are subject to a BART determination analysis for the CNWR.

The BART-eligible sources (emission units) for the Plant City facility are: SAP A, B, C and D; DAP/MAP Plants A, X, Y and Z; and the A and B Shipping Baghouses. As indicated by the applicant, the visibility impacts from the DAP/MAP plants and the shipping baghouses are only 0.016 dv and 0.004 dv respectively compared to a maximum impact of 0.237 dv from the C SAP, therefore a complete reduction of the impact from the MAP/DAP plants and baghouses would not result in a significant improvement of visibility. Due to this conclusion by the applicant, the applicant suggested that current controls on the DAP/MAP and the existing baghouses are BART; therefore, no further modeling was completed with regards to these sources.

Table 2. CF Industries, Plant City – Existing Visibility Impacts at CNWA. Contribution of Visibility Impairing Particle Species Types

Emission Unit	Percent Contribution to 8th Highest Visibility Impacts (dv)											
	2001				2002				2003			
	Visibility Impact (dv)	Contribution of [a] SO_4 (%)	NO_3 (%)	PM_{10} (%)	Visibility Impact (dv)	Contribution of [a] SO_4 (%)	NO_3 (%)	PM_{10} (%)	Visibility Impact (dv)	Contribution of [a] SO_4 (%)	NO_3 (%)	PM_{10} (%)
SAP A	0.145	99.0	1.0	0.0	0.112	99.6	0.4	0.0	0.128	99.1	0.9	0.0
SAP B	0.174	98.7	1.3	0.0	0.120	99.7	0.3	0.0	0.149	99.7	0.3	0.0
SAP C	0.202	99.6	0.4	0.0	0.180	99.2	0.8	0.0	0.237	99.3	0.7	0.0
SAP D	0.199	99.6	0.4	0.0	0.174	98.6	1.4	0.0	0.232	99.3	0.7	0.0
DAP/MAP A	0.016	2.4	5.2	92.4	0.014	0.0	11.9	88.1	0.016	2.3	5.0	92.7
DAP/MAP X	0.012	3.2	10.4	86.4	0.011	3.5	23.1	73.4	0.013	12.4	6.7	80.9
DAP/MAP Y	0.015	2.5	8.1	89.4	0.014	5.4	5.9	88.7	0.016	9.9	5.4	84.7
DAP/MAP Z	0.013	12.5	3.4	84.1	0.012	3.3	21.6	75.0	0.014	2.7	11.9	85.4
Ship Baghouse A	0.004	0.0	0.0	100.0	0.003	0.0	0.0	100.0	0.004	0.0	0.0	100.0
Ship Baghouse B	0.004	0.0	0.0	100.0	0.003	0.0	0.0	100.0	0.004	0.0	0.0	100.0

The SAP contribute to visibility impairment primarily by emitting sulfate particles; therefore, the applicant provided a BART analysis for the SAP regarding SO_2 only. Emission rates used in the BART modeling analysis were from recently permitted 24-hr emission limits for SAP A and B and continuous emissions monitoring system (CEMS) data for SAP C and D, which reflect the maximum actual concentrations during normal operation.

As shown above, based on the 24-hour visibility impairment values for 2001 to 2003, the 8th highest (98th percentile) were determined. The maximum pre-control predicted impacts are 0.145, 0.174, 0.237 and 0.232 for SAP A, B, C and D respectively.

3. BART ANALYSIS AND PRELIMINARY BART DETERMINATION FOR SAP A, B, C AND D

This section provides the control technology review and BART determination for the following emissions units.

Table 3. CF Industries, Plant City – List of Sulfuric Acid Plants

EU No.	Emission Unit Description
002	SAP A – 1300 tons per day (TPD) of 100% H_2SO_4 produced
003	SAP B – 1600 tons per day (TPD) of 100% H_2SO_4 produced
007	SAP C – 2,962 tons per day (TPD) of 100% H_2SO_4 produced
008	SAP D – 2,962 tons per day (TPD) of 100% H_2SO_4 produced

Process Description and Pollutants from SAP A, B, C and D

The following diagram is useful for the discussion of SO_2 emissions control. At CFI molten elemental sulfur is combusted to produce the source of the gaseous SO_2 used to manufacture sulfuric acid. Thus SO_2 is a valuable important intermediate raw material for the process.

Conversion of SO_2 to sulfur trioxide (SO_3) takes place in several vanadium catalyst beds within a converter tower. The specific type of catalyst greatly affects the reactions and the emissions. The progressively more concentrated SO_3 is absorbed into a recirculating stream of sulfuric acid in one or two absorbers (single or double staged absorption processes). The following figure from a European Commission document shows the keys steps (with the exception of the sulfur combustion part) involved in the contact sulfuric acid process used at CFI.

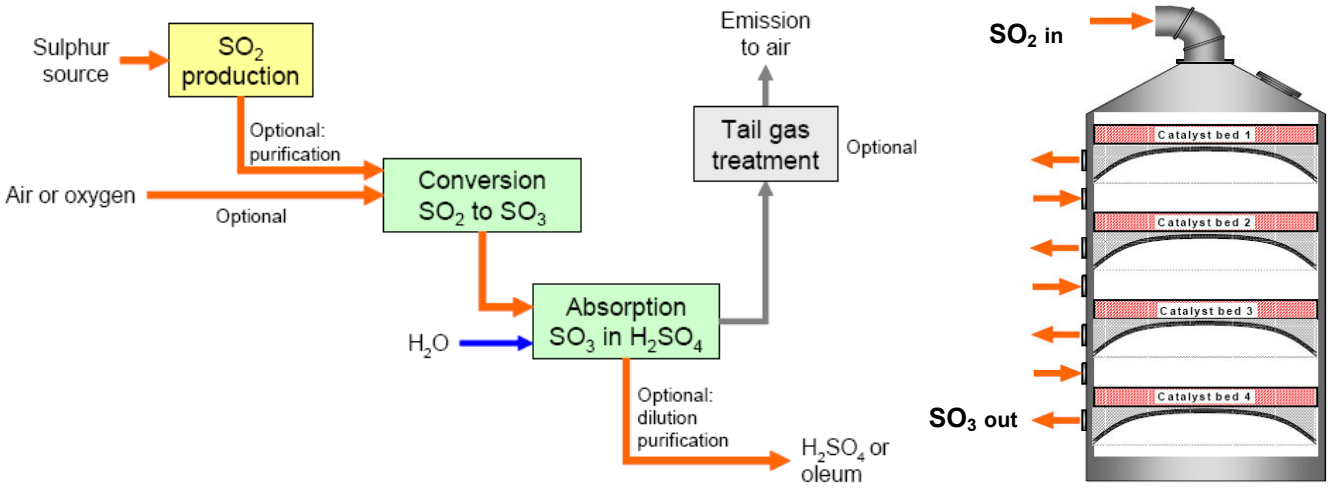

Figure 2. Diagram of the Contact Sulfuric Acid Manufacturing Process and Conversion of SO_2 to SO_3

The following figure from the same European Commission document shows the two main variations of the contact processes including single stage absorption and double staged absorption. The double staged version shown on the left also shows the sulfur burner. CFI employs double staged absorption on SAP C and D. It features two absorbers and typical conversion efficiencies greater than 99.7% are achieved.

The single stage version has only one absorber and achieves only 97-98% absorption, thus leaving a significant amount of SO_2 that is not converted to product and which requires further tail gas scrubbing to control emissions. CFI employs single staged absorption on SAP A and B.

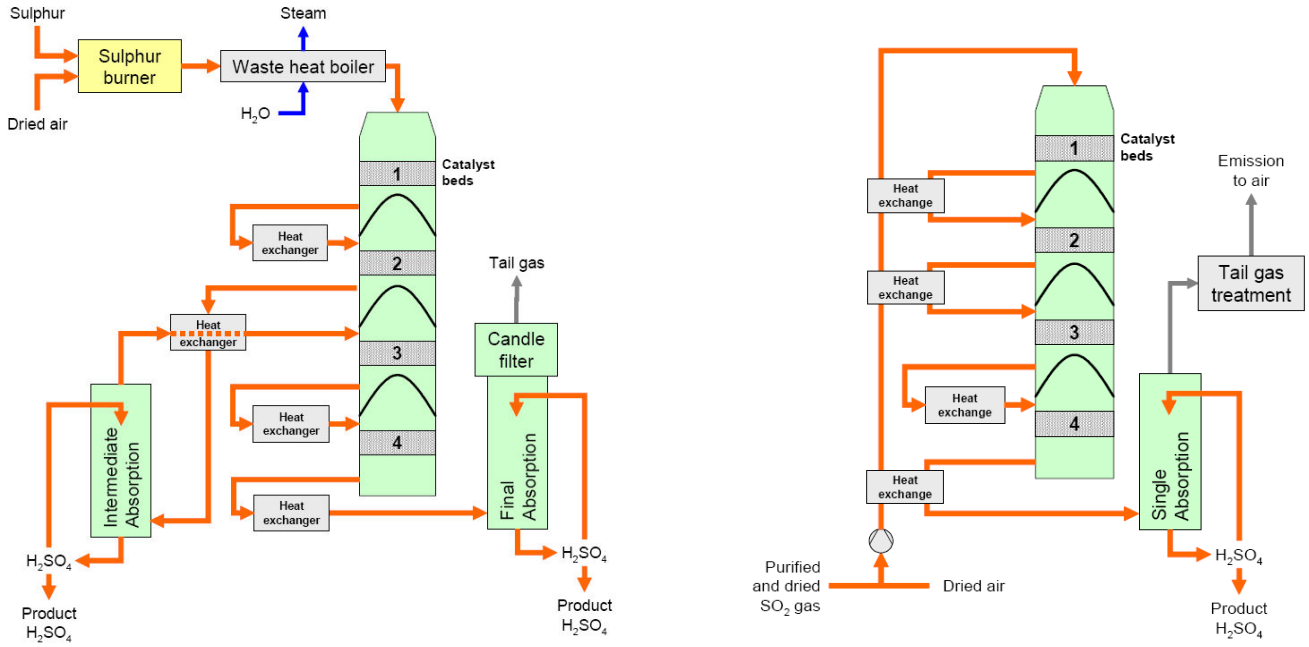

Figure 3. Sulfur Burning and Double Staged Absorption. Single Stage Absorption and Tail Gas Treatment

The key emissions from the double staged version are SO_2, sulfur trioxide (SO_3) and sulfuric acid mist (SAM or H_2SO_4). All are key intermediate raw materials or products as well as pollutants. NO_X and minor amounts of PM from the sulfur source (typically combustion of molten sulfur) will also exit through the SAP stack.

In the single stage process, the tail gas is scrubbed. At CFI scrubbing is accomplished using ammonia (NH_3) to control and recover SO_2, SO_3 and SAM. Such scrubbing results in the production of a usable by-product that is useful elsewhere in fertilizer production. However the ammoniated sulfate species constitute direct filterable PM emissions from SAP A and B. These species are similar to fine PM ($PM_{2.5}$) formed in the environment from precursors such as NH_3 and SO_4. They differ from SAM in that they will be captured on an EPA Method 5 filter, whereas SAM may or may not be captured or react on the filter media and filtered dust.

BART Analysis for SO_2

Applicant's SO_2 Control Technology Review

According to the applicant, except for SAP A these emissions units have established SO_2 (and SAM) emissions limits set according to the best available control technology (BACT) conducted in 2004 and 2007. These BACT permits were issued within the last 3 years. The relevant permits are:

a. Permit PSD-FL-355 was issued on July 23, 2007, to CFI for SAP B which is a single stage absorption plant. SO_2 emissions are limited to 3.5 lb SO_2/ton of 100% H_2SO_4 produced (lb/ton of acid), 3-hour rolling average, as demonstrated by a continuous emissions monitoring system (CEMS). Cesium promoted catalyst in the final (fourth) bed in conjunction with NH_3 scrubbing of the tail gas constitutes the control technology to achieve the limit. For reference the BACT SAM limit was determined to be 0.075 lb SAM/ton of acid. The same permit reduced the SO_2 limit for SAP A to 250 pounds per hour (lb/hr) on a 24-hour basis.

b. Permit PSD-FL-339 issued on June 1, 2004, to CFI for SAP C and D which are double staged absorption plants. SO_2 emissions are limited to 3.5 lb/ton of acid, 3-hour rolling average, as demonstrated by CEMS. Cesium promoted vanadium catalyst in the final (fourth) bed in conjunction with the double staged absorption process constitutes the control technology to achieve the limit. For reference the BACT SAM limit was determined to be 0.10 lb/ton of acid.

c. Draft permit PSD-FL-339B was distributed on December 3, 2007 for a production increase from SAP C and D. The permit further reduced the SO_2 emission limit to 3.25 lb/ton of acid, 3-hour rolling average, as demonstrated by CEMS. The SAM limit was reduced to 0.093 lb/ton of acid.

The present SO_2 limit on the single stage SAP A is 5.6 lb/ton of acid. For reference, the present SAM limit is 0.30 lb/ton of acid. The additional limit in permit PSD-FL-355 of 250 pounds per hour (lb/hr) on a 24-hour basis equates to approximately 4.6 lb/ton of acid. No further changes in SO_2 (or SAM) limits are proposed by CFI as BART for the single stage SAP A and B or the double staged SAP C and D.

Department's SO_2 Control Technology Review and BART Determination

The Department has issued several BACT determinations since 1998 for other facilities specifying a limit of 3.5 lb/ton of acid (or lower) on a progressively more stringent time averaging basis. Similar values have been set in recent years for plants at Piney Point Phosphates, Mosaic New Wales, Mosaic Riverview, Mosaic Bartow and PCS White Springs. As mentioned above, the limit in draft permit PSD-FL-339B for CFI double staged SAP C and D is 3.25 lb/ton of acid.

The Department has determined that 3.25 lb SO_2/ton of acid on a 3-hour basis is BART for SAP C and D. This is the value already proposed under draft permit PSD-FL-339B. It is achievable by the double absorption process coupled with use of cesium promoted vanadium catalyst in the final (fourth) converter bed.

The Department has determined that 3.50 lb SO_2/ton of acid on a 3-hour basis is BART for single stage SAP B. This is the value previously determined in 2007 as BACT under permit PSD-FL-355. The value is achievable by the single stage absorption process coupled with use of cesium promoted vanadium catalyst in the final (fourth) converter bed and followed by NH_3 scrubbing of the tail gas.

SAP A is very similar to SAP B, but has not been subjected to a PSD review and BACT determination. The present emission limit of 5.6 lb/ton of acid is less than the applicable limit for existing SAP of 10 lb/ton of acid given in Department Rule 62-296.402, F.A.C. The corresponding value for a new or modified SAP is 4.0 lb/ton of acid in accordance with 40 CFR 60, Subpart H – Standards of Performance for Sulfuric Acid Plants.

According to last ten compliance tests reviewed by the Department, SO_2 emissions from SAP A have ranged from 3.0 to 3.8 lb/ton of acid. Addition of cesium promoted catalyst with greater vanadium content will comfortably allow achievement of a lower limit and lower actual emissions than reflected by the recent tests.

The Department made its first determination that cesium catalyst is cost-effective in terms of cost/ton of SO_2 removed from SAP in 1998 even without contemplating production increases. At that time, the Department concluded that the cost-effectiveness was less than $1,000/ton of SO_2 removed. Given that no production increases are contemplated, the addition of a small layer of cesium promoted catalyst with increased vanadium concentration and hollow cylindrical shape in the final converter bed can allow the plant to operate longer between turnarounds. This helps offset some of the added cost of the catalyst.

The Department has determined that 3.50 lb SO_2/ton of acid on a 3-hour basis is BART for SAP A. The value is achievable by the single absorption process coupled with use of cesium promoted vanadium catalyst in the final converter followed by NH_3 scrubbing of the tail end gases. SAM is discussed further below.

Compliance will be demonstrated using the installed CEMS presently required under existing permits. These CEMS shall be properly calibrated, maintained, and operated to comply with: 40 CFR 60 Subpart A, General Provisions; 40 CFR 60 Appendix B, Performance Specification 2; and, 40 CFR 60, Appendix F, Quality Assurance Procedures for Gas CEMS Used for Compliance Determination.

In summary, the proposed BART emission limitations for these plants are as follows:

Table 4. CF Industries, Plant City – SO_2 BART Determinations for the Sulfuric Acid Plants

Source	BART Determination
SAP A	3.50 lbs/ton of 100% H_2SO_4 and 190 lb/hr based on 3-hour CEMS basis
SAP B	3.50 lbs/ton of 100% H_2SO_4 and 233.3 lb/hr based on 3-hour CEMS basis
SAP C	3.25 lbs/ton of 100% H_2SO_4 and 401 lb/hr based on 3-hour CEMS basis
SAP D	3.25 lbs/ton of 100% H_2SO_4 and 401 lb/hr based on 3-hour CEMS basis

Although SAP A and B are similar, the allowable mass emissions for SAP B are greater because the plant was modified under permit PSD-FL-355 to achieve greater production. The production increase was part of the justification for use of cesium promoted catalyst in SAP B. Because the production is less on SAP A, significantly less cesium promoted catalyst would be required in the fourth (final) converter bed to achieve the same 3.5 lb/ton of acid limitation when compared with SAP B.

BART Analysis for PM/PM_{10}

Applicant's PM/PM_{10} Control Technology Review

For each of the SAP, the applicant stated that "more than 99% of the …… visibility impact is due to sulfate particles". The analysis concentrated on control of SO_2 to reduce emissions of SO_2 as a precursor of such sulfate particles but did evaluate direct PM emissions of sulfate particles from the SAP.

Department's PM/PM_{10} Control Technology Review and BART Determination

BART also controls PM emissions that are defined as " all finely divided solid or liquid material, other than uncombined water, emitted to the atmosphere as measured by applicable reference methods, or an equivalent or alternative method …"

Unabsorbed SO_3 from the process is very hygroscopic and quickly combines with water to form SAM which is a finely divided liquid and arguably constitutes direct PM emissions from the SAP stacks. Stack exhaust gases that contain gaseous SO_3 and fine liquid SAM particles are heated in the EPA Method 5, sampling train. The SAM particles can reenter the gaseous state as SO_3 and water and may or may not be captured on the filter media. SAP C and D have recent and low SAM BACT determinations that are adequate for BART if SAM emissions are treated as direct PM emissions.

The case of SAP A and B is different because in addition to SAM, they can directly emit ammoniated sulfates that are filterable even on a heated filter. Because SAP A and B are single stage absorption plants, there is a significant amount of SO_2 remaining in the gas leaving absorber. CFI practices SO_2 and SAM control/recovery by use of two-staged NH_3 scrubbing. Scrubbing and neutralization of the exhaust gas using NH_3 results in the formation of ammonium bisulfite and ammonium sulfite that are further processed by treatment with sulfuric acid to make ammonium sulfate. The resultant ammonium sulfate by-product is consumed on-site in the DAP/MAP plants.

NH_3 scrubbing has a potentially beneficial effect on SAM because of the neutralization. Therefore the BACT SAM limits are less for SAP B than SAP C and D. However direct emissions of the resultant ammoniated sulfates as PM can cause formation of "blue haze". Whereas SAM might be considered a $PM_{2.5}$ precursor (if not direct $PM_{2.5}$ emissions), the ammoniated sulfates are clearly direct $PM_{2.5}$ emissions.

The measures that control SAM are useful for controlling ammoniated sulfate emissions. In the sulfuric acid industry the most common measure is use of high efficiency mist eliminators. There are a number of designs that rely on several different modes of reduction including interception of the particles by the filter media (typically bundles of fibers), impaction of the particle onto filter media and diffusion of the finest particles towards the filter media.

The Department has determined that a limit of 0.075 lb SAM/ton of acid will, as a surrogate for the ammoniated sulfates, satisfy BART for SAP A. The new BART limit is substantially less than the present limit of 0.30 lb/ton of acid and is also less than the limit of 0.15 lb/ton of acid applicable to new or modified SAP accordance with Subpart H. The existing mist eliminators can be upgraded as needed to meet the lower limits. Typically the additional product recovery partially offsets the additional control costs such that the technology is cost-effective in terms of $/ton of PM/PM10 removed and $/ton of SAM removed.

The BACT-based SAM limitations discussed in the previous section for SAP B, C and D will not be changed. All four SAP are subject to a visible emissions limit of 10% opacity. The opacity limitations in conjunction with the SAM limits constitute BART for the four SAP.

BART Analysis for NO_X

Applicant's NO_X Control Technology Review

The applicant indicated that no known NO_X control technologies have been employed by SAP.

Department's NO_X Control Technology Review and BART Determination

The potential causes of NO_X from the SAP are thermal fixation of nitrogen at very high temperatures in the furnace and oxidation of fuel nitrogen. However, combustion in sulfur furnaces generally occurs at lower temperatures than their counterparts in the power industry, namely fuel-oil fired boilers. Therefore thermal NO_X is not an important factor from a properly operated sulfur furnace. Also elemental sulfur used in the furnaces

should have fairly low levels of nitrogen compared with fuel oil. Therefore NO_X emissions are also generally low from SAP furnaces and some projects do not trigger a BACT determination.

However, the Department has actually issued BACT determinations for several projects at a limit of 0.12 lb/ton of acid. These include determinations for SAP B, C and D. The values were further lowered for SAP C and D under permit PSD-FL-339B to 0.11 lb NO_X/ton of acid.

The Department has determined that the present NO_X limits constitute BART for SAP B, C and D. A limit of 0.12 lb/ton of acid will be included as BART for SAP A. The control technology is the relatively low combustion temperature to avoid thermal NO_X production and the typically low nitrogen sulfur.

An initial NO_X stack test shall be performed in accordance with EPA Method 7 or 7E. Because the potential NO_X emissions from each SAP are less than 100 TPY a test frequency of every 5 years is required from Rule 62-297, F.A.C. and is deemed adequate for BART.

4. BART ANALYSIS AND PRELIMINARY BART DETERMINATION FOR DAP/MAP PLANTS

This section provides the control technology review and BART determination for the following emissions units:

Table 5. CF Industries, Plant City – List of Diammonium Phosphate/Monoammonium Phosphate Plants

EU No.	Emission Unit Description
010	Diammonium Phosphate/Monoammonium Phosphate (DAP/MAP) Plant A
011	Diammonium Phosphate/Monoammonium Phosphate (DAP/MAP) Plant X
012	Diammonium Phosphate/Monoammonium Phosphate (DAP/MAP) Plant Y
013	Diammonium Phosphate/Monoammonium Phosphate (DAP/MAP) Plant Z

Process Description and Pollutants from DAP/MAP Plants A, X, Y and Z

The following figure from the European Fertilizer Manufacturers Association (EFMA) shows two similar fertilizer process schemes (including DAP/MAP) that differ in the type of reactor used in the first stages.

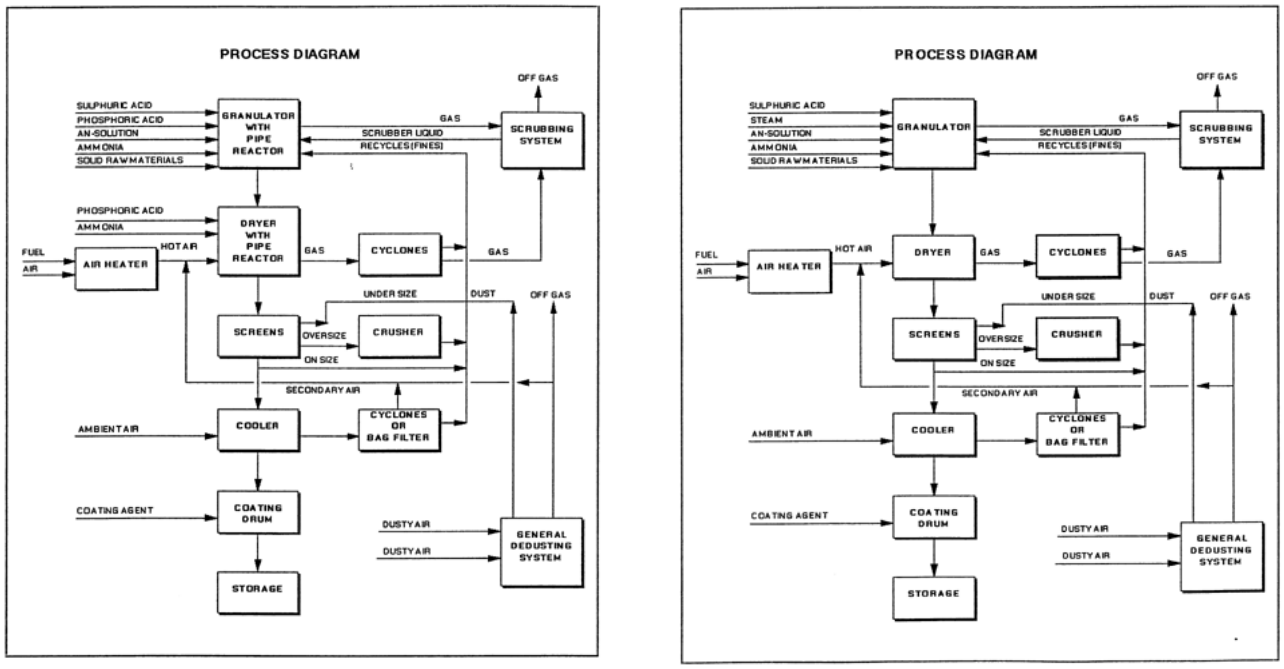

Figure 4. Pipe Reactor and Drum Granulation Systems and Typical Air Pollution Control Equipment.

At the CFI MAP/DAP plants, phosphoric acid is reacted with ammonia to produce fertilizer. In the basic ammoniated phosphate process, anhydrous ammonia is reacted with phosphoric acid. The slurry produced by the ammoniation is then sprayed onto a bed of solids in the granulator and additional ammonia (if required) is added to complete the acid neutralization and produced the final product grade.

The resulting slurry/solids mixture is dried in a fossil fuel fired direct contact rotary dryer. The dried solids are then screened to remove on size product. The product size material is cooled and then conveyed to storage. The over-sized and under-sized materials are crushed and recirculated through the granulator.

The key pollutants from the DAP/MAP plants are fluoride (particulate and gaseous), other PM in the form of DAP and MAP, and also NH_3. According to Table 2, the effect of emissions from the MAP/DAP plants on visibility is very much less than the effects of the four SAP. This is logical given that collective emissions of SO_2 from the four SAP are over 5,000 TPY whereas emissions (primarily PM) from the DAP/MAP plants are calculated in terms of a few hundred TPY.

The four DAP/MAP plants are subject to 40 CFR 63, Subpart BB - National Emission Standards for Hazardous Air Pollutants From Phosphate Fertilizers Production Plants (Subpart BB). Subpart BB includes a limitation on fluoride (as F) whether in gaseous or particulate form of 0.060 lb/ton of equivalent P_2O_5 feed (lb/ton feed). The limitation at least insures proper PM control within most of the DAP/MAP process.

The four DAP/MAP plants include medium to high efficiency wet scrubbers that use phosphoric acid and then pond water to reduce F and PM from the reactor and granulators. They are also equipped with abatement scrubbers using fresh water for final cleanup. Emissions from the dryers, coolers, mills and screens are controlled by cyclones, wet scrubbers with phosphoric acid or pond water as the scrubbing medium, and by abatement scrubbers using fresh water.

BART Analysis for SO_2

Applicant's SO_2 Control Technology Review

The applicant did not address SO_2 emissions from the DAP/MAP plants.

Department's SO_2 Control Technology Review and BART Determination

The four dryers associated with the four DAP/MAP plants are rated at 28.5 to 49.7 million British thermal units per hour (mmBtu/hr). Each is fired with natural gas. DAP/MAP plants X, Y and Z use fuel oil No. 2 as backup while DAP/MAP Plant A uses No. 2 through No. 5 fuel oil as backup.

According to Table 2, SO_2 emissions from the DAP/MAP plants contribute much less to visibility impairment than PM/PM_{10} emissions and the DAP/MAP plants contribute very much less to visibility impairment than the four SAP. Even when firing fuel oil, the four SO_2 emissions from the dryers at the four DAP/MAP plants are minimal compared with emissions from the four SAP. No separate BART SO_2 limits will be set for the DAP/MAP plants.

BART Analysis for PM/PM_{10}

Applicant's PM/PM_{10} Control Technology Review

The applicant listed the control equipment and the permitted or recently requested limitations for the four DAP/MAP plants but did not conduct a further assessment.

Department's PM/PM_{10} Control Technology Review and BART Determination

The physical equipment installed at the four DAP/MAP plants to meet the Subpart BB limits are sufficient for the purposes of BART. The Department has actually conducted a number of BACT reviews for PM/PM_{10} from DAP/MAP plants. These include:

a. Permit PSD-FL-251 issued on August 8, 2001 to Cargill Fertilizer Riverview facility for the Nos. 3 and 4 MAP plants. The BACT emissions limit was established as 0.12 lb PM/PM_{10}/ ton P_2O_5 feed.

b. Permit PSD-FL-255 issued on April 21, 1999 to Cargill Fertilizer Bartow facility for the No. 3 DAP/MAP plant. The BACT emissions limit was established as 0.18 lb/ton P_2O_5 feed.

c. Permit PSD-FL-322 issued on March 2, 2002 to Cargill Fertilizer Bartow facility for the No. 4 DAP plant. The BACT emissions limit was established as 0.15 lb/ton P_2O_5 feed.

d. PSD-FL-336 issued on March 16, 2004 to Cargill Fertilizer Riverview facility for the No. 6 Granulation plant. The BACT emissions limit was established as 0.15 lb/ton ton P_2O_5 feed.

The present PM/PM_{10} limits at the DAP/MAP plants at CFI range from 13 to 15.3 lb/hr and equate to 0.21 to 0.44 lb/ton of P_2O_5 feed (depending on the plant and the product). The Department evaluated historical test data (for the period 1984 to beginning of 2007) for these plants from Department's records. Results of the tests data for PM indicate that the actual emissions are much lower than the allowable.

On the basis of the recent BACT determinations and on the statistical data, the Department has determined that a PM/PM_{10} limit of 0.18 lb/ton of P_2O_5 feed constitutes BART for DAP/MAP plants A, X, Y and Z. The BART limit is achievable with the installed wet scrubbers used for chemical recovery and the final abatement scrubbers along with the measures already in place to insure compliance with Subpart BB.

Compliance with the BART particulate matter emission limit shall be demonstrated annually in accordance with EPA Reference Method 5 in accordance with 40 CFR 60, Appendix A.

BART Analysis for NO_X

Applicant's NO_X Control Technology Review

The applicant did not address NO_X emissions from the DAP/MAP plants.

Department's NO_X Control Technology Review and BART Determination

Thermal and fuel NO_X from the natural gas fired dryers should be relatively low. According to Table 2, NO_X emissions from the DAP/MAP plants contribute much less to visibility impairment than PM/PM_{10} emissions and the DAP/MAP plants contribute very much less to visibility impairment than the four SAP. No separate BART NO_X limits will be set for the DAP/MAP plants.

5. ANALYSIS AND PRELIMINARY BART DETERMINATION FOR SHIPPING BAGHOUSE UNITS

This section provides the control technology review and BART determination for the following emissions units:

Table 6. CF Industries, Plant City – List of Shipping Baghouses Subject to BART

EU No.	Emission Unit Description
015	Shipping Unit A Baghouse
018	Shipping Unit B Baghouse

Process Description and Pollutants from Shipping Baghouses A and B

Fertilizer from the four MAP/DAP plants is stored in Storage Buildings A and B, and is loaded onto trucks and railcars for shipment. Shipping Units A and B consist of sizing, screening, and conveying systems for transferring MAP/DAP from storage buildings to the truck and railcar loading operations. The maximum loading rate of Shipping Units A and B are limited to 250 TPH and 500 TPH, respectively.

Storage Buildings A and B are fugitive sources of PM emissions as fugitive dust is generated from the transfer points in the conveying system. Dust is controlled by the application of dust suppressant coating oil. PM emissions from some of the transfer points and sizing and screening within each shipping unit by a baghouse

(10,000 acfm Mikro-Pulsaire high efficiency Model 1F2-48). The truck and railcar loading operations are also fugitive sources of PM emissions and are controlled by a second application of dust suppressants (coating oil).

Applicant's PM/PM_{10} Control Technology Review

The applicant did not perform a technology review and proposed the existing control technology as BART.

Department's PM/PM_{10} BART Determination for the "A" and "B" Shipping Units

The permitted PM emission limit for Shipping Unit A Baghouse and Shipping Unit B Baghouse is 1.71 lb/hr each. The Department evaluated historical and recent test data for these units from Department's records. Results of the tests data for PM indicate that the actual emission is close to the allowable. The BART emission limit for these units will remain unchanged.

Compliance with the a visible emissions standard of 5% opacity in accordance with EPA Reference Method 9 as contained in 40 CFR 60, Appendix A will constitute compliance with the proposed BART determination.

6. PRELIMINARY DETERMINATION

The Department makes a preliminary determination that the proposed project will comply with all applicable state and federal air pollution regulations regarding BART as conditioned by the draft permit. This determination is based on a technical review of the complete application, all available information, reasonable assurances provided by the applicant, and the conditions specified in the draft permit.