KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

KA 261-91-01

October 22, 1991

Mr. Clair Fancy
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Sulfuric Acid Plants 10 and 11 and
Molten Sulfur System
Agrico Chemical Company (SPCW)
Polk County, Florida
Permit File Nos. AC53-199112 and AC53-201152

Dear Mr. Fancy:

This is in response to two letters dated July 26 and August 26, 1991, requesting additional information on the above projects. Since FDER will review both applications as one overall project, the responses to the two letters are submitted together.

Sulfuric Acid Plants, Permit File No. AC 53-199112

1. **What facilities will use the additional sulfuric acid produced by the modified plants? Where are these facilities located?**

The additional sulfuric acid produced will be sold to the Sulfuric Acid Trading Company (SATCO) in Tampa.

2. **What is the maximum rating of the turbogenerator? How many MW will be generated when the acid production is 2700 TPD?**

The total power generation capacity of the existing No. 1 turbine generator and the new No. 2 turbine generator is about 47.8 MW.

3. **In order to determine whether a proposed modification will result in significant net emissions increases of regulated pollutants, the increase or decrease is quantified by using the proposed "new allowable" emissions minus the "old actual" emissions. The old actual emissions must be based on the previous two years of operating data unless some other period is deemed to be more representative of normal operating conditions. Please recalculate the changes in all regulated pollutant emissions using this criteria. It appears the project may also be subject to PSD for nitrogen oxides based on this criteria. Please provide copies of the annual operating reports for the sulfuric acid plants during the 2 years selected to support your actual emission calculations. Please redo the appropriate modeling analyses using the corrected input values. The Department's files also indicate that the two sulfuric acid plants were permitted at only 1800 tons per day during the PSD SO_2 baseline year. This would impact PSD increment consumption. In addition, the existing molten sulfur system (current permit number A053-187290) which was permitted after-the-fact in 1990 has never been included in any modeling analysis. Emissions due to this source should be included in the appropriate modeling analyses.**

Emission Calculations

The emission calculations have been revised as suggested by FDER using actual production factors in estimating actual annual emissions. The production data from the 1989 and 1990 annual operating reports which were relied on for the emission estimates are presented in Attachment 1 along with the revised calculations. It should be noted that although the

revised emission calculations reflect higher net emission increases as a result of the proposed project, the rule applicability remains the same for sulfur dioxide, sulfuric acid mist, and nitrogen oxides.

Modeling

The ambient air quality analysis submitted to FDER previously needs to be updated to incorporate two changes. The first issue addresses the inclusion of the SO_2 emissions from the molten sulfur system, totaling about 2.8 lbs/hr, into the ambient air quality analysis. The second issue concerns the baseline SO_2 emissions of sulfuric acid plant Nos. 10 and 11 which should have reflected an originally permitted production capacity of 1800 tons per day instead of 2000 tons per day for each plant. Accordingly, the PSD baseline SO_2 emissions for each of the acid plants should be represented as 300 lbs/hr (37.83 g/s) and not 333.3 lbs/hr (42.04 g/s) in the SO_2 Class II PSD increment consumption analysis.

To address the above changes in the ambient air quality impact analyses presented previously to FDER, two options were considered. The first option was to evaluate the incremental impact due to just the change in the emission rates previously modeled. The second option was to update the emission inventory and perform the entire modeling again. In discussing these options with both Mr. Tom Rogers and Mr. Cleve Holladay

of the FDER staff, it was agreed that the first option would be acceptable to FDER.

Molten Sulfur System Modeling

In accordance with the modeling protocol agreed to with FDER, the SO_2 emissions from the molten sulfur system were modeled using the ISC-ST model, Version 90346, with the entire system's SO_2 emissions modeled as being emitted from a single stack. The theoretical stack chosen is centrally located within the system and has the same vent characteristics as a molten sulfur storage tank vent. Since the sulfur system is surrounded by tall structures in all directions, building downwash was included in the modeling. The model input parameters are presented below:

Source No.	SO_2 Emissions (g/s)	X (m)	Y (m)	Height (m)	Temp. (°K)	Velocity (m/s)	Diameter (m)
1	0.35	0	0	7.3	366	1	0.3

Building Dimensions: Height = 18.3 meters, L/W = 100 meters

The receptor locations chosen for this modeling are the same as the receptor locations used in the previously submitted modeling.

It was conservatively assumed that the maximum impacts of the molten sulfur system, added to the previously predicted maximum impacts, would

result in the maximum combined predicted impact. An overly conservative maximum predicted impact would occur using this approach because the individual maximums could occur on different days and at different locations, as evident from the modeling.

The results of the molten sulfur system modeling are summarized in Table 1. The results are also compared with the previous PSD Increments Analysis in Table 3 and the Ambient Air Quality Standards Analysis in Table 4. Based on the modeling results it can be concluded that the sulfur dioxide emissions from the molten sulfur system will not cause or contribute to any violations of the ambient air quality standards.

PSD Increment Analysis

The appropriate PSD baseline SO_2 emissions for Agrico's sulfuric acid plant Nos. 10 and 11, based on a permitted sulfuric acid production of 1800 tons per day, would be 300 pounds per hour for each plant. Since the emission rate used in the previous analysis was 333.3 pounds per hour for each plant, the incremental impact analysis modeled simply the difference between the two numbers.

An emission rate of 33.3 lbs/hr (4.2 g/s) was modeled using the ISC-ST model, Version 90346, with the same stack characteristics and receptor locations as the previously used in the PSD increment analysis.

TABLE 1

SUMMARY OF SULFUR DIOXIDE AMBIENT AIR IMPACT ANALYSIS
MOLTEN SULFUR SYSTEM

AGRICO CHEMICAL COMPANY
POLK COUNTY, FLORIDA

Meteorological Data	Sulfur Dioxide Impacts ($\mu g/m^3$)[1]		
	Annual	3-hour	24-hour
1982	2.3 (500m, 240°)	79.7 (500m, 230°)	16.6 (500m, 280°)
1983	2.1 (500m, 240°)	76.3 (500m, 240°)	21.0 (500m, 270°)
1984	2.6 (500m, 250°)	83.9 (500m, 240°)	26.5 (500m, 250°)
1985	2.5 (500m, 240°)	70.6 (500m, 270°)	16.9 (500m, 240°)
1986	2.3 (500m, 240°)	93.0 (500m, 220°)	26.7 (500m, 250°)
Significant Impact (17-2.100(171)(a),FAC)	1.0	25.0	5.0

[1] The SO_2 ambient air impacts reflect the maximum predicted impacts and their location.

TABLE 2

SUMMARY OF INCREMENTAL SULFUR DIOXIDE IMPACT ANALYSIS
SULFURIC ACID PLANTS NOS. 10 AND 11

AGRICO CHEMICAL COMPANY
POLK COUNTY, FLORIDA

Meteorological Data	Sulfur Dioxide Incremental ($\mu g/m^3$)[1]		
	Annual	3-hour	24-hour
1982	-[2]	28.5 (750m, 250°)	9.2 (1000m, 360°)
1983	-	29.5 (750m, 40°)	8.8 (1000m, 250°)
1984	-	31.1 (500m, 270°)	7.9 (750m, 250°)
1985	-	31.3 (750m, 80°)	8.1 (2000m, 120°)
1986	1.0 (750m, 90°)	31.2 (500m, 90°)	8.6 (750m, 90°)

[1] The SO_2 ambient air impacts reflect the maximum predicted impacts and their location.

[2] See previous modeling results.

TABLE 3

SUMMARY OF SULFUR DIOXIDE PSD INCREMENT ANALYSIS

AGRICO CHEMICAL COMPANY
POLK COUNTY, FLORIDA

Ambient Air Impact	Sulfur Dioxide Impact ($\mu g/m^3$)		
	Annual	3-hour	24-hour
Revised Incremental Impacts	1.0	31.3	9.2
Molten Sulfur System Impacts	2.6	93.0	26.7
Previously Modeled Impacts	3.2	142.3	44.3
Total Predicted Impacts	6.8	266.6	80.2
Allowable Class II PSD Increment	20	512	91

TABLE 4

SUMMARY OF AMBIENT AIR QUALITY STANDARDS
ANALYSIS FOR SULFUR DIOXIDE

AGRICO CHEMICAL COMPANY
POLK COUNTY, FLORIDA

Ambient Air Impact	Sulfur Dioxide Impact ($\mu g/m^3$)		
	Annual	3-hour	24-hour
Molten Sulfur System Impacts	2.6	93.0	26.7
Previously Modeled Impacts	36.3	451.1	229.1
Total Predicted Impacts	38.9	544.1	255.8
Ambient Air Quality Standard	60	1300	260

As with the molten sulfur system modeling, it was conservatively assumed that the maximum impacts of the emission rate modeled, added to the previously predicted maximum impacts, would result in the maximum combined predicted impact.

The results of the incremental SO_2 emissions analysis are presented in Table 2 and compared with the previous PSD Increments Analysis in Table 3. Based on the results, it can be concluded that the revised PSD SO_2 baseline emissions for the two sulfuric acid plants at Agrico's facility will not cause or contribute to any violations of the allowable SO_2 Class II PSD Increments.

The modeling output is presented as a separate appendix and also on diskette.

4. **The application does not contain process flow diagrams for the proposed modified facility. Although Figures 3-1A and 3-1B purport to be process flow diagrams, they are, in actuality, plant equipment layout diagrams. Please submit process flow diagrams for the actual (not typical) proposed modified facility.**

A process flow diagram for Agrico's modified sulfuric acid manufacturing process is presented in Attachment 2.

5. **The plant equipment layout diagrams (Figures 3-1A and 3-1B) seem to indicate that drying towers will be utilized. Please confirm that the drying towers will be utilized in the proposed modified facility. Utilization of the drying towers should be reflected in the process flow diagrams requested above.**

The drying towers will continue to be used in the proposed modified facility as indicated on the attached process flow diagram.

6. **Please provide the Department with reasonable assurance that the efficiency of the converters will not be degraded while operating at the proposed new process conditions and higher process rates. The answer to this question must:**

   a. **completely describe the process streams that each converter was originally designed to handle,**

   b. **completely describe the process streams that each converter will handle in the proposed modified facility, and**

   c. **explain why the differences between (a) and (b) will not degrade converter efficiency.**

7. **Please provide the Department with reasonable assurance that the efficiency of the absorbers will not be degraded while operating at the proposed new process conditions and higher process rates. The answer to this question must:**

   a. **completely describe the process streams that each absorber was originally designed to handle,**

   b. **completely describe the process streams that each absorber will handle in the proposed modified facility, and**

   c. **explain why the differences between (a) and (b) will not degrade absorber efficiency.**

8. **Please provide the Department with reasonable assurance that the efficiency of the mist eliminators will not be degraded while operating at the proposed new process conditions and higher process rates. The answer to this question must:**

   a. **completely describe the process streams that each mist eliminator was originally designed to handle,**

   b. **completely describe the process streams that each mist eliminator will handle in the proposed modified facility, and**

   c. **explain why the differences between (a) and (b) will not degrade mist eliminator efficiency.**

The efficiency of the final tower/mist eliminators should remain the same because the gas volume through the final tower/mist eliminator will be approximately the same as the current operation with approximately the same acid flow over the tower.

The gas strength to the converter will be increased to 11.8% equivalent SO_2. Additional catalyst will be added to each of the converter beds to maintain 99.7% overall conversion of SO_2 to SO_3. See Attachment 3 for details on process flows.

As additional assurance that Agrico's modified sulfuric acid plants will meet the applicable regulatory requirements, test data from a similarly modified plant at IMC is presented in Attachment 4. The IMC sulfuric acid plant utilizes the same Heat Recovery System (HRS) technology that is proposed for the sulfuric acid plants at Agrico. The IMC compliance test

data demonstrate that the acid plants modified for additional heat recovery using the HRS technology will be able to comply with the applicable sulfur dioxide and sulfuric acid mist emission standards.

9. Please submit emissions reports demonstrating compliance with FAC Rule 17-2.600(2)(b) and 40 CFR 60, Subpart H, from an operating sulfuric acid plant utilizing the same Monsanto process proposed for this modified facility.

As stated in response 8 above, the compliance test data from the IMC plant utilizing the HRS technology proposed for Agrico demonstrate the ability of such a plant to comply with the applicable air emission standards.

Molten Sulfur Storage System, Permit File No. AC 53-201152

1. Please clarify the process rate for this system. The 150,000 lbs/hr process rate for sulfur listed in Section IIIB. of the application is not equivalent to the maximum process rate of 2,050 TPD listed in Attachment II.

The 150,000 pounds per hour molten sulfur utilization rate listed in the permit application form corresponds to the molten sulfur requirement of the sulfuric acid plants. The 2050 tons per day molten sulfur process rate listed in Attachment II corresponds to the maximum sulfur receiving rate via railcars/tanker trucks.

2. **What is the basis of the pollutant concentrations listed in Attachment 1? What is the ventilation rate for the system?**

3. **Please provide a copy of the Koogler & Enviroplan data that the 0.2 grains/dscf sulfur particle concentration is based on.**

4. **What is the basis of the equilibrium concentrations for H_2S, SO_2, and VOC? What is the relationship between the equilibrium concentrations, concentrations in Attachment 1, and the emission estimates?**

5. **Please provide a copy of the 3 references for emission estimates prepared by Dr. John B. Koogler.**

6. **What is the basis for the wind induced ventilation for the 5 vents on the storage tanks (Attach. 3c, 4,c.)?**

The response to questions 2, 3, 4, 5, and 6, can be best addressed by a summary of how the emission factors for various pollutants and the ventilation rates for molten sulfur storage tanks were developed. This information is provided in Attachment 5. There are numerous references which form the basis of the emission calculation protocol used by all the molten sulfur handling facilities when air construction permit applications were submitted to FDER. Copies of the references noted in the summary document are not attached because they are quite voluminous and are already in the FDER files on the Sulfur Rulemaking and also in the initial group of molten sulfur facility air construction permit applications.

The emission calculations for the modification of the existing molten sulfur system follows the same format as the emission calculations initially submitted to, and accepted by, FDER. The only changes are the proposed molten sulfur handling rates which correspond to the requested increase in the permitted sulfuric acid production rates.

I would very much appreciate your prompt review of the information being submitted and will be glad to provide any other information you may require to expedite the permitting process.

If you have any questions, please do not hesitate to give me a call.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa
Enc.

c: Mr. Phillip Steadham, Agrico
Mr. William Thomas, FDER SW District
A. Hanks
C. Holladay
Q. Harper, EPA
C. Shaver, NPS

ATTACHMENT 1

REVISED EMISSION CALCULATIONS

CHANGES IN PRODUCTION AND EMISSION RATES

AGRICO CHEMICAL COMPANY
POLK COUNTY, FLORIDA

	Sulfuric Acid Plant 10	Sulfuric Acid Plant 11
Permit Allowable Conditions		
Rate (TPD)	2000	2000
SO2 (lb/ton)	4	4
(lb/hr)	333.3	333.3
(TPY)	1460	1460
Mist (lb/ton)	0.15	0.15
(lb/hr)	12.5	12.5
(TPY)	54.8	54.8
Operating Factor	1	1
Actual Conditions		
Rate (TPD)	2000	2000
SO2 (lb/ton)	3.21	3.5
(lb/hr)	306.8	297.7
(TPY)	1097.2	1205.1
Mist (lb/ton)	0.104	0.127
(lb/hr)	11.0	10.3
(TPY)	35.5	43.4
Operating Factor	0.937	0.935
Proposed Conditions		
Rate (TPD)	2700	2700
SO2 (lb/ton)	4	4
(lb/hr)	450.0	450.0
(TPY)	1971.0	1971.0
Mist (lb/ton)	0.15	0.15
Mist (lb/hr)	16.9	16.9
(TPY)	73.9	73.9
Operating Factor	1	1

NOTE:

1. See Appendix for calculations of emission rates.
2. Sulfuric acid plants No. 10 and 11 are permitted to operate 8760 hours per year.

NET EMISSION INCREASES(1)

AGRICO CHEMICAL COMPANY
POLK COUNTY, FLORIDA

Pollutant	Emissions (tons/yr) Sulfuric Acid Plant 10		11
SO2			
Present (actual)	1097.2		1205.1
Proposed	1971.0		1971.0
Change	873.8		765.9
Total Increase		1639.7	
Significant Increase (3)		40	
MIST			
Present (actual)	35.5		43.4
Proposed	73.9		73.9
Change	38.4		30.5
Total Increase		68.9	
Significant Increase (3)		7	
NOx			
Present (actual)(2)	41.0		41.0
Proposed(2)	59.1		59.1
Change	18.1		18.1
Total Increase		36.2	
Significant Increase (3)		40	

(1) See Appendix for emission calculations.
(2) NOx emissions based on Monsanto data.
(3) Presented in Table 500.2, Chapter 17-2, FAC.

EMISSION RATE CALCULATIONS

PERMITTED CONDITIONS: (Each Plant)

SULFURIC ACID PLANTS NO. 10 AND 11

2000 tons per day 100% acid (rated capacity)
SO2 - 4.0 lbs/ton
Mist - 0.15 lb/ton
Operating Factor - 1.0
(Based on Permits No. A053-176685 and A053-145510)

ACTUAL CONDITIONS:

(Emissions based on previous compliance test results)

See Table 2-1.

SULFURIC ACID PLANT NO. 10

2000 tons per day 100% acid
SO2 - 3.21 lbs/ton
Mist - 0.104 lb/ton
Operating Factor - 0.937 (Based on 89-90 production data)

SULFURIC ACID PLANT NO. 11

2000 tons per day 100% acid
SO2 - 3.53 lbs/ton
Mist - 0.127 lb/ton
Operating Factor - 0.935 (Based on 89-90 production data)

PROPOSED CONDITIONS: (Each Plant)

SULFURIC ACID PLANTS NO. 10 AND 11

2700 tons per day 100% acid
SO2 - 4.0 lbs/ton
Mist - 0.15 lb/ton
Operating Factor - 1.0

PERMITTED EMISSION RATE CALCULATIONS (Each Plant)

SULFURIC ACID PLANTS NO. 10 AND 11

SO2:	Hourly	=	4.0 lbs/ton x 2000/24 tons/hr
		=	333.3 lb/hr
	Annual	=	333.3 lbs/hr x 8760 hrs/yr x 1/2000 ton/lb
		=	1460.0 TPY
MIST:	Hourly	=	0.15 lb/ton x 2000/24 tons/hr
		=	12.5 lbs/hr
	Annual	=	12.5 lbs/hr x 8760 hrs/yr x 1/2000 ton/lb
		=	54.8 TPY

ACTUAL EMISSION RATE CALCULATIONS

(Emissions based on previous compliance test results)

SULFURIC ACID PLANT NO. 10

SO2:	Hourly	=	306.8 lbs/hr
	Annual	=	3.21 lbs/ton x (638,230 + 728,999)/2 tons/yr x 1/2000 ton/lb
		=	1097.2 TPY
MIST:	Hourly	=	11.0 lbs/hr
	Annual	=	0.104 lb/ton x (638,230 + 728,999)/2 tons/yr x 1/2000 ton/lb
		=	35.5 TPY
NOx	Hourly	=	2000 tons/day x 0.12 lb/ton x 1/24 day/hr
		=	10.0 lbs/hr (NOx emission factor based on Monsanto data attached)
	Annual	=	0.12 lb/ton x (638,230 + 728,999)/2 ton/yr x 1/2000 ton/lb
		=	41.0 TPY

SULFURIC ACID PLANT NO. 11

SO2:	Hourly	=	297.7 lbs/hr
	Annual	=	3.53 lbs/ton x (639,508 + 726,088)/2 tons/yr x 1/2000 ton/lb
		=	1205.1 TPY
MIST:	Hourly	=	10.3 lbs/hr
	Annual	=	0.127 lb/ton x (639,508 + 726,088)/2 tons/yr x 1/2000 ton/lb
		=	43.4 TPY
NOx	Hourly	=	2000 tons/day x 0.12 lb/ton x 1/24 day/hr
		=	10.0 lbs/hr
	Annual	=	0.12 lb/ton x (639,508 + 726,088)/2 ton/yr x 1/2000 ton/lb
		=	41.0 TPY

PROPOSED EMISSION RATE CALCULATIONS: (Each Plant)

SULFURIC ACID PLANTS NO. 10 AND 11

SO2:	Hourly	=	2700 tons/day x 4.0 lbs/ton x 1/24 day/hr
		=	450.0 lbs/hr
	Annual	=	450.0 lbs/hr x 8760 hr/yr x 1/2000 ton/lb
		=	1971.0 TPY
MIST:	Hourly	=	2700 tons/day x 0.15 lbs/ton x 1/24 day/hr
		=	16.9 lbs/hr
	Annual	=	16.9 lbs/hr x 8760 hrs/yr x 1/2000 ton/lb
		=	73.9 TPY
NOx	Hourly	=	2700 tons/day x 0.12 lb/ton x 1/24 day/hr
		=	13.5 lbs/hr
	Annual	=	13.5 lbs/hr x 8760 hrs/yr x 1/2000 ton/lb
		=	59.1 TPY

NET ANNUAL EMISSION CHANGES

Total Actual SO2	=	1097.2 + 1205.1 = 2302.3 TPY
Total Proposed SO2	=	2 x 1971 = 3942.0 TPY
Net Change SO2	=	3942 - 2302.3 = 1639.7 TPY
Total Actual Mist	=	35.5 + 43.4 = 78.9 TPY
Total Proposed Mist	=	2 x 73.9 = 147.8 TPY
Net Change Mist	=	147.8 - 78.9 = 68.9 TPY
Total Actual NOx	=	2 x 41.0 = 82.0 TPY
Total Proposed NOx	=	2 x 59.1 = 118.2 TPY
Net Change NOx	=	118.2 - 82.0 = 36.2 TPY

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

ANNUAL OPERATION REPORT FORM FOR AIR EMISSIONS SOURCES

For each permitted emission point, please submit a separate report for calendar year 19 90 prior to March 1st of the following year.

I GENERAL INFORMATION

1. Source Name: Agrico Chemical Company
2. Permit Number: A053-176685
3. Source Address: South Pierce Chemical Works, P.O. Box 1110
   Mulberry, Florida 33860
4. Description of Source: Sulfuric Acid Plant #10 - Double Absorption Contact Process with High Efficiency Demisters.

II ACTUAL OPERATING HOURS: 24 hrs/day 7 days/wk 52 wks/yr
Actual: 8623 hours

III RAW MATERIAL INPUT PROCESS WEIGHT: (List separately all materials put into process and specify applicable units if other than tons/yr)

Raw Material	Input Process Weight	
Sulfur	237,975	tons/y
		tons/y
		tons/y
		tons/y
		tons/y

IV PRODUCT OUTPUT (Specify applicable units)

Sulfuric Acid (100%)	728,999 Tons/year

DER Form 17-1.202(6)
Effective November 30, 1982

Northwest District
160 Governmental Center
Pensacola, Florida 32501-5794
904-436-8300

Northeast District
3426 Bay St.
Jacksonville, Florida 32207
904-798-4200

Central District
3319 Maguire Blvd., Suite 232
Orlando, Florida 32803-3767
305-894-7555

Southwest District
4520 Oak Fair Blvd.
Tampa, Florida 33610-7347
813-623-5561

South District
2269 Bay St.
Fort Myers, Florida 33901-2896
813-332-6975

Southeast District
1900 S. Congress Ave., Suite
West Palm Beach, Florida
305-964-6644

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHWEST DISTRICT
4520 OAK FAIR BLVD.
TAMPA, FLORIDA 33610-7347
813-623-5561
Suncom—552-7612

ANNUAL OPERATION REPORT FORM FOR AIR EMISSIONS SOURCES

For each permitted emission point, please submit a separate report for calendar year 19 89 prior to March 1st of the following year.

I GENERAL INFORMATION

1. **Source Name:** Agrico Chemical Company
2. **Permit Number:** A053-101764
3. **Source Address:** South Pierce Chemical Works, P.O. Box 1110
   Mulberry, Florida 33860
4. **Description of Source:** Sulfuric Acid Plant #10 - Double Absorption
   Contact Process with High Efficiency Demisters.

II ACTUAL OPERATING HOURS: 24 hrs/day 7 days/wk 52 wks/yr
Actual: 8194.8 hours

III RAW MATERIAL INPUT PROCESS WEIGHT: (List separately all materials put into process and specify applicable units if other than tons/yr)

Raw Material	Input Process Weight	
Sulfur	210,615.9	tons/yr
		tons/yr
		tons/yr
		tons/yr
		tons/yr

IV PRODUCT OUTPUT (Specify applicable units)

Sulfuric Acid (100%)	638,230.1 Tons/year

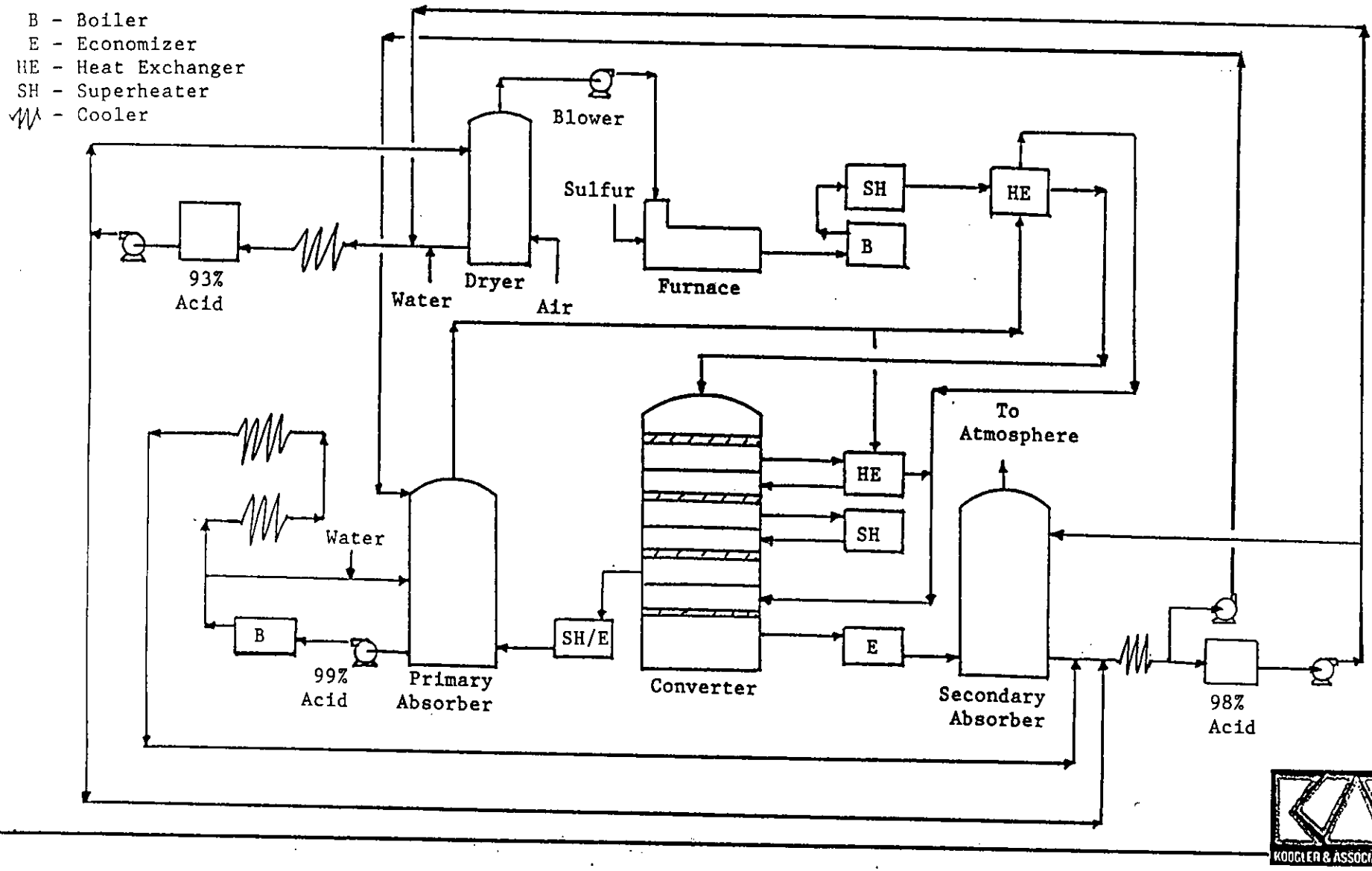
ATTACHMENT 2

PROCESS FLOW DIAGRAM

DUAL ABSORPTION SULFURIC ACID PLANT

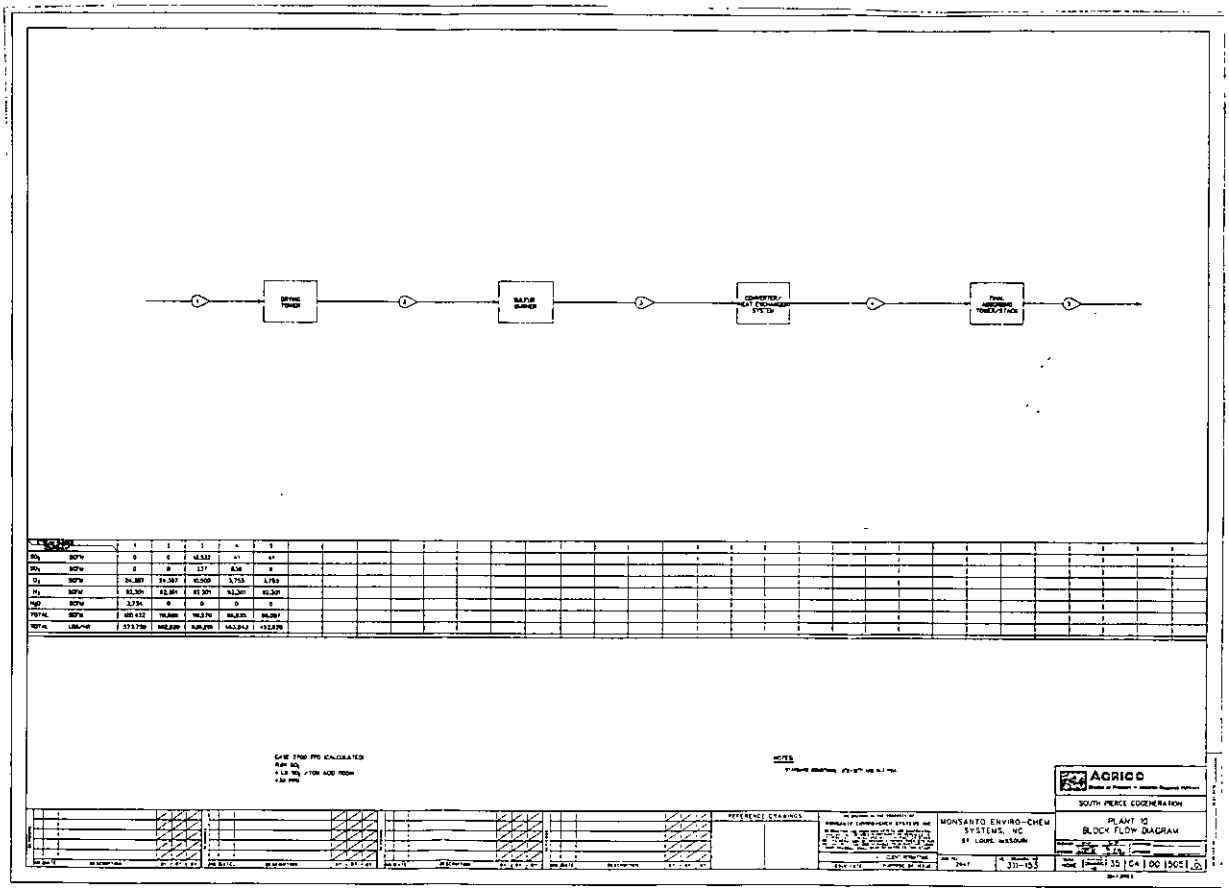
PROCESS FLOW DIAGRAM

AGRICO CHEMICAL COMPANY
POLK COUNTY, FLORIDA



ATTACHMENT 3

PROCESS FLOW DETAILS

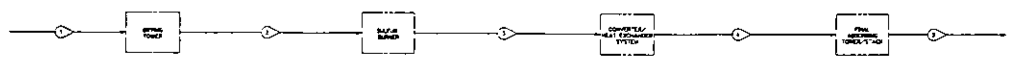


AGRICO

SOUTH PEACE COGENERATION

PLANT 10
BLOCK FLOW DIAGRAM

MONSANTO ENVIRO-CHEM SYSTEMS, INC
ST. LOUIS, MISSOURI



STREAM NO.		1	2	3	4	5
SO_2	SCFM	0	0	13,537	41	41
SO_3	SCFM	0	0	327	838	0
O_2	SCFM	24,387	24,387	10,500	3,755	3,755
N_2	SCFM	82,301	92,301	92,301	92,301	92,301
H_2O	SCFM	3,734	0	0	0	0
TOTAL	SCFM	120,422	116,688	116,370	96,835	96,097
TOTAL	LBS/HR	572,758	542,530	538,2[illegible]	483,843	452,828

CASE 2700 TPD [illegible]
[illegible] SO_2
[illegible] LB SO_2 / TON ACID [illegible]
[illegible] PPM

NOTES
[illegible]

REFERENCE DRAWINGS

MONSANTO ENVIRO-CHEM SYSTEMS INC.
ST. LOUIS, MISSOURI

AGRICO

SOUTH PIERCE COGENERATION

PLANT [illegible]
BLOCK FLOW DIAGRAM

311-154

35 | 04 | 00 | 50E

ATTACHMENT 4

IMC TEST DATA

Monsanto Enviro-Chem

Monsanto Enviro-Chem Systems, Inc.
Corporate Pointe
P.O. Box 14547
St. Louis, Missouri 63178-4547
Phone: (314) 275-5700

October 11, 1991

Mr. Clair H. Fancy
Florida Dept. of Environmental Regulations
Twin Towers Office Building
Tallahassee, Florida 32399-2400

Dear Mr. Fancy:

I understand per Mr. Kenneth Watkins of Agrico Chemical Co. that as a result of Agrico's DER permits application for a sulfuric acid project you have requested compliance data from a sulfuric acid plant which has been modified to incorporate Monsanto Enviro-Chem's Heat Recovery System. To satisfy that request please find enclosed the results of the compliance test taken 9/26/91 on IMC's plant 03.

The Heat Recovery System installed on IMC's plant is essentially the same process and equipment that will be installed on Agrico's plant. Much of the Heat Recovery System major equipment such as the tower, boiler and dilutor will be nearly identical.

I am also sending the enclosed compliance data to Mr. Pradeep Raval of Koogler & Associates a consultant working for Agrico who I understand is addressing this issue along with some other issues relative to Agrico's permit application. I expect the enclosed information will satisfy you needs if not please let me know.

Yours Truly,

Larry J. Ewing

Larry J. Ewing
Sr. Project Manager

cc: Paradeep Raval
Kenneth Watkins
David Randolph
Bob Smith

SUMMATION OF SULFURIC PLANT RATES AND COMPLIANCE RESULTS

EMISSION RATE CALCULATIONS FROM 40 CFR 60.84 & 60.85

E SO2/MIST = C SO2/MIST X S/0.265 - (0.0126 X O2)

E SO2/MIST = SO2/MIST EMISSION RATE, LB/TON ACID
C SO2/MIST = SO2/MIST CONCENTRATION, LB/DSCF OF SAMPLE
S = 11800 DSCF/TON ACID
O2 = OXYGEN CONCENTRATION OF STACK GAS

PLANT 03 DATE 9/26/91

RUN #	DSCF	MG. SO2	MG. MIST	% OXYGEN
1	42.59	1121.00	8.34	5.13
2	42.04	1107.00	8.36	5.13
3	42.03	969.00	8.90	5.28

		LBS/TON		LBS/TON
RUN 1	SO2	3.41	MIST	.03
RUN 2	SO2	3.41	MIST	.03
RUN 3	SO2	3.02	MIST	.03
AVG.		3.28		.03

BEGINNING FLOW METER READING	2973700	TIME/HRS	9 35
ENDING FLOW METER READING	3019200	TIME/HRS	12 52
MINUTES OF FLOW	197		
TOTAL FLOW/GAL	45500		
FLOW/GPM MAGMETER	231		

PRORATED PRODUCTION RATE FOR 24 HOURS 2442 TPD 100% ACID

DUPONT READING 320, EQUALS 3.16 LBS/TON

METHOD 7E NOX RESULTS

PPM*DSCFM*60*1/1E6*1/385*46 EQUALS LBS/HR NOX

NOX PPM	10.10	
DSCFM	110034	
LBS/HR NOX	7.97	(ALLOWABLE, 14.5 LBS/HR)
NOX LBS/TON OF H2SO4	.08	(ALLOWABLE, .12 LBS/TON)

9/26/91

SO2.CAL

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To DAVE RANDOLPH	From RCE & IMC
Co. MONSANTO	Co.
Dept.	Phone #
Fax # (314) 275 5701	Fax # 428-1563

10-11-91 08:41 AM P01

Monsanto Enviro-Chem

MONSANTO ENVIRO-CHEM SYSTEMS INC.
Corporate Square Office Park
Box 14547
St. Louis, Missouri 63178

MR. CLAIR H. FANCY
FLORIDA DEPT. OF ENVIRONMENTAL REGULATIONS
TWIN TOWERS OFFICE BUILDING
TALLAHASSEE, FL 32399-2400

ATTACHMENT 5

MOLTEN SULFUR EMISSION FACTORS SUMMARY

EMISSION FACTORS FOR SULFUR PARTICLES, TRS, SO_2 AND VOC IN MOLTEN SULFUR STORAGE AND HANDLING SYSTEMS

Sulfur particle emissions have been measured by Koogler & Associates (November 1988) from molten sulfur storage tanks in the phosphate chemical fertilizer industry. The measured sulfur particle concentrations in the gases vented from the storage tanks have ranged from 0.3-0.5 grains/ft^3. The higher concentrations were measured when the tanks were being filled with molten sulfur, and the lower concentrations when the tanks were idle. The average natural ventilation rates on multi-vent tanks were measured at about 18 cfm/vent.

Measurements of sulfur particle emissions at the Pennzoil terminals in Tampa, Florida, in October 1986 by Enviroplan were measured at 0.46 grains/ft^3 (NOTE: Data was corrected by Koogler and comments were transmitted to FDER, December 30, 1986). However, later tests conducted by Enviroplan (1987) at Sulfur Storage Company, Inc. in Tampa, Florida, measured sulfur particle concentrations at 0.12 grain/ft^3. It is believed that the Pennzoil tests and the Koogler tests during tank filling could contain condensed organics. Enviroplan (1987) indicated the total particulate concentrations including condensible hydrocarbons could be 2.5 times the sulfur particulate concentration.

Therefore, a reasonable estimate of sulfur particle concentration under all conditions is:

$$(0.3 + 0.12)/2 = 0.2 \text{ grains/ft}^3$$

Air vented from molten sulfur storage tanks and pits is also expected to contain small quantities of total reduced sulfur compounds, including H_2S (TRS), sulfur dioxide and volatile organic compounds (VOCs). The volatile organic compounds result from small quantities of petroleum products contained in Frasch sulfur (approximately 0.25%) and the vaporization of these compounds at the storage temperature of molten sulfur. The reduced sulfur compounds result from the reduction of elemental sulfur in the presence of carbon supplied by the petroleum products and the SO_2 results from the oxidation of elemental sulfur.

A limited number of measurements have been made on molten sulfur storage tanks at Frasch sulfur terminals in the Tampa area to determine TRS, SO_2, and VOC concentrations in the headspace of the tanks over molten sulfur. These measurements have been made on molten sulfur storage tanks with capacities in the range of 10,000 tons which are air purged at rates between 10 and 63 cfm to prevent the accumulation of H_2S. Because of the size of the tanks, the fact that they are air purged and the fact that sulfur delivered to the Port of Tampa most probably has a higher fraction of VOCs (due to the fact that there has been less time for the volatile fraction of the petroleum products to vaporize), measurements made in Tampa will overestimate TRS, SO_2 and VOC emissions from phosphate chemical fertilizer facilities which later receive the sulfur. However, as no other

data is available, the Tampa data will be used to estimate TRS (including H_2S), SO_2 and VOC emissions factors for molten sulfur storage tanks and molten sulfur pits. It should be recognized that the application of these emission factors will overstate the actual emissions by some unknown amount.

Measurements of TRS made in November 1983 by TRC and reported in the FDER "Sulfur Report" (February 1984) show the following:

Tank Purge Rate (CFM)	TRS (as H2S) in Headspace Over Molten Sulfur (ppm, vol)
43	280
63	403

Measurements made by Enviroplan, Inc. in 1987 in the headspace over molten sulfur in a tank purged at the rate of 10 cfm showed an average TRS concentration of 638 ppm (vol).

A "typical" concentration of TRS (as H_2S) in the headspace over molten sulfur can be estimated from these data:

$$[280 + 403 + 2(638)]/4 = 490 \text{ ppm (vol)}$$

$$= 3.5 \times 10^{-5} \text{ lb/ft}^3 \text{ at } 200^{\circ}\text{F}$$

Measurements of SO_2 made by TRC (1983) in the tank headspace over molten sulfur at purge rates of 43 and 63 cfm averaged 553 ppm (vol). This converts to an SO_2 concentration of 7.3×10^{-5} lb/ft^3 at 200°F.

Measurements made by Enviroplan, Inc. (1987) in the tank headspace over molten sulfur at STI in Tampa showed VOC concentrations that averaged 5.2×10^{-5} lb/ft^3.

Table 1 summarizes the above emission factors for molten sulfur storage and handling systems.

TABLE 1
SUMMARY OF EMISSION FACTORS FOR
MOLTEN SULFUR STORAGE AND
HANDLING SYSTEMS

Air Pollutant	Emission Factor
Sulfur Particle	0.2 grains/ft^3
TRS (as H_2S)	3.5×10^{-5} lb/ft^3
SO_2	7.3×10^{-5} lb/ft^3
VOC	5.2×10^{-5} lb/ft^3

REFERENCES

1. "Preliminary Report on Emissions From Tank No. 4 at Sulfur Terminal Co.,Inc., Tampa, Florida." TRC Environmental Consultants, Inc., East Hartford, Connecticut, December 30, 1983.

2. "Sulfur Report." Bureau of Air Quality Management, Florida Department of Environmental Regulation, Tallahassee, Florida, February 1984.

3. "Sulfur Particulate Emission Measurement Project at the Pennzoil Terminals in Tampa, Florida." Enviroplan, Inc., West Orange, New Jersey, October 1986.

4. Comments in a letter dated December 30, 1986, by Dr. John Koogler, Koogler & Associates to Mr. Steve Smallwood, FDER, on Enviroplan's Pennzoil Sulfur Company emission measurement report.

5. "Technical Report Supporting Application to the Florida DER For An Alternate Sulfur Particulate Emissions Sampling Procedure." Enviroplan, Inc., West Orange, New Jersey, October 30, 1987.

6. "Particulate Matter Emission Measurements From Molten Sulfur Storage Tanks at Gardinier, Inc., Tampa, Florida." Koogler & Associates, Gainesville, Florida, November 7-8, 1988.

7. Discussions with Enviroplan, Inc. at a meeting in New Orleans, Louisiana, on July 6, 1989. Enviroplan supplied measurement data on TRS and VOC concentrations in the headspace over molten sulfur storage tanks at the Sulfur Terminals Company, Inc. in Tampa, Florida, for testing which was conducted during September 1987.