RTP ENVIRONMENTAL ASSOCIATES INC.
AIR • WATER • SOLID WASTE CONSULTANTS
239 U.S. Highway 22 East • Green Brook, New Jersey 08812
(908) 968-9600

LETTER OF TRANSMITTAL

TO Mr. Clair Fancy
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32301

Date: 02-13-96 Proj. ID: LPPPP

WE ARE SENDING YOU: [X] Attached [ ] Under separate cover
VIA: [ ] 1st Class Mail [ ] Federal Express [X] Hand Delivery [ ] Other
THE FOLLOWING ITEMS:

Copies	Date	No.	Description
1	02-13-96		BACT Review for Piney Point Phosphates

THESE ARE TRANSMITTED AS CHECKED BELOW:

[ ] For approval [ ] For review and comment [ ] Resubmit ____ copies for approval
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REMARKS Clair,
Hope this helps,
Don

COPY TO:

SIGNED: Donald L. Elias

If enclosures are not as noted, kindly notify us at once.

MEMORANDUM

RECEIVED
FEB 14 1996
BUREAU OF
AIR REGULATION

TO: Clair H. Fancy, P.E.

FROM: Donald F. Elias

DATE: February 13, 1996

SUBJECT: BACT Review for Piney Point Phosphate Application

Attached is the BACT Review we performed on the Piney Point Phosphate proposed sulfuric acid plant. As can be noted in the report, several control technologies appear cost-effective (i.e., reasonable) and available. These included two tail gas controls, ammonia and sodium carbonate scrubbing. It is possible that the hydrogen peroxide technology licensed by Monsanto EnviroChem may also prove reasonable and available. Further, we looked at catalyst replacement on a more frequent cycle. For this review, we looked at a nine-month replacement cycle. Costs were low enough that we did not utilize the fact that the additional replacement cycle would only occur every other year, thus, further reducing the actual cost per ton values. It would also be possible to consider other cycles such as 12 or 15 months at even lesser costs.

I hope the enclosed proves useful in the BACT review for this permit. Should you wish to discuss it further, please feel free to contact me at (908 968-9600.

cc: B. Beals, USEPA (w/ attachments)
G. Worley, USEPA (w/o attachments)
S. Kukier, USEPA (w/o attachments)
E. Porter, USFWS (w/o attachments)
C. Rhodes, USFWS (w/ attachments)
D. Beason, FDEP (w/ attachments)
H. Rice, Manatee County (w/ attachments)
D. Dee, Landers & Parsons (w/ attachments)
P. Amundsen, Amundsen and Moore (w/ attachments)

DFE/mpj

BEST AVAILABLE CONTROL TECHNOLOGY REVIEW

Of

Piney Point Phosphates, Inc.
Proposed Sulfuric Acid Plant
(PSD-FL-144)

By

RTP Environmental Associates, Inc.
239 U.S. Highway 22 East
Green Brook, New Jersey 08812
(908) 968-9600

February 13, 1996

BEST AVAILABLE CONTROL TECHNOLOGY REVIEW

Introduction

Based upon RTP's recent review of the proposed Piney Point Phosphate Facility, one of the major public concerns was the level of control technology proposed for the sulfuric acid plant (SAP) and the resultant emissions increases of sulfur dioxide (SO2) and sulfuric acid mist (SAM). The proposed SAP facility incorporates the dual absorption process and filter mist eliminators, as stated by the project Applicant in its November 1989 and Revised Prevention of Significant Deterioration (PSD) Applications, and represents, in their opinion, best available control technology (BACT). The proposed SO2 and SAM limits comply with the current New Source Performance Standard (NSPS) (40 CFR 60.80-60.85, Subpart H).

The purpose of the following discussion is to review the Applicant's proposed BACT and investigate additional alternatives and the possible control from those alternatives consistent with US Environmental Protection Agency (EPA) policies and guidance with regard to BACT.

BACT Process

Prior to discussing the proposed BACT and identified alternatives, it is necessary to discuss the BACT determination process. The BACT determination process envisioned by the EPA within the PSD permitting process is based on the concept of a "top down" analysis. In layman terms, the top down approach simply lists all possible alternatives based upon the stringency of control achieved by each alternative, i.e., from the highest level of control to the lowest level allowed. In the case of the Piney Point Facility proposal, the lowest level allowed would be the NSPS (Subpart H) emissions levels at 4 pounds of SO2 per ton of 100% H_2SO_4 produced, and 0.15 pounds of SAM per ton of 100% H_2SO_4 produced. Therefore, the BACT analysis process should consider any available alternative which could result in emissions levels of SO2 and SAM that are more stringent than the NSPS requirements. Once the hierarchy of alternatives is established each alternative is then evaluated for the following parameters:

- Application Feasibility
- Emissions Impacts

- Environmental Impacts
- Energy Impacts
- Economic Impacts

If an alternative has impacts that are unacceptable or is not achievable, then the next less stringent alternative is evaluated until the Applicant arrives at an alternative that is deemed acceptable. This process is applied to basic process equipment and to control equipment. According to EPA, this process should consider technologies employed outside of the US, as well as lower polluting processes in general.

Pursuant to the EPA New Source Review Workbook (USEPA-NSR, 1990) the following points must be considered in order to produce a correct "top down" BACT analysis.

- A level of control may be eliminated from an evaluation, without eliminating the control technology itself.

- Control alternatives and/or process alternatives that are "available" and "applicable" are considered as technically feasible.

- The EPA does not expect an Applicant to accept an emission limit as BACT solely because it was previously required on a similar source type. Differing levels of control for a given technology may be considered.

- The primary consideration in a cost analysis should be given to the quantification of the cost of control, not the economic situation of the applicant or source. Therefore, applicants should not eliminate control alternatives based on economic parameters that provide an indication of the affordability of a control alternative relative to the economic status or position of the application or source.

- Control cost estimates on the order of ±30% (accuracy) are widely accepted for BACT analysis purposes. If more accurate data is available it should be used to fine tune the cost estimate.

- The cost-effectiveness analysis should not be used to set or define the environmental objective, and secondly, cost-effectiveness should not be construed as a measure of adverse economic impact.

- The environmental impacts analysis in the BACT process should concentrate on impacts other than those of the pollutant under consideration on the Ambient Air Quality Standard (AAQS), i.e., impacts such as solid or hazardous waste generation, water discharges, visibility impacts and impacts on vegetation.

- The energy impact portion of the BACT analysis should only consider direct energy consumption of each alternative, not any indirect energy impacts. Indirect energy impacts may be considered if the impact is unusual or significant and if the impact can be well quantified.

Using these basic premises, the review of the Applicant's BACT submittal was performed in the following section.

Applicant BACT Review

For the purposes of evaluating and updating the Applicant's BACT submittal, RTP used some of the data from the Applicant's old and revised application packages. These items are as follows:

- Dual absorption process proposed (for SO2 control).

- High efficiency mist eliminators proposed for SAM control.

- Stack Data: 126,949 ACFM at 170 degrees Fahrenheit/or 106,395 DSCFM at 68 degrees Fahrenheit.

- Process SO2 absorption efficiency at 99.7%.

- SAM control efficiency (based on particle size) overall at 90%.

- Emissions estimates:

	Predicted Actuals		**Allowables**		**Potentials**	
	lb/hr	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**
SO2	450	1971	450	1971	450	1971
SAM	16.9	74	16.9	74	16.9	74

- Maximum H_2SO_4 production rate equals 2,700 tons per day (100% H_2SO_4).

- No exhaust gas (tail gas) treatment beyond dual absorption and mist elimination is proposed.

- Base case BACT (submitted by Applicant) is dual absorption with mist eliminators.

- Alternative controls considered by Applicant:

  SO2 - Ammonia Scrubbing

  SO2 - Sodium Bisulfite Scrubbing

  SO2 - Molecular Sieves

  SAM - Electrostatic Precipitators (ESPs)

- The Applicant concluded that the following control alternatives are not technically applicable to sulfuric acid plants (SAPs):

  Sodium Bisulfite Scrubbing for SO2

Molecular Sieves for SO_2

ESPs for SAM

- Ammonia scrubbing was reviewed by the Applicant as a substitution for the dual absorption system and rejected as BACT.

Updated BACT Determination

Based upon recent available information (Buonicore and Davis, 1992), we believe the following air pollution control measures are available and can be used for control of sulfur dioxide at SAPs:

- Dual Absorption (generally accepted as BACT for meeting NSPS emission limits for modifying a single absorption plant)

- Sodium Sulfite Scrubbing
  This process has been used for reducing SO_2 emissions from single absorption sulfuric acid plants.

- Hydrogen Peroxide Scrubbing
  This is a demonstrated process developed by Dupont and later sold to Monsanto Chemical Company.

- Ammonia Scrubbing
  Ammonia scrubbing is capable of achieving the same level of controls as other tail gas scrubbers. Also, if the sulfuric acid plant is part of a fertilizer complex, the resultant ammonia sulfate can be a reasonably priced source of ammonia.

For SAM, the most efficient available control technology is the packed-filter tubular mist eliminators developed by Monsanto Chemical Company.

Sulfur Dioxide Control Review - Dual Absorption

The dual absorption technology has been demonstrated to meet NSPS limits of 4 pounds of SO2 per ton of (100%) sulfuric acid produced and has been used extensively in upgrading single absorption facilities. Substituting other types of tail gas scrubbing (i.e., bisulfite, hydrogen peroxide, and ammonia) does not provide any apparent economic benefit over that of dual absorption technology. Thus, currently, the dual absorption technology is accepted as BACT for recently proposed sulfuric acid plants.

However, in a "top down" BACT determination, potential additional levels of control need to be evaluated. RTP has determined two processes which may result in further additional reductions of sulfur dioxide:

- Tail Gas Scrubbing
- Process Modifications of the Dual Absorption Technology

Sulfur Dioxide Control Review - Tail Gas Scrubbing

The proposed facility will have the potential to emit, as proposed, about 450 pounds per hour of sulfur dioxide and about 17 pounds per hour of SAM. There are three demonstrated tail gas scrubbing technologies which have been used for SAPs - sodium sulfite, hydrogen peroxide, and ammonia scrubbing. The hydrogen peroxide process, as noted earlier, has been sold to Monsanto Chemical Company, which is also the equipment provider for the proposed SAP. Contact with Monsanto Chemical Company - EnviroChem Staff (Shafer, pers. comm.) resulted in the following:

- Monsanto was informed of RTP's desire to obtain available data on potential SO2/SAM control systems for SAPs as part of a BACT review for a proposed Florida facility.

- Monsanto questioned RTP as to our function , i.e., were we opposing the plant or were we working for the developer. RTP explained that our position was not one of opposition or support for the proposed facility but rather that our task was to simply provide a neutral third party review of the current status of SO2/SAM controls for SAPs with respect to the project developer's BACT application materials.

- Monsanto staff were well aware that the Piney Point Phosphate Project is under review, as the developer was currently a client of Monsanto for numerous aspects of the proposed plant. As such, Monsanto would not release any information on its control processes which in their belief would or could be used in a detrimental manner as regarded a current customer or client. RTP, respecting this position, did not make any further requests of Monsanto staff.

As such, information regarding the hydrogen peroxide process is not available, nor information regarding other tail gas processes which Monsanto has developed for other SAP. Nonetheless, RTP has prepared a preliminary assessment of the technology, based upon the available information regarding potential cost estimates and control efficiencies. Basically the three scrubbing processes would use similar equipment and their cost differences would be mainly due to differences in chemical costs and potential waste handling costs. Because ammonia appears to be the least costly of the three scrubbing processes noted to be used for sulfuric acid plants and the resultant ammonia sulfate could be used in the fertilizer aspects of the proposed plant, ammonia scrubbing was chosen as the best option for the other tail gas scrubbing processes.

Sulfur Dioxide Control Review - Ammonia Scrubbing

Both general technical guidance literature (Buonicore and Davis, 1992), and the Applicant's initial application discuss ammonia scrubbing for tail gas SO2 at SAPs. Both references clearly indicate the technology is capable of substantial SO2 reductions. Sulfur dioxide is captured by the system in the form of ammonia sulfate, which may or may not be a marketable by-product depending on the fertilizer market demand. The process, per the Applicant, has proven effective in reducing SO2 emissions to levels below the NSPS limits.

Disadvantages stated by the Applicant with regard to the use of ammonia scrubbing were listed as follows:

(1) A waste by-product (ammonia sulfate) is produced. Its marketability is unknown.

(2) The system introduces a process foreign to the plant operators.

(3) The system is a high maintenance process.

(4) The system does not impact plant size, i.e., no size reduction in plant capacity.

Objection (1) is not addressable in this review, as we have no information concerning marketability.

Objections (2), (3), and (4) are not sufficient to eliminate the technology from consideration. The costs must be evaluated against the potential reductions before rejecting this alternative.

Based upon the cost estimate for ammonia scrubbing provided by the Applicant in its initial application, RTP prepared an updated cost estimate. Table 1 on the following page presents the updated costs. The main differences between the Applicant's cost estimate and RTP's estimate are listed below:

(1) Chemical costs were adjusted to correspond to the revised potential to emit for sulfur dioxide (as reflected in the Applicant's subsequent submittals). This item is the major cost difference between the initial application and the RTP review. This resulted in a major decrease in operating costs.

(2) Operating Labor and Supervision, Maintenance Labor and Materials were adjusted to be similar to costs in operation of a dual absorption unit. A significant cost reduction was noted.

(3) Direct capital costs and utilities have been factored into 1995 dollar costs. A net increase was noted.

(4) Recommended USEPA factors were used for Indirect Capital Costs, Capital Recovery, Insurance and Taxes. No significant cost differences were noted.

Details regarding Table 1 are included in Appendix 1. Total annual cost for an ammonia scrubbing process is estimated to be approximately $2,000,000.

Ammonia scrubbers are capable of substantial reductions of sulfur dioxide. RTP estimates that control efficiencies of 80% and above could be obtained on an emission rate of 4 pounds of SO2 per ton of acid, or an equivalent exhaust concentration of about 420 parts per million. Based on 80% control efficiency, the sulfur dioxide emissions would be reduced by 1,577 tons per year to 394 tons per year, or 90 pounds per hour from the original 450 pounds per hour. SAM emissions are also expected to be reduced, however, an estimate of the reduction is not known. RTP would expect that the ammonia scrubber would be inserted after the SAM demister units for the more efficient removal of SAM. Based on the expected removal rate of SO2, a control cost effectiveness value of $1,258 per ton can be estimated from the available information submitted by the Applicant regarding the project.

In addition, RTP has requested from several vendors of sulfur dioxide control equipment, budgetary quotes on reducing the sulfur dioxide emissions from a sulfuric acid plant. Capital costs received were significantly lower than those presented in Table 1 and range from $183,750 to $450,000. The scrubbing reagents proposed, however, are not those that have been traditionally used for sulfuric acid plants, i.e., ammonia, sodium bisulfite, and hydrogen peroxide. They include the reagents (i.e., sodium carbonate, sodium hydroxide, and calcium carbonate) that are usually used in control of sulfur dioxide from other sources.

TABLE 1

COST ANALYSIS FOR SO2 CONTROL BY AMMONIA SCRUBBING
2700 TPD CONTACT SULFURIC ACID PLANT

MANATEE COUNTY, FLORIDA

CAPITAL COST		
Direct		
Scrubber and Auxiliaries		4,594,700
Indirect (including: Engineering and Supervision, Construction, Contractor, Contingency)		1,424,400
TOTAL CAPITAL COST		6,019,100
ANNUAL COST		
Direct		
Operating Labor and Supervision	11,600	
Maintenance Labor	9,400	
Maintenance Materials	9,400	
Utilities	333,700	
Chemicals	350,000	
		714,100
Indirect (including: Overhead and Payroll)		18,300
Capital Recovery (10 years)		981,100
Insurance and Taxes		240,800
TOTAL ANNUAL COST		1,954,300

Technically there are no significant reasons why these reagents would not work as well as the other originally considered reagents. The main issue would be waste disposal and the cost for properly managing the spent reagents. Table 2 presents the cost analysis for one of the vendors (detailed information is included in Appendix 2). The total annual cost is estimated to be about $1,817,600 with a 80% removal rate of sulfur dioxide and a 20% removal rate of H_2SO_4 mist. Over 1,591 tons would be removed for a control cost effectiveness value of $1,142 per ton. This value is in the same range as the ammonia scrubbing, but lower by about 8%.

TABLE 2

COST ANALYSIS FOR SO2 CONTROL BY SODIUM CARBONATE SCRUBBING
2700 TPD CONTACT SULFURIC ACID PLANT

MANATEE COUNTY, FLORIDA

CAPITAL COST		
TOTAL CAPITAL COST (Turn Key)		450,000
ANNUAL COST		
Direct		
Operating Labor and Supervisor	8,400	
Maintenance Labor	2,800	
Maintenance Materials	2,800	
Utilities	98,600	
Chemicals	1,051,200	
Waste Disposal	554,000	
		1,717,800
Indirect (including: Overhead and Payroll)		8,400
Capital Recovery		73,400
Insurance and Taxes		18,000
TOTAL ANNUAL COST		1,817,600

Process Modifications of the Dual Absorption Technology

An interesting aspect of the dual absorption technology is that a catalyst is utilized in the efficient production of sulfuric acid from sulfur dioxide. It is noted in the New Source Performance Standard review of sulfuric acid plants (USEPA, 1985) that new catalyst will result in lower SO2 emissions when compared to older or spent catalyst. The text (USEPA, 1985) discussing this aspect is presented below.

> *"Literature indicates that dual absorption plants can be expected to operate after an initial startup period with fresh catalyst with SO2 emissions in the range of 2 to 3 lb/ton. To determine whether emission control performance deteriorates with time, a number of inquiries were made of sulfuric acid plants that were subject to NSPS.*
>
> *Data obtained from a 1,800 ton/day dual absorption sulfuric acid plant (two production units) indicated an apparent deterioration of emission performance following initial startup. The NSPS compliance test for this plant (Method 8) showed emissions to average 0.93 lb SO2 per ton of acid produced. About a year later, emissions recorded by the continuous emissions monitor (CEM) had increased to 2.59 lb/ton. Nineteen months after the performance test, the emission recorded by the CEM had increased to 2.95 lb/ton, and the CEM data recorded 30 months after the performance test indicated a SO2 emission rate of 3.2 lb/ton.*
>
> *Another plant had an NSPS test result of 0.95 lb SO2/ton after fresh catalyst was added to the absorption towers, but reported a day-to-day operating level of 1 to 2 lb SO2/ton.*
>
> *From these data, it can be seen that the SO2 emission values obtained during the initial compliance test do not necessarily reflect day-to-day plant operating levels. These levels appear to realistically lie in the 2 to 3 lb/ton range for dual absorption units. There is a definite trend towards increased SO2 emission values as the conversion catalyst ages and its activity correspondingly decreases. Thus, even though a large percentage of the compliance test results are significantly less than NSPS of 4 lb/ton, it appears that SO2 emissions tend to rise towards the control limit as the plant and catalyst age.*
>
> *Acid mist emission (and related opacity) levels are unaffected by conversion catalyst aging. These emissions are primarily a function of moisture levels in the sulfur feedstock and air fed to the sulfur burner, and the efficiency of final absorber operation."*

The initial application is based upon catalyst being replaced about every 18 months. A proposed process modification could be to replace the catalyst on a 9 month schedule rather than the original anticipated 18 month period. Costs associated with increasing the catalyst cycle would be:

- Catalyst costs would essentially double as compared to the 18 month cycle.

- Increases in maintenance costs and labor costs due to more frequent catalyst change-outs.

Table 2 presents RTP's estimate for using a 9 month catalyst schedule. These costs are based upon the BACT information presented for the dual absorption technology in the Applicant's initial application.

Several aspects of the cost estimate are listed below:

- No direct or indirect capital costs are anticipated with this process change.

- No additional operating labor or utilities are anticipated.

- Catalyst, Maintenance Labor and Materials are assumed to double. Also, the costs have been factored into 1995 dollars for an additional cost increase.

- Capital Recovery and Insurance/Taxes changes would be zero because no capital costs are required for this process change.

Details regarding Table 3 are provided in Appendix 1. Total annual costs for a short term catalyst cycle are estimated to total about $118,000.

Determining a control efficiency for utilizing this process is extremely difficult because there is no detailed data on catalyst degradation versus SO2 emissions available. However, by noting several aspects of dual absorption technology presented in the permitting documentation and the NSPS documentation, a generalized assumption can be made, contingent upon the available information. Presently the proposed permitted emissions rate for the facility is about 450 pounds per hour of SO2 or 4 pounds of SO2 per ton of acid produced. This corresponds to about 422 parts per million of SO2 in the stack exhaust. Information presented in the NSPS document (USEPA, 1985) indicates that on average a 2.0 pound per ton level of SO2 is achievable with new catalyst, with evidence that the level could be much lower. Using the 2.0 pound per ton level at the start and the proposed 4.0 pound per ton, a nine month level could be expected to be about 3.0 pounds per ton if the degradation is a linear function. This would result in a 25% reduction in permitted SO2 emissions. Additional information presented in the application permit documentation shows a recent facility developed by Monsanto as having SO2 emission concentrations of about 150 to 200 parts per million in the stack exhaust. Assuming that these tests correspond to a recently started facility or fresh catalyst and the catalyst degrades linearly over 18 months, then at nine months the concentration could be in the range of about 300 parts per million or again a reduction of about 25 percent. This level of control would reduce SO2 to 1,478 tons per year from 1,971 tons per year or about 340 pounds per hour from the proposed 450 pounds per hour. Overall, SO2 emissions would be calculated to be reduced by 493 tons per year, for a control cost effectiveness value of $240 per ton. Actual data regarding these assumptions would refine this analysis.

SAM Control Review

As noted earlier, the most efficient available control technology is the packed-filter tubular mist eliminator developed by Monsanto Chemical Company and is generally accepted as BACT. However, the ammonia tail gas scrubbing process review for SO2 emissions should reduce somewhat the SAM emissions.

TABLE 3

COST ANALYSIS FOR SO2 CONTROL BY CATALYST PROCESS CHANGE 2700 TPD CONTACT SULFURIC ACID PLANT

MANATEE COUNTY, FLORIDA

CAPITAL COST		
Direct Capitol Costs		∅
Indirect Capitol Costs		∅
TOTAL CAPITAL COST (assumes NSPS Base Case Plant)		∅
ANNUAL COST		
Direct		
Operating Labor and Supervisor	∅	
Maintenance Labor	9,400	
Maintenance Materials	9,400	
Utilities	∅	
Catalyst (9 month cycle)	87,600	
		106,400
Indirect (including: Overhead and Payroll)		11,300
Capital Recovery		∅
Insurance and Taxes		∅
Credit for Acid Recovery		(unknown)
TOTAL ANNUAL COST		117,700

Reasonableness of the Cost Effectiveness Value

In order to ascertain the reasonableness of the calculated cost effectiveness values, they must be compared to a range of values currently accepted by air permitting agencies as derived from BACT analyses or other control cost data. Generally, the cost effectiveness values accepted by air agencies can be represented in the following manner:

Program	Range of Cost-Effectiveness
Lowest Achievable Emission Rate	Highest
Best Available Control Technology	Middle
Reasonably Available Control Technology	Lowest

There are of course exceptions to the ranking, and the various control schemes will show considerable overlap. Examples of various rankings are as follows:

- Data derived from a recent Prevention of Significant Deterioration application in South Carolina indicates that the State currently uses a cost effectiveness value of $3,000 per ton removed for all "criteria pollutants" as BACT, i.e., Nitric oxides (NOx), Sulfur dioxide(SO2), Carbon monoxide (CO), particulate matter sized less than or equal to 10 microns aerodynamic diameter (PM10), and Volatile Organic Compounds (VOC). (Taylor, pers. comm.)

- The South Coast Air Quality Management District (California) currently utilizes a Lowest Achievable Emission Rate/Best Available Control Technology cost effectiveness value for SO2 at $18,300 per ton removed. The Air Quality Management District is attainment for SO2. Prior to December 1987 the SO2 value was set at $3,900 per ton removed. (SCAQMD-BACT, 1992)

- The National Acid Precipitation Assessment Program/State of Science and State of Technology (NAPAP/SOS-T, 1989) report delineates an acceptable SO2 cost effectiveness range of $1,300 to $9,700 per ton removed (1995 dollars).

- A report published by the California Air Resources Board (CARB, 1983) regarding the review of the California State Ambient Air Quality Standard for SO2 indicates an acceptable cost effectiveness value range of $240 to $5,320 per ton removed (1983 dollars). Adjustment of these values to 1995 dollars results in a range of $290 to $6,400 per ton removed.

Taking a conservative approach and combining the above range results in a general cost effectiveness value range of $1,300 to $9,700 per ton removed (lowest and highest value deleted). Comparing the costs calculated in the alternative control scenarios, which range from $240 to $1,300 per ton removed, we can see that these costs are well within the combined cost effectiveness range, and should therefore be considered as reasonable for BACT.

This report evaluated several options for controlling acid gas emissions and identified several that are reasonable and available. These included two tail gas treatments (ammonia and sodium carbonate scrubbing). Additionally, the hydrogen peroxide control system may be available, but data was not provided by Monsanto. One process change (i.e., increased catalyst replacement cycles) also appeared cost effective. If a nine-month catalyst is deemed non-cost effective, other cycles (i.e., 12,15 months, etc.) should be considered.

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APPENDIX 1

Basis of Cost Estimates

Cost Basis For Ammonia Scrubbing (Table 1 of Text)

<u>Capital Cost</u>

Direct:

Use Applicant cost estimate updated with an inflation factor: 1989 factor, 355.4; 1995 factor, 381.9 from Chemical Engineering Index (CEI = 1.07456).

$4,275,800 x 1.07456 (CEI) = $4,594,700

Indirect:

Use Agency factor of 31% of *Direct Capital Costs*.

$4,594,700 x 0.31 = $1,424,400

<u>Annual Cost</u>

Direct:

Operating Labor and Supervision use Applicant cost estimate for dual absorption and updated with CEI.

$10,800 x CEI = $11,600

Maintenance Labor use Applicant cost estimate for dual absorption and updated with CEI.

$8,775 x CEI = $9,400

Maintenance Materials use Agency factor of 100% of Maintenance Labor.

$9,400

Utilities use Applicant estimates with CEI.

$310,500 x CEI = $333,700

Chemical use 245 lb/hr of ammonia estimated to be used at about $320/ton at an annual cost of $343,400.

Indirect use EPA factor of 60% of *Operating Labor and Supervision* plus *Maintenance Labor* plus *Maintenance Material* for:

0.6 x ($11,600 + $9,400 + $9,400) = $18,300

Capital Recovery use EPA factor of 16.3% of *Total Capital Cost* for:

$6,019,100 x 0.163 = $981,100

Insurance and Taxes use EPA factor of 4% of *Total Capital Cost* for:

$6,019,100 x 0.04 = $240,800

Cost Basis For Sodium Carbonate Scrubbing (Table 2 of Text)

Capital Cost **$450,000**

1. A Turn Key would include indirect capital costs, thus this cost becomes the *Total Capitol Cost*.

Annual Cost

Direct:

Operating Labor and Supervision use the vendor estimate of 240 hr/yr at $35/hr at an annual operating cost of $8,400, estimated.

Maintenance Labor use the vendor estimate of 80 hr/yr at $35/hr, at an annual maintenance cost of $2,800, estimated.

Maintenance Materials use 100% of Maintenance Labor, $2,800.

Utilities use 6 cents per kilowatt at 150 kilowatts per hour for an annual cost of $78,840. 30 gallons per minute at about $1.25 per 1,000 gallons equals $19,710 for a total utilities cost of $98,550.

Chemical use of 800 lb/hr, estimated by the vendor for chemical consumption at about $300/ton at an annual cost of $1,051,200 estimated.

Waste Disposal is estimated at about 1,265 lb/hr of 30 percent moisture waste generated. Disposal costs are estimated at $100/ton for an annual cost of $554,000.

Indirect use EPA factor of 60% of *Operating Labor and Supervision* plus *Maintenance Labor* plus *Maintenance Material* for:

$$0.6 \times (\$8,400 + \$2,800 + \$2,800) = \$8,400$$

Capital Recovery use EPA factor of 16.3% of *Total Capital Cost* for:

$450,000 x 0.163 = $73,350

Insurance and Taxes use EPA factor of 4% of *Total Capital Cost* for:

$450,000 x 0.04 = $18,000

Cost Basis For Catalyst Process Changes (Table 3 of Text)

Capital Cost

Anticipated to be zero because all equipment necessary would be already installed.

Annual Cost

Direct:

Operating Labor and Supervision - no operating labor changes are anticipated.

Maintenance Labor use *Maintenance Labor* of Dual Absorption with CEI factor.

Maintenance Materials use EPA factor of 100% of *Maintenance Labor*.

Utilities - no changes from normal operations anticipated.

Catalyst use of a 9 month recycle rate from the 18 month cycle cost estimate of $40,500 anticipated to be about $81,500, updated with CEI factor for a total of $87,040.

Indirect use EPA factor of 60% of *Operating Labor and Supervision* plus *Maintenance Labor* plus *Maintenance Material* for:

$$0.6 \times (\$0 + \$9{,}400 + \$9{,}400) = \$11{,}300$$

Capital Recovery and *Insurance and Taxes* anticipated to be zero because no capital costs are anticipated.

Credit for Acid Recovery - no estimate for acid recovery can be made at this time.

APPENDIX 2

Vendor Cost Information

BECO

BECO ENGINEERING COMPANY

P.O. BOX 443 OAKMONT, PA 15139 (412) 828-6080 FAX (412) 828-6144

FACSIMILE TRANSMITTAL

TO	: RTP Environmental	DATE	: 31 Jan 96
ADDRESS	: San Diego, CA	SENT BY	: BJL
FAX NUMBER	: 619-456-0127		
ATTN	: Mr. Paul Neil	PAGE 1 OF 3	
REFERENCE	: Ref: Acid Plant SO^2 Removal		

Dear Mr. Neil:

In response to your fax of January 26, I am attaching a copy of our flowsheet for a Beco "packaged" SO_2 removal scrubber. The scrubber would be a horizontal flow Beco "MultiMicro/Venturi" (MMV) scrubber, containing two reagent solution spray/MMV stages and a final water-spray demisting stage. Based on the limited data in your fax, we estimate that the scrubber cross-section would be 9' x 11'. I am also appending a photo of a similar MMV scrubber, albeit smaller cross-section (capacity = 60,000 ACFM).

We have done a number of sulfuric acid plant mist control systems. Your fax did not detail whether the origin of the SAM is mist mechanically-generated in the absorber, or whether it is a submicron aerosol mist formed in the vapor phase by hydrolysis of SO_3 by moisture. If it is mechanically-generated droplets, our equipment will remove well over 90%; if submicron aerosol, only 20%.

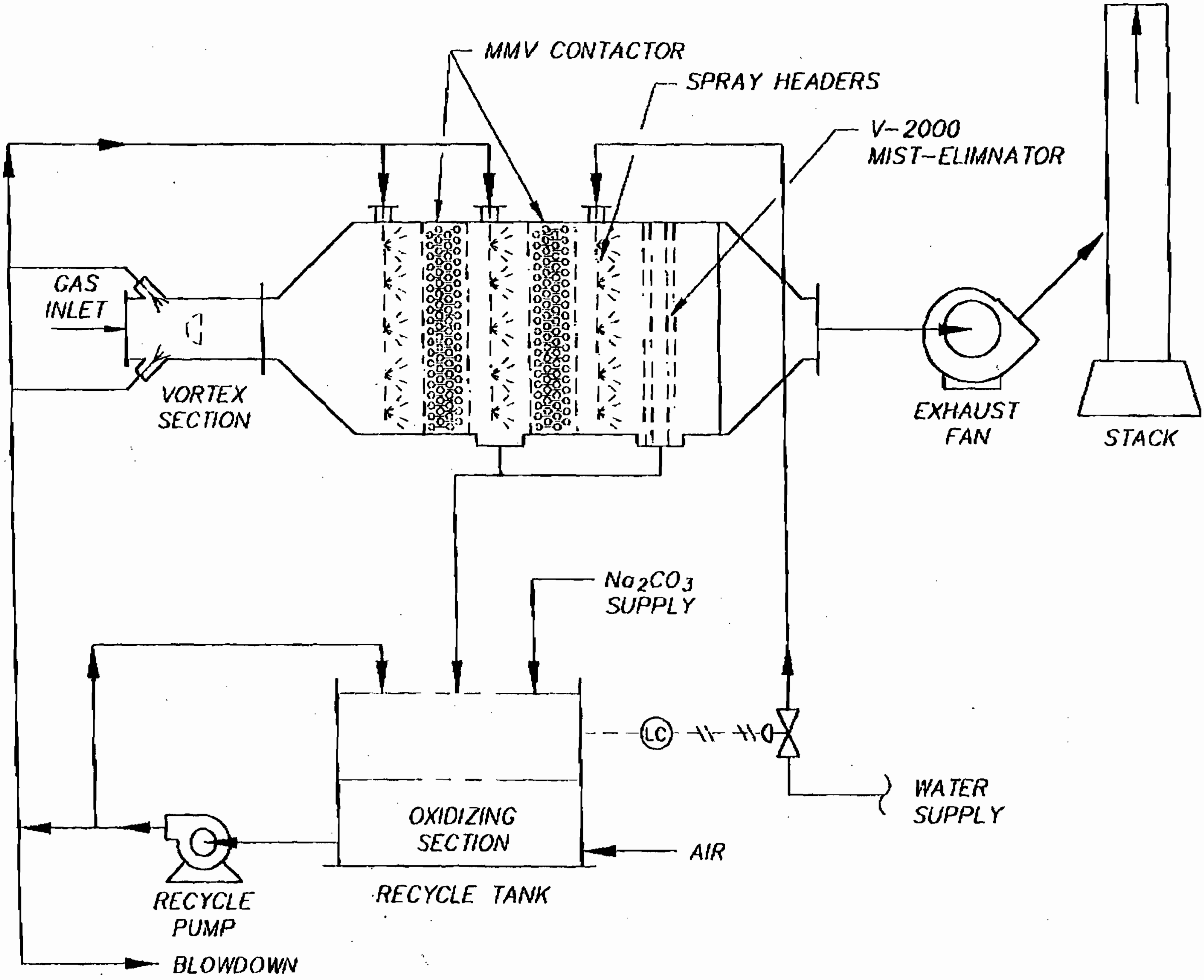
We estimate a turnkey cost of approximately $450,000, not including fan and stack. Chemical consumptions are estimated to be 700-800 lbs/hr of soda ash and 30 GPM of makeup water. Utility consumption would be about 150 kW, including incremental fan HP. For a clean gas system, maintenance labor is estimated at 80 man-hours/year, while operating labor is estimated at 240 man-hours/year.

We look forward to the opportunity to be of service to you and your client on this project.

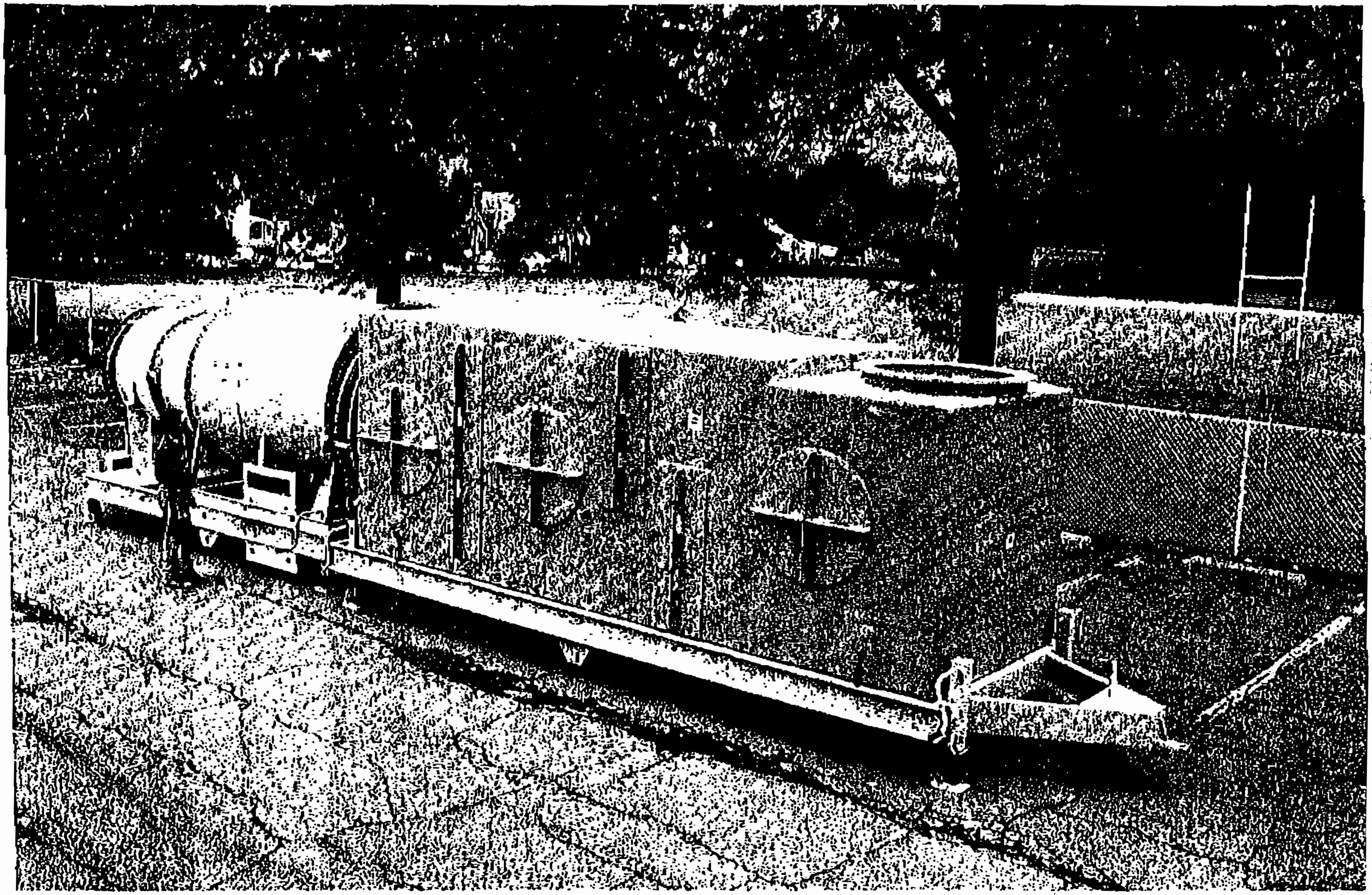
Sincerely yours,

B. J. Lerner

PACKAGED MMV SULFUR DIOXIDE REMOVAL SYSTEM



Best Available Copy



This transportable scrubber is a Beco Engineering "Multi-MicroVenturi" (MMV) horizontal-flow 50,000 CFM unit. The Beco MMV has the highest efficiency/energy ratio of any venturi type scrubber, and this transportable MMV is operating in excess of 95% efficiency at 5" W.C..

FACSIMILE TRANSMITTAL

RTP ENVIRONMENTAL ASSOCIATES INC.
AIR • WATER • SOLID WASTE CONSULTANTS

OUR FAX NUMBER: (619) 456-0127

February 1, 1996

Page 1 of 1

FROM:	TO:
Paul Neil	B. J. Lerner
COMPANY:	**COMPANY:**
RTP Environmental Assoc. San Diego, California (619) 456-8020 (619) 456-0127 FAX	BECO Engineering Co. Oakmont, PA (412) 828-6080

Via Fax No.: (412) 828-6144

MESSAGE

RE: ACID PLANT SO2 REMOVAL

Dear Mr. Lerner:

Thank you for your quick response. The S.A.M. in the stack gas is anticipated to be a submicron mist. You noted that BECO has experience with S.A. plants, has BECO installed any existing scrubbers for the control of SO2 on S.A. plants? Also, what is the anticipated removal of SO2 by your proposed scrubber system? Can ammonia be used as the scrubbing solution in your system? What costs and other aspects would be different if ammonia is used?

Thank you, PN

BECO ENGINEERING COMPANY

P.O. BOX 443 OAKMONT, PA 15139 (412) 828-6080 FAX (412) 828-6144

FACSIMILE TRANSMITTAL

TO	: RTP Environmental	DATE	: 6 Feb 96
ADDRESS	: San Diego, CA	SENT BY	: BJL
FAX NUMBER	: 619-456-0127		
ATTN	: Mr. Paul Neil	PAGE 1 OF 1	
REFERENCE	: Ref: Acid Plant SO^2 Removal		

Dear Mr.Neil:

In response to the questions raised in your fax of February 1:

a) Beco does not have any SO_2 scrubbers installed on sulfuric acid plants. We do have a number of mist eliminators and SO_3 absorber units in operation on sulfuric acid plant.

b) Removal capacity of the scrubber is a function of the number of contact stages used in the design. The design outlined in our earlier fax would easily give you the 80% removal specified.

c) Ammonia scrubbing of the off-gas from sulfuric acid plant is an old technology. It has its own advantages and drawbacks. The latter include "blue fume" formation of ammonium bisulfite, although there are methods of operation to get around this. The ammonia system cannot be operated in the type of scrubber we proposed in our earlier fax.

We welcome the opportunity for cooperation on this project, but the data base we are working from is inadequate for making process decisions.

Sincerely yours,

B. J. Lerner

DUCON ENVIRONMENTAL SYSTEMS, INC.

"Leaders in Air Pollution Control since 1938"

QUOTATION NO.		P96-208
CUSTOMER REF. NO.	DATE 2/2/96	SLSMN JT
TOTAL NO. OF PAGES:		1 5

PROJECT RTP Environmental Associates

OUR LOCAL REP. Accrodyne

Fax# 1-619-753-0329

David Perrine

560934

RTP Environmental Associates Inc.
7514 Grand Ave#1-432
San Diego, CA 92037

ATTENTION: Mr. Paul Neil

WE TAKE PLEASURE IN SUBMITTING THE FOLLOWING QUOTATION FOR YOUR CONSIDERATION AND LOOK FORWARD TO RECIEVING YOUR ORDER. THIS QUOTATION IS SUBJECT TO OUR STANDARD TERMS AND CONDITIONS

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	NET AMOUNT
A.	1	Based on the data in your fax we are pleased to offer the following for your consideration: One (1) Ducon AS-125 Ventri-sorber, complete with ro decks and liquid spray nozzles. Material of construction to be 11 ga. stainless steel. Approximate weight 25,000 lbs. For approximate size see drawing # SK-92-AS. Installation not included. TERMS: 15% W/ORDER; 35% DUE 60 DAYS AFTER ORDER BALANCE UPON SHIPMENT DELIVERY: 8-10 WEEKS AFTER ORDER ABOVE PRICES GOOD FOR 60 DAYS		$183,750.00

TERMS OF SALE	FOB DESTINATION / FOB SHIPPING POINT	EST. SHIPPING DATE		
SEE ATTACHED	FOB SHIPPING POINT X	8 TO 10 WEEKS	TOTAL	$183,750

AUTHORIZED BY:

Jim Tsaveras

Applications Engineer

110 Bi-County Boulevard • Farmingdale, NY 11735 • U.S.A.
TEL: (516) 420-4900 • FAX: (516) 420-4985

Airotech, Inc.

February 2, 1996

RTP Environmental Associates, Inc.
7514 Girard Avenue #1-432
San Diego, CA. 92037

ATTENTION: Paul Neil

SUBJECT: Fluidized Bed Wet Scrubber for Sulfuric Acid Plant
Tampa, Florida
Airotech, Inc. Budget Proposal No. P-2599

Dear Mr. Neil:

Airotech, Inc. is pleased to submit its budgetary proposal to design, fabricate and supply one (1) fluidized bed wet scrubber to control SO_2 and SAM emissions at a sulfuric acid plant. The scrubber vessel will be fabricated in sections for field assembly.

A. DESIGN CONDITIONS

Gas Volume, ACFM	102,000-127,000
Gas Temperature,	170°F
%H_2O in Flue Gas	5.0
SO_2 Loading, Lb/Hr.	450
SAM Loading, Lb/Hr	16.9
SO_2 Removal Rate	80% by Wt.
SAM Removal Rate	90% by Wt.
C_aCO_3 Utilization Rate	700 Lb/Hr

B. SYSTEM TECHNICAL DATA

Model No.	198-FB-2
No. of Stages	2
Diameter	16'-6" I.D.
Height above grade	40'-0"
Spray Liquor Requirement @ 35 PSIG	5000 GPM
Pressure Drop across Scrubber	7" W.G.

BOYLE CENTER • 120 NINTH AVE. • HOMESTEAD, PA 15120-1600 • PHONE (412) 462-4404 • FAX (412) 462-8816

C. SCOPE OF WORK

1. WET SCRUBBER

Design, fabricate and supply one (1) Model 198-FB-2 fluidized bed scrubber vessel complete with the following:

a) 3/16" 304 SS vessel including side inlet duct flange, top outlet duct flange, flat bottom and conical outlet transition
b) Two (2) stages of mobile packing (EcoSpheres) between interior SS support grids
c) Twelve (12) bolted access panels - 24"x24" - including gasketing
d) Spray nozzles (full cone) for scrubber beds saturation including internal distribution piping, fittings and external flange connection (SS)
e) Mist eliminator assemblies (FRP) including SS support angles
f) Perimeter mounting angle at base - CS painted
g) Drain outlet flange connections - SS
h) Overflow flange connections - SS
i) Magnehelic gauge to measure differential pressure across scrubber beds
j) Internal piping supports (SS)

2. ERECTION SUPERVISION AND FIELD START-UP

At per diem rates.

PURCHASER'S RESPONSIBILITIES

1. Foundations including anchor bolts.
2. Ductwork/stack downstream of scrubber outlet.
3. Installation of equipment supplied by Purchaser and Airotech, Inc.
4. Ductwork upstream of scrubber inlet.
5. Field performance testing.
6. Fan including motor.
7. All required motor starters.
8. All required external drain, supply and overflow piping including valves.
9. Scrubber external access facilities.
10. 5000 GPM liquor supply at 35 PSIG to Airotech's spray nozzle header connection.
11. Make-up water supply.
12. Recirculation tank including ph control system using C_aCO_3.
13. Adequate supply of C_aCO_3 including delivery system to recirculation tank.
14. Recirculation tank blowdown treatment prior to reuse or final disposal.
15. All required taxes, licenses, permits, etc.

D. PRICING (Budgetary)

Airotech, Inc. will design, fabricate and supply one (1) fluidized bed wet scrubber as described herein for the budget price of:

. . . . $ 250,000.00
FOB Shipping Point - Prepay and Add

E. ESTIMATED SCHEDULE

Contract award to submittal of GA drawings . 4 to 6 weeks

GA approval to equipment delivery . . . 14 to 16 weeks

We appreciate your interest in the equipment and services provided by Airotech, Inc. for air pollution control. We look forward to working with RTP Environmental Associates on this project. Do not hesitate to contact the undersigned at 412/462-4404 with any questions on this proposal.

Very truly yours,

Anthony J. Brajdic
Engineering and Service Manager

dcb

Attachment

cc: J & W Associates (W. Pearson)

Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

November 3, 1997

Mr. Brian Beals, Section Chief
Air, Radiation Technology Branch
Preconstruction/HAP Section
U.S. EPA - Region IV
61 Forsyth Street
Atlanta, Georgia 30303

Re: Piney Point Phosphates, Inc.
0810002-004-AC

Dear Mr. Beals:

Enclosed for your review and comment are two copies of the above referenced request. It consists of a PSD application to refurbish an existing sulfuric acid plant at a cost of over $15,000,000. It will operate at its perviously permitted rate.

Please forward your comments to my attention at the letterhead address as soon as possible. The Bureau's Fax number is (850)922-6979. If you have any questions, please contact John Reynolds at (850)488-1344.

Sincerely,

A. A. Linero 11/3

A. A. Linero, P.E.
Administrator
New Source Review Section

AAL/kt

enclosures

cc: J. Reynolds, BAR

November 3, 1997

Mr. John Bunyak, Chief
Policy, Planning & Permit Review Section
NPS-Air Quality Division
Post Office Box 25287
Denver, Colorado 80225

Re: Piney Point Phosphates, Inc.
0810002-004-AC

Dear Mr. Bunyak:

Enclosed for your review and comment is the above referenced request. It consists of a PSD application to refurbish an existing sulfuric acid plant at a cost of over $15,000,000. It will operate at its perviously permitted rate.

Please forward your comments to my attention at the letterhead address as soon as possible. The Bureau's Fax number is (850)922-6979. If you have any questions, please contact John Reynolds at (850)488-1344.

Sincerely,

A. A. Linero, P.E.
Administrator
New Source Review Section

AAL/kt

enclosures

cc: J. Reynolds, BAR

RTP ENVIRONMENTAL ASSOCIATES INC.
AIR • WATER • SOLID WASTE CONSULTANTS
239 U.S. Highway 22 East • Green Brook New Jersey 08812

DATE: 11-26-97

FAX#: (904) 922-6979

TO: Mr. Clair Fancy
FDEP

FROM: Donald F. Elias and Michael J. Hober

PROJECT NAME: LPPPP

PAGES TO FOLLOW: 8

NOTES: Please see the following memo RE: Control Cost Estimates for the Piney Point Phosphates PSD Application
Hard copy will follow via mail.

IF YOU SHOULD HAVE ANY QUESTIONS OR PROBLEMS, PLEASE CONTACT Mike or Mary AT (908) 968-9600.

RTP FAX NO.: (908) 968-9603

MEMORANDUM

TO: Mr. A. A. Linero, P.E.

FROM: Michael J. Hober and Donald F. Elias MJH

DATE: November 26, 1997

SUBJECT: Control Cost Estimates for the Piney Point Phosphate PSD Application

Attached are calculation sheets for two separate cases estimating a cost per ton of sulfur dioxide (SO_2) removed ($/ton) for different potential scenarios at the Piney Point Phosphates facility. Case 1 estimates potential emissions savings from overdesign of the new plant (i.e., plant designed for 2700 tons of 100% H_2SO_4 per day [ton/day] and operated at 2000 tons/day). Case 2 utilizes the Mulberry facility data provided in the PSD application for the existing plant to estimate SO_2 reductions if SO_2 plant emissions (i.e., catalyst degradation) were gradually increased over time rather than constant at the permit level. Further explanation of each case is presented below to match with the attached sheets.

Case 1 - Facility Overdesign

According to the data supplied by Piney Point Phosphates, sulfuric acid facilities are designed for a set production rate and operators maximize their operation of the plant until they reach the permit limits for acid production or SO_2 emission. Case 1 analyzes the $/ton of SO_2 removed for building a 2700 ton/day sulfuric acid plant and operating at 2000 tons/day. It is then assumed that SO_2 emissions can be maintained at either 2.0 or 2.5 lbs SO_2 per ton of acid (lb/ton) produced. This assumption is confirmed by data from U.S. Agri-Chemicals from 1990 to 1996 and by data from Piney Point from 1988 and 1989. The two scenarios presented utilize cost data presented in the March 5, 1997 letter from Robert C. Stewart of Piney Point Phosphates, Inc. to Dr. Richard Garrity of the FDEP Southwest District Office. This letter notes on page 4 that the cost of a new 2700 ton/day plant has risen to over $60 million (assumed to be $62 million) from about $44 million in 1989. Also, in the same letter on page 7, two costs are provided for a replacement 2000 ton/day plant, which are $46.5 million (Mr. Hartman) and $42 million (Monsanto). Both of these are used for comparison.

As shown in the attached calculations, operating an overdesigned plant (2700 ton/day) at 2000 ton/day, with SO_2 emissions reduced from 3.95 lb/ton to lower levels (2.0 and 2.5 lb/ton), results in costs that range from about $2050/ton to $[illegible]550/ton of SO_2 removed.

RE: Piney Point Phosphates
November 26, 1997
Page 2

The increase in cost of 40% between a 2000 ton/day plant and a 2700 ton/day plant (an increase in production of 35%) as presented by Piney Point Phosphates appears excessive. The calculations show two common engineering methods used to escalate a capital project's cost. The first method is the "Sixth-Tenth's" rule which shows that escalating the cost of $46.5 million for a 2000 ton/day plant to 2700 tons/day would be approximately $55.7 million. The second method incorporates General Construction Cost Index factors published monthly in the Engineering News Record (ENR) which shows that the increased cost of a 2700 ton/day plant over time would be $55.2 million. Both methods indicate that Piney Point Phosphates' estimate of over $60 million in 1997 dollars for a 2700 ton/day plant appears to be excessive.

Use of a capital cost of $55.5 million for a 2700 ton/day plant operating at 2000 ton/day with SO_2 emissions of 2.0 to 2.5 lb/ton (versus 3.95 lb/ton for an 2000 ton/day plant with a capital cost of $44.25 million) would give costs for reducing SO_2 emissions of about $1500/ton (2.0 lb/ton) to $2000/ton (2.5 lb/ton). Thus, consideration of lower capital costs for constructing an overdesigned plant (2700 tons/day) would significantly reduce the $/ton of SO_2 removed costs for operations at 2000 tons/day.

It is also useful to determine how the cost of reducing emissions would affect the cost of acid production. In Appendix D of the October 31, 1997 application, data from Mulberry Phosphates, Inc. was presented and summarized. The data showed that the facility averaged 1599 tons/day of acid produced during the first nine months after a turnaround and 1558 tons/day of acid produced over an 18-month period without a 9-month turnaround. The cost of a nine-month turnaround in an 18-month cycle provided by Piney Point Phosphates in Table 4-1 of the permit application was $649,300. It appears that the costs presented in Table 4-1 are high and, more importantly, do not account for the benefit of increased acid production with a turnaround. When the data are scaled to a 2000 ton/day plant, it appears that the increased acid production with a 9-month turnaround would be 26,578 tons in an 18-month period. Assuming a minimum value of $20 per ton as claimed by Piney Point Phosphates in Table 4-1, the benefit of the increased production would be $531,560. Thus, the real cost for the 9-month turnaround would be $0.11 per ton of acid produced when based on the net cost of the turnaround ($649,300 - $531,560). This value is expected to be overly conservative. If the increased acid production allowed Piney Point Phosphates to either sell acid or avoid purchasing acid at market prices ($35/ton according to Piney Point Phosphates), the benefit to Piney Point Phosphates for a 9-month turnaround would be $930,230, which exceeds the cost of the turnaround. This is detailed in the attached calculations.

Case 2 - Gradual Catalyst Degradation

The table presented as Case 2 compares the monthly average SO_2 emission and H_2SO_4 production values for the Mulberry facility (columns II and III) included in the PSD application, with values resulting from an assumed linear degradation of the catalyst. Columns IV and VI of the table show calculated linear increased SO_2 emissions (per ton of H_2SO_4 produced) compared to calculated linear decreased production of H_2SO_4. Columns V and VII present the differential amounts of SO_2 emissions and acid production between the theoretical estimate and the actual Mulberry Station data. The differential SO_2 emissions results in assumed tons of emissions saved. The differential production of acid is the assumed production penalty (or if negative (-) surplus) resulting from lower SO_2 emissions. Columns VIII through XI present the same analysis as columns IV through VII, except these assume a nine-month turnaround is performed with resultant lower SO_2 emissions and higher production capability. Conservative end point values were taken from the Mulberry data and used for the linearization assessment. These conservative end points most likely over-estimate the production penalty amounts. The calculation of \$/ton of SO_2 removed utilized the differential cost of acid (\$15.00 per ton) referenced in Table 4-1 of the PSD application. Also, the cost of \$649,300 for catalyst changeout referenced in Table 4-1 was included in the \$/ton of SO_2 removed calculation to conservatively estimate costs for the scenario with a nine-month turnaround. These analyses result in \$/ton of SO_2 removed values of \$1282/ton for the 18-month turnaround scenario and \$1201/ton for the 9-month turnaround scenario. The interesting point of the analysis is that costs are lower on a \$/ton of SO_2 removed basis when there is an additional turnaround. The lower cost is associated with significantly lower SO_2 emissions overall and substantially increased H_2SO_4 production rates overall.

These analyses demonstrate that it is possible to optimize the plant's operations to maximize production while minimizing emissions. By comparison, the data presented in Appendix D of the October 31, 1997 application maximizes both production and emissions.

Should you have questions or need additional information, please feel free to contact either Michael J. Hober or Donald F. Elias at 732/968-9600.

cc: C. Fancy
B. Beals
G. Worley
E. Porter
D. Shepherd
G. McCutchen
W. Vatavuk
W. Corbin
Project File: LPPPP

CALCULATIONS OF COSTS FOR CASE 1 - FACILITY OVERDESIGN

Givens:

1) Capital cost of new 2700 ton/day sulfuric acid plant = $62,000,000 (per Piney Point)

2) Capital cost of new 2000 ton/day sulfuric acid plant = $46,500,000 (per Hartman) or $42,000,000 (per Monsanto)

3) Amortization period of 20 years and interest rate of 7% (based on USEPA Control Cost Manual) gives an annual cost factor = 0.094

Calculations:

a)

Capital Cost for 2700 ton/day plant	$62,000,000	$62,000,000
Capital Cost for 2000 ton/day plant	-46,500,000	-42,000,000
Capital Cost Difference between 2700 and 2000 ton/day plant	$15,500,000	$20,000,000
Annual Cost Factor	x 0.094	x 0.094
Annual Capital Cost for building a 2700 ton/day plant and operating at 2000 tons/day	$1,457,000	$1,880,000

b) Annual SO_2 emissions for 2000 ton/day plant with SO_2 emissions of 3.95 lb/ton (i.e., slightly less than NSPS limit):

$$\frac{2000\ tons\ acid}{day} \times \frac{3.95\ lbs\ SO_2}{ton\ acid} \times \frac{365\ days}{year} \times \frac{ton}{2000\ lbs} = \frac{1441.75\ tons\ SO_2}{year}$$

c) Annual SO_2 emissions for 2700 ton/day plant producing 2000 ton/day with SO_2 emissions of 2.0 and 2.5 lb/ton:

$$\frac{2000\ tons\ acid}{day} \times \frac{2.0\ lbs\ SO_2}{ton\ acid} \times \frac{365\ day}{year} \times \frac{ton}{2000\ lbs} = \frac{730\ tons\ SO_2}{year}$$

$$\frac{2000\ tons\ acid}{day} \times \frac{2.5\ lbs\ SO_2}{ton\ acid} \times \frac{365\ days}{year}\ \frac{ton}{2000\ lbs} = \frac{912.5\ tons\ SO_2}{year}$$

d) Tons/year of SO_2 removed for 2.0 lb/ton = 1442 - 730 = 712 tons/year of SO_2
Tons/year of SO_2 removed for 2.5 lb/ton = 1442 - 913 = 529 tons/year of SO_2

e) Cost ($/ton) of removed SO_2 for building a 2700 ton/day plant at $62 million and operating at 2000 ton/day versus a 2000 ton/day plant costing $46.5 million:

@ 2.0 lbs SO_2/ton H_2SO_4 = ($1,457,000)/(712) = $2046/ton SO_2 removed
@ 2.5 lbs SO_2/ton H_2SO_4 = ($1,457,000)/(529) = $2754/ton SO_2 removed

f) Cost ($/ton) of removed SO_2 for building a 2700 ton/day plant at $62 million and operating at 2000 ton/day versus a 2000 ton/day plant costing $42 million:

@ 2.0 lbs SO_2/ton H_2SO_4 = ($1,880,000)/(712) = $2640/ton SO_2 removed
@ 2.5 lbs SO_2/ton H_2SO_4 = ($1,880,000)/(529) = $3554/ton SO_2 removed

OTHER METHODS FOR CALCULATING THE COST OF A 2700 TON/DAY FACILITY:

g) "Six-Tenths" Rule:

$$\$46.5\ \textit{million for a 2000 tpd plant (per Hartman)}\ x \left(\frac{2700}{2000}\right)^{0.6} = \$55.7\ \textit{million}$$

h) Engineering News Review (ENR):

- Construction Cost Index for October, 1989 = 4658
- Construction Cost Index for October, 1997 = 5848
- Construction Cost Escalation Factor = $\frac{5848}{4658}$ = 1.255
- Escalated Construction Costs from 1989 to 1997 =
  $44 million x 1.255 = $55,220,000

CALCULATIONS OF NET COST BENEFIT OF INCREASED ACID PRODUCTION DUE TO 9-MONTH TURNAROUND:

Givens:

1) Average daily acid production with a 9-month turnaround = 1599 tons acid/day
Average daily acid production with an 18-month turnaround = 1558 tons acid/day

2) Cost of producing sulfuric acid = $20 per ton
Cost of purchasing sulfuric acid = $35 per ton

3) Days in 18-month period = 551 days

Calculations:

a) 1599 tons acid/day x 551 days = 881,049 tons acid with 9-month turnaround
1558 tons acid/day x 551 days = 858,458 tons acid with 18-month turnaround
22,591 tons acid increased production for a 1700 ton/day plant

b) Scaling the 18-month production rate and increase for a 2000 ton/day plant with a 9-month turnaround gives the following:

$$881{,}049 \; tons \; x \; \frac{2000 \; tons/day}{1700 \; tons/day} = 1{,}036{,}528 \; tons \; acid$$

= total amount of acid produced in 18 months with 2000 ton/day plant using 9-month turnaround

$$22{,}591 \; tons \; x \; \frac{2000 \; tons/day}{1700 \; tons/day} = 26{,}578 \; tons \; acid$$

= increased production for 9-month turnaround

c) Net cost benefit of 9-month turnaround for cost of producing acid is:

26,578 tons acid x $20 per ton = $531,560 (benefit for additional acid produced)

$$\frac{(\$649{,}300 - \$531{,}560)}{1{,}036{,}528 \; tons \; of \; acid} = \$0.114/ton \; of \; acid$$ (additional cost of producing acid)

d) Net cost benefit of 9-month turnaround for cost of purchasing or selling acid is:

26,578 tons acid x $35 per ton = $930,230

CASE 2 - GRADUAL CATALYST DEGRADATION

Col. I	Col. II	Col. III	Col. IV	Col. V	Col. VI	Col VII	Col. VIII	Col. IX	Col. X	Col. XI
Mulberry Station Monthly Data			Assuming Linear Catalyst Degradation				Assuming Linear Catalyst degradation and a 9 Month Catalyst Changeout			
Month	SO2 Monthly Av. Emissions (lb/ton) AVG	H2SO4 Production (ton/day) AVG	SO2 Theo. emission rate (lb/ton) AVG	Net SO2 Reduction tons M. Total	Theo H2SO4 Production Rate (tons/day) AVG	Reduction in H2SO4 Production M. Total	SO2 Theo. emission rate (lb/ton) AVG	Net SO2 Reduction tons M. Total	Theo H2SO4 Production Rate (tons/day) AVG	Reduction in H2SO4 Production M. Total
12/95	1.53	1545	1.47	0.731	1546	(-11)	1.47	0.731	1546	(-11)
1/96	3.18	1613	1.56	39.591	1541	2146	1.56	39.591	1541	2146
2/96	3.73	1625	1.67	48.415	1534	2643	1.67	48.415	1534	2643
3/96	3.71	1622	1.79	48.420	1527	2959	1.79	48.420	1527	2959
4/96	3.65	1613	1.91	40.825	1520	2703	1.91	40.825	1520	2703
5/96	3.90	1604	2.03	46.626	1512	2831	2.03	46.626	1512	2831
6/96	3.74	1577	2.15	37.960	1505	2159	2.15	37.960	1505	2159
7/96	3.75	1577	2.27	35.486	1498	2386	2.27	35.486	1498	2386
8/96	3.70	1590	2.40	29.166	1490	2800	2.40	29.166	1490	2800
9/96	3.48	1571	2.51	21.702	1483	2475	1.51	43.586	1544	764
10/96	3.91	1580	2.63	29.348	1476	3020	1.63	52.426	1537	1247
11/96	3.88	1546	2.75	26.373	1468	2331	1.75	49.737	1530	497
12/96	3.92	1519	2.87	24.701	1461	1801	1.87	48.425	1522	(-94)
01/97	3.95	1517	3.00	22.562	1454	1974	1.99	46.257	1515	79
02/97	4.01	1533	3.11	19.012	1447	2412	2.11	40.632	1508	701
03/97	3.96	1527	3.23	17.356	1440	2692	2.22	41.193	1501	796
04/97	3.95	1469	3.35	12.886	1432	1049	2.34	34.339	1494	(-724)
05/97	3.97	1490	3.47	11.578	1425	2026	2.46	34.852	1486	131
06/97	3.49	1424	3.59	1.461	1418	179	2.58	19.534	1479	(-1655)
07/97	3.62	1407	3.71	0.314	1411	(-109)	2.70	19.577	1472	(-1943)
08/97	3.73	1391	3.83	1.417	1403	(-377)	2.82	17.936	1464	(-2211)
09/97	3.91	1540	3.95	0.349	1396	4022	2.94	20.981	1457	2310
AVGs.	3.73	1540	2.72		1470		2.11		1507	
Net Totals				516		44,112		797		20,514

1)	Net production loss with turnaround at end of period (tons):	44,112
	Net reduction in tons SO2:	516.282
	Cost in dollars per ton SO2 reduction[1]:	$1,282
2)	Net production loss with 9 month turnaround (tons):	20,514
	Net reduction in tons SO2:	796.695
	Cost in dollars per ton SO2 reduction[1] [2]:	$1,201

[1] Assumes a differential cost of $15/ton for lost H2SO4 production
[2] Includes Piney Point calculated cost of $649,300 for catalyst changeout

RTP ENVIRONMENTAL ASSOCIATES INC.
AIR • WATER • SOLID WASTE CONSULTANTS
239 U.S. Highway 22 East • Green Brook, New Jersey 08812

DATE: 11-21-97

FAX#: (904) 922-6979

TO: Mr. Al Linero

DEP

111 South Magnolia, Suite 4

Tallahassee, FL 32301

FROM: Donald F. Elias

PROJECT NAME: LPPPP

PAGES TO FOLLOW: 18

NOTES: Comments to Piney Point Phosphates Air Permit Application and Copy of PDS Permit for Mississippi Phosphate Corp.

IF YOU SHOULD HAVE ANY QUESTIONS OR PROBLEMS, PLEASE CONTACT Don or Mary AT (908) 968-9600.

RTP FAX NO.: (908) 968-9603

RTP ENVIRONMENTAL ASSOCIATES INC.®

AIR · WATER · SOLID WASTE CONSULTANTS

239 U.S. Highway 22 East
Green Brook, New Jersey 08812-1909 (732) 968-9600
(rtpnj@rtp-environmental.com) Fax: (732) 968-9603

November 21, 1997

Mr. A. A. Linero, P.E.
Florida Dept. of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Manatee Co. Comments on October 31st Piney Point Phosphates Air Permit Application

Dear Mr. Linero:

We have received the October 31, 1997 PSD permit application for rehabilitation and reactivation of the existing 2000 ton/day sulfuric acid plant at Piney Point Phosphates, Inc. (PPPI). The Manatee County Attorney's Office and Environmental Management Department would like to offer the following comments:

(1) In Section 4.0 on page 19, the application states that *"In a typical plant with a double absorption system, the sulfur dioxide in the tail gas is approximately 4 pounds per ton of acid produced and the acid mist is approximately 0.15 pounds per ton of acid produced."* Since these emission levels are the New Source Performance Standards (NSPS) levels which are not to be exceeded, typical actual emissions must obviously be less. Compliance tests in the Department's Southwest District files for similar facilities show typical emission levels significantly less than NSPS limits for some plants. For example, the two U.S. Agri-Chemicals Corporation facilities in Bartow from 1990 to 1996 had the following emissions during recent compliance stack tests (production rate repermitted from 2200 to 3000 tons/day on July 10, 1995):

		-----lb SO2/ton-----				-----lb SAM/ton-----				Prod.
	Date	Run1	Run2	Run3	Avg.	Run1	Run2	Run3	Avg.	tons/day
SAP#1	11/19/96	2.03	2.01	2.04	2.03	0.046	0.041	0.038	0.042	2153
	12/06/95	1.78	1.75	1.66	1.73	0.025	0.024	0.024	0.024	2130
	04/03/95	2.39	2.36	2.31	2.36	0.032	0.031	0.028	0.030	2358
	11/29/94	1.78	1.83	1.90	1.84	0.042	0.031	0.026	0.033	1970
	??/??/93	------- 1993 stack test report not in permit files --------								
	11/13/92	1.85	1.85	1.85	1.85	0.054	0.052	0.062	0.056	2043
	11/12/91	2.56	2.57	2.51	2.55	0.036	0.040	0.038	0.038	2294
	09/20/90	1.71	1.66	1.74	1.70	0.025	0.033	0.030	0.029	2038
SAP#2	11/20/96	2.32	2.22	2.14	2.23	0.042	0.057	0.041	0.047	2222
	12/05/95	2.41	2.37	2.35	2.38	0.023	0.023	0.017	0.021	2258
	11/30/94	2.83	2.78	2.78	2.80	0.033	0.035	0.036	0.035	2364
	12/08/93	2.37	2.24	2.33	2.31	0.047	0.043	0.043	0.044	2178
	11/11/92	2.92	2.86	2.87	2.88	0.024	0.015	0.042	0.027	2260
	11/14/91	2.77	2.73	2.80	2.77	0.046	0.049	0.048	0.048	2077
	09/18/90	2.52	2.42	2.52	2.49	0.056	0.053	0.056	0.055	2152

From these data, it appears that emissions significantly lower than NSPS limits can be consistently achieved at sulfuric acid plants with throughputs around 2000 tons/day.

(2) Only control technologies included in the 1985 NSPS review document (EPA-450/3-85-012) were considered in detail in the BACT analysis for SO_2 and SAM as noted in Section 4.2 on the bottom of page 20. The 1990 USEPA Draft New Source Review Workshop Manual requires that all available control technologies be evaluated: *"The control alternatives should include not only existing controls for the source category in question, but also (through technology transfer) controls applied to similar source categories and gas streams, and innovative control technologies."* Please evaluate other types of control technologies, such as scrubbers using hydrogen peroxide or sodium sulfite (Wellman-Lord process), which could be used for control of acid gas emissions at sulfuric acid plants as described in the 1990 Air & Waste Management Association's Air Pollution Engineering Manual.

These other scrubbing technologies were discussed only briefly in Section 4.2.1.4 on page 29. The application states that sodium sulfite *"...scrubbing is not considered a demonstrated control alternative."* For other scrubbing liquors, it is stated that *"Without going through a detailed cost analysis to evaluate these scrubbing technologies, it can be stated that the capital investment cost and many of the direct and indirect annual costs will be very similar to the costs incurred with ammonia scrubbing. Because of the higher chemical costs and/or waste disposal costs, these other technologies are expected to be more costly than ammonia scrubbing."*

Scrubbing with hydrogen peroxide has the advantage of generating no by-product or purge streams since the H_2SO_4 generated can be returned to the process. Since the hydrogen peroxide scrubbing technology can be licensed from Monsanto, the vendor of the sulfuric acid plant, please have Monsanto provide cost estimates, certified by a professional engineer, on such scrubbing systems and their control efficiencies.

In addition, we have obtained a capital equipment quote from a nationally known air pollution control equipment vendor of less than $1 million to fabricate and install a fluidized bed limestone scrubber system to provide up to 95% control of SO_2 emissions for the flow characteristics given in the Permit Application. This option was not considered or evaluated in the BACT analyses contained in the Permit Application.

(3) In Section 4.2.1.1 on page 22, it is stated that *"in an effort to optimize plant performance, most plants in the fertilizer industry tend to run at SO_2 emission levels close to the permitted rate."* On pages 22 and 23, recent improvements in plant design, operating changes, and catalyst performance are discussed. These changes, as noted on page 23, *"...have allowed sulfur burning sulfuric acid plants to operate much more efficiently* (i.e., produce more acid) *and still operate in compliance with the NSPS limit*

for sulfur dioxide of 4.0 pounds per ton of acid. Further on page 23, the application states that *"If maximum sulfuric acid production is the motive of the operator, as will be the case with PPP,...[t]he sulfur feed rate to the burner will then be increased until either the sulfuric acid production rate limited by permit is reached or the sulfur dioxide emission rate limited by permit is reached."*

Please quantify the advantages/disadvantages for the plant to operate at lower lb/ton rates. Also, these statements appear to suggest that improvements in sulfuric acid plant and catalyst designs could have reduced lb/ton SO_2 emissions had production limits before any such improvements been maintained. This hypothesis is supported by the significant number of sulfuric acid plants in Florida which have been repermitted at higher production rates during the past decade without major equipment modifications. Please provide detailed information, including costs, for designing and/or operating a plant which will consistently achieve SO_2 emission rates less than 3.0 and 3.5 lbs/ton.

(4). In Section 4.2.1.1 on page 24, it is stated that *"...immediately after turnaround the sulfur dioxide emissions are in the range of 3.25 pounds per ton of acid produced and approach 4.0 pounds per ton of acid (daily average) within approximately two months after turnaround."* This is in direct contradiction to information provided by USEPA in the NSPS Review document (EPA-450/3-85-012) in which USEPA evaluated emissions data from numerous sulfuric acid plants. USEPA cited the example of an 1800 ton/day dual-absorption facility that showed initial SO_2 emissions of 0.93 lbs/ton, gradually increasing to 2.95 lbs/ton after 19 months and 3.2 lbs/ton after 30 months. This and similar data from other facilities led USEPA to the conclusion that *"Thus, even though a large percentage of the compliance test results are significantly less than the NSPS of 4 lbs/ton, it appears that SO_2 emissions tend to rise towards the control limit as the plant and catalyst age."*

The current catalyst activity information in the most recent permit application also contradicts information provided by Pradeep Raval to John Reynolds for this project (see attached February 1, 1996 memorandum), which shows SO_2 emissions of 2.7 lb/ton after turnaround, increasing relatively linearly to 3.7 lb/ton after 18 months. Also, information obtained from Farmland Hydro (also attached) shows SO_2 emissions increasing linearly from about 2.0 lb/ton after a turnaround to around 3 lb/ton about two to three months before the next turnaround. This inconsistency has serious implications with regards to the cost analyses for additional plant turnarounds as presented in Table 4-1. Please justify with data from Piney Point, if possible, the assumption that very little SO_2 reduction occurs with plant turnaround.

As noted above, the Mulberry facility data presented in Appendix D does not conform to previous information provided on catalyst degradation and plant performance. This would lead one to believe that the catalyst is being over-saturated at the Mulberry facility and the optimum production of acid relative to SO_2 emissions at the Mulberry facility lies somewhere between 1545 and 1613 tons/day (on average). If the Mulberry facility were to have been operated at slightly lower production rates consistent with previous information (i.e., SO_2 emissions linearly increase and acid production linearly decreases over time between turnarounds), calculations based on the Mulberry data show that SO_2 emissions could have been reduced by 516 tons over the 21.5 month period with an H_2SO_4 production loss of 44,112 tons -- a cost of $661,680 (at $15/ton differential cost). This would result in a control cost of $1282/ton of SO_2 as compared to operating the Mulberry facility at the maximum production rate allowed by the NSPS emission limit. Adding one additional turnaround during the 21.5 month period would have reduced SO_2 emissions by 797 tons with an H_2SO_4 production loss of 20,514 tons -- a cost of $307,710 (again, at $15/ton differential cost). Because of the savings accrued by the extra H_2SO_4 production due to the additional turnaround, the control cost is only $1200/ton of SO_2 as compared to operating the Mulberry facility at the maximum production rate allowed by the NSPS emission limit. This includes the additional cost of $649,300 given by PPPI for the turnaround cycle.

(5) Figures 4-1 and 4-2 do not appear to directly correlate to data presented in Appendix D. Were the data "smoothed" or averaged? Please explain how and why they were manipulated. Also, please explain why daily production exceeded the permitted production limit of 1700 tons/day during 26 days of the dataset and what enforcement actions resulted.

(6) Table 4-1 presents the projected costs to replace facility catalysts (turnaround) on a nine month schedule. Please provide the following information:
   (a) You provide an auxiliary steam cost by an auxiliary boiler of 1,350 gal/hour fuel at 24 hours/day. Please provide the steam requirements for the phosphoric acid and diammonium phosphate plants and detail whether continuous firing of the boiler is necessary.
   (b) What percent of the daily output of the sulfuric acid (2000 ton/day) is utilized for the fertilizer plant?
   (c) Does the phosphoric acid/diammonium phosphate plant have regular maintenance intervals that can be coincided with the additional downtime of the sulfuric acid plant? What are typical turnaround times for these facilities?
   (d) Is it not true that water treatments would be necessary for the process steam regardless if generated in a boiler or in the sulfuric acid plant? If so, why are additional costs added to Table 4-1?
   (e) The costs in Table 4-1 project facility costs for an additional nine-month plant turnaround. The text indicates that the only positive benefit is approximately 25 tons of SO_2 emissions per year. Based on the data provided in Appendix D, it appears that the facility would experience a significant H_2SO_4 production increase that would partially offset the cost of the turnaround. Based on this data, the

Mulberry facility would have produced an additional 22,591 tons of sulfuric acid in 18 months with a nine-month turnaround. Given that the data were collected when the facility was operating under Air Operating Permit number AO53-198769 with a limitation of 1700 tons/day of 100% sulfuric acid, the additional production would need to be scaled relative to the 2000 tons/day Piney Point facility. Therefore, the expected increase in production at the Piney Point facility would be 26,578 tons, resulting in an offsetting benefit of \$531,560 for an H_2SO_4 cost of \$20 per ton. If you assume a cost of \$35 per ton (the average cost of purchased acid), the cost benefit would be \$930,230. Please incorporate these benefits in your BACT figures. The calculations for the \$20 per ton figure are attached.

(f) Table 4-1 includes a cost differential of \$255,000 to purchase 2000 tons/day of sulfuric acid over the 8.5 day turnaround.

(i) Does the phosphoric acid/diammonium phosphate plant fully utilize 2000 tons/day of 100% sulfuric acid? If so, please provide production data to demonstrate this.

(ii) Wouldn't it be more cost effective to install storage vessel(s) to store excess sulfuric acid prior to shutdown than purchase material on the open market? If not, please provide a cost analysis amortized over the appropriate number of years demonstrating that the costs of storage tanks would be significantly more than \$255,000 every nine months during the same period.

(iii) Wouldn't the current two-5000 ton acid storage tanks be available for use during turnaround? Therefore, you would not need a full 8.5 days of replacement acid as these tanks could be refilled with excess acid as available or at least at favorable pricing.

(7) Why does the data presented in Appendix D, dated from December 20, 1995 through January 2, 1996, have significantly lower lb/ton values than the rest of the data set? What occurred on January 3, 1996 that doubled SO_2 emissions (on average)?

(8) As mentioned in comment (4) above, the data presented in Appendix D does not demonstrate the expected gradual increase in SO_2 emissions per ton of H_2SO_4 produced as the catalyst degrades. As noted in comment (7) above, low initial SO_2 emissions (1.53 lbs/ton on average) were observed for a 13-day period immediately after the plant turnaround, but abruptly increased by a factor of 2 (3.18 lbs/ton on average) after a shutdown of one day. SO_2 emissions then averaged between 3.5-4.0 lbs/ton for the remainder of the 18-month data period regardless of the production output of the facility. SO_2 emissions are expected to be directly proportional to the ability of the catalyst to convert SO_2 to SO_3. Over-saturating the catalyst with SO_2 may slightly increase production of H_2SO_4, but at a cost of nearly 2 to 2.5 times the emissions of SO_2. Please provide the following:

(a) What is the theoretical limit of SO_2 conversion in the catalyst system?
(b) What is the projected H_2SO_4 production at the theoretical SO_2 limit?
(c) What is the typical SO_2 concentration fed to the catalyst, and what is the ratio to the theoretical limit?
(d) Can the facility vary the inlet SO_2 concentration to the catalyst?
(e) Please provide corresponding inlet SO_2 concentrations to the catalyst for the data period in Appendix D.
(f) What are the costs involved in operating the plant at closer to the theoretical limit of SO_2?
(g) What are the costs in number 4 (above) relative to the expected decrease in SO_2 emissions?
(h) Is it possible to optimize H_2SO_4 production relative to SO_2 emissions (i.e., maximize production relative to minimum emissions)? If not, please provide detailed analyses demonstrating why.

(9) In Section 4.2.1.1 on pages 24-25, the application states that a nine-month turnaround would result in a reduction of 38 tons of SO_2. However, a value of 25 tons per year was used to determine the cost effectiveness of such an additional turnaround. This is not correct. The total increase in cost for the additional turnaround is relative to an 18-month period, thus, the total tons removed over that period should be used. Therefore, the value of 38 tons should have been used in the analysis instead of 25 tons. In addition, while reviewing the data summary at the end of Appendix D, it appears that the actual tons of SO_2 removed is 45 tons. The analysis by PPPI did not account for days the facility did not operate (268 days of operation the first nine months and 539 days of total operation in 18 months). Once again, scaling this value relative to a 2000 ton/day facility versus the 1700 ton/day Mulberry facility from which the data is derived increases the value to 53 tons. Therefore, even using the data contained in Appendix D, the BACT analysis should utilize 53 tons instead of 25 tons.

(10) In Section 4.2.1.3 on pages 27-28, the application states that the by-product of an ammonia scrubber (a 20% solution of ammonia sulfate) has the potential to be incorporated directly into either the phosphoric acid plant or the diammonium phosphate plant. It is concluded that the ammonium sulfate must be wasted because it cannot be incorporated into the diammonium phosphate plant without further consideration of the phosphoric acid plant.
(a) Please provide further detailed analyses of why the ammonium sulfate solution cannot be incorporated directly into the diammonium phosphate plant and quantify the effect on the fertilizer nitrogen and P_2O_5 contents.
(b) Please provide further detailed analyses of why the ammonium sulfate solution cannot be incorporated directly into the phosphoric acid plant and quantify the effect on production and P_2O_5 loss.

(c) Also, it is our understanding that Mr. Len Friedman has a patent on a process to allow such waste to be used at the facility. Please provide any information on the use of such a process at the subject facility.

(11) Please provide vendor quotes or other verifiable information that an ammonia scrubber system would cost $3.5 million and achieve a control efficiency of only 50% as assumed in Section 4.2.1.3 on page 28 (also see comment (2) above). Provide detailed cost analyses on costs for waste disposal, waste treatment, and utilities as shown on Table 4-2. Also, the capital recovery costs in Table 4-2 should be revised for 20 years at 7% interest as recommended by recent USEPA guidance.

(12) Please provide any data supporting the statement that the sulfuric acid plant reliability would be reduced as a result of an add-on scrubber.

(13) The modeling analyses in Section 5.0 on pages 41-44 illustrate modeling analyses where netting analyses are performed by comparing existing potential emissions to future potential emissions (hence all impacts are zero). This conflicts with USEPA modeling guidance in that existing actual emissions are to be considered in such a netting analysis (see attached January 10, 1990 letter from USEPA Region IV and May 24, 1995 letter from the Department concerning the proposed 2700 ton/day sulfuric acid plant at the same facility). Therefore, please provide a modeling analysis consistent with the facility netting analysis in Section 3.1.

If you have any questions, please feel free to contact me at (732) 968-9600.

Sincerely,

RTP ENVIRONMENTAL ASSOCIATES, INC.®

Donald F. Elias
Principal

cc: C.Fancy
J.Steinsnyder, Esq.
D.Dee, Esq.
K.Collins-Fleming
M.Hober
W.Corbin
LPPPP Proj.File

CALCULATIONS - PINEY POINT PHOSPHATES

Based on data provided in Appendix D and the text of *Report in Support of a PSD Permit Application for Piney Point Phosphates, Inc.*, the following information was utilized to calculate the production increase resulting from a nine-month turnaround.

(a) Initial nine-month data period = 275 days (Appendix D)
(b) Average production during initial nine-month period = 1599 tons of acid per day (Appendix D)
(c) 18-month data period = 551 days (Appendix D)
(d) Average production during full 18-month period = 1558 tons of acid per day
(e) Cost of producing H_2SO_4 = $20.00 per ton
(f) Permitted production at Mulberry Phosphates, Inc. = 1700 tons of acid per day (AO53-198789)
(g) Proposed production at Piney Point Phosphates = 2000 tons of acid per day

CALCULATIONS:

1. Additional Production Total:

$$\frac{1599\ tons}{day} \times 551\ days = 881{,}049\ tons/18\text{-}month\ period$$

$$\frac{1558\ tons}{day} \times 551\ days = 858{,}458\ tons/18\text{-}month\ period$$

$$Difference = 22{,}591\ tons/18\text{-}month\ period$$

2. Production Scale Up to Piney Point's Capability:

$$\frac{22{,}591\ tons}{1700\ tons/day} :: \frac{X}{2000}\ tons/day$$

$$X = 26{,}578\ tons\ H_2SO_4\ produced$$

3. Increased Revenue Calculation:

26,578 tons H_2SO_4 at $20.00 per ton = $531,560 depo NB

BEST AVAILABLE COPY

MEMORANDUM

TO: John Reynolds, FDEP

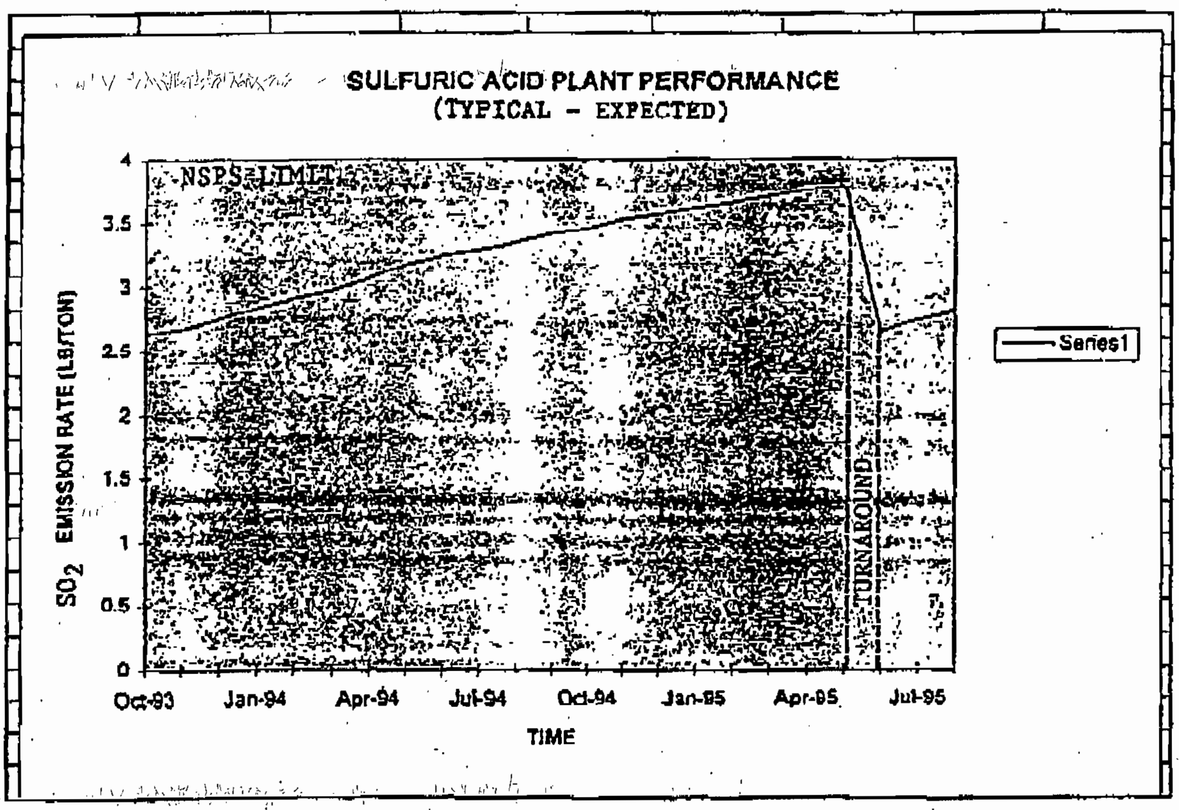
FROM: Pradeep Raval

DATE: February 1, 1996

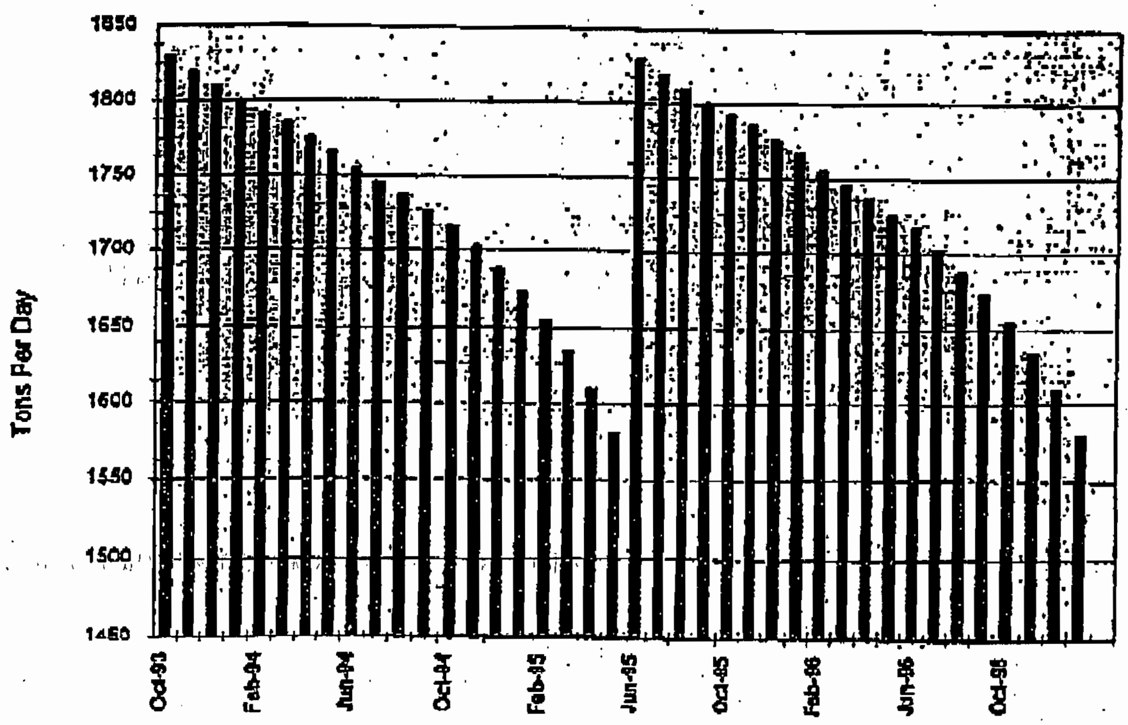
SUBJECT: Sulfuric Acid Plant Performance Information

This is a follow up to our conversation yesterday regarding the variation in performance/emissions of a typical sulfuric acid plant relative to plant turnarounds. The attached graph shows the typical performance expected from a sulfuric acid plant.

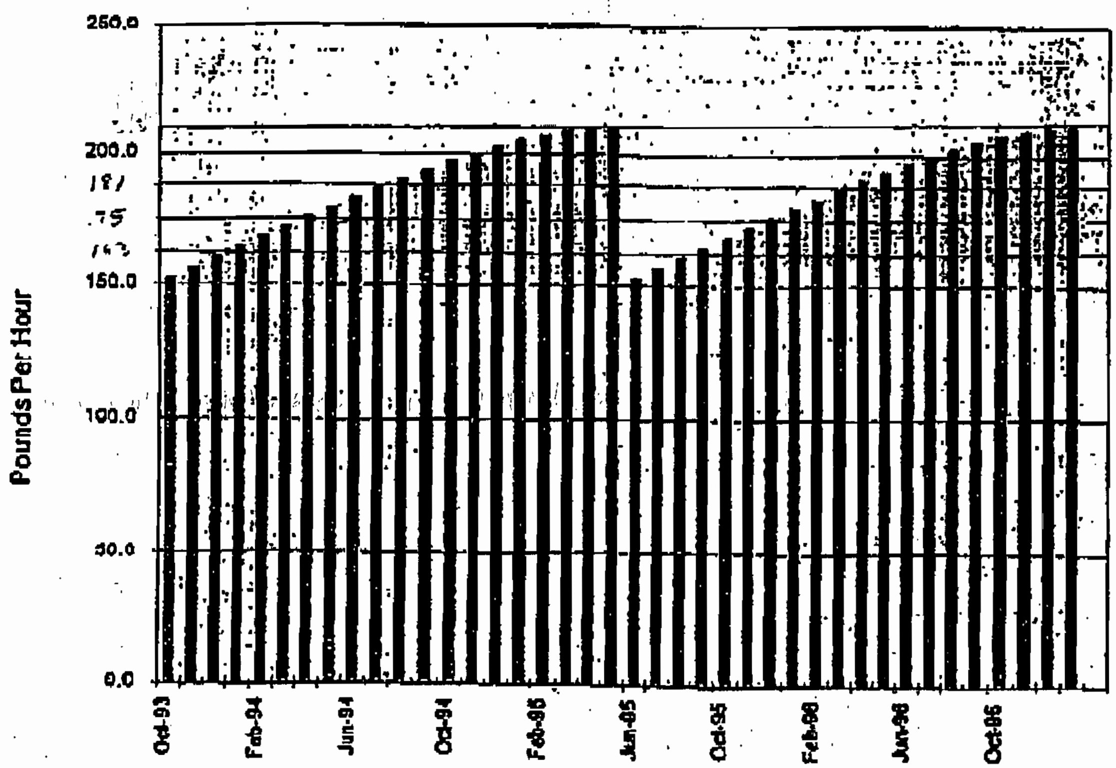
par.



TYPICAL SULFURIC ACID PLANT
DAILY PRODUCTION OVER TIME (20 month TA schedule)



TYPICAL SULFURIC ACID PLANT
SO2 EMISSIONS (20 month TA schedule)



Best Available Copy

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

JAN 10 1990

4APT-APB-cdw

Ms. Patricia G. Adams
Planner
Bureau of Air Quality Management
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: Royster Phosphates, Inc. (PSD-FL-144)

Dear Ms. Adams:

This is to acknowledge receipt of the permit application for the above referenced source, dated December 6, 1989. As discussed between Mr. Barry Andrews of FDER and Mr. Gregg Worley of my staff on January 8, 1990, we have the following comment.

In determining the "actual" emissions of the existing sulfuric acid plant, the maximum production rate and emission rates which occurred during the previous five years were used. The "actual" emissions, however, should be an average of the previous two years operating data unless another period is more representative. Therefore, it is likely that the actual emissions from the existing facility are in fact lower than the maximum numbers presented by the source. Consequently, the source may also be subject to PSD review for NO_x. In any case the greater changes in emissions should be included in the modelling.

By letter dated December 14, 1989, we transmitted to your office a copy of the First Circuit Court of Appeals upholding the "actual-to-potential" applicability rules of the PSD requirements. Please refer to this ruling as a basis for our comments.

Thank you for the opportunity to review this package. Any questions or comments may be directed to Mr. Gregg Worley of my staff at (404) 347-2864.

Sincerely yours,

Bruce P. Miller

Bruce P. Miller, Chief
Air Programs Branch
Air, Pesticides, and Toxics
Management Division

[illegible]

FLORIDA

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Lawton Chiles
Governor

Virginia B. Wetherell
Secretary

May 24, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. F. Ivan Nance, Environmental/Technical Manager
Piney Point Phosphates, Incorporated
13300 U. S. Highway 41 North
Palmetto, Florida 34221

Dear Mr. Nance:

Subject: Permit No. AC 41-173305 & PSD-FL-144

The Department has reviewed your application for a construction permit to replace the existing sulfuric acid plant with a new plant. We need more information in order to continue processing this application. Please complete the application by providing the information requested below:

1. Your response to the attached comments from the National Park Service.

2. The annual area of significant impact modeling should be based on the difference between the proposed emissions and the actual annual hourly emissions. Please redo the annual area of significant impact modeling using the correct inputs.

If you have any questions, please call John Reynolds, permit engineer, or Cleve Holladay, meteorologist, at 904-488-1344, or send your written comments to me at the above address.

Sincerely,

5/24

A. A. Linero, P.E.
Administrator
New Source Review Section

AL/ch/kt

Enclosure

cc: John B. Koogler, Koogler and Associates

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▸ 6

To Bill Corbin	From Don Shepherd
Dept./Agency RTP Assoc	Phone # 303-969-2075
Fax # 732-968-9693	Fax # 303-969-2822

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

STATE OF MISSISSIPPI AIR POLLUTION CONTROL PERMIT

AND PREVENTION OF SIGNIFICANT DETERIORATION AUTHORITY TO CONSTRUCT AIR EMISSIONS EQUIPMENT THIS CERTIFIES THAT

Mississippi Phosphates Corporation
601 Highway 611
Pascagoula, Mississippi

has been granted permission to construct air emissions equipment to comply with emission limitations, monitoring requirements and other conditions set forth herein. This permit is issued in accordance with the provisions of the Mississippi Air and Water Pollution Control Law (Section 49-17-1 et. seq., Mississippi Code of 1972), and the regulations and standards adopted and promulgated thereunder and under authority granted by the Environmental Protection Agency under 40 CFR 52.01 and 52.21.

Issuance Date: ______________

MISSISSIPPI ENVIRONMENTAL QUALITY PERMIT BOARD

____

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

Permit No. 1280-00044

SR-539.c4.1

DRAFT

PART I
GENERAL CONDITIONS

1. Any activities not identified in the application are not authorized by this permit.

2. All air pollution control facilities shall be designed and constructed such as to allow proper operation and maintenance of the facilities.

3. The necessary facilities shall be constructed so that solids removed in the course of control of air emissions may be disposed of in a manner such as to prevent the solids from becoming windborne and to prevent the materials from entering State waters without the proper environmental permits.

4. The air pollution control facilities shall be constructed such that diversion from or bypass of collection and control facilities is not needed except as provided for in Regulation APC-S-1, "Air Emission Regulations for the Prevention, Abatement, and Control of Air Contaminants", Section 10.

5. The construction of facilities shall be performed in such a manner as to reduce both point source and fugitive dust emissions to a minimum.

6. The permittee shall allow the Mississippi Department of Environmental Quality Office of Pollution Control and the Mississippi Environmental Quality Permit Board and/or their representatives upon presentation of credentials:

   a. To enter upon the permittee's premises where an air emission source is located or in which any records are required to be kept under the terms and conditions of this permit; and

   b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any air emissions.

7. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to:

   a. Violation of any terms or conditions of this permit.

   b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts, or

   c. A change in any condition that requires either a temporary or permanent reduction or elimination of authorized air emissions.

DRAFT

8. Except for data determined to be confidential under the Mississippi Air & Water Pollution Control Law, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Mississippi Department of Environmental Quality Office of Pollution Control.

9. The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

10. Nothing herein contained shall be construed as releasing the permittee from any liability for damage to persons or property by reason of the installation, maintenance, or operation of the air cleaning facility, or from compliance with the applicable statutes of the State, or with local laws, regulations, or ordinances.

11. This permit may only be transferred upon approval of the Mississippi Environmental Quality Permit Board.

12. This permit is for air pollution control purposes only.

13. Approval to construct will expire should construction not begin within eighteen (18) months of the issuance of this permit, or should construction be suspended for eighteen (18) months.

14. Prior to startup of air emissions equipment at this source, the permittee must submit certification that construction was completed in accordance with the approved plans and specifications.

DRAFT

PART II
EMISSION LIMITATIONS AND MONITORING REQUIREMENTS

Beginning ISSUANCE DATE, the permittee is authorized to construct air emissions equipment for the emission of air contaminants from Emission Point AA-001, the No. 2 Sulfuric Acid Plant.

The air emissions equipment shall be constructed to comply with the emission limitations and monitoring requirements specified below.

EMISSION LIMITATIONS

Sulfur Dioxide	**3.25 lbs/ton, not to exceed 231.9 lbs/hr and 1015.6 tons/year, as determined by EPA Reference Method 8, 40 CFR 60, Appendix A.**
Sulfuric Acid Mist	**0.15 lbs/ton, not to exceed 10.7 lbs/hr and 46.88 tons/year, as determined by EPA Reference Method 8, 40 CFR 60, Appendix A.**
Opacity	**10% as determined by EPA Referance Method 9, 40 CFR 60, Appendix A.**

All test methods specified above shall be those versions, or their approved equivalents, which are in effect ISSUANCE DATE.

MONITORING REQUIREMENTS

The permittee shall install, calibrate and maintain a continuous monitoring system for the measurement of sulfur dioxide. A conversion factor shall be established for the purpose of converting monitoring data into units of the applicable standard. The conversion factor shall be determined, as a minimum, three times daily by measuring the concentration of sulfur dioxide entering the converter using suitable methods and calculating the appropriate conversion factor for each eight-hour period.

DRAFT

PART II
EMISSION LIMITATIONS AND MONITORING REQUIREMENTS

Beginning ISSUANCE DATE, the permittee is authorized to construct air emissions equipment for the emission of air contaminants from Emission Point AA-017, the No. 3 Sulfuric Acid Plant.

The air emissions equipment shall be constructed to comply with the emission limitations and monitoring requirements specified below.

EMISSION LIMITATIONS

Sulfur Dioxide	**3.25 lbs/ton, not to exceed 231.9 lbs/hr and 1015.6 tons/year, as determined by EPA Test Method 8, 40 CFR 60, Appendix A.**
Sulfuric Acid Mist	**0.15 lbs/ton, not to exceed 10.7 lbs/hr and 46.88 tons/year, as determined by EPA Test Method 8, 40 CFR 60, Appendix A.**
Opacity	**10% as determined by EPA Test Method 9, 40 CFR 60, Appendix A.**

All test methods specified above shall be those versions, or their approved equivalents, which are in effect ISSUANCE DATE.

MONITORING REQUIREMENTS

The permittee shall install, calibrate and maintain a continuous monitoring system for the measurement of sulfur dioxide. A conversion factor shall be established for the purpose of converting monitoring data into units of the applicable standard. The conversion factor shall be determined, as a minimum, three times daily by measuring the concentration of sulfur dioxide entering the converter using suitable methods and calculating the appropriate conversion factor for each eight-hour period.

DRAFT

PART III
OTHER REQUIREMENTS

1) The permittee is limited to a production total of 1,250,000 tons of sulfuric acid per rolling 365 day average.

2) The permittee shall maintain records showing the production rate for each day and for each consecutive 365-day period. All records shall be maintained on site by the permittee for a period of five (5) years following the date of such record.

3) The permittee shall submit semi-annual reports summarizing the total production rate for both sulfuric acid plant No. 2 and plant No. 3 for each consecutive 365-day period. The report shall be submitted no later than 30 days from the semi-annual periods ending June 30 and December 30.

4) For Emission Points AA-001 and AA-017, within 60 days of achieving the maximum production rate but no later than 180 days after the modifications, the permittee shall demonstrate compliance with the SO_2 and Sulfuric Acid Mist emission limitations by stack testing in accordance with EPA Reference Method 8 and submittal of a stack test report.

A pretest conference at least thirty (30) days prior to the scheduled test date is needed to ensure that all test methods and procedures are acceptable to the Office of Pollution Control. Also, the Office of Pollution Control must be notified prior to the scheduled test date. At least TEN (10) DAYS notice should be given so that an observer can be scheduled to witness the test.

5) The permittee shall submit excess emissions and monitoring systems performance reports and/or summary report form on a quarterly basis.

6) Emission Points AA-001 and AA-017, the No.2 and No. 3 Sulfuric Acid Plants, are subject to the New Source Performance Standards for Sulfuric Acid Plants as described in 40 CFR 60, Subpart H and the General Provisions as described in 40 CFR 60, Subpart A.

7) The permittee must provide in writing the date that the maximum production rates are reached. The dates must be provided no later than ten days after the actual date.

DRAFT

Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

November 7, 1997

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Ivan Nance
Corporate Environmental Manager
Piney Point Phosphates, Inc.
13300 US Highway 41 North
Palmetto, Florida 34221

Re: DEP File No. 0810002-004-AC (PSD-FL-242)
Piney Point Sulfuric Acid Plant Project

Dear Mr. Nance:

We received your application on October 30, 1997 for an air construction permit to modify the existing sulfuric acid plant at Piney Point Phosphates in Palmetto, Manatee County. We are conducting a completeness review at this time. However, we understand that you wish to know of any information we may require to process this application as soon as we become aware of it. We are awaiting any comments from EPA, the National Park Service, Manatee County, and our District office as well as internal review by our review engineer and modeler/meteorologist assigned to this application. Additional Department comments will be provided to you by November 26. Any other comments will be forwarded to you as soon as we receive them. My own initial review of the application indicates that the following items need to be provided or clarified:

1. We do not waive the requirement for items listed in the Facility Supplementary Information. This includes basic process flow diagrams which specifically reflect the existing and planned configuration. We agree that much of the information is actually in our files on the facility and we will access it in our review. However this specific application should stand on its own and the information should be more easily accessible to anyone other than our staff who wishes to inspect it.
2. The Best Available Control Technology Review was very instructive. Please submit an analysis of a scenario wherein certain plant components are designed (or "overdesigned") such that present production objectives are met and emission levels of 3.5 and 3.0 pounds of sulfur dioxide per ton of sulfuric acid (averaged for periods longer than one day but less than thirty days) are maintained throughout the turn-around cycle of the plant.
3. Evaluate the scenario wherein the plant (if not overdesigned) must be de-rated to meet the above values throughout the same cycle. Include benefits such as less wear and tear as well as costs.

We are continuing to process the application and will advise you as issues arise. If you have any questions regarding this matter, please call me or John Reynolds at (850)488-1344.

Sincerely,

A. A. Linero 11/7

A. A. Linero, P.E. Administrator
New Source Review Section

AAL/aal

cc: Brian Beals, EPA
John Bunyak, NPS
Bill Thomas, SWD
Karen Collins, Manatee County
John Koogler, P.E.

Copy JR CH SA

Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

November 17, 1997

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Robert Stewart, Sr. Vice President
Operations and Administration
Piney Point Phosphates, Inc.
13300 US Highway North
Palmetto, Florida 34221

Re: DEP File No. 0810002-004-AC
Piney Point Sulfuric Acid Plant Project

Dear Mr. Stewart:

We are reviewing your application to modify the existing sulfuric acid plant in Palmetto. It will not be complete until we receive the information requested below as well as your response from a further request for additional information which we will send you on November 25. The next request will include any comments from the National Park Service, Manatee County, EPA, and our modeling experts.

We have, nevertheless, begun our technical review. Best Available Control Technology (BACT) was proposed in the application as 4 pounds of sulfur dioxide per ton of acid (lb SO_2/ton) and 0.15 pounds of sulfuric acid mist (lb SAM/ton). The proposed values represent the New Source Performance Standards (NSPS) limits in force during the previous operation of the plant when it was permitted to produce 2000 tons per day (TPD) of sulfuric acid.

Other factors being equal, lower SO_2 emissions should result due to the planned replacement of degraded Type 210 and Type 11 vanadium containing (VC) pelletized catalyst in Converter 1 with low pressure LP 120 and LP 110 VC ring catalyst and the planned replacement of all pelletized VC catalyst in Converter 2 with LP 110 VC ring catalyst. The old catalysts were introduced by Monsanto in 1925 and 1963, whereas the LP line was first produced in 1980. With the lower pressure drop and improved conversion, it may be possible to enhance production, maintain it longer and still achieve lower emissions.

Though costly, total replacement of all pelletized catalyst in Converter 1 with the LP line could also result in even more SO_2 reduction and production improvement. It might even be advisable in order to minimize potential blockage of the internal ring openings by remaining pellets.

Instead of replacing the catalyst in Converter 2 with LP 110 VC catalyst as planned, it can be replaced with a "cesium-promoted" VC catalyst such as CS-110. This allows significant reduction of the operating temperature in Pass 5. The CS line was introduced in 1989 and has been demonstrated at several double absorption plants. This provides another opportunity for reduced emissions, higher steam production, and possibly increased production despite the higher cost. Please evaluate separately and in combination, the costs and benefits of both additional catalyst replacement scenarios given above.

We do not recommend processes which result in by-products or wastes and do not expect Piney Point Phosphates Inc. (PPPI) to review them further. It appears that these processes are not generally competitive with those which result in production of additional acid.

Since both absorption towers will be replaced, there are process modifications which should be considered which also result in production of sulfuric acid. One example is the "Centaur SO_2 Removal Process" developed by Monsanto in conjunction with Calgon. Basically, Converter 2 can be replaced with a reactor containing highly activated carbon catalyst/adsorbent. Wet conversion occurs in the bed which retains the acid. The acid is released by sequential back-washing of bed sections. The catalyst can operate at very low temperatures. This can result in reduced pressure drop across the plant as well as lower heat waste, lower emissions, and possibly increased production. Besides elimination of the second converter and its catalyst, it would eliminate the need for the planned replacement of the final tower, some heat exchangers, and the economizer.

Other possibilities exist such as peroxide oxidation of SO_2 to sulfuric acid. Monsanto or another company may have developed such a process. The point is that potentially feasible options need to be considered whether or not they have actually been employed on sulfuric acid plants in Florida. Please provide the technical and cost evaluations of all the options described above to allow the Department to make a thorough BACT determination. We would appreciate review of our information request by your contractor, Monsanto Enviro-Chem.

The planned replacement of all towers and their mist eliminators ought to make it possible to decrease SAM emissions. The mist eliminators described appear to be very efficient and the plant does not produce oleum which would otherwise make it more difficult to achieve a lower rate than 0.15 lb SAM/ton.

We are conducting the present evaluation under the assumption that a second plant will not be operated while the existing plant is used. Both the PSD analysis submitted for modifying the existing plant and the one submitted for building a second plant include emissions estimates for only one plant at the site. This will ultimately need to be reconciled when Piney Point's final plans are known. If there is a simultaneous two-plant option, it cannot be implemented under the applications submitted to-date.

If you have any questions regarding this matter, please call me at 850/488-1344.

Sincerely,

A. A. Linero 11/17

A. A. Linero, P.E. Administrator,
New Source Review Section

AAL/aal

cc: Brian Beals, EPA
John Bunyak, NPS
Bill Thomas, SWD
Karen Collins, Manatee County
Ivan Nance, PPPI
John Koogler, P.E., K&A

Mississippi Phosphates Corporation™

Highway 49 East
Post Office Box 986
Yazoo City, Mississippi 39194
Phone (601) 746-5529
Fax (601) ~~746-9458~~ 751-2926

June 23, 1997

RECEIVED
JUN 24 1997
Dept. of Environmental Quality
Office of Pollution Control

Mr. Don Watts, Air Division
Mississippi Department of Environmental Quality
P. O. Box 10385
Jackson, MS 39289-0385

Dear Mr. Watts:

Re: Mississippi Phosphates Corporation, Jackson County, Pascagoula, Mississippi
Sulfuric Acid Plant Modifications - Air Permit to Construct

Attached are four copies of an application for an Air Permit to Construct for modifications to the Mississippi Phosphates Corporation (MPC) facility in Pascagoula, Mississippi. Two copies are for your agency. We understand you will forward one copy to EPA Region IV and one copy to the U.S. Fish and Wildlife Service. Mississippi Phosphates plans to increase the maximum production rates in the No. 2 (Emission Point 001) and No. 3 (Emission Point 017) sulfuric acid plants from a nominal 1,650 tons acid per day (100% basis) for each plant to 1,786 tons per day for each plant. Plant location and emission point layout diagrams are found in Appendix 6.

This production increase will be accomplished by changing the physical configuration of the catalyst used in these plants. The sulfuric acid plants at Mississippi Phosphates use vanadium pentoxide-based catalysts to convert SO_2 gas to SO_3 gas which is then absorbed in water to form sulfuric acid. The catalyst currently used in MPC's sulfuric acid plants is pellet-shaped. A ring-shaped catalyst of the same vanadium pentoxide material will replace the pellet catalyst, which will lower the pressure drop through the catalyst beds and allow greater gas throughput for both plants. No other plant modifications will be made to achieve the described production rate increase. Additional information on the process and the proposed modifications is provided in Appendix 1.

Based on a review of applicable regulations, Mississippi Phosphates proposes the following permit conditions to limit air pollutant emissions from the facility:

	No. 2 Plant	No. 3 Plant
SO_2	3.26 lb/ton	3.26 lb/ton
Sulfuric Acid Mist	0.15 lb/ton	0.15 lb/ton
Opacity	10%	10%

NSPS

The federal New Source Performance Standards for sulfuric acid plants is found at 40 CFR 60 Subpart H (Performance Standards Applicable to New and Modified Sulfuric Acid Plants). This regulation limits emissions from new or modified sulfuric acid plants to 4.0 pounds SO_2 and 0.15 pound of sulfuric acid mist per ton of 100% sulfuric acid produced. An opacity limit of 10% maximum applies to NSPS sulfuric acid plants. Sulfuric acid plant No. 3 is currently subject to the federal NSPS and meets these standards.

The limits proposed for this modification are at least as stringent as the NSPS.

Subpart H also requires the installation of a continuous monitoring system (CEMS) for SO_2, and a system to determine at least three times per day a factor to convert SO_2 concentration to a value of pounds of SO_2 per ton of acid produced. Both sulfuric acid plants have CEMS systems installed now, and both will implement systems to generate the required conversion factors.

No other state or federal New Source Performance Standards apply to this modification.

National Ambient Air Quality Standards (NAAQS)

The area around the Mississippi Phosphates facility is considered "In Attainment" for all criteria pollutants regulated under the federal Clean Air Act. Mississippi Phosphates operated a series of ambient monitors for SO_2 for a number of years around the facility. Data from these monitors demonstrated a clear trend of compliance with the SO_2 NAAQS standard around the MPC facility. Also, one of the state's SO_2 ambient monitors is located within just a few miles of the MPC sulfuric acid production area. Data from this monitor shows ambient SO_2 concentrations in the area are consistently well below the NAAQS SO_2 standards for annual-, 24 hour-, and 3 hour averaging times. We believe that a marginal increase in current SO_2 emissions will not significantly affect ambient concentrations.

There are no ambient air quality standards for SO_3 or sulfuric acid mist.

PSD Applicability

This is a major modification pursuant to APC-S-2 and 40 CFR 52.21. The proposed limits result in a significant net emission increase for sulfuric acid mist. Therefore, a Prevention of Significant Deterioration review is required. Limits for SO_2 are sufficiently low so that the increase in SO_2 emissions is below the PSD threshold of 40 tons per year. There is no PSD threshold for SO_3. See Appendix 2 for emissions calculations.

The elements of a PSD review, found at 40 CFR 52.21, paragraphs (j-p), are:

- control technology review
- source impact analysis
- air quality analysis
- source information
- additional impact analysis
- Class I area analysis

Paragraph (j) of 40 CFR 52.21 requires each major modification subject to PSD review to meet each applicable limitation under the State Implementation Plan (SIP) and each applicable limitation under 40 CFR Parts 60 and 61. The Mississippi SIP limits SO_2 emissions from sulfuric acid plants to 2,000 parts per million, acid mist to 0.5 pounds per ton, and SO_3 to 0.2 pounds per ton. Federal New Source Performance Standards (NSPS) for new and modified sulfuric acid plants are found at 40 CFR 60 Subpart K. They limit SO_2 emissions to 4.0 pounds per ton and sulfuric acid mist emissions to 0.15 pounds per ton. There is no requirement in 40 CFR Part 61 applicable to this modification. The proposed limits for the sulfuric acid plants will meet or surpass all of the limits listed above.

Paragraph (j) further requires that major modifications apply best available control technology (BACT) for each pollutant which would result in a significant net emission increase. For the MPC modification, this would be sulfuric acid mist only. A BACT analysis has been performed and is found in Appendix 3 to this application. The analysis determined that the existing acid mist control devices on both MPC sulfuric acid plants meet BACT criteria. Therefore, no additional control devices are necessary.

Paragraph (k) requires demonstration that allowable increases of Clean Air Act pollutants from a proposed modification would not cause or contribute to a violation of a national ambient air quality standard or any PSD increment. Because there is no national ambient air quality standard or PSD increment for sulfuric acid mist, no demonstration of source impact against these standards has been made for this modification.

Paragraph (m) sets forth requirements for pre-application and post-construction air quality analysis (e.g., ambient monitoring). For pre-application monitoring, subparagraph (ii) of this section says that for "any such pollutant for which no National Ambient Air Quality Standard exists, the analysis shall contain such air quality monitoring as the

Administrator determines is necessary to assess ambient air quality for that pollutant". Also, post-construction monitoring is required only as deemed necessary by the Administrator. As previously stated, no NAAQS exists for sulfuric acid mist. Further, no reference method for monitoring ambient sulfuric acid mist has been established by EPA. Therefore neither pre-application nor post-construction monitoring is appropriate for this permit.

Source information required for proposed modifications is detailed in paragraph (n). Necessary information includes a description of the nature, location, design capacity and typical operating schedule of the modification, including specifications and drawings showing design and plant layout. It also requires provision of a schedule of construction, description of continuous emissions reduction systems, and emissions estimates. All required information, except for plant design specifications and drawings, are contained in this application package. Additional plant design information will be provided to MDEQ upon request.

Paragraph (o) details the information that must be provided regarding additional impacts resulting from the modification, including impairments to visibility, soils and vegetation resulting from the modification, both directly and indirectly.

Procedures for source modifications possibly impacting Federal Class I areas are detailed in paragraph (p). The MPC facility is located approximately 30 miles (48 kilometers) from the Breton National Wildlife Refuge, a federal Class I area. The Administrator is required to provide written notice to the federal land manager of a permit application for a major modification which may affect a Class I area. The federal land manager for Breton is the U. S. Fish and Wildlife Service.

In discussions preceding submittal of this application, the federal land manager requested that both a visibility screening and a regional haze analysis be performed. The Class I Visibility Analysis and the Regional Haze Analysis are found in Appendix 4. The results of both analyses indicate no significant impacts resulting from this modification. The federal land manager also requested that an analysis of additional impacts be performed including those to soil and vegetation. This analysis is located in Appendix 5. No impacts are known.

Hazardous Air Pollutants

Neither of the three regulated pollutants affected by this modification, SO_2, SO_3 and sulfuric acid mist, are listed as hazardous air pollutants in Section 112 of the federal Clean Air Act. Therefore, no state or federal hazardous air pollutant regulations, including NESHAPS, apply.

State Regulations

Several state regulations are potentially applicable to this modification.

APC-S-1, Section 3.1 (a) limits opacity from manufacturing facilities to 40% or less. This standard is less stringent than the federal NSPS requirement of 10% or less.

APC-S-1, Section 4.2 (a) limits sulfur dioxide emissions from existing process plants to 2,000 ppmv and from new process plants to 500 ppmv. Based on estimated gas flow rates, MPC will have to meet lower levels than 500 ppmv in order to meet the proposed limit of 3.26 pounds of SO_2 per ton acid.

APC-S-1, Section 4.2(c) limits sulfuric acid mist emissions from sulfuric acid manufacturing plants to 0.5 pounds per ton acid. This limit is not as stringent as the proposed 0.15 pound mist per ton acid. Section 4.2(c) also limits sulfur trioxide (SO_3) emissions from sulfuric acid manufacturing plants to 0.2 pounds per ton acid. MPC believes it can meet this standard. In Standard Method 8, which is used to demonstrate compliance with sulfuric acid mist limits, SO_3 is absorbed in an 80% isopropanol/20% water solution, where it is then converted to sulfuric acid. It is this catch that is used to determine sulfuric acid mist emissions. Therefore, a sample meeting the standard of 0.15 pounds of sulfuric acid mist is actually meeting a combined acid mist/SO_3 limit of 0.15 pounds per ton.

Because the total of SO_3 and sulfuric acid mist must meet a limit more stringent than the state limit for SO_3 alone, MPC is not proposing the state SO_3 limit as a permit condition.

Anticipated Construction Schedule

Mississippi Phosphates plans to implement this planned change around March, 1998.

We believe this application addresses all information requirements typically required by your agency of applicants for Air Permits to Construct. If additional information or clarification is required, please contact staff member, Trey Fleming, at (601) 751-2225.

Sincerely,

William A. Stewart

William A. Stewart
Director of Environmental Programs

TF
Attachments
L0607401.A57

6.1697

APPENDIX 1
PROCESS AND MODIFICATION DESCRIPTION
Mississippi Phosphates Corporation
Sulfuric Acid Plant Modifications

I. CURRENT PROCESS

The Mississippi Phosphates Corporation (MPC) facility in Pascagoula, Mississippi, has two nearly identical sulfuric acid plants currently operating. The process used in these plants is called "Bayer-Lurgi Double Catalysis". Both units have nameplate capacities of 1,500 tons per day sulfuric acid (100% acid basis). However, both plants can operate at instantaneous rates as high as about 1,650 tons per day as currently permitted.

Molten sulfur is atomized and burned in pre-dried air to form SO_2 gas. SO_2 gas is catalytically converted by a vanadium catalyst to SO_3 gas. SO_3 gas is absorbed in a 98.5% solution of sulfuric acid, where it combines with water to form sulfuric acid (H_2SO_4).

$$S \xrightarrow[\text{heat}]{} SO_2 \xrightarrow[\text{catalyst}]{} SO_3 \xrightarrow[H_2O]{} H_2SO_4$$

II. MODIFICATION

Both plants currently use a vanadium-based catalyst that is shaped in solid pellets approximately four millimeters in diameter by ten millimeters long. The planned modification will replace the pellet-shaped catalyst with ring-shaped catalyst approximately 0.75 inches diameter and one inch long and made of the same vanadium material. Use of the new catalyst will lower the pressure drop though the catalyst beds and allow greater gas throughput, resulting in increased acid production rates. MPC estimates the maximum instantaneous production rates for each plant after catalyst changeout to be 1,786 tons per day. No other changes are required to reach the projected rates.

Use of the new catalyst is expected to lower the amount of SO_2 emitted per ton of acid produced from each of the plants. Both MPC plants will meet federal New Source Performance Standards after this modification.