This document is based on CF Industries' Updated AMP Submitted on May 23, 2011 (and revised on August 15, 2011).

UPDATED ALTERNATIVE MONITORING PLAN REQUIREMENTS

Overview

EPA approved the initial AMP for the A, X, Y and Z Plants as described in Appendix AMP under the current Title V Permit No. 0570005-032-AV. EPA exempted the A, X, Y and Z Plant primary scrubbers from monitoring requirements as they were identified as inherent process equipment which serve the purpose of recovering and returning product to the production process (see EPA Approval Letter included in this appendix).

The AMP requirements herein have been updated to reflect scrubbing system changes that have been implemented in accordance with FDEP Permit No. 0570005-030-AC. Accordingly, the X, Y and Z Plant secondary scrubbers have been removed from the monitoring requirements as they use acid scrubbing and are therefore considered inherent process equipment which serve the purpose of recovering and returning product to the production process. Consequently, only the A, X, Y and Z Plant abatement scrubbers and the A Plant fume and dryer downcomers are subject to the AMP requirements.

Updated AMP (please refer to EPA Approval Letter format included in this appendix)

1.1 Scrubbers and Parameters Monitored

The proposed updated AMP consists of the following:

a. *NO CHANGE TO CURRENT AMP* - In each of the four granulation plants, continuous monitoring and recording of the fluoride abatement scrubber liquid pH is proposed instead of the pressure drop across the abatement scrubber. A minimum pH of 4.5 has been demonstrated to FDEP to be a viable limitation and is a condition of the current Title V permit.

b. *NO CHANGE TO CURRENT AMP* – In each of the four granulation plants, continuous monitoring and recording of the liquid flow to the fluoride abatement scrubber is proposed and is a condition of the current Title V permit.

c. *PROPOSED UPDATE TO CURRENT AMP* - The primary scrubber in granulation plants A, X, Y and Z and secondary scrubbers in plants X, Y, and Z will not be monitored as they are inherent process equipment which serves the purpose of recovering and returning product (i.e. nitrogen and phosphate) to the production process. The water flow to the A plant Header feeding the downcomer will continue to be monitored as required under the current AMP.

1.2 Measurement Techniques

NO CHANGE TO CURRENT AMP - Existing pH probes will monitor the pH of the abatement scrubber water. Existing magnetic flow meters will monitor the liquid flow to the abatement scrubbers.

1.3 Monitoring Frequency

NO CHANGE TO CURRENT AMP - The pH and liquid flow rate will be monitored continuously and recorded in a data logger.

PROPOSED UPDATE TO CURRENT AMP - In the event of monitoring equipment failure, the parameters will be monitored and/or recorded manually every 2 hours.

1.4 Establishment & Reestablishment of Indicator Ranges

PROPOSED UPDATE TO CURRENT AMP - Since indicator ranges have already been established, to reestablish the indicator ranges, the permittee shall use either MACT Option 1 or MACT Option 2 as described below.

MACT Option 1 - The permittee shall follow the specific procedures referred to as MACT Option (1) (see 40 CFR 63.625(f)(1) as it applies to a DAP Plant) to reestablish each indicator range.

The indicator range shall be reestablished in accordance with the following conditions:

a. Upon successful completion of each required annual compliance test, the indicator values during testing shall be used to reestablish the indicator range;

b. Updated tables shall be submitted with the compliance test results. The reestablished minimum and maximum values of the indicator range shall be clearly shown in the tables; and,

c. Upon establishment of a new indicator range the permittee shall operate under the new indicator range.

MACT Option 2 - The permittee shall follow the specific procedures referred to as MACT Option (2) (see 40 CFR 63.625(f)(2) as it applies to a DAP Plant) to reestablish each indicator range.

The indicator range shall be reestablished in accordance with the following conditions:

a. Upon successful completion of each required annual compliance test, the indicator values during testing shall be used to reestablish the indicator range;

b. The indicator values during testing shall be added into the individual emission unit compliance test results historical data set and a new indicator range shall be established;

c. Updated tables shall be submitted with each compliance test result. The permittee shall indicate whether or not the indicator range has changed as a result of the annual compliance testing. The reestablished minimum and maximum values of the indicator range shall be clearly shown in the tables submitted; and,

d. Upon establishment of a new indicator range the permittee shall operate under the new indicator range.

1.5 Justification

NO CHANGE TO CURRENT AMP - The justification for the proposed AMP, consistent with the justification previously approved by EPA, is that the 40CFR63 Subpart BB scrubber monitoring requirements will not result in an appreciable environmental benefit through a reduction in HF emissions and the proposed alternative parameters have already been approved by EPA and FDEP as being appropriate for the subject abatement scrubbers.

1.6 Averaging Time

PROPOSED UPDATE TO CURRENT AMP - The data logger will convert the continuous measured values to 15-minute block averages and generate daily averages. The MACT requirements under 40 CFR 63.624 specifies an averaging period of daily (24-hours). Accordingly, a 24~hour (daily) block average period was selected as appropriate in this updated AMP. This averaging period is consistent with that approved by FDEP for other phosphate fertilizer facilities. A shorter averaging period is not warranted.

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Herschel E. Morris
General Manager
CF Industries, Inc.
Plant City Phosphate Complex
P. O. Drawer L
Plant City, Florida 33564-9007

Dear Mr. Morris:

This is in response to your letter dated May 3, 2004, regarding an application for approval of alternative monitoring for the CF Industries, Inc. Plant City Phosphate Complex (CFI), and also your letter dated February 25, 2005, regarding additional information to support the alternative monitoring request. CFI is subject to the Phosphate Acid Manufacturing MACT, 40 CFR Part 63, Subpart AA, and the Phosphate Fertilizers Production MACT, 40 CFR Part 63, Subpart BB. Alternative monitoring is being requested, pursuant to Subpart BB, for the Granulation Plants A, X, Y, and Z.

Granulation Plants X, Y, and Z are identical plants producing granulated ammonium phosphate fertilizer products. The gas streams from each of the three plants pass through systems of 10 individual scrubbers, consisting of primary (phosphoric acid scrubbing medium) scrubbers, secondary (process water scrubbing medium) scrubbers, and a final pH-controlled fresh water spray, fluoride abatement scrubber. Scrubber segments (groups of scrubbers treating gases from the respective Fume, Dryer, Cooler, or Dust sources) are connected in series with the flow of gases through the entire segment to be monitored by the combined pressure drop across the segment. The liquid delivery pressure in the pond water cyclonic scrubbers will be measured and recorded manually. The water flow and pH of the abatement scrubber water will be monitored and recorded continuously. The flow of the phosphoric acid scrubbing medium to the primary scrubbers will not be monitored, as these scrubbers do not function to remove fluorides from the gas stream.

Granulation Plant A also produces granulated ammonium phosphate fertilizer products. Although the equipment and process in Plant A is very similar to the equipment and process in Plants X, Y, and Z, Plant A is older, smaller, and serves as a back-up unit for the other three plants. CFI is proposing to continuously monitor the gas pressure drop across each of the scrubber segments, and to continuously monitor the water flow in the header line to the freshwater downcomer scrubber nozzles, the water flow to the fluoride abatement scrubber, and the pH of the abatement scrubber water.

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The proposed alternative monitoring consists of the following:

1. In each of the four granulation plants, continuous monitoring and recording of the fluoride abatement scrubber liquid pH is proposed in lieu of the pressure drop across the abatement scrubber. A minimum pH of 4.5 has been demonstrated to the Florida Department of Environmental Protection to be a viable limitation and is a condition of CFI's current Title V permit. The pressure drop across the abatement scrubber is not proposed for measurement because it is an extremely low value and meaningful variations would not be detectable.

2. In each of the four granulation plants, the pressure drop for each of the parallel scrubber segments upstream of the fan and fluorine abatement scrubber is proposed to be continuously monitored and recorded, in lieu of the pressure drop across each scrubber.

3. In Granulation Plant A, continuous monitoring and recording of the water flow through the header feeding the three downcomer scrubbers is proposed.

4. In Granulation Plants X, Y, and Z, the secondary scrubber liquid flow condition is proposed to be monitored by pressure gauges with the readings manually recorded at 2-hour intervals.

5. In each of the four granulation plants, CFI proposes not to monitor the liquid flows to the primary scrubbers on the basis that they are inherent process equipment which serves the purpose of recovering and returning product (i.e., nitrogen and phosphate) to the production process.

Justification for the proposed alternative monitoring is based on CFI's determination that the Subpart BB scrubber monitoring requirements will not result in an appreciable environmental benefit through a reduction in hydrogen fluoride emissions, requires a substantial expenditure of funds for the purchase and installation of monitoring equipment due to the unusually large number of scrubbers in the CFI Granulation plants, and due to the large number of scrubbers there is an unreasonably high cost-to-benefit ratio in comparison with the acceptable ratio stated by the Environmental Protection Agency (EPA) in the Subpart BB preamble.

We have completed our review of the CFI proposed alternative monitoring plan and have one outstanding issue regarding the test plans to establish scrubber segment pressure ranges in each of the four granulation plants. In section 3 of the HF MACT Initial Performance Test Plan for CF Industries, dated February 2005, the test plans for establishing the allowable scrubber segment pressure range describe the process as a minimum of two test runs, with a minimum of one test run performed at the lower end of the scrubber pressure drop and liquid flow rate range, and a minimum of one test run performed at the upper end of the scrubber pressure drop range and liquid flow rate range. It is our position that a minimum of three test runs should be conducted at both the lower and upper end of the pressure drop to improve the odds of obtaining representative results. In addition to concerns about the representativeness of results from a

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single test run, CFI could have difficulty complying with the scrubber flow limits set using the test results if there are any process or testing anomalies during a single test run. Therefore, as a final action on CFI's alternative monitoring request and based on information contained in the original May 3, 2004, request and the additional information dated February 25, 2005, EPA approves CFI's alternative monitoring request for Granulation Plants A, X, Y, and Z with the following condition:

> * For establishing the scrubber segments pressure drop range during the required performance test, CFI shall perform a minimum of three test runs for the lower end of the pressure drop range and a minimum of three test runs for the upper end of the pressure drop.

Please note that the review and approval of CFI's alternative monitoring request was coordinated with the Hillsborough County, Florida, Environmental Protection Commission. If you have questions regarding this alternative monitoring request, please contact Lee Page of the EPA Region 4 staff at (404) 562-9131.

Sincerely,

Beverly H. Banister
Director
Air, Pesticides & Toxics
Management Division

cc: Ron Dennis, Hillsborough County EPC
✓ Cindy Phillips, FLDEP

ALTERNATIVE MONITORING PLAN

CF Industries, Inc.
Plant City Phosphate Complex
10608 Paul Buchman Highway
Plant City, Florida 33565

February 25, 2005

ALTERNATIVE MONITORING PLAN

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Appendix A - Extractive FTIR Testing for Hydrogen Fluoride in the X-DAP, Y-MAP, B-PAP, and ACU Stack Emissions, May, 2002.

Appendix B - Design Engineer's Comments

Appendix C - HF MACT Initial Performance Test Plan

0.0 Proposed Alternative Monitoring Plan Summary

The proposed monitoring in the phosphoric acid plants will meet the requirements of the Hydrogen Fluoride Maximum Achievable Control Technology (HF MACT) Rule,40 CFR 63, Subpart AA. However, in the granulation plants (A,X,Y, and Z) substantial changes to the Subpart BB Rule monitoring are being proposed in the Alternative Monitoring Plan. Table 1 provides a summary of the proposed scrubber monitoring. Sections 1.0 through 3.0 of the Plan describe the pollution control systems and the proposed monitoring of those systems in the phosphoric acid plants and granulation plants which are subject to the rule. Sections 4.0 and 5.0 discuss the economic and technical justification for the proposed alternative monitoring plan. The emissions from the affected plants currently meet the NESHAP emission standards established in the rule and additional pollution control equipment is therefore not required for HF MACT compliance.

1.0 Phosphoric Acid Plants

In the phosphoric acid plants (EU 004, EU 009) there are no planned deviations from the monitoring required in the HF MACT Rule, Subpart AA. These plants operate horizontal cross flow packed bed scrubbers and utilize process water for the scrubbing medium. The "A" Phosphoric Acid Plant (EU 004) has the existing installed equipment required to monitor scrubber water flow and pressure drop across the scrubber. In the "B" Phosphoric Acid Plant (EU 009), a scrubber water flow meter and differential pressure transmitter will be installed on the scrubber in order to meet the requirements.

1.1 Performance Indicators

The monitoring indicators specified by Subpart AA will be used. The scrubber water flow rate provides an indication that the water flow to the scrubber is sufficient, and the gas pressure drop is an indicator of scrubber packing integrity.

1.2 Measurement Techniques

The scrubber water flows and pressure drops will be monitored continuously using a magnetic flowmeter and differential pressure transmitters.

1.3 Monitoring Frequency

An Aspen Data Historian will record the values every 30 seconds.

1.4 Averaging time

The Data Historian will convert the measured values to fifteen-minute block averages. The Historian will average the fifteen-minute values over three-hour periods for the determination of compliance.

2.0 "X,Y, and Z" Granulation Plants

Granulation Plants "X", "Y", and "Z" (EU011, EU012, EU013), are identical plants producing granulated ammonium phosphate fertilizer products (MAP and DAP). Alternatives to the monitoring required in the HF MACT Rule, Subpart BB, are being proposed for these plants, for the reasons explained in Sections 4.0 and 5.0. The gas streams from each of the three plants pass through systems of 10 individual scrubbers.

The scrubber system for each plant consists of primary (phosphoric acid scrubbing medium) venturi and cyclonic scrubbers on the fume, dryer, and dust systems for ammonia and product recovery; secondary (process water scrubbing medium) cyclonic scrubbers on the fume, dryer, and cooler systems; and a final pH-controlled, fresh water spray, fluoride abatement scrubber. The fluoride abatement scrubber collects the gas streams from the fume, dryer, cooler, and dust scrubber segments and subjects them to an intense fresh water scrub before exhausting the gases through the emission stack. The freshwater fluoride abatement scrubber functions as an extra layer of insurance against fluoride emissions including HF. Figure 1 is a process block flow diagram of the XYZ granulation plants. Figure 2 is a schematic diagram of the XYZ granulation plant scrubber systems.

The fluoride abatement scrubber is a vertical spray chamber scrubber with fresh water sprays and a chevron type structured packing for mist elimination. Since it uses fresh water scrubbing exclusively, the abatement scrubber is believed to be unique to CF within the Phosphate Industry. The abatement scrubber pump sump is initially filled with non-process reuse water. Water from the abatement scrubber sump is pumped through ammonia vaporizer heat exchangers where the water is cooled before being sprayed in the abatement scrubber. Scrubber water is cooler than the process gases and causes condensation of fresh water from the stream of air and process gases entering the scrubber. This results in a continuous source of makeup fresh water to the scrubber and results in a subsequent blow down of the scrubber water without any other makeup water source.

2.1 Performance Indicators

As an alternative to the Subpart BB monitoring it is proposed that the gas pressure drop across each of the scrubber segments (groups of scrubbers connected in series treating gases from the respective Fume, Dryer, Cooler, or Dust sources) be monitored and recorded continuously. Since the scrubbers in each segment are connected in series, the flow of gases through the entire segment can be monitored by the combined pressure drop across the segment. The liquid delivery pressure in the pond water cyclonic scrubbers will be measured and recorded manually. The liquid water flow and pH of the abatement scrubber water will be monitored and recorded continuously. The flow of the phosphoric acid scrubbing medium to the primary scrubbers will not be monitored, as these scrubbers do not function to remove fluorides from the gas stream.

2.2 Measurement Techniques

The segment pressure drops will be measured using differential pressure transmitters. Pressure gauges will measure the nozzle delivery pressure in the pond water cyclonic scrubbers. Magnetic flow meters will be installed to measure the liquid flow to the fluoride abatement scrubber sprays. Existing pH probes will monitor the pH of the abatement scrubber water.

2.3 Monitoring Frequency

The fluoride abatement scrubber liquid water flow and pH, and the pressure drop through each parallel segment, will be monitored continuously. An Aspen Data Historian will record the measured values every 30 seconds. The liquid delivery pressure to the nozzles in the pond water cyclonic scrubbers will be manually recorded in the Historian at the 2-hour intervals specified in the facility's Compliance Assurance Monitoring Plan.

2.4 Averaging time

The Data Historian will convert the continuously-measured values to fifteen-minute block averages. The Historian will average the fifteen-minute values over three-hour periods for the determination of compliance. The Historian will calculate three-hour running averages of the liquid delivery pressures to the secondary scrubber nozzles.

3.0 "A" Granulation Plant

Granulation Plant "A" (EU010) also produces granulated ammonium phosphate fertilizer products MAP and DAP, but is older and smaller than the "X,Y, and Z" Plants, and currently serves as a "back-up" unit for the other three plants. Alternative monitoring to the monitoring specified in the Subpart BB rule is being proposed for this plant as well, for the reasons explained in Sections 4.0 and 5.0.

The gas streams from this plant pass through a system of 8 individual scrubbers consisting of primary (phosphoric acid scrubbing medium) venturi and cyclonic scrubbers followed by fresh water spray downcomer scrubbers in the combined dust/dryer segment and the fume segment; a fresh water spray downcomer scrubber in the cooler segment, and a final, pH-controlled, freshwater, fluoride abatement scrubber. The pH-controlled abatement scrubber water is also used in the downcomer scrubber sprays. The fluoride abatement scrubber collects the gas streams from the fume, dust/dryer, and cooler scrubber segments and subjects them to an intense fresh water scrub before exhausting the gases through the emission stack. The freshwater fluoride abatement scrubber functions as an extra layer of insurance against fluoride emissions including HF. Figure 3 is a process block flow diagram of the "A" Granulation Plant. Figure 4 is a schematic diagram of the "A" Granulation Plant scrubber system.

The fluoride abatement scrubber is a vertical spray chamber scrubber with fresh water sprays and a chevron type structured packing for mist elimination. Since it uses fresh water scrubbing exclusively, the abatement scrubber is believed to be unique to CF within the phosphate industry. The abatement scrubber pump sump is initially filled with non-process reuse water. Water from the abatement scrubber sump is pumped through ammonia vaporizers where the water is cooled before being sprayed in the abatement scrubber. Scrubber water is cooler than the process gases and causes condensation of fresh water from the stream of air and process gases entering the scrubber. This results in a continuous source of

makeup fresh water to the scrubber and results in a subsequent blow down of the scrubber water without any other makeup water source.

3.1 Performance Indicators

As an alternative to the Subpart BB monitoring it is proposed that the gas pressure drop across each of the scrubber segments be monitored and recorded continuously. Also it is proposed to continuously monitor and record the liquid water flow in the header line to the freshwater downcomer scrubber nozzles, the liquid water flow to the fluoride abatement scrubber, and the pH of the abatement scrubber water. The flow of the phosphoric acid scrubbing medium to the primary scrubbers will not be monitored, as these scrubbers do not function to remove fluorides from the gas stream.

3.2 Measurement Techniques

The segment pressure drops will be measured using differential pressure transmitters. The liquid water flow to the downcomer sprays and to the abatement scrubber will be measured with magnetic flow meters. The existing pH probe will monitor the pH of the abatement scrubber water.

3.3 Monitoring Frequency

The abatement scrubber pump liquid water flow and pH, the liquid water flow to the downcomer scrubber nozzles, and the gas pressure drop through each scrubber segment will be monitored and recorded continuously. An Aspen Data Historian will record the values every 30 seconds.

3.4 Averaging Time

The Data Historian will convert the recorded values to fifteen-minute block averages, and will average the fifteen-minute values over three-hour periods for the determination of compliance.

4.0 Economic Justification For Alternative Monitoring

Alternative monitoring of the granulation plant scrubbers is being proposed on the grounds that the Subpart BB scrubber monitoring called for under Rule 40 CFR 63 will not result in an appreciable environmental benefit through a reduction in HF emissions, requires a substantial expenditure of funds for the purchase and installation of monitoring equipment due to the unusually large number of scrubbers in the CF granulation plants, and therefore has an unreasonably high cost-to-benefit ratio in comparison with the acceptable ratio stated by the Environmental Protection Agency in the rule preamble. CF was proactive in installing the four unique fresh water fluoride abatement scrubbers in 1975 as extra fluoride emission control devices, and has been consistently meeting the Subpart BB emission standards since that time. Plant stack testing using Fourier Transform Infrared technology (FTIR) has been conducted (Appendix A – URS Report). That testing has demonstrated that the CF Plant City Complex has an estimated HF emission potential of 1.7 TPY HF from point sources (Table 2 – Calculation of Annual HF Emissions). The implementation of additional monitoring equipment called for under

the HF MACT Rule (Table 3 – Equipment List) would cost an estimated $1,161,000 (Table 4 – Cost Estimate) and is expected to have negligible impact on actual HF emissions from the complex. In order to calculate a cost-to-benefit ratio (dollar cost of additional monitoring equipment divided by reduction in tons of HF emitted), CF has assumed that, if all monitoring called for in the HFMACT rule were implemented, rare upsets in scrubber performance caused by plugging or disruption of scrubber liquid or gas flows could be detected more quickly than they are with monitoring under other rules (Periodic Monitoring and Compliance Assurance Monitoring). If the additional monitoring over a 15-year instrument life were able to reduce the HF emissions from point sources by a conservative 10%, then the cost-to-benefit ratio would be calculated to be $453,000 per ton of HF [$1,161,000 / (10% x 1.7 TPY HF x 15 years)]. This number is 9 times higher than the cost-to-benefit ratio stated to be "inappropriately high" and "unreasonable in terms of cost" in EPA's example presented in the rule preamble at Federal Register Vol. 64, Page 31361 and on Page 31369. In that example EPA concluded that an expense of $50,000 per ton of abated HF emissions would not be economically justified. Ergo, the much higher cost per ton ratio of the Subpart BB monitoring for the CF granulation plant scrubbers is not justified, and the allowance of an alternative monitoring plan is reasonable.

5.0 Technical Justification For Alternative Monitoring

The CF monitoring proposal provides the monitoring specified by 40 CFR 63 Subpart AA for Phosphoric Acid Plants "A" and "B". It also provides the monitoring specified by 40 CFR 63 Subpart BB for the fresh water liquid flow rates to the fluorine abatement scrubbers at the four Granulation Plants "A", "X", "Y", and "Z". The alternative monitoring elements of the CF proposal are justified as follows.

(1) In each of the four granulation plants, continuous monitoring and recording of the fluorine abatement scrubber liquid pH is proposed in lieu of the pressure drop across the abatement scrubber. The pH of the scrubber liquid is controlled above pH 4.5 by caustic addition, in order to maintain the affinity of the liquid for fluoride gases and any phosphoric acid droplets coming from the upstream scrubber stages. The 4.5 minimum pH has been demonstrated to the Florida Department of Environmental Protection to be a viable limitation and is a condition of the current Title V permit. A high pH in the scrubbing liquid would not reduce the absorption of HF or other fluorides, so an upper range limit is not needed. CF proposes to retain the limit as it currently exists in the permit without further performance testing.

The pressure drop across the abatement scrubber is not proposed for measurement because it is an extremely low value and meaningful variations would not be detectable. The scrubber body is a spray chamber with no packing and the chevron-type structured mist eliminator packing at the scrubber exit is not susceptible to plugging or corrosion. Also, a loss of the gas flow through the scrubber is extremely unlikely, so there is no malfunction condition involving the gas flow to be detected by measuring the pressure drop.

(2) In each of the four granulation plants, the segment pressure drop for each of the parallel scrubber segments upstream of the fan and fluorine abatement scrubber is proposed to be continuously monitored and recorded, in lieu of the pressure drop across each scrubber. This provides a measurable indicator of the gas flow through all the scrubbers, or of any blockage that might occur in the scrubber segment. There is no significant opportunity for the gases to escape the system as they flow through the scrubber segment toward the fan, so pressure drop monitoring of the scrubber segment is a satisfactory substitute for the monitoring of the pressure drop across each scrubber..

(3) In Granulation Plant "A", continuous monitoring and recording of the liquid water flow through the header feeding the three downcomer scrubbers is proposed. Blockage or corrosion damage to any of the scrubber nozzles is unlikely in this neutralized fresh water system, but any such malfunction would affect the flow rate through the header line.

(4) In Granulation Plants "X, Y, and Z", the secondary scrubber liquid flow condition is proposed to be monitored by pressure gauges with the readings manually recorded at 2-hour intervals as proposed in the facility's Compliance Assurance Monitoring Plan. The continuous monitoring of this parameter is not needed due to the cost and the back-up effect provided by the fluoride abatement scrubber operating downstream.

(5) In each of the four granulation plants, CF proposes not to monitor the liquid flows to the primary scrubbers (venturi/cyclonic scrubber combinations using 28% phosphoric acid as a scrubbing medium) on the same basis that they are excluded from the Compliance Assurance Monitoring Rule provisions in 40 CFR 64; ie. that they are Inherent Process Equipment which serves the purpose of recovering product to the process. These units were stated by the design engineer to have the purpose of recovering ammonia and product dust from the gas stream and returning it to the production process (Appendix B – Design Engineer's Comments). Because they use phosphoric acid as a scrubbing liquid at the same concentration as is present in the phosphoric acid reactor, which is known to be a major source of fluoride gases, these scrubbers should be considered a source of fluoride gases rather than fluoride emission control equipment. The primary scrubbers are thus not HF control equipment, but inherent process equipment for recovering nitrogen and phosphate process materials.

Additionally, the monitoring of liquid flows to these scrubbers is extremely problematic due to constant scaling and pluggage of the monitoring devices with precipitating gypsum and fluosilicate compounds.

TABLES

TABLE 1
Alternative Monitoring Plan Summary

Scrubber	Liquid Monitoring	Gas Monitoring
"A" & "B" Phosphoric Acid Plants:		
A-Phosphoric Acid Packed Bed Cross-Flow Scrubber	Liquid Flow, continuous	Pressure Drop, continuous
B-Phosphoric Acid Packed Bed Cross-Flow Scrubber	Liquid Flow, continuous	Pressure Drop, continuous
"A" Granulation Plant:		
Dryer Acid Cyclonic Scrubber		Segment* Pressure Drop, continuous
Dryer Acid Venturi Scrubber		Segment* Pressure Drop, continuous
Reactor Acid Cyclonic Scrubber		Segment* Pressure Drop, continuous
Reactor Acid Venturi Scrubber		Segment* Pressure Drop, continuous
Downcomer Fresh Water Fluoride Scrubber	Liquid Flow**, continuous	Segment* Pressure Drop, continuous
Fresh Water Fluoride Abatement Scrubber	Liquid Flow, continuous & pH, continuous	***
"X", "Y", "Z" Granulation Plants:		
Fume Acid Venturi Scrubber (3)		Segment* Pressure Drop, continuous
Fume Acid Cyclonic Scrubber (3)		Segment* Pressure Drop, continuous
Fume Pond Water Cyclonic Scrubber (3)	Delivery Pressure, 2-hour interval	Segment* Pressure Drop, continuous
Dryer Acid Venturi Scrubber (3)		Segment* Pressure Drop, continuous
Dryer Acid Cyclonic Scrubber (3)		Segment* Pressure Drop, continuous
Dryer Pond Water Cyclonic Scrubbers (3)	Delivery Pressure, 2-hour interval	Segment* Pressure Drop, continuous
Cooler Pond Water Cyclonic Scrubber	Delivery Pressure, 2-hour interval	Segment* Pressure Drop, continuous
Dust Acid Venturi Scrubber (3)		Segment* Pressure Drop, continuous
Dust Acid Cyclonic Scrubbers (3)		Segment* Pressure Drop, continuous
Fresh Water Fluoride Abatement Scrubber (3)	Liquid Flow, continuous & pH, continuous	***

* A segment constitutes a train of scrubbers in series or a single scrubber, excluding the fresh water fluoride abatement scrubber.

** One flow meter in the common header pipe delivers water to the three downcomer scrubbers.

*** Gas flow indicated by Segment Pressure Drop.

TABLE 2
CF Industries Inc. Plant City Phosphate Complex
Emission Estimates For HF

Source/Unit	Point Source Total Allowable F (TPY)	HF Factor (HF/F) Ratio	Point Source Potential to Emit HF (TPY)	Estimated Fugitive HF (TPY)	Total HF Emission Potential (TPY)	Notes
A-DAP/MAP[a]	6.04	4.1%	0.25	0.12	0.37	Assumes 0.5% uncaptured fumes from all sources & 99% scrubber efficiency
X-DAP/MAP/GTSP[a,c]	6.70	4.1%	0.27	0.14	0.41	Assumes 0.5% uncaptured fumes from all sources & 99% scrubber efficiency
Y-DAP/MAP/GTSP[b,c]	9.60	5.8%	0.56	0.28	0.84	Assumes 0.5% uncaptured fumes from all sources & 99% scrubber efficiency
Z-DAP/MAP[a]	6.31	4.1%	0.26	0.13	0.39	Assumes 0.5% uncaptured fumes from all sources & 99% scrubber efficiency
A-PAP[d]	5.20	3.0%	0.16	0.18	0.34	Assumes 0.5% uncaptured fumes from reactor, 10% uncaptured fumes from filters and other sources, 99% scrubber efficiency, 93% of fumes from reactor.[e]
B-PAP[g]	4.60	3.0%	0.14	0.16	0.30	Assumes 0.5% uncaptured fumes from reactor, 10% uncaptured fumes from filters and other sources, 99% scrubber efficiency, 93% of fumes from reactor.[e]
Acid Clarification	1.23	4.7%	0.06	0.03	0.09	Assumes 0.5% uncaptured fumes from all sources & 99% scrubber efficiency
Shipping Scrubber[c]	NA	NA	NA	NA	NA	Assumes 0.5% uncaptured fumes from all sources & 99% scrubber efficiency
Misc HF Sources				0.107	0.107	Assumes 1.51 Lb HF/day/acre from the surface area of tanks and ditches with pond water. Vacuum Pump HF emissions per AP-42 1/95 Table 8.9-1; Controlled emission factor for Phosphoric Acid Plant filter vacuum pump
Process Water Cooling Ponds[f]	NA	NA	NA	0.85	0.85	Uses 0.02 µg/(m2-s) HF pond emission factor from the 1/7/94 Radian report. Assumes an average 6.8MPH wind speed, an average annual pond water temperature of 95°F, and a pond coverage area of 311 Acres.
		Total	1.70	2.00	3.70	

[a]Note: While permitted for DAP & MAP, these plants have only produced DAP in the last 10+Yr. No testing was done in A and Z DAP/MAP. Therefore, the X-DAP HF emission factor was used.

[b]Note: This plant produces both DAP & MAP on a routine basis. The Y-MAP HF emission factor was used because it was higher than the X-DAP factor.

[c]Note: GTSP has not been produced in more than 10 years. If GTSP is produced in the future, emission factors will be developed and the facility's status as a HAP source will be re-evaluated.

[d]Note: No testing was done in A-PAP. The emission factor for B-PAP was used for A-PAP.

[e]Note: Past fume duct tests in A & B PAP have indicated that 93% of the fluoride fumes entering the scrubbers come from the reactor. The filter and other sources contribute only 7% of the fluorides.

[g, f]Note: See Appendix B for sample calculations.

TABLE 3 - Monitoring Equipment List For HFMACT Rule - Specified Monitoring

	Area	Loop #	DWG. #	New/Exist.	Flow meter req'd	Size	DP req'd	Description
1	APAP	2185	20-TW-035	Exist.				APAP Scrubber Process Water Supply Flow
2	APAP	2185	20-TW-035A	Exist.				APAP Scrubber Pressure
3	BPAP	3098		New	1	8"		BPAP Scrubber Process Water Supply Flow
4	BPAP	3099		New			1	BPAP Scrubber Pressure
5	X DAP	4547X	5.1-T-51	Exist.				X Dryer Scrubber Pressure
6	X DAP	4545X	5.1-T-53	Exist.				X Dust Scrubber Pressure
7	X DAP	4546X	5.1-T-52	Exist.				X Fume Scrubber Pressure
8	X DAP	4560X	5.1-T-54	Exist.				X Cooler Scrubber Pressure
9	X DAP	4330X		New	1	4"		X Dryer Secondary Scrubber Flow (pond water supply)
10	X DAP	4331X		New	1	4"		X Fume Secondary Scrubber Flow (pond water supply)
49	Z DAP	4340Z		New				Z Abatement Scrubber Pressure
50	A DAP	4333A		New	1	6"		A DAP Dryer Venturi Scrubber Flow (low pres. liquor supply)
51	A DAP	4334A		New	1	6"		A DAP Fume Venturi Scrubber Flow (low pres. liquor supply)
52	A DAP	4336A		New	1	4"		A DAP Dryer Primary (cyclonic) Scrubber Flow (high pres. liquor supply)
53	A DAP	4337A		New	1	4"		A DAP Fume Primary (cyclonic) Scrubber Flow (high pres. liquor supply)
54	A DAP	4547A	5.0-T-23	Exist.				A DAP Dryer Scrubber Pressure
55	A DAP	4546A	5.0-T-22	Exist.				A DAP Fume Scrubber Pressure
56	A DAP	4339A		New	1	14"		A DAP Abatement Scrubber Flow (pond water supply)
57	A DAP	4340A		New			1	A DAP Abatement Scrubber Pressure

TABLE 4

ADDITIONAL SCRUBBER PROCESS MONITORING COST ESTIMATE

	Qty.	Spares		Total
4" meters	22	1	$5,000.00	$115,000.00
6" meters	9	1	$5,400.00	$54,000.00
8" meters	1	1	$6,050.00	$12,100.00
14" meters	4	1	$11,000.00	$55,000.00
DP's	6	1	$2,500.00	$17,500.00
Enclosures	42		$950.00	$39,900.00
I/O cabinet	3		$2,000.00	$6,000.00
JB's	10		$550.00	$5,500.00
PLC's	3		$15,000.00	$45,000.00
I/O cards	3		$2,500.00	$7,500.00
Mech Eng.	1		$65,000.00	$65,000.00
Elect. Eng.	1		$45,000.00	$45,000.00
Software Eng.	1		$25,000.00	$25,000.00
Mech. Installation	42		$5,350.00	$224,700.00
Elect. Installation	58		$4,400.00	$255,200.00
Taxes				$27,000.00
Freight				$10,000
Subtotal				$1,009,400.00
Contingency 15%				$151,410.00
Total				**$1,161,000.00**

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Please see Project 0570005-032-AV for Figures and Appendices.