State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee

To: ______ Loctn.: ______
To: ______ Loctn.: ______
To: ______ Loctn.: ______
From: ______ Date: ______

12.17.23

TO: Jacob D. Varn
Secretary

FROM: J. P. Subramani, Chief JPSubramani
Bureau of Air Quality Management

DATE: August 20, 1979

SUBJECT: BACT Determination - New Wales Chemicals, Inc. Sulfuric Acid Plants No. 4 and No. 5, to be located in Polk County

Facility: Two identical double absorption sulfuric acid plants with a combined process input rate of 1320 tons/day of sulfur.

<u>BACT Determination Requested by the Applicant</u>:

Pollutant	
SO_2:	4 lbs/ton 100% H_2SO_4 acid produced
Sulfuric Acid Mist:	0.15 lbs/ton 100% H_2SO_4 acid produced

<u>Date of Receipt of a Complete BACT Application</u>:

June 5, 1979

<u>Date of Publication in the Florida Administrative Weekly</u>:

August 6, 1979

<u>Date of Publication in a Newspaper of General Circulation</u>:

August 8, 1979, The Ledger, Lakeland, Florida

Study Group Members:

A BACT determination on a sulfuric acid plant was completed April 16, 1979. There has been no significant technological improvement since that date. Thus the same BACT applies and a study group is not needed.

EPA's New Source Performance Standards (NSPS) for Sulfuric Acid Plants:

Pollutant	Rate of Concentration
SO_2:	4 #/ton of 100 H_2SO_4
Sulfuric Acid Mist:	0.15 #/ton of 100% H_2SO_4

BACT Determination by the Florida Department of Environmental Regulation:

SO_2:	Emission not to exceed 4.0 #/ton of 100% H_2SO_4/attainable with a double absorption system.
Sulfuric Acid Mist:	Emissions not to exceed 0.15 #/ton of 100% H_2SO_4/attainable with a high efficiency demister.
Opacity:	Not greater than 10 percent.
Test Method:	As precribed in EPA NSPS, 40 CFR, Part 60, Subpart H.

Justification of DER Determination:

There has been no significant technological improvements since December 1978 when EPA reviewed its NSPS for this type of source. Although lower emissions than NSPS are attainable the selection of NSPS as BACT allows for the normal decrease in efficiency with the passage of time.

Details of the Analysis May be Obtained by Contacting:

Victoria Martinez, BACT Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Twin Towers Office Building
Tallahassee, Florida 32301

Recommendation from: Bureau of Air Quality Management

by: JP Subramani
J. P. Subramani

Date: AUGUST 20, 1979

Approved by: Jacob D. Varn
Jacob D. Varn

Date: 21st AUGUST 1979

JDV/es

Attachment

PAID

DER
APR 10 1979
SOUTHWEST DISTRICT
TAMPA

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

Source Type: [X] Air Pollution [ ] Incinerator

Application Type: [X] Construction [ ] Operation [ ] Modification [ ] Renewal of DER Permit No. ____

Company Name: NEW WALES CHEMICALS, INC. County: POLK

Identify the specific emission point source(s) addressed in this application (i.e.: Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired): CONTACT SULFURIC ACID PLANT WITH DOUBLE ABSORPTION (05)

Source Location: Street: HWY. 640 & COUNTY LINE RD. City: MULBERRY

UTM: East 396.6 North 3078.9

Latitude: ___° ___' ___"N. Longitude: ___° ___' ___"W.

Appl. Name and Title: THOMAS L. CRAIG, VICE PRESIDENT AND GENERAL MANAGER

Appl. Address: P. O. BOX 1035 MULBERRY, FL. 33860

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative of* NEW WALES CHEMICALS, INC.

I certify that the statements made in this application for a CONSTRUCTION permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provisions of Chapter 403, Florida Statutes, and all the rules and regulations of the Department and revisions thereof. I also understand that a permit, if granted by the Department, will be nontransferable and I will promptly notify the Department upon sale or legal transfer of the permitted establishment.

THOMAS L. CRAIG
Name of Person Signing (please Type or Print)

Thomas L Craig VICE PRES. & GEN. MGR.
Signature of the Owner or Authorized Representative and Title

Date: 4-6-79 Telephone No.: 813-428-2531

*Attach a letter of authorization.

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgement, that the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the Department. It is also agreed that the undersigned will furnish the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signature: ____

Name: CRAIG A. PFLAUM
(Please Type)

Mailing Address: P. O. BOX 1035
MULBERRY, FL. 33860

Company Name: NEW WALES CHEMICALS, INC.

Telephone No.: 813-428-2531

Florida Registration Number: 18595

Date: 4-6-79

(Affix Seal)

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

NEW SOURCE 2000 TPD DESIGN MONSANTO ENVIROCHEM DOUBLE ABSORPTION SULFURIC ACID PLANT. PLANT DESIGN WILL ACHIEVE NEW SOURCE PERFORMANCE STANDARDS FOR SULFURIC ACID PLANTS.

B. Schedule of Project Covered in this Application (Construction Permit Application Only).

Start of Construction: JUNE 30, 1980 Completion of Construction: JUNE 30, 1983

C. Costs of Construction. (Note: show breakdown of estimated costs only for individual components/units of the project serving pollution control purpose. Information on actual costs shall be furnished with the application for operation permit.)

ESTIMATED COST OF DOUBLE VS. SINGLE ABSORPTION PLUS INSTALLATION OF BRINKS DEMISTERS, WATER REUSE FACILITIES, CONTINUOUS MONITOR FOR SO_2 AND ACCESS COMPLIANCE MONITORING IS $5,000,000.00

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

NONE

E. Is the emission point considered to be a New* or Existing* source, as defined in Chapter 17-2.02(5) & (6), Florida Administrative Code?
X New ____ Existing

F. Is this application associated with or part of a Development of Regional Impact (DRI) pursuant to Chapter 380, Florida Statutes, and Chapter 22F-2, Florida Administrative Code? ____ Yes X No

G. Normal Equipment Operating Time: hrs/day: 24 ; days/wk: 7 ; wks/yr: 50 ; if seasonal, describe: ____

*Note

New Source: any source which came into existence, began operation or construction, or received a permit for the latter on or after January 18, 1972.

Existing Source: any source in existence, operating or under construction (or with a permit to construct) prior to January 18, 1972.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES

(other than incinerators)

A. Raw Materials and Chemicals Used in Your Process:

Description	Utilization Rate lbs./hr.	Relate to Flow Diagram
MOLTEN SULFUR	660 TPD	SULFUR BURNER

B. Process Rate:

1) Total Process Input Rate (lbs./hr.): 660 TPD SULFUR

2) Product Weight (lbs/hr): 2000 TPD H_2SO_4

C. Airborne Contaminants Discharged:

Name of Contaminant	Actual Discharge*		Allowed Discharge Rate Per Ch. 17-2, F.A.C.**	Allowable Discharge*** (lbs./hr.)	Relate to Flow Diagram
	lbs./hr.	T/yr.			
SO_2	≦ 4 TPD		4# SO_2/TON H_2SO_4	–	STACK
H_2SO_4 MIST	≦ 0.15	TPD	0.15# MIST/TON	H_2SO_4	STACK

D. Control Devices:

Name and Type (Model and Serial No.)	Contaminant	Efficiency†	Range of Particles Size Collected (in microns)	Basis for Efficiency††
DOUBLE ABSORPTION	SO_2	99.7	NA	DESIGN
TOWERS WITH BRINKS	H_2SO_4 MIST	100%	>3 MICRONS	"
HV MIST ELIMINATORS		85–97%	1–3 MICRONS	"
		50–85%	<1/2 MICRON	"

*Estimate only if this is an application to construct.

**Specify units in accordance with emission standards prescribed within Section 17-2.04, F.A.C. (e.g. Section 17-2.04(6)(e)1.a. specifies that new fossil fuel steam generators are allowed to emit particulate matter at a rate of 0.1 lbs. per million BTU heat input computed as a maximum 2-hour average.)

***Using above example for a source with 250 million BTU per hour heat input: $\frac{0.1 \text{ lbs}}{\text{MMBTU}} \times \frac{250 \text{ MMBTU}}{\text{hr.}} = 25$ lbs./hr.

†See Supplemental Requirements, page 5, number 2.

††Indicate whether the efficiency value is based upon performance testing of the device or design data.

E. Fuels: NA

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg./hr.	Max./hr.	

*Units: Natural Gas - MMCF/hr.; Fuel Oils, Coal - lbs./hr.

Fuel Analysis:

Percent Sulfur: ______ Percent Ash: ______

Density: ______ lb./gal.

Heat Capacity: ______ BTU/lb. ______ BTU/gal.

Other Fuel Contaminants: ______

F. If applicable, indicate the percent of fuel used for space heating: Annual Average: ______ Maximum: ______

G. Indicate liquid or solid wastes generated and method of disposal:

ALL BLOWDOWN REUSED IN KINGSFORD OPERATION

H. Emission Stack Geometry and Flow Characteristics (provide data for each stack):

Stack Height: 199 ft.

Stack Diameter: 8.5 ft.

Gas Flow Rate: 120,000 ACFM

Gas Exit Temperature: 160 °F

Water Vapor Content: 0 %

SECTION IV: INCINERATOR INFORMATION

NOT APPLICABLE

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Lbs./Hr. Incinerated							

Description of Waste: ______

Total Weight Incinerated (lbs./hr.): ______ Design Capacity (lbs./hr.): ______

Approximate Number of Hours of Operation per Day: ______ , days/week: ______

Manufacturer: ______

Date Constructed: ______ Model No.: ______

	Volume (ft.)^3	Heat Release (BTU/hr.)	Fuel		Temp. (°F)
			Type	BTU/hr.	
Primary Chamber					
Secondary Chamber					

Stack Height: ______ ft. Stack Diameter: ______ Stack Temp.: ______ °F

Gas Flow Rate: ______ ACFM ______ DSCFM*

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of Pollution Control Device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (Specify): ______

Brief Description of Operating Characteristics of Control Device: ______

Ultimate Disposal of Any Effluent Other Than That Emitted From the Stack (scrubber water, ash, etc.): ______

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please Provide the Following Supplements Required For All Pollution Sources:

1. Total process input rate and product weight - show derivation.
2. Efficiency estimation of control device(s) - show derivation. Include pertinent test and/or design data.
3. An 8½" x 11" flow diagram, which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
4. An 8½" x 11" plot plan of facility showing the exact location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.
5. An 8½" x 11" plot plan showing the exact location of the establishment, and points of airborne emissions in relation to the surrounding area, residences and other permanent structures and roadways. (*Example: Copy of USGS topographic map.*)
6. Description and sketch of storm water control measures taken both during and after construction.
7. An application fee of $20.00, unless exempted by Chapter 17-4.05(3), FAC, made payable to the Department of Environmental Regulation.
8. With construction permit application, include design details for control device(s). Example: for baghouse, include cloth to air ratio; for scrubber, include cross-sectional sketch; etc.
9. Certification by the P.E. with the operation permit application that the source was constructed as shown in the construction permit application.

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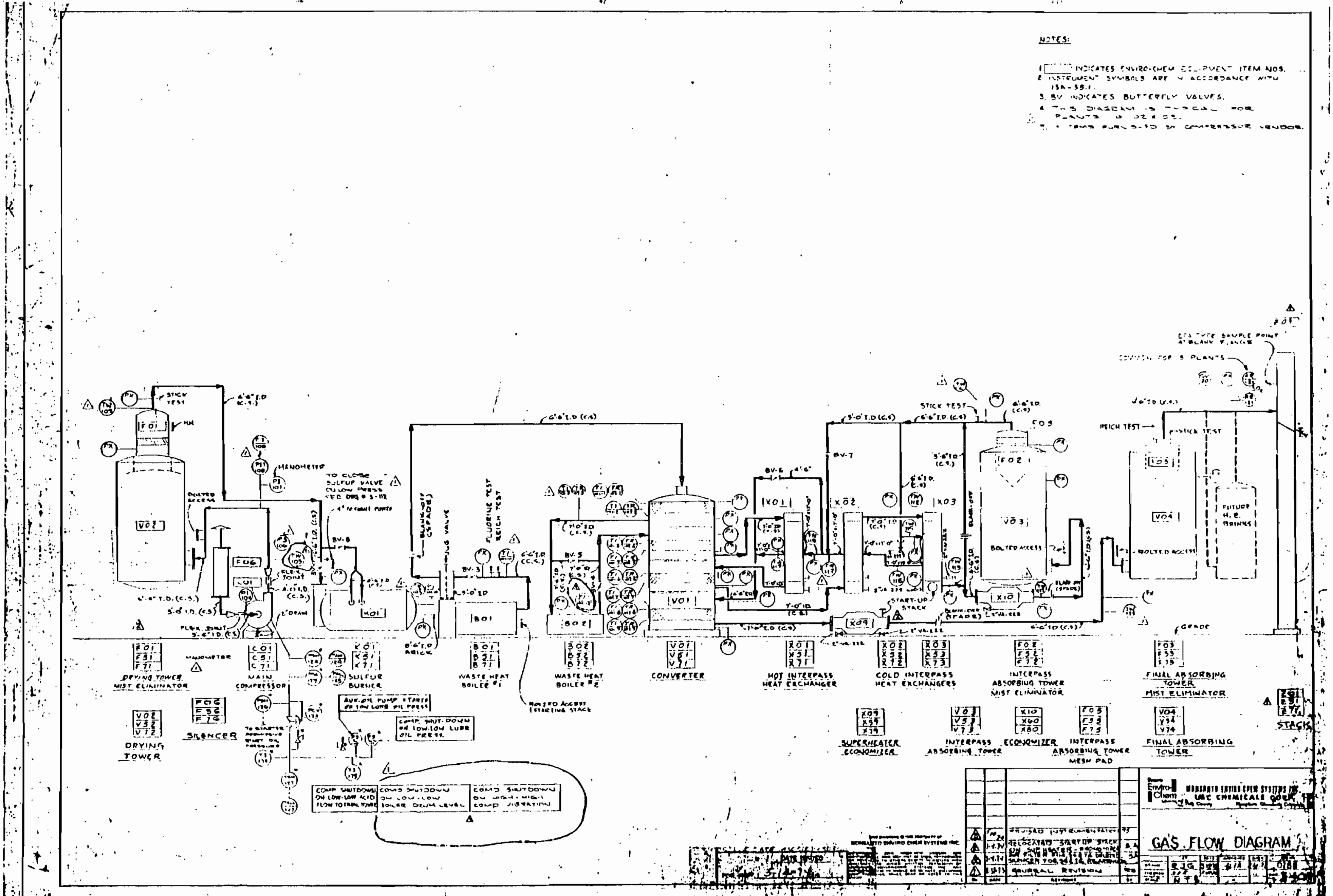

NOTES:

1. ▭ INDICATES ENVIRO-CHEM EQUIPMENT ITEM NOS.
2. INSTRUMENT SYMBOLS ARE IN ACCORDANCE WITH ISA-S5.1.
3. BV INDICATES BUTTERFLY VALVES.
4. THIS DIAGRAM IS TYPICAL FOR PLANTS [illegible]
5. [illegible] ITEMS FURNISHED BY COMPRESSOR VENDOR.

COMP. SHUT-DOWN ON LOW-LOW ACID FLOW TO FINAL TOWER

COMP SHUTDOWN ON LOW-LOW BOILER DRUM LEVEL

COMP SHUTDOWN ON HIGH-HIGH COMP VIBRATION

AUX. OIL PUMP STARTS ON LOW LUBE OIL PRESS

COMP. SHUT-DOWN ON LOW-LOW LUBE OIL PRESS.

TO CLOSE SULFUR VALVE ON LOW PRESS SEE DWG # S-112

Enviro-Chem
MONSANTO ENVIRO-CHEM SYSTEMS INC.
USC CHEMICALS CORP.

GAS FLOW DIAGRAM

4		REVISED INSTRUMENTATION	
3		RELOCATED STARTUP STACK	
2		[illegible] SUPERHEATER - ECONOMIZER [illegible] SILENCER [illegible]	
1		GENERAL REVISION	
NO.	DATE	REVISION	BY

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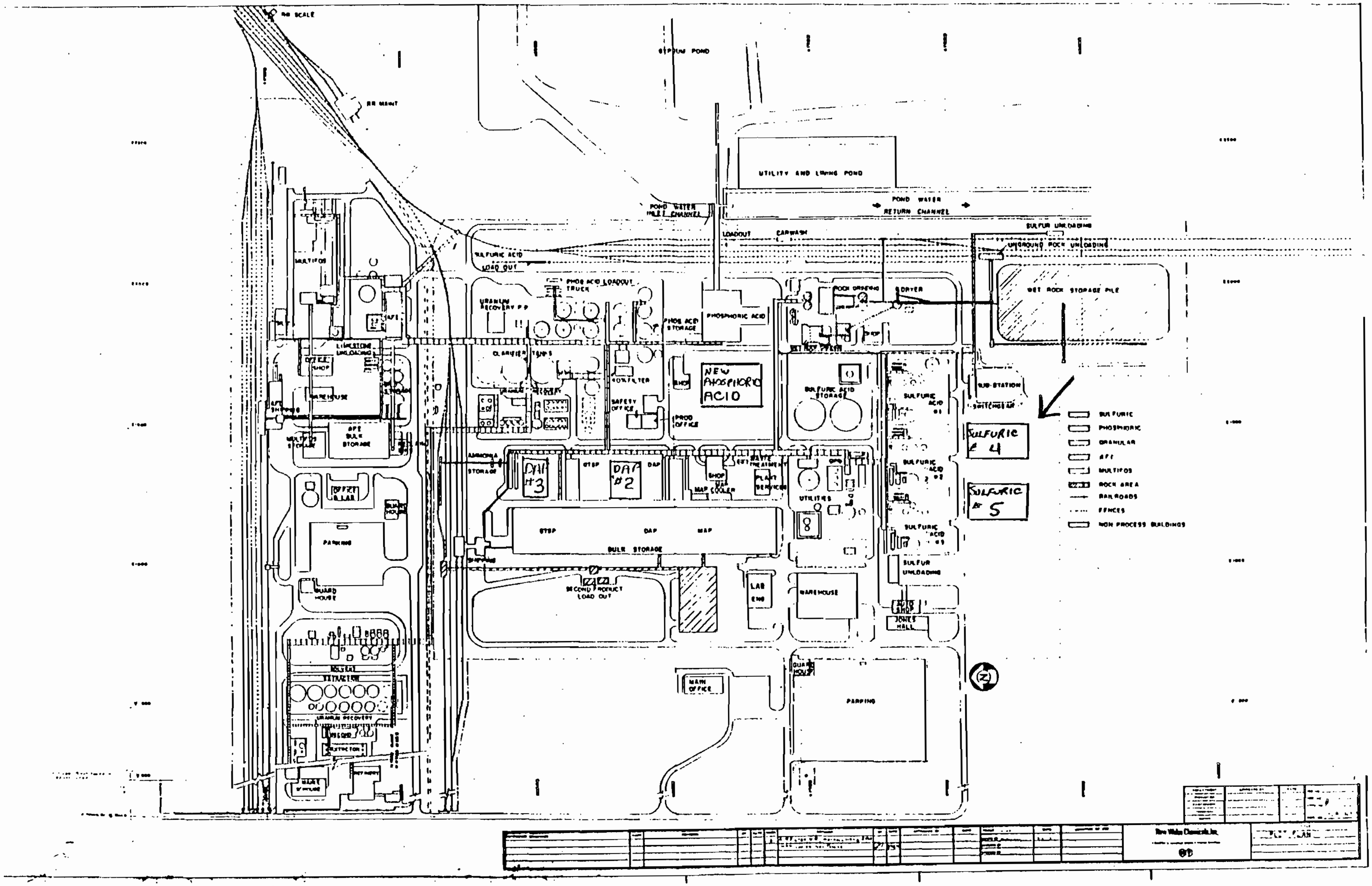


HARRY L. CARROLL
Vice President
Florida

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

November 22, 1978

Mr. T. L. Craig
Vice President & General Manager
New Wales Chemicals, Inc.
Post Office Box 1035
Mulberry, Florida 33860

Dear Tom:

This letter is your authorization to sign on behalf of New Wales Chemicals, Inc. the various applications for permits, specifically the applications for operating permits from the Florida Department of Environmental Regulation.

Very truly yours,

Harry Carroll

Harry L. Carroll

t

Post Office Box 3807 • Lakeland, Florida 33802 • (813) 646-5061

STATE OF FLORIDA

DEPARTMENT OF STATE • DIVISION OF CORPORATIONS

I certify from the records of this office that IMC CHEMICALS CORP., changed its name to; NEW WALES CHEMICALS, INC., is a corporation organized under the Laws of the State of Delaware, authorized to transact business within the State of Florida, qualified on the 1st day of June, 1977, under the new name.

I further certify that said corporation has paid all fees due this office through December 31, 1977 and its status is active.

GIVEN under my hand and the Great
Seal of the State of Florida, at
Tallahassee, the Capital, this the
1st day of June
1977 .

SECRETARY OF STATE

PAID

D.E.R.
APR 10 1979
SOUTHWEST DISTRICT
TAMPA

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

Source Type: [X] Air Pollution [ ] Incinerator

Application Type: [X] Construction [ ] Operation [ ] Modification [ ] Renewal of DER Permit No. ________

Company Name: NEW WALES CHEMICALS, INC. **County:** POLK

Identify the specific emission point source(s) addressed in this application (i.e.: Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired): CONTACT SULFURIC ACID PLANT WITH DOUBLE ABSORPTION (04)

Source Location: Street: HWY. 640 & COUNTY LINE RD. **City:** MULBERRY

UTM: East 396.6 **North** 3078.9

Latitude: ___ ___ ° ___ ___ ' ___ ___ "N. **Longitude:** ___ ___ ° ___ ___ ' ___ ___ "W.

Appl. Name and Title: THOMAS L. CRAIG, VICE PRESIDENT AND GENERAL MANAGER

Appl. Address: P. O. BOX 1035 MULBERRY, FL. 33860

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative of* NEW WALES CHEMICALS, INC.

I certify that the statements made in this application for a CONSTRUCTION permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provisions of Chapter 403, Florida Statutes, and all the rules and regulations of the Department and revisions thereof. I also understand that a permit, if granted by the Department, will be nontransferable and I will promptly notify the Department upon sale or legal transfer of the permitted establishment.

THOMAS L. CRAIG
Name of Person Signing (please Type or Print)

Thomas L Craig VICE PRES. & GEN. MGR.
Signature of the Owner or Authorized Representative and Title

Date: 4-6-79 Telephone No.: 813-428-2531

*Attach a letter of authorization.

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgement, that the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the Department. It is also agreed that the undersigned will furnish the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signature: Craig A Pflaum

Name: CRAIG A. PFLAUM
(Please Type)

Company Name: NEW WALES CHEMICALS, INC.

Florida Registration Number: 18595

(Affix Seal)

Mailing Address: P. O. BOX 1035
MULBERRY, FL. 33860

Telephone No.: 813-428-2531

Date: 4-6-79

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

NEW SOURCE 2000 TPD DESIGN MONSANTO ENVIROCHEM DOUBLE ABSORPTION SULFURIC ACID PLANT. PLANT DESIGN WILL ACHIEVE NEW SOURCE PERFORMANCE STANDARDS FOR SULFURIC ACID PLANTS.

B. Schedule of Project Covered in this Application (Construction Permit Application Only).

Start of Construction: JUNE 30, 1980 Completion of Construction: JUNE 30, 1983

C. Costs of Construction. (Note: show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

ESTIMATED COST OF DOUBLE VS. SINGLE ABSORPTION PLUS INSTALLATION OF BRINKS DEMISTERS, WATER REUSE FACILITIES, CONTINUOUS MONITOR FOR SO2 AND ACCESS COMPLIANCE MONITORING IS $5,000,000.00

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

NONE

E. Is the emission point considered to be a New* or Existing* source, as defined in Chapter 17-2.02(5) & (6), Florida Administrative Code?
X New ____ Existing

F. Is this application associated with or part of a Development of Regional Impact (DRI) pursuant to Chapter 380, Florida Statutes, and Chapter 22F-2, Florida Administrative Code? ____ Yes X No

G. Normal Equipment Operating Time: hrs/day: 24 ; days/wk: 7 ; wks/yr: 50 ; if seasonal, describe: ____

*Note

New Source: any source which came into existence, began operation or construction, or received a permit for the latter on or after January 18, 1972.

Existing Source: any source in existence, operating or under construction (or with a permit to construct) prior to January 18, 1972.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES

(other than incinerators)

A. Raw Materials and Chemicals Used in Your Process:

Description	Utilization Rate lbs./hr.	Relate to Flow Diagram
MOLTEN SULFUR	660 TPD	SULFUR BURNER

B. Process Rate:

1) Total Process Input Rate (lbs./hr.): 660 TPD SULFUR

2) Product Weight (lbs/hr): 2000 TPD H_2SO_4

C. Airborne Contaminants Discharged:

Name of Contaminant	Actual Discharge*		Allowed Discharge Rate Per Ch. 17-2, F.A.C.**	Allowable Discharge*** (lbs./hr.)	Relate to Flow Diagram
	lbs./hr.	T/yr.			
SO_2	≦ 4 TPD		4# SO_2/TON H_2SO_4	–	STACK
H_2SO_4 MIST	≦ 0.15	TPD	0.15# MIST/TON	H_2SO_4	STACK

D. Control Devices:

Name and Type (Model and Serial No.)	Contaminant	Efficiency†	Range of Particles Size Collected (in microns)	Basis for Efficiency††
DOUBLE ABSORPTION	SO_2	99.7	NA	DESIGN
TOWERS WITH BRINKS	H_2SO_4 MIST	100%	>3 MICRONS	"
HV MIST ELIMINATORS		85-97%	1-3 MICRONS	"
		50-85%	<1/2 MICRON	"

*Estimate only if this is an application to construct.

**Specify units in accordance with emission standards prescribed within Section 17-2.04, F.A.C. (e.g. Section 17-2.04(6)(e)1.a. specifies that new fossil fuel steam generators are allowed to emit particulate matter at a rate of 0.1 lbs. per million BTU heat input computed as a maximum 2-hour average.)

***Using above example for a source with 260 million BTU per hour heat input: $\frac{0.1\ \text{lbs}}{\text{MMBTU}} \times \frac{260\ \text{MMBTU}}{\text{hr.}} = 26$ lbs./hr.

†See Supplemental Requirements, page 5, number 2.

††Indicate whether the efficiency value is based upon performance testing of the device or design data.

E. Fuels: NA

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg./hr.	Max./hr.	

*Units: Natural Gas - MMCF/hr.; Fuel Oils, Coal - lbs./hr.

Fuel Analysis:

Percent Sulfur: ______ Percent Ash: ______

Density: ______ lb./gal.

Heat Capacity: ______ BTU/lb. ______ BTU/gal.

Other Fuel Contaminants: ______

F. If applicable, indicate the percent of fuel used for space heating: Annual Average: ______ Maximum: ______

G. Indicate liquid or solid wastes generated and method of disposal:

ALL BLOWDOWN REUSED IN KINGSFORD OPERATION

H. Emission Stack Geometry and Flow Characteristics (provide data for each stack):

Stack Height: 199 ft. Stack Diameter: 8.5 ft.

Gas Flow Rate: 120,000 ACFM Gas Exit Temperature: 160 °F

Water Vapor Content: 0 %

SECTION IV: INCINERATOR INFORMATION

NOT APPLICABLE

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Lbs./Hr. Incinerated							

Description of Waste: ______

Total Weight Incinerated (lbs./hr.): ______ Design Capacity (lbs./hr.): ______

Approximate Number of Hours of Operation per Day: ______, days/week: ______

Manufacturer: ______

Date Constructed: ______ Model No.: ______

	Volume (ft.)^3	Heat Release (BTU/hr.)	Fuel		Temp. (°F)
			Type	BTU/hr.	
Primary Chamber					
Secondary Chamber					

Stack Height: ____________ ft. Stack Diameter: ____________ Stack Temp.: ____________ °F

Gas Flow Rate: ____________ ACFM ____________ DSCFM*

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of Pollution Control Device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (Specify): ____________

Brief Description of Operating Characteristics of Control Device: ____________

Ultimate Disposal of Any Effluent Other Than That Emitted From the Stack (scrubber water, ash, etc.): ____________

SECTION V: SUPPLEMENTAL REQUIREMENTS

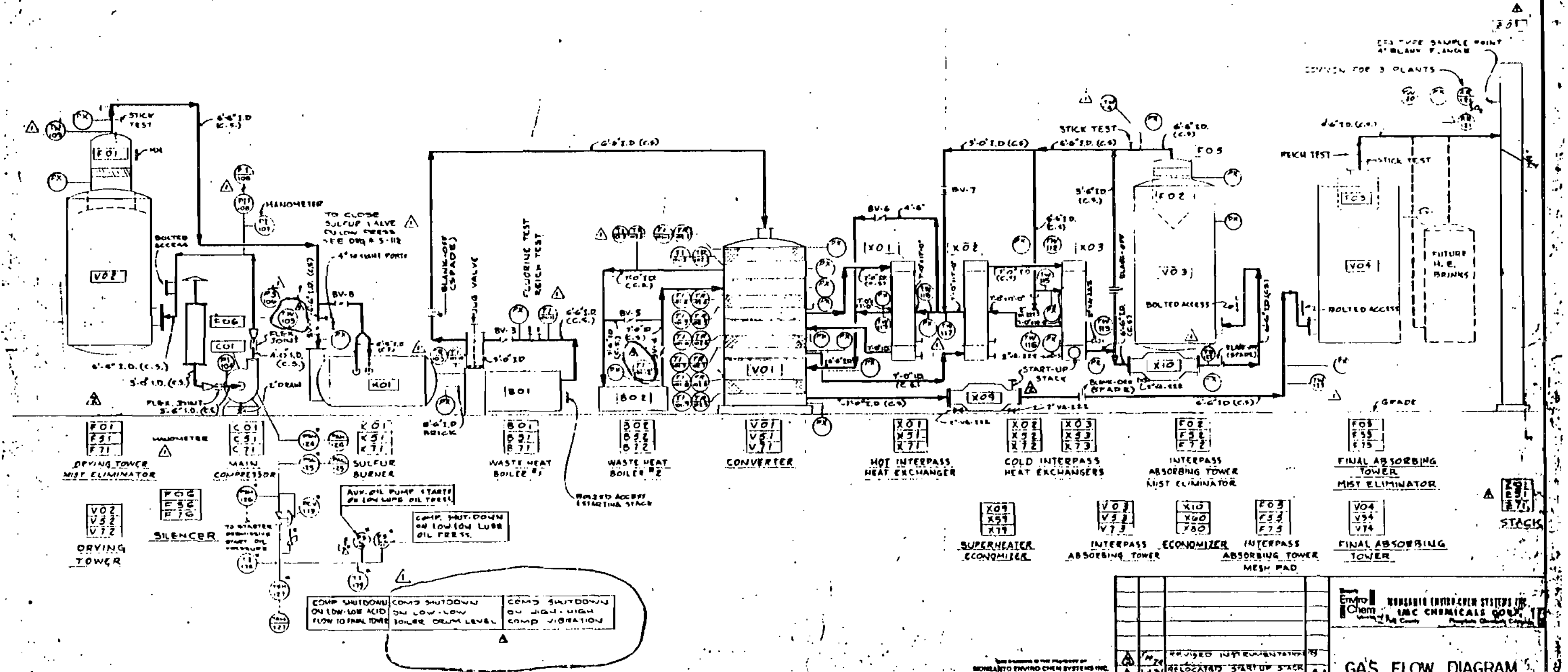
Please Provide the Following Supplements Required For All Pollution Sources:

1. Total process input rate and product weight - show derivation.
2. Efficiency estimation of control device(s) - show derivation. Include pertinent test and/or design data.
3. An 8½" x 11" flow diagram, which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
4. An 8½" x 11" plot plan of facility showing the exact location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.
5. An 8½" x 11" plot plan showing the exact location of the establishment, and points of airborne emissions in relation to the surrounding area, residences and other permanent structures and roadways. (Example: Copy of USGS topographic map.)
6. Description and sketch of storm water control measures taken both during and after construction.
7. An application fee of $20.00, unless exempted by Chapter 17-4.05(3), FAC, made payable to the Department of Environmental Regulation.
8. With construction permit application, include design details for control device(s). Example: for baghouse, include cloth to air ratio; for scrubber, include cross-sectional sketch; etc.
9. Certification by the P.E. with the operation permit application that the source was constructed as shown in the construction permit application.

BEST AVAILABLE COPY

NOTES:

1. ▭ INDICATES ENVIRO-CHEM EQUIPMENT ITEM NOS.
2. INSTRUMENT SYMBOLS ARE IN ACCORDANCE WITH ISA-S5.1.
3. BV INDICATES BUTTERFLY VALVES.
4. THIS DIAGRAM IS TYPICAL FOR PLANTS [illegible]
5. ITEMS FURNISHED BY COMPRESSOR VENDOR.



No.	DATE	REVISIONS	BY
4	[illegible]	REVISED INSTRUMENTATION	[illegible]
3	[illegible]	RELOCATED START-UP STACK SUPERHEATER-ECONOMIZER [illegible]	S.A.
2	[illegible]	[illegible] SILENCER [illegible]	[illegible]
1	[illegible]	GENERAL REVISION	[illegible]

Enviro-Chem
MONSANTO ENVIRO-CHEM SYSTEMS INC.
IMC CHEMICALS GROUP
Polk County
Phosphate Chemicals Complex

GAS FLOW DIAGRAM

R.J.G.
N.T.S.
0788
S-408

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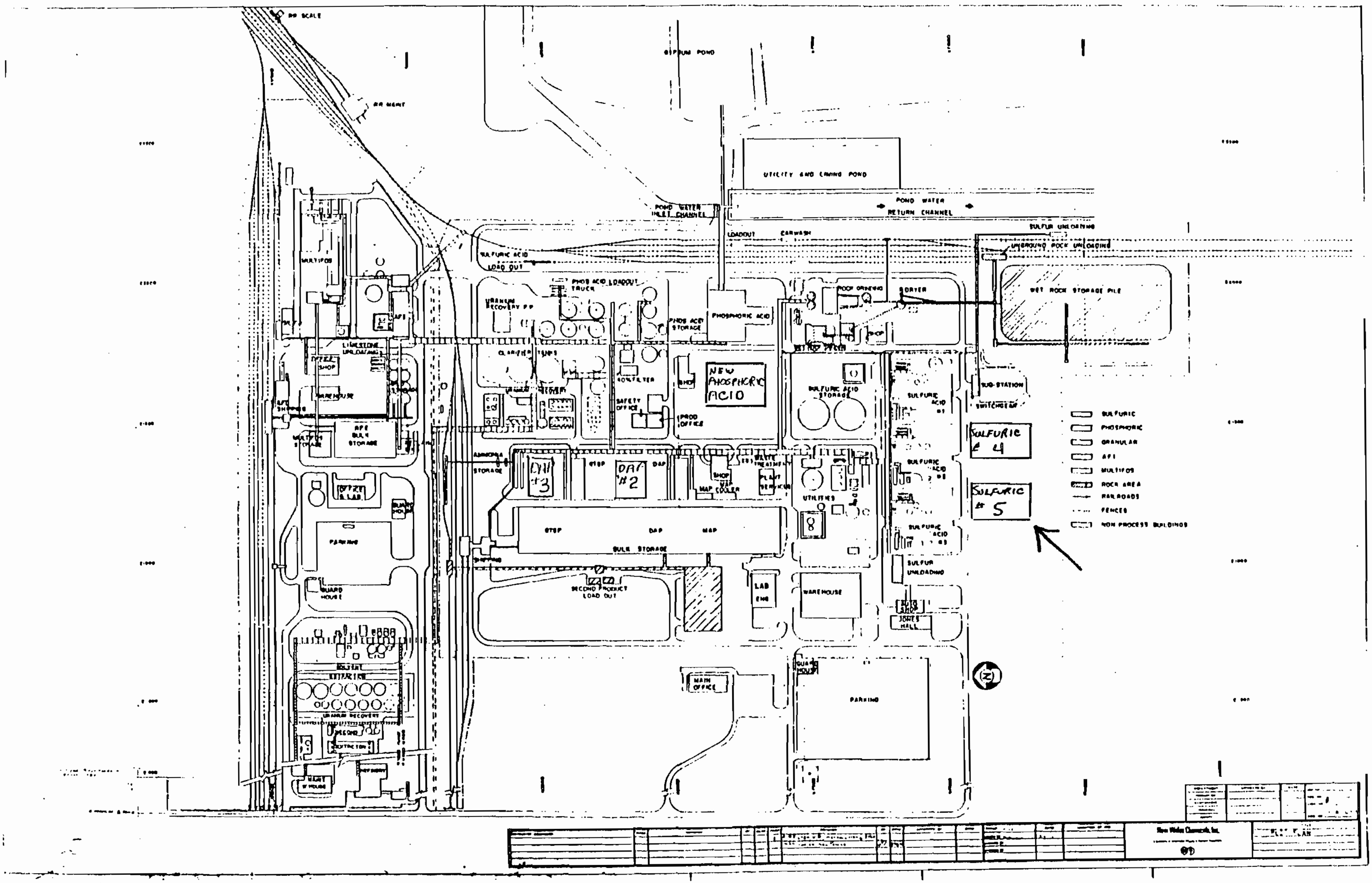


HARRY L. CARROLL
Vice President
Florida

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

November 22, 1978

Mr. T. L. Craig
Vice President & General Manager
New Wales Chemicals, Inc.
Post Office Box 1035
Mulberry, Florida 33860

Dear Tom:

This letter is your authorization to sign on behalf of New Wales Chemicals, Inc. the various applications for permits, specifically the applications for operating permits from the Florida Department of Environmental Regulation.

Very truly yours,

Harry L. Carroll

t

Post Office Box 3807 • Lakeland, Florida 33802 • (813) 646-5061

STATE OF FLORIDA

DEPARTMENT OF STATE • DIVISION OF CORPORATIONS

I certify from the records of this office that IMC CHEMICALS CORP., changed its name to; NEW WALES CHEMICALS, INC., is a corporation organized under the Laws of the State of Delaware, authorized to transact business within the State of Florida, qualified on the 1st day of June, 1977, under the new name.

I further certify that said corporation has paid all fees due this office through December 31, 1977 and its status is active.

GIVEN under my hand and the Great Seal of the State of Florida, at Tallahassee, the Capital, this the 1st day of June 1977.

SECRETARY OF STATE

P.O. BOX 1035 • MULBERRY, FLORIDA 33860
TELEPHONE: AREA CODE 813 • 428-2531

file:
12.17.23

IMC
INTERNATIONAL MINERALS & CHEMICAL CORPORATION

August 4, 1981

AUG 1981
BUREAU
AOM

Chief, Consolidated Permits Branch
Enforcement Division
U.S.Environmental Protection Agency
345 Courtland St. NE
Atlanta, GA 30365

RE: PSD-FL-072

Dir Sir:

In accordance with Part II: General Conditions Section 3 of the above referenced PSD Permit, International Minerals & Chemical Corporation, New Wales Operations is hereby notifying you that the compliance testing for Sulfuric Acid Plant No.04 has been scheduled for September 15, 1981.

IMC, New Wales Operations, intends to use the services of Sholtes & Koogler Environmental Consultants, 12316 NW 6th St. Gainesville, Florida 32601 for the performance of the required testing.

At this time we also wish to inform you of the name change from New Wales Chemcials Inc., a subsidiary of International Minerals & Chemical Corporation to International Minerals & Chemical Corporation, New Wales Operations. The name change was brought about through a statutory merger and does not constitute any change in ownership.

Very truly yours,

R. L. Girardin/for
Joseph M. Baretincic
Director,
Environmental Services

CC: R.R.Garrett - Tampa
S. Smallwood - Tallahassee

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee

To: ______________ Loctn.: ______________
To: ______________ Loctn.: ______________
To: ______________ Loctn.: ______________
From: ______________ Date: ______________

Reply Optional [ ] Reply Required [ ] Info. Only [ ]
Date Due: ________ Date Due: ________

TO: Steve Smallwood

THRU: Bill Thomas

FROM: Willard Hanks wmh

DATE: January 14, 1981

SUBJ: New Wales Chemicals, Inc. - Polk County
Maufunction of a Sulfuric Acid Plant.

Around 10 a.m. on November 24, 1980, the vibration detector on the combustion air blower to the boiler in one of New Wales Chemicals, Inc. sulfuric aicd plant was activated and automatically shut the blower down. As the plant operates under pressure (+248" water), the sulfur dioxide gas in the process equipment (furnace, boiler, ducts and convertors) escaped through the air inlet filter to the atmosphere.

The sulfur dioxide plume settled on the plants' property where 77 workers (construction) were building new chemical facilities. The company sent these workers to a hospital where all but two were checked and released that day. Two workers that had a history of cardiac and respiratory problems were held about 48 hours for observation before being released.

When the blower shut down, plant personnel closed a manually operated valve between the air inlet filter and the air dryer. Inspection of the blower did not reveal any problem and it was concluded that the vibration detector had malfunctioned. The sulfuric acid plant was then placed back into operation. After attending to the immediate problems, the company reported the incident to the SW District Office.

The company has disconnected the automatic blower shut down feature from the vibration detector to prevent a repeat of this malfunction. No enforcement action is planned against the company for this incident by Hillsborough County or the SW District Offices. I see no grounds for enforcement action by DER as the problem was caused by a malfunction of safety instrumentation on process equipment.

WH:BT:dav

new wales
file

12.17.23

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

BOB GRAHAM
GOVERNOR

JACOB D. VARN
SECRETARY

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

January 9, 1981

Mr. R. E. Jones, Jr., Vice President
New Wales Chemicals, Inc.
Post Office Box 1035
Mulberry, Florida 33860

Dear Mr. Jones:

The Bureau of Air Quality Management acknowledges receipt of two applications for permits to modify sulfuric acid plants #4 and #5 at the New Wales Chemicals complex. A preliminary review of the applications has been made, and the technical staff requests additional information on the modeling data and completion of construction dates.

The modeling data showed several apparent inconsistencies in the input emission rates. For example, compare emission data for runs 3/74-78, 10, and 11. Why are the emission rates different between runs for the same point sources, 59-09, 59-10, 59-27, and 59-96? Also,what is the emission unit 59-33? Some of these emission rates are not consistent with the previous permit application. An explanation of these points is needed to complete the modeling review.

There are also inconsistencies in the indicated completion of construction dates:

9/1/81 for plant No. 4
12/1/81 for plant No. 5
6/30/83 for both plants

What are the correct dates?

If you have any questions on the data requested, please contact Tom Rogers at (904) 488-1344. We will resume processing your application as soon as this information is received.

Sincerely,

LWGeorge

for/ Steve Smallwood, P.E.
Chief
Bureau of Air Quality
Management

SS:TH:caa

cc: John Koogler

For Both Sulfuric Acid Plants

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

( ) Yes ( ) No

Contaminant	Rate or Concentration
SO2	≤ 4 LBS./TON H2SO4 ACID PRODUCED
H2SO4 ACID MIST	≤ 0.15 LBS./TON H2SO4 ACID PRODUCED

B. Has EPA declared the best available control technology for this class of sources? (If yes, attach copy)

( ) Yes (X) No

Contaminant	Rate or Concentration

C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration
SO2	≤ 4 LBS./TON 100% H2SO4 ACID PRODUCE
H2SO4 ACID MIST	≤ 0.15 LBS./TON 100% H2SO4 ACID PRODUCED

D. Describe the existing control and treatment technology (if any).

1. Control Device/System: DOUBLE ABSORPTION

2. Operating Principles: SEE PG. 4-11 THROUGH 4-13 OF ATTACHED DOCUMENT (NSPS REVIEW FOR SULFURIC ACID PLANTS)

3. Efficiency:* 99.7%

4. Capital Costs: EST. TOTAL PLANT COS @ $14 MILLION

5. Useful Life: LIFE OF PLANT

6. Operating Costs: NA

7. Energy: NA

8. Maintenance Cost: NA

9. Emissions:

Contaminant	Rate or Concentration
SO2	≤ 4 LBS./TON 100% ACID PRODUCED
H2SO4 ACID MIST	≤ 0.15 LBS./TON 100% H2SO4 ACID PRODUCED

*Explain method of determining D 3 above.

670 TONS S YIELD 2000 TPD 100 H2SO4 ACID PRODUCED WITH 4 TPD SO2 MAXIMUM EMITTED VIA STACK. 4 TPD SO2 EMITTED YIELDS 2 TPD S LOST. THEREFORE, $\frac{2.0 \text{ TPD S} \times 100\%}{670 \text{ TPD S BURNED}} = 0.3\%$ LOSS OR 99.7% RECOVERY.

10. Stack Parameters

a. Height: 199 ft. b. Diameter: 8.5 ft.

c. Flow Rate: 140,000 ACFM d. Temperature: 160 °F

e. Velocity: 38-40 FPS

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if neceaasry).

1. SEE PG. 7-1 OF ATTACHED DOCUMENT. (NSPS REVIEW FOR SULFURIC ACID PLANTS)

a. Control Device: CONTACT ACID PLANT WITH DOUBLE ABSORPTION

b. Operating Principles: SEE PAGES 4-11 THROUGH 4-13 OF ATTACHED DOCUMENT. (NSPS REVIEW FOR SULFURIC ACID PLANTS)

c. Efficiency*: 99.7% d. Capital Cost: NA

e. Useful Life: LIFE OF PLANT f. Operating Cost: NA

g. Energy*: NA h. Maintenance Cost: NA

i. Availability of construction materials and process chemicals: GOOD

j. Applicability to manufacturing processes: INTEGRAL PART OF PROCESS.

k. Ability to construct with control device, install in available space, and operate within proposed levels: GOOD

2.

a. Control Device:

b. Operating Principles:

c. Efficiency*: d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy**: h. Maintenance Costs:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

*Explain method of determining efficiency.
**Energy to be reported in units of electrical power - KWH design rate.

3.

a. Control Device:

b. Operating Principles:

c. Efficiency*:
d. Capital Cost:

e. Life:
f. Operating Cost:

g. Energy:
h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space and operate within proposed levels:

4.

a. Control Device

b. Operating Principles:

c. Efficiency*:
d. Capital Cost:

e. Life:
f. Operating Cost:

g. Energy:
h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

1. Control Device: DOUBLE ABSORPTION

2. Efficiency*: 99.7%
3. Capital Cost: EST. COST $14 MILLION

4. Life: LIFE OF PLANT
5. Operating Cost: NA

6. Energy: NA
7. Maintenance Cost: NA

8. Manufacturer: MONSANTO ENVIROCHEM

9. Other locations where employed on similar processes:

a.

(1) Company: AGRICO

(2) Mailing Address: SOUTH PIERCE

(3) City: SOUTH PIERCE
(4) State: FLORIDA

(5) Environmental Manager: HAROLD LONG

(6) Telephone No. 428-1423

*Explain method of determining efficiency above.

(7) Emissions:*

CONTAMINANT	RATE OR CONCENTRATION
SO_2	≦ 4.0 LBS./TON ACID
ACID MIST	≦ 0.15 LBS./TON ACID

(8) **Process Rate:*** ≃ 2,000 TPD

b.

(1) **Company:** C.F. CHEMICALS, INC.

(2) **Mailing Address:** [illegible]

~~(3) **City:** BARTOW~~ ~~(4) **State:** FLORIDA~~

(5) **Environmental Manager:** W. A. SCHIMMING

(6) **Telephone No:** 533-3181

(7) **Emissions:***

CONTAMINANT	RATE OR CONCENTRATION
SO_2	≦ 4.0 LBS./TON ACID
ACID MIST	≦ 0.15 LBS./TON ACID

(8) **Process Rate:*** 2,000 TPD

10. **Reason for selection and description of systems:**

THIS IS THE MOST EFFICIENT PROCESS CURRENTLY AVAILABLE FROM BOTH AN EMISSION STANDPOINT AND A RECOVERY STANDPOINT.

SEE ATTACHED DOCUMENT.
(NSPS REVIEW FOR SULFURIC ACID PLANTS)

*Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

BY CURRENT EMISSION LIMITING STANDARDS, THIS TECHNOLOGY MEETS OR EXCEEDS ALL APPLICABLE STANDARDS. THEREFORE, THE ONLY POSSIBLE IMPACT WOULD BE TO CONSTRUCT A PLANT WHICH WOULD HAVE MINIMAL IMPACT ON THE ENVIRONMENT AND WOULD ALSO PROVIDE INCREASED EMPLOYMENT FOR THE CONSTRUCTION TRADES ON A SHORT TERM BASIS AND LONG TERM EMPLOYMENT FOR PEOPLE TO OPERATE AND MAINTAIN THE NEW PLANTS.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

(NSPS REVIEW FOR SULFURIC ACID PLANTS)

12.17.23

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee	
To:	Loctn.:
To:	Loctn.:
To:	Loctn.:
From:	Date:

TO: Jacob D. Varn
Secretary

FROM: J. P. Subramani, Chief JPSubramani
Bureau of Air Quality Management

DATE: August 20, 1979

SUBJECT: BACT Determination - New Wales Chemicals, Inc. Sulfuric Acid Plants No. 4 and No. 5, to be located in Polk County

Facility: Two identical double absorption sulfuric acid plants with a combined process input rate of 1320 tons/day of sulfur.

BACT Determination Requested by the Applicant:

Pollutant	
SO_2:	4 lbs/ton 100% H_2SO_4 acid produced
Sulfuric Acid Mist:	0.15 lbs/ton 100% H_2SO_4 acid produced

Date of Receipt of a Complete BACT Application:

June 5, 1979

Date of Publication in the Florida Administrative Weekly:

August 6, 1979

Date of Publication in a Newspaper of General Circulation:

August 8, 1979, The Ledger, Lakeland, Florida

22

Study Group Members:

A BACT determination on a sulfuric acid plant was completed April 16, 1979. There has been no significant technological improvement since that date. Thus the same BACT applies and a study group is not needed.

EPA's New Source Performance Standards (NSPS) for Sulfuric Acid Plants:

Pollutant	Rate of Concentration
SO_2:	4 #/ton of 100% H_2SO_4
Sulfuric Acid Mist:	0.15 #/ton of 100% H_2SO_4

BACT Determination by the Florida Department of Environmental Regulation:

SO_2:	Emission not to exceed 4.0 #/ton of 100% H_2SO_4/attainable with a double absorption system.
Sulfuric Acid Mist:	Emissions not to exceed 0.15 #/ton of 100% H_2SO_4/attainable with a high efficiency demister.
Opacity:	Not greater than 10 percent.
Test Method:	As prescribed in EPA NSPS, 40 CFR, Part 60, Subpart H.

Justification of DER Determination:

There has been no significant technological improvements since December 1978 when EPA reviewed its NSPS for this type of source. Although lower emissions than NSPS are attainable the selection of NSPS as BACT allows for the normal decrease in efficiency with the passage of time.

Details of the Analysis May be Obtained by Contacting:

Victoria Martinez, BACT Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Twin Towers Office Building
Tallahassee, Florida 32301

Recommendation from: Bureau of Air Quality Management

by: JP Subramani
J. P. Subramani

Date: AUGUST 20, 1979

Approved by: Jacob D. Varn
Jacob D. Varn

Date: 21ST AUGUST 1979

JDV/es

Attachment

State of Florida

DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee	
To:	Loctn.:
To:	Loctn.:
To:	Loctn.:
From:	Date:

TO: District Managers

ATTN: Air Engineers and Local Programs

FROM: Victoria Martinez VM

DATE: August 24, 1979

SUBJECT: Best Available Control Technology (BACT)
Pursuant to Chapter 17-2.03 FAC

Attached for your information is a copy of the BACT determination by the Florida Department of Environmental Regulation for New Wales Chemicals, Inc. Sulfuric Acid Plants No. 4 and No. 5, to be located in Polk County. The control technology established by the BACT determination is:

SO_2:	Emission not to exceed 4.0 #/ton of 100% H_2SO_4/attainable with a double absorption system.
Sulfuric Acid Mist:	Emissions not to exceed 0.15 #/ton of 100% H_2SO_4/attainable with a high efficiency demister
Opacity:	Not greater than 10 percent
Test Method:	As prescribed in EPA NSPS, 40 CFR, Part 60, Subpart H.

Information regarding the determination may be obtained by writing Victoria Martinez, Department of Environmental Regulation, 2600 Blair Stone Road, Twin Towers Office Building Tallahassee, Florida 32301.

VM/es

Attachment

cc: Jim Estler

PAID

DER
APR 30 1979
SOUTHWEST DISTRICT
TAMPA

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

Source Type: ☒ Air Pollution ☐ Incinerator

Application Type: ☒ Construction ☐ Operation ☐ Modification ☐ Renewal of DER Permit No. ______

Company Name: NEW WALES CHEMICALS, INC. **County:** POLK

Identify the specific emission point source(s) addressed in this application (i.e.: Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired): CONTACT SULFURIC ACID PLANT WITH DOUBLE ABSORPTION (05)

Source Location: Street: HWY. 640 & COUNTY LINE RD. **City:** MULBERRY

UTM: East 396.6 **North** 3078.9

Latitude: ___ ° ___ ' ___ "N. **Longitude:** ___ ° ___ ' ___ "W.

Appl. Name and Title: THOMAS L. CRAIG, VICE PRESIDENT AND GENERAL MANAGER

Appl. Address: P. O. BOX 1035 MULBERRY, FL. 33860

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative of* NEW WALES CHEMICALS, INC.

I certify that the statements made in this application for a CONSTRUCTION permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provisions of Chapter 403, *Florida Statutes*, and all the rules and regulations of the Department and revisions thereof. I also understand that a permit, if granted by the Department, will be nontransferable and I will promptly notify the Department upon sale or legal transfer of the permitted establishment.

THOMAS L. CRAIG
Name of Person Signing (please Type or Print)

Thomas L Craig VICE PRES. & GEN. MGR.
Signature of the Owner or Authorized Representative and Title

Date: 4-6-79 **Telephone No.:** 813-428-2531

*Attach a letter of authorization.

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgement, that the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the Department. It is also agreed that the undersigned will furnish the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signature: Craig A Pflaum

Name: CRAIG A. PFLAUM
(Please Type)

Company Name: NEW WALES CHEMICALS, INC.

Florida Registration Number: 18595

(Affix Seal)

Mailing Address:
P. O. BOX 1035
MULBERRY, FL. 33860

Telephone No.: 813-428-2531

Date: 4-6-79

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

NEW SOURCE 2000 TPD DESIGN MONSANTO ENVIROCHEM DOUBLE ABSORPTION SULFURIC ACID PLANT. PLANT DESIGN WILL ACHIEVE NEW SOURCE PERFORMANCE STANDARDS FOR SULFURIC ACID PLANTS.

B. Schedule of Project Covered in this Application (Construction Permit Application Only).

Start of Construction: JUNE 30, 1980 Completion of Construction: JUNE 30, 1983

C. Costs of Construction. (Note: show breakdown of estimated costs only for individual components/units of the project serving pollution control purpose. *Information on actual costs shall be furnished with the application for operation permit.*)

ESTIMATED COST OF DOUBLE VS. SINGLE ABSORPTION PLUS INSTALLATION OF BRINKS DEMISTERS, WATER REUSE FACILITIES, CONTINUOUS MONITOR FOR SO2 AND ACCESS COMPLIANCE MONITORING IS $5,000,000.00

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

NONE

E. Is the emission point considered to be a New* or Existing* source, as defined in Chapter 17-2.02(5) & (6), Florida Administrative Code?

__X__ New ______ Existing

F. Is this application associated with or part of a Development of Regional Impact (DRI) pursuant to Chapter 380, Florida Statutes, and Chapter 22F-2, Florida Administrative Code? ______ Yes __X__ No

G. Normal Equipment Operating Time: hrs/day: 24 ; days/wk: 7 ; wks/yr: 50 ; if seasonal, describe: ______

*Note

New Source: any source which came into existence, began operation or construction, or received a permit for the latter on or after January 18, 1972.

Existing Source: any source in existence, operating or under construction (or with a permit to construct) prior to January 18, 1972.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES

(other than incinerators)

A. Raw Materials and Chemicals Used in Your Process:

Description	Utilization Rate lbs./hr.	Relate to Flow Diagram
MOLTEN SULFUR	660 TPD	SULFUR BURNER

B. Process Rate:

1) Total Process Input Rate (lbs./hr.): 660 TPD SULFUR

2) Product Weight (lbs/hr): 2000 TPD H2S04

C. Airborne Contaminants Discharged:

Name of Contaminant	Actual Discharge*		Allowed Discharge Rate Per Ch. 17-2, F.A.C.**	Allowable Discharge*** (lbs./hr.)	Relate to Flow Diagram
	lbs./hr.	T/yr.			
S02	≦ 4 TPD		4# S02/TON H2S04	-	STACK
H2S04 MIST	≦ 0.15	TPD	0.15# MIST/TON	H2S04	STACK

D. Control Devices:

Name and Type (Model and Serial No.)	Contaminant	Efficiency†	Range of Particles Size Collected (in microns)	Basis for Efficiency††
DOUBLE ABSORPTION	S02	99.7	NA	DESIGN
TOWERS WITH BRINKS	H2S04 MIST	100%	>3 MICRONS	"
HV MIST ELIMINATORS		85-97%	1-3 MICRONS	"
		50-85%	<1/2 MICRON	"

*Estimate only if this is an application to construct.

**Specify units in accordance with emission standards prescribed within Section 17-2.04, F.A.C. (e.g. Section 17-2.04(6)(e)1.a. specifies that new fossil fuel steam generators are allowed to emit particulate matter at a rate of 0.1 lbs. per million BTU heat input computed as a maximum 2-hour average.)

***Using above example for a source with 260 million BTU per hour heat input: $\frac{0.1 \text{ lbs}}{\text{MMBTU}} \times \frac{260 \text{ MMBTU}}{\text{hr.}} = 26$ lbs./hr.

†See Supplemental Requirements, page 5, number 2.

††Indicate whether the efficiency value is based upon performance testing of the device or design data.

E. Fuels: NA

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg./hr.	Max./hr.	

*Units: Natural Gas - MMCF/hr.; Fuel Oils, Coal - lbs./hr.

Fuel Analysis:

Percent Sulfur: ______ Percent Ash: ______

Density: ______ lb./gal.

Heat Capacity: ______ BTU/lb. ______ BTU/gal.

Other Fuel Contaminants: ______

F. If applicable, indicate the percent of fuel used for space heating: Annual Average: ______ Maximum: ______

G. Indicate liquid or solid wastes generated and method of disposal:

ALL BLOWDOWN REUSED IN KINGSFORD OPERATION

H. Emission Stack Geometry and Flow Characteristics (provide data for each stack):

Stack Height: 199 ft. Stack Diameter: 8.5 ft.

Gas Flow Rate: 120,000 ACFM Gas Exit Temperature: 160 °F

Water Vapor Content: 0 %

SECTION IV: INCINERATOR INFORMATION

NOT APPLICABLE

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Lbs./Hr. Incinerated							

Description of Waste: ______

Total Weight Incinerated (lbs./hr.): ______ Design Capacity (lbs./hr.): ______

Approximate Number of Hours of Operation per Day: ______, days/week: ______

Manufacturer: ______

Date Constructed: ______ Model No.: ______

	Volume (ft.)^3	Heat Release (BTU/hr.)	Fuel		Temp. (°F)
			Type	BTU/hr.	
Primary Chamber					
Secondary Chamber					

Stack Height: ______________ ft. Stack Diameter: ______________ Stack Temp.: ______________ °F

Gas Flow Rate: ______________ ACFM ______________ DSCFM*

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of Pollution Control Device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (Specify): ______________

Brief Description of Operating Characteristics of Control Device: ______________

Ultimate Disposal of Any Effluent Other Than That Emitted From the Stack (scrubber water, ash, etc.): ______________

SECTION V: SUPPLEMENTAL REQUIREMENTS

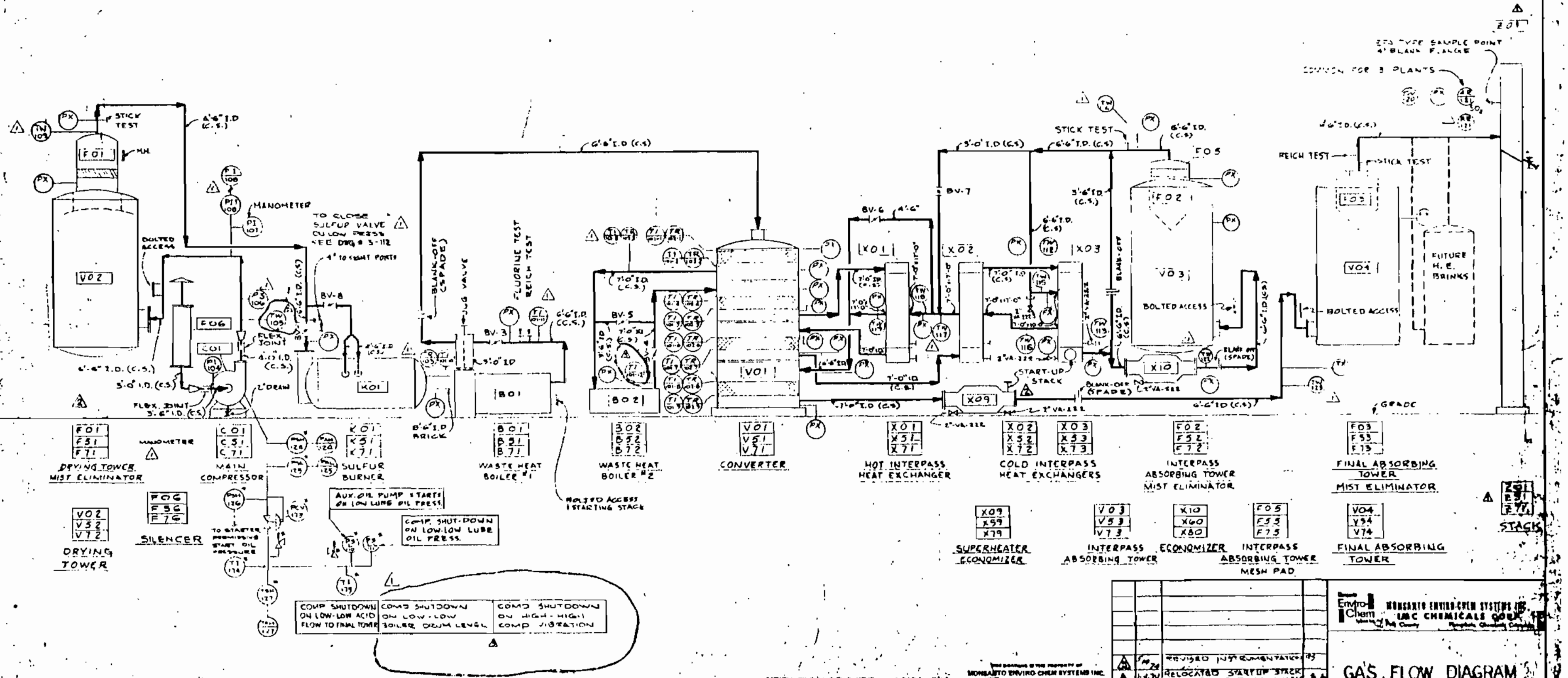
Please Provide the Following Supplements Required For All Pollution Sources:

1. Total process input rate and product weight - show derivation.
2. Efficiency estimation of control device(s) - show derivation. Include pertinent test and/or design data.
3. An 8½" x 11" flow diagram, which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
4. An 8½" x 11" plot plan of facility showing the exact location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.
5. An 8½" x 11" plot plan showing the exact location of the establishment, and points of airborne emissions in relation to the surrounding area, residences and other permanent structures and roadways. (Example: Copy of USGS topographic map.)
6. Description and sketch of storm water control measures taken both during and after construction.
7. An application fee of $20.00, unless exempted by Chapter 17-4.05(3), FAC, made payable to the Department of Environmental Regulation.
8. With construction permit application, include design details for control device(s). Example: for baghouse, include cloth to air ratio; for scrubber, include cross-sectional sketch; etc.
9. Certification by the P.E. with the operation permit application that the source was constructed as shown in the construction permit application.

BEST AVAILABLE COPY

NOTES:

1. ☐ INDICATES ENVIRO-CHEM EQUIPMENT ITEM NOS.
2. INSTRUMENT SYMBOLS ARE IN ACCORDANCE WITH ISA-S5.1.
3. BV INDICATES BUTTERFLY VALVES.
4. THIS DIAGRAM IS TYPICAL FOR PLANTS [illegible]
5. ITEMS FURNISHED BY COMPRESSOR VENDOR.



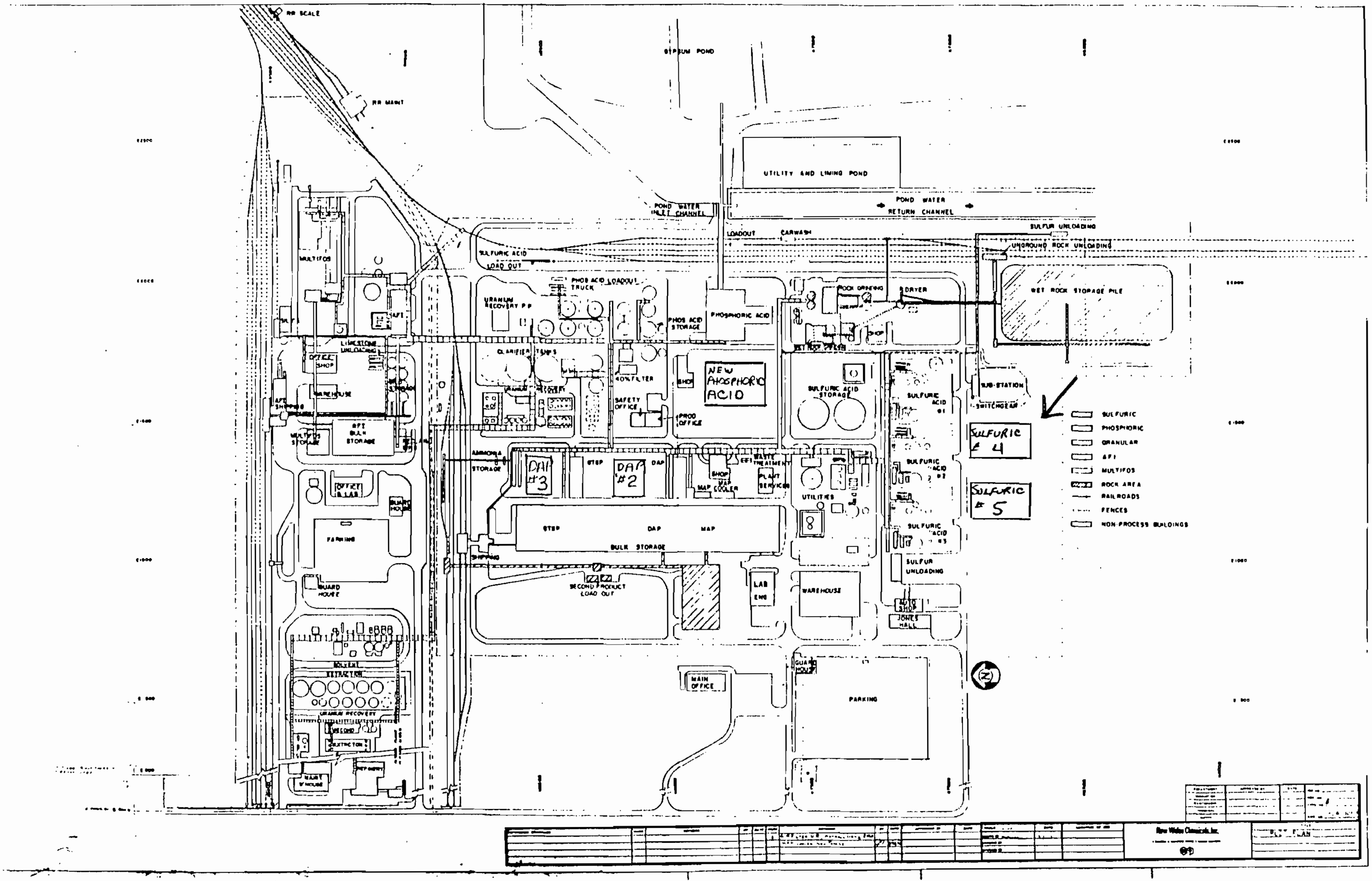
No.	DATE	REVISIONS	BY
4	5-24	REVISED INSTRUMENTATION	[illegible]
3	1-4-74	RELOCATED STARTUP STACK SYN. SUP HEATER - ECONOMIZER	S.A.
2	1-4-74	AIR FILTER F04, 54 & 74 DELETED. SILENCER F06, 56 & 76 RELOCATED	S.A.
1	3-31-73	GENERAL REVISION	[illegible]

MONSANTO ENVIRO-CHEM SYSTEMS INC.
IMC CHEMICALS CORP.

GAS FLOW DIAGRAM

DRAWN: RJG
SCALE: NTS

BEST AVAILABLE COPY



HARRY L. CARROLL
Vice President
Florida

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

November 22, 1978

Mr. T. L. Craig
Vice President & General Manager
New Wales Chemicals, Inc.
Post Office Box 1035
Mulberry, Florida 33860

Dear Tom:

This letter is your authorization to sign on behalf of New Wales Chemicals, Inc. the various applications for permits, specifically the applications for operating permits from the Florida Department of Environmental Regulation.

Very truly yours,

Harry Carroll

Harry L. Carroll

t

Post Office Box 3807 • Lakeland, Florida 33802 • (813) 646-5061

STATE OF FLORIDA

DEPARTMENT OF STATE • DIVISION OF CORPORATIONS

I certify from the records of this office that IMC CHEMICALS CORP., changed its name to; NEW WALES CHEMICALS, INC., is a corporation organized under the Laws of the State of Delaware, authorized to transact business within the State of Florida, qualified on the 1st day of June, 1977, under the new name.

I further certify that said corporation has paid all fees due this office through December 31, 1977 and its status is active.

GIVEN under my hand and the Great Seal of the State of Florida, at Tallahassee, the Capitol, this the 1st day of June 1977.

SECRETARY OF STATE

PAID

D.E.R.
APR 10 1979
SOUTHWEST DISTRICT
TAMPA

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

Source Type: ☒ **Air Pollution** ☐ **Incinerator**

Application Type: ☒ **Construction** ☐ **Operation** ☐ **Modification** ☐ **Renewal of DER Permit No.** ______

Company Name: NEW WALES CHEMICALS, INC. **County:** POLK

Identify the specific emission point source(s) addressed in this application (i.e.: Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired): CONTACT SULFURIC ACID PLANT WITH DOUBLE ABSORPTION (04)

Source Location: Street: HWY. 640 & COUNTY LINE RD. **City:** MULBERRY

UTM: East 396.6 **North** 3078.9

Latitude: ___ ° ___ ' ___ "N. **Longitude :** ___ ° ___ ' ___ "W.

Appl. Name and Title: THOMAS L. CRAIG, VICE PRESIDENT AND GENERAL MANAGER

Appl. Address: P. O. BOX 1035 MULBERRY, FL. 33860

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative of* NEW WALES CHEMICALS, INC.

I certify that the statements made in this application for a CONSTRUCTION permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provisions of Chapter 403, Florida Statutes, and all the rules and regulations of the Department and revisions thereof. I also understand that a permit, if granted by the Department, will be nontransferable and I will promptly notify the Department upon sale or legal transfer of the permitted establishment.

THOMAS L. CRAIG
Name of Person Signing (please Type or Print)

Thomas L Craig VICE PRES. & GEN. MGR.
Signature of the Owner or Authorized Representative and Title

Date: 4-6-79 **Telephone No.:** 813-428-2531

*Attach a letter of authorization.

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgement, that the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the Department. It is also agreed that the undersigned will furnish the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signature: ______

Name: CRAIG A. PFLAUM
(Please Type)

Mailing Address: P. O. BOX 1035
MULBERRY, FL. 33860

Company Name: NEW WALES CHEMICALS, INC.

Telephone No.: 813-428-2531

Florida Registration Number: 18595

Date: 4-6-79

(Affix Seal)

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

NEW SOURCE 2000 TPD DESIGN MONSANTO ENVIROCHEM DOUBLE ABSORPTION SULFURIC ACID PLANT. PLANT DESIGN WILL ACHIEVE NEW SOURCE PERFORMANCE STANDARDS FOR SULFURIC ACID PLANTS.

B. Schedule of Project Covered in this Application (Construction Permit Application Only).

Start of Construction: JUNE 30, 1980 Completion of Construction: JUNE 30, 1983

C. Costs of Construction. (Note: show breakdown of estimated costs only for individual components/units of the project serving pollution control purpose. *Information on actual costs shall be furnished with the application for operation permit.*)

ESTIMATED COST OF DOUBLE VS. SINGLE ABSORPTION PLUS INSTALLATION OF BRINKS DEMISTERS, WATER REUSE FACILITIES, CONTINUOUS MONITOR FOR SO2 AND ACCESS COMPLIANCE MONITORING IS $5,000,000.00

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

NONE

E. Is the emission point considered to be a New* or Existing* source, as defined in Chapter 17-2.02(5) & (6), Florida Administrative Code?
X New ____ Existing

F. Is this application associated with or part of a Development of Regional Impact (DRI) pursuant to Chapter 380, Florida Statutes, and Chapter 22F-2, Florida Administrative Code? ____ Yes X No

G. Normal Equipment Operating Time: hrs/day: 24 ; days/wk: 7 ; wks/yr: 50 ; if seasonal, describe: ____

*Note

New Source: any source which came into existence, began operation or construction, or received a permit for the latter on or after January 18, 1972.

Existing Source: any source in existence, operating or under construction (or with a permit to construct) prior to January 18, 1972.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES

(other than incinerators)

A. Raw Materials and Chemicals Used in Your Process:

Description	Utilization Rate lbs./hr.	Relate to Flow Diagram
MOLTEN SULFUR	660 TPD	SULFUR BURNER

B. Process Rate:

1) Total Process Input Rate (lbs./hr.): 660 TPD SULFUR

2) Product Weight (lbs/hr): 2000 TPD H_2SO_4

C. Airborne Contaminants Discharged:

Name of Contaminant	Actual Discharge*		Allowed Discharge Rate Per Ch. 17-2, F.A.C.**	Allowable Discharge*** (lbs./hr.)	Relate to Flow Diagram
	lbs./hr.	T/yr.			
SO_2	≦ 4 TPD		4# SO_2/TON H_2SO_4	–	STACK
H_2SO_4 MIST	≦ 0.15	TPD	0.15# MIST/TON	H_2SO_4	STACK

D. Control Devices:

Name and Type (Model and Serial No.)	Contaminant	Efficiency†	Range of Particles Size Collected (in microns)	Basis for Efficiency††
DOUBLE ABSORPTION	SO_2	99.7	NA	DESIGN
TOWERS WITH BRINKS	H_2SO_4 MIST	100%	>3 MICRONS	"
HV MIST ELIMINATORS		85–97%	1–3 MICRONS	"
		50–85%	<1/2 MICRON	"

*Estimate only if this is an application to construct.

**Specify units in accordance with emission standards prescribed within Section 17-2.04, F.A.C. (e.g. Section 17-2.04(6)(e)1.a. specifies that new fossil fuel steam generators are allowed to emit particulate matter at a rate of 0.1 lbs. per million BTU heat input computed as a maximum 2-hour average.)

***Using above example for a source with 260 million BTU per hour heat input: $\frac{0.1 \text{ lbs}}{\text{MMBTU}} \times \frac{260 \text{ MMBTU}}{\text{hr.}} = 26$ lbs./hr.

†See Supplemental Requirements, page 5, number 2.

††Indicate whether the efficiency value is based upon performance testing of the device or design data.

E. Fuels: NA

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg./hr.	Max./hr.	

*Units: Natural Gas - MMCF/hr.; Fuel Oils, Coal - lbs./hr.

Fuel Analysis:

Percent Sulfur: ______ Percent Ash: ______

Density: ______ lb./gal.

Heat Capacity: ______ BTU/lb. ______ BTU/gal.

Other Fuel Contaminants: ______

F. If applicable, indicate the percent of fuel used for space heating: Annual Average: ______ Maximum: ______

G. Indicate liquid or solid wastes generated and method of disposal:

ALL BLOWDOWN REUSED IN KINGSFORD OPERATION

H. Emission Stack Geometry and Flow Characteristics (provide data for each stack):

Stack Height: 199 ft. Stack Diameter: 8.5 ft.

Gas Flow Rate: 120,000 ACFM Gas Exit Temperature: 160 °F

Water Vapor Content: 0 %

SECTION IV: INCINERATOR INFORMATION

NOT APPLICABLE

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Lbs./Hr. Incinerated							

Description of Waste: ______

Total Weight Incinerated (lbs./hr.): ______ Design Capacity (lbs./hr.): ______

Approximate Number of Hours of Operation per Day: ______ , days/week: ______

Manufacturer: ______

Date Constructed: ______ Model No.: ______

	Volume (ft.)^3	Heat Release (BTU/hr.)	Fuel		Temp. (°F)
			Type	BTU/hr.	
Primary Chamber					
Secondary Chamber					

Stack Height: ____________ ft. Stack Diameter: ____________ Stack Temp.: ____________ °F

Gas Flow Rate: ____________ ACFM ____________ DSCFM*

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of Pollution Control Device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (Specify): ____________

Brief Description of Operating Characteristics of Control Device: ____________

Ultimate Disposal of Any Effluent Other Than That Emitted From the Stack (scrubber water, ash, etc.): ____________

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please Provide the Following Supplements Required For All Pollution Sources:

1. Total process input rate and product weight - show derivation.
2. Efficiency estimation of control device(s) - show derivation. Include pertinent test and/or design data.
3. An 8½" x 11" flow diagram, which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
4. An 8½" x 11" plot plan of facility showing the exact location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.
5. An 8½" x 11" plot plan showing the exact location of the establishment, and points of airborne emissions in relation to the surrounding area, residences and other permanent structures and roadways. (Example: Copy of USGS topographic map.)
6. Description and sketch of storm water control measures taken both during and after construction.
7. An application fee of $20.00, unless exempted by Chapter 17-4.05(3), FAC, made payable to the Department of Environmental Regulation.
8. With construction permit application, include design details for control device(s). Example: for baghouse, include cloth to air ratio; for scrubber, include cross-sectional sketch; etc.
9. Certification by the P.E. with the operation permit application that the source was constructed as shown in the construction permit application.

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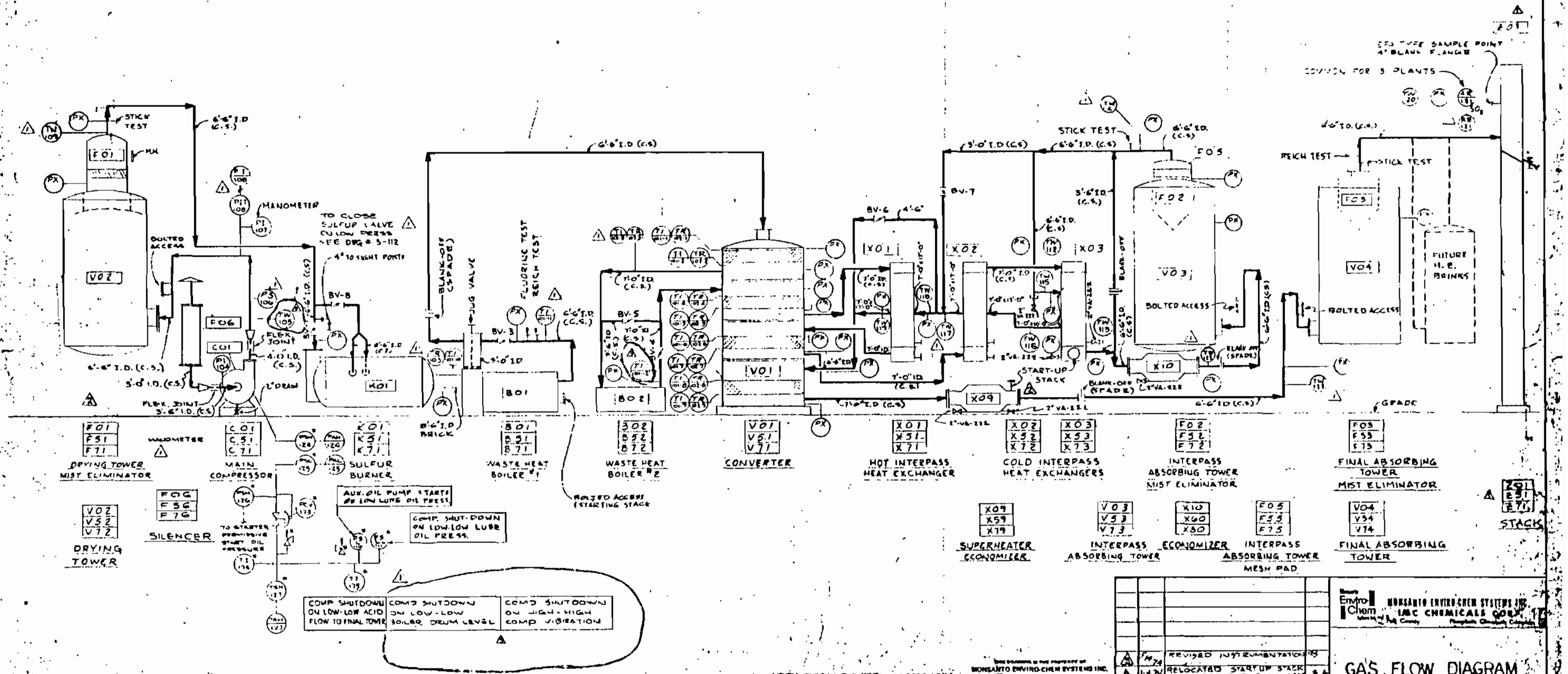
NOTES:

1. ☐ INDICATES ENVIRO-CHEM EQUIPMENT ITEM NOS.
2. INSTRUMENT SYMBOLS ARE IN ACCORDANCE WITH ISA-S5.1.
3. BV INDICATES BUTTERFLY VALVES.
4. THIS DIAGRAM IS TYPICAL FOR PLANTS 01, 02 & 03.
5. ITEMS FURNISHED BY COMPRESSOR VENDOR.



THIS DRAWING IS THE PROPERTY OF MONSANTO ENVIRO-CHEM SYSTEMS INC. [illegible]

DATE ISSUED

FOR FAB 5-14-74

No.	DATE	REVISIONS	BY
4	6-74	REVISED INSTRUMENTATION	RS
3	1-4-74	RELOCATED START UP STACK ON SUP HEATER-ECONOMIZER	S.A.
2	1-4-74	AIR FILTER F04,54 & 74 DELETED, SILENCER F06,56 & 76 REARRANGED	SA
1	3-1-73	GENERAL REVISION	RS

Monsanto Enviro-Chem

MONSANTO ENVIRO-CHEM SYSTEMS INC.
IMC CHEMICALS CORP.
Polk County Phosphate Chemicals Complex

GAS FLOW DIAGRAM

DRAWN RJG
CHECKED
SCALE N.T.S.
0788
5-402

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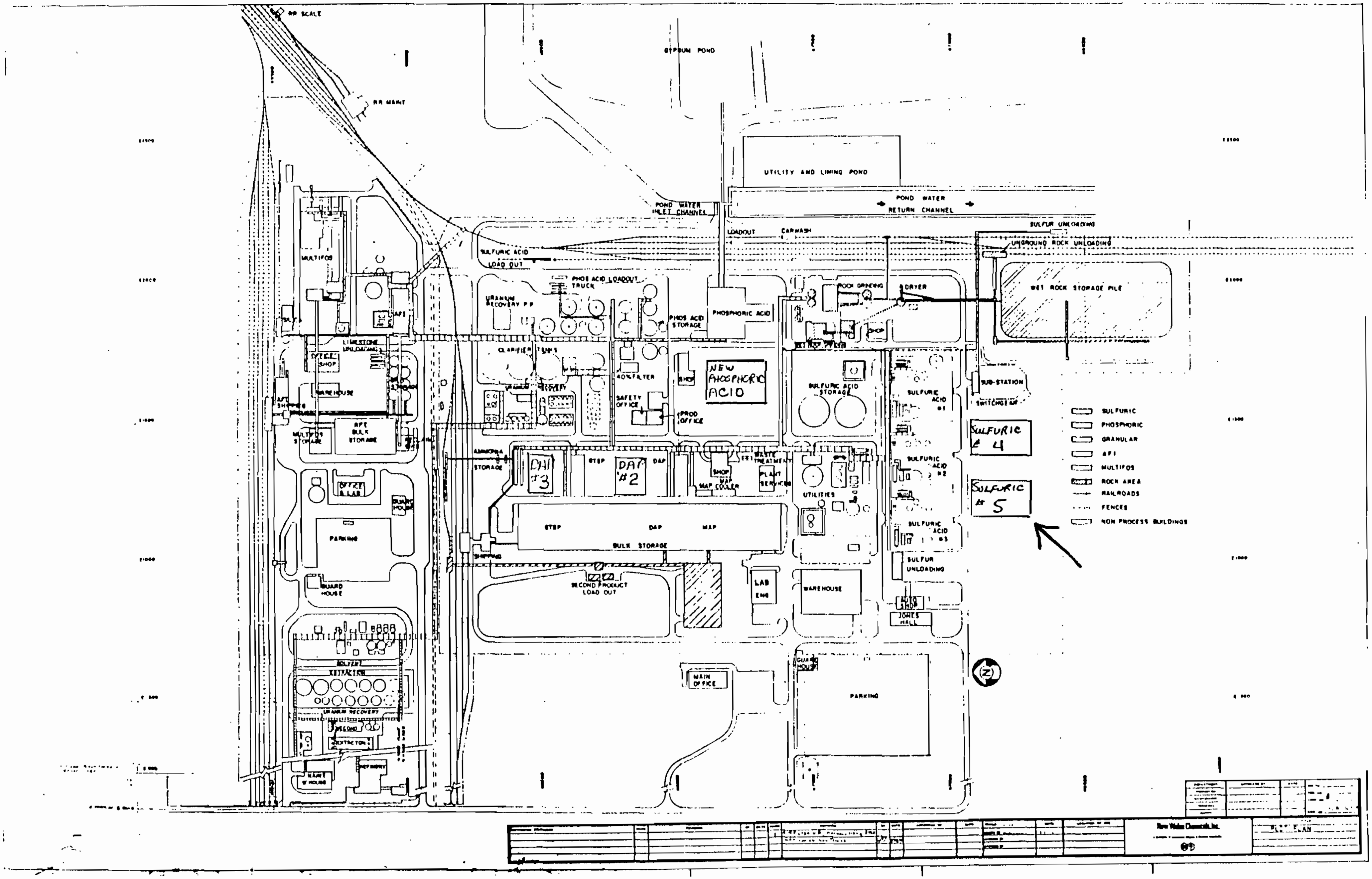

HARRY L. CARROLL
Vice President
Florida

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

November 22, 1978

Mr. T. L. Craig
Vice President & General Manager
New Wales Chemicals, Inc.
Post Office Box 1035
Mulberry, Florida 33860

Dear Tom:

This letter is your authorization to sign on behalf of New Wales Chemicals, Inc. the various applications for permits, specifically the applications for operating permits from the Florida Department of Environmental Regulation.

Very truly yours,

Harry L. Carroll

t

Post Office Box 3807 • Lakeland, Florida 33802 • (813) 646-5061

STATE OF FLORIDA

DEPARTMENT OF STATE • DIVISION OF CORPORATIONS

I certify from the records of this office that IMC CHEMICALS CORP., changed its name to; NEW WALES CHEMICALS, INC., is a corporation organized under the Laws of the State of Delaware, authorized to transact business within the State of Florida, qualified on the 1st day of June, 1977, under the new name.

I further certify that said corporation has paid all fees due this office through December 31, 1977 and its status is active.

GIVEN under my hand and the Great
Seal of the State of Florida, at
Tallahassee, the Capital, this the
1st day of June
1977.

SECRETARY OF STATE

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

( ) Yes ( ) No

Contaminant	Rate or Concentration
SO_2	$\leqq$ 4 LBS./TON H_2SO_4 ACID PRODUCED
H_2SO_4 ACID MIST	$\leqq$ 0.15 LBS./TON H_2SO_4 ACID PRODUCED

B. Has EPA declared the best available control technology for this class of sources? (If yes, attach copy)

( ) Yes (X) No

Contaminant	Rate or Concentration

C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration
SO_2	$\leqq$ 4 LBS./TON 100% H_2SO_4 ACID PRODUCE
H_2SO_4 ACID MIST	$\leqq$ 0.15 LBS./TON 100% H_2SO_4 ACID PRODUCED

D. Describe the existing control and treatment technology (if any).

1. Control Device/System: DOUBLE ABSORPTION
2. Operating Principles: SEE PG. 4-11 THROUGH 4-13 OF ATTACHED DOCUMENT. (NSPS REVIEW FOR SULFURIC ACID PLANTS)
3. Efficiency:* 99.7%
4. Capital Costs: EST. TOTAL PLANT COS @ $14 MILLION
5. Useful Life: LIFE OF PLANT
6. Operating Costs: NA
7. Energy: NA
8. Maintenance Cost: NA
9. Emissions:

Contaminant	Rate or Concentration
SO_2	$\leqq$ 4 LBS./TON 100% ACID PRODUCED
H_2SO_4 ACID MIST	$\leqq$ 0.15 LBS./TON 100% H_2SO_4 ACID PRODUCED

*Explain method of determining D 3 above.

670 TONS S YIELD 2000 TPD 100 H_2SO_4 ACID PRODUCED WITH 4 TPD SO_2 MAXIMUM EMITTED VIA STACK. 4 TPD SO_2 EMITTED YIELDS 2 TPD S LOST. THEREFORE,

$$\frac{2.0 \text{ TPD S} \times 100\%}{670 \text{ TPD S BURNED}} = 0.3\% \text{ LOSS OR } 99.7\% \text{ RECOVERY.}$$

10. Stack Parameters

a. Height: 199 ft. b. Diameter: 8.5 ft.

c. Flow Rate: 140,000ACFM d. Temperature: 160 °F

e. Velocity: 38-40 FPS

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if neceaasry).

1. SEE PG. 7-1 OF ATTACHED DOCUMENT. (NSPS REVIEW FOR SULFURIC ACID PLANTS)

a. Control Device: CONTACT ACID PLANT WITH DOUBLE ABSORPTION

b. Operating Principles: SEE PAGES 4-11 THROUGH 4-13 OF ATTACHED DOCUMENT. (NSPS REVIEW FOR SULFURIC ACID PLANTS)

c. Efficiency*: 99.7% d. Capital Cost: NA

e. Useful Life: LIFE OF PLANT f. Operating Cost: NA

g. Energy*: NA h. Maintenance Cost: NA

i. Availability of construction materials and process chemicals: GOOD

j. Applicability to manufacturing processes: INTEGRAL PART OF PROCESS.

k. Ability to construct with control device, install in available space, and operate within proposed levels: GOOD

2.

a. Control Device:

b. Operating Principles:

c. Efficiency*: d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy**: h. Maintenance Costs:

i. Availability of construction materials and process chemicals.

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

*Explain method of determining efficiency.
**Energy to be reported in units of electrical power - KWH design rate.

3.

a. Control Device:

b. Operating Principles:

c. Efficiency*:

d. Capital Cost:

e. Life:

f. Operating Cost:

g. Energy:

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space and operate within proposed levels:

4.

a. Control Device

b. Operating Principles:

c. Efficiency*:

d. Capital Cost:

e. Life:

f. Operating Cost:

g. Energy:

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

1. Control Device: DOUBLE ABSORPTION

2. Efficiency*: 99.7%

3. Capital Cost: EST. COST $14 MILLION

4. Life: LIFE OF PLANT

5. Operating Cost: NA

6. Energy: NA

7. Maintenance Cost: NA

8. Manufacturer: MONSANTO ENVIROCHEM

9. Other locations where employed on similar processes:

a.

(1) Company: AGRICO

(2) Mailing Address: SOUTH PIERCE

(3) City: SOUTH PIERCE

(4) State: FLORIDA

(5) Environmental Manager: HAROLD LONG

(6) Telephone No. 428-1423

*Explain method of determining efficiency above.

(7) **Emissions:***

CONTAMINANT	RATE OR CONCENTRATION
SO2	≦ 4.0 LBS./TON ACID
ACID MIST	≦ 0.15 LBS./TON ACID

(8) **Process Rate:*** ≃ 2,000 TPD

b.

(1) **Company:** C.F. CHEMICALS, INC.

(2) **Mailing Address:**

~~(3) **City:** BARTOW~~ ~~(4) **State:**~~ ~~FLORIDA~~

(5) **Environmental Manager:** W. A. SCHIMMING

(6) **Telephone No:** 533-3181

(7) **Emissions:***

CONTAMINANT	RATE OR CONCENTRATION
SO2	≦ 4.0 LBS./TON ACID
ACID MIST	≦ 0.15 LBS./TON ACID

(8) **Process Rate:*** 2,000 TPD

10. **Reason for selection and description of systems:**

THIS IS THE MOST EFFICIENT PROCESS CURRENTLY AVAILABLE FROM BOTH AN EMISSION STANDPOINT AND A RECOVERY STANDPOINT.

SEE ATTACHED DOCUMENT.
(NSPS REVIEW FOR SULFURIC ACID PLANTS)

---

*Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

BY CURRENT EMISSION LIMITING STANDARDS, THIS TECHNOLOGY MEETS OR EXCEEDS ALL APPLICABLE STANDARDS. THEREFORE, THE ONLY POSSIBLE IMPACT WOULD BE TO CONSTRUCT A PLANT WHICH WOULD HAVE MINIMAL IMPACT ON THE ENVIRONMENT AND WOULD ALSO PROVIDE INCREASED EMPLOYMENT FOR THE CONSTRUCTION TRADES ON A SHORT TERM BASIS AND LONG TERM EMPLOYMENT FOR PEOPLE TO OPERATE AND MAINTAIN THE NEW PLANTS.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

(NSPS REVIEW FOR SULFURIC ACID PLANTS)

United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park NC 27711

EPA-450/3-79-003
January 1979

Air

EPA

A Review of Standards of Performance for New Stationary Sources - Sulfuric Acid Plants

NSPS

EPA-450/3-79-003

A Review of Standards of Performance for New Stationary Sources - Sulfuric Acid Plants

by

Marvin Drabkin and Kathryn J. Brooks

Metrek Division of the MITRE Corporation
1820 Dolley Madison Boulevard
McLean, Virginia 22102

Contract No.68-02-2526

EPA Project Officer: Thomas Bibb

Emission Standards and Engineering Division

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air, Noise, and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

January 1979

This report has been reviewed by the Emission Standards and Engineering Division of the Office of Air Quality Planning and Standards, EPA, and approved for publication. Mention of trade names or commercial products is not intended to constitute endorsement or recommendation for use. Copies of this report are available through the Library Services Office (MD-35), U.S. Environmental Protection Agency, Research Triangle Park, N.C. 27711; or, for a fee, from the National Technical Information Services, 5285 Port Royal Road, Springfield, Virginia 22161.

Publication No. EPA-450/3-79-003

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LIST OF TABLES

1.0 EXECUTIVE SUMMARY

The objective of this report is to review the New Source Performance Standard (NSPS) for the sulfuric acid plant production ~~unit in terms of developments in control technology,~~ economics and new issues that have evolved since the original standard was promulgated in 1971. Possible revisions to the standard are analyzed in the light of compliance test data available for plants built since the promulgation of the NSPS. The NSPS review includes the SO_2 emission and acid mist emission standards. The opacity standard, while included in the sulfuric acid plant NSPS, is not reviewed separately since it is directly related to the acid mist emission standard. The following paragraphs summarize the results and conclusions of the analysis, as well as recommendations for future action.

1.1 Best Demonstrated Control Technology

Sulfur dioxide and acid mist are present in the tail gas from the contact process sulfuric acid production unit. In modern four-stage converter contact process plants burning sulfur with approximately 8 percent SO_2 in the converter feed, and producing 98 percent acid, SO_2 and acid mist emissions are generated at the rate of 13 to 28 kg/Mg of 100 percent acid (26 to 56 lb/ton) and 0.2 to 2 kg/Mg of 100 percent acid (0.4 to 4 lb/ton), respectively. The dual absorption process is the best demonstrated control technology* for SO_2 emissions from sulfuric acid plants, while the high efficiency acid mist eliminator is the best demonstrated control technology for acid mist emissions. These two emission control systems have become the systems of choice for sulfuric acid plants built or modified since the promulation of the NSPS. Twenty-eight of the 32 new or modified sulfuric acid production plants built since 1971 and subject to NSPS incorporate the dual absorption process; and all 32 plants use the high efficiency acid mist eliminator.

1.2 Current SO_2 NSPS Levels Achievable With Best Demonstrated Control Technology

All 32 sulfuric acid production units subject to NSPS showed compliance with the current SO_2 NSPS control level of 2 kg/Mg (4 lb/ton). The 26 compliance test results for dual absorption plants showed a considerable range from a low of 0.16 kg/Mg (0.32 lb/ton) to a high of 1.9 kg/Mg (3.7 lb/ton) with an average of 0.09 kg/Mg (1.8 lb/ton). The average SO_2 emission level obtained in the NSPS compliance tests for dual absorption plants is about one order of magnitude lower than the SO_2 emission level obtained from uncontrolled single absorption plants. Information received on the performance of several sulfuric acid plants indicates that low SO_2 emission

---

*It should be noted that standards of performance for new sources established under Section 111 of the Clean Air Act reflect emission limits achievable with the best adequately demonstrated technological system of continuous emission reduction (taking into consideration the cost of achieving such emission reduction, as well as any nonair quality health and environmental impacts and energy requirements).

results achieved in NSPS compliance tests apparently do not reflect day-to-day SO_2 emission levels. These levels appear to rise toward the standard as the conversion catalyst ages and its activity drops. Additionally, there may be some question about the validity of low SO_2 NSPS values, i.e. less than 1 kg/Mg (2 lb/ton), due to defects in the original EPA Method 8. Based on all of these considerations, it is recommended that the level of SO_2 emissions as specified in the current NSPS not be changed at this time.

1.3 Economic Considerations Affecting the SO_2 NSPS

The cost of more frequent conversion catalyst replacement as a method of maintaining low SO_2 emission values, i.e., below 1 kg/Mg (2 lb/ ton), was estimated in this study. Complete replacement of catalyst in the first three beds of the four-bed catalytic converter, approximately three times as frequently as is normally practiced, was estimated to result in an increase in operating cost of 55 cents/Mg of 100 percent acid. From an economic standpoint, this method would not be feasible since pretax profits could be reduced by 20 percent or more.

Based on an estimated sulfuric acid plant growth rate of four new production lines per year between 1981 and 1984, a 50 percent reduction of the present SO_2 NSPS level--from 2 kg/Mg (4 lb/ton) to 1 kg/Mg (2 lb/ton)--would result in a drop in the estimated percentage SO_2 contribution of these new sulfuric acid plants to the total national SO_2 emissions, from 0.04 percent to 0.02 percent. The national impact of a more stringent SO_2 NSPS would be marginal due to the very small decrease in SO_2 emissions (resulting from a tighter standard) from the sulfuric acid plants projected to be built during the 1981 through 1984 period.

1.4 Current Acid Mist Levels (and Related Opacity Levels) Achievable With Best Demonstrated Control Technology

All 32 sulfuric acid production units subject to NSPS showed compliance with the current acid mist NSPS control level of 0.075 kg/Mg of 100 percent acid (0.15 lb/ton). The NSPS compliance test data are all from plants with acid mist emission control provided by the high efficiency acid mist eliminator. The data showed a wide range with a low of 0.008 kg/Mg (0.016 lb//ton) to a high of 0.071 kg/Mg (0.141 lb/ton), and an overall average value of 0.04 kg/Mg (0.081 lb/ton). Acid mist emission (and related opacity) levels are unaffected by factors affecting SO_2 emissions, i.e., conversion catalyst aging. Rather, acid mist 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 order-of-magnitude spread observed in NSPS compliance test values is probably a result of variation in these factors. Additionally, variability in the original EPA Method 8 may have contributed to this spread. Making the acid mist standard more stringent is not believed to be practicable at this time because of the need to provide a margin of safety due to in-plant operating fluctuations, which introduce variable quantities of moisture into the sulfuric acid production line.

2.0 INTRODUCTION

In Section 111 of the Clean Air Act, "Standards of Performance for New Stationary Sources," a provision is set forth which requires that "The Administrator shall, at least every four years, review and, if appropriate, revise such standards following the procedure required by this subsection for promulgation of such standards." Pursuant to this requirement, the MITRE Corporation, under EPA Contract No. 68-02-2526, is to review 10 of the promulgated NSPS including the sulfuric acid plant production unit.

The main purpose of this report is to review the current sulfuric acid standards for SO_2, acid mist and opacity and to assess the need for revision on the basis of developments that have occurred or are expected to occur in the near future. This report addresses the following issues:

1. A review of the definition of the present standards and the NSPS monitoring requirements.
2. A discussion of the status of the sulfuric acid industry and the status of applicable control technology.
3. An analysis of SO_2, acid mist and opacity test results and review of level of performance of best demonstrated control technology for emission control.
4. A review of the impact of NSPS revision on sulfuric acid production economics, and the effect of new sulfuric acid plant construction on the NSPS.

Based on the information contained in this report, conclusions are presented and specific recommendations are made with respect to changes in the NSPS.

3.0 CURRENT STANDARDS FOR SULFURIC ACID PLANTS

3.1 Background Information

Prior to the promulgation of the NSPS in 1971, almost all existing contact process sulfuric acid plants were of the single-absorption design and had no SO_2 emission controls. Emissions from these plants ranged from 1500 to 6000 ppm SO_2 by volume, or from 10.8 kg of SO_2/Mg of 100 percent acid produced (21.5 lb/ton) to 42.5 kg of SO_2/Mg of 100 percent acid produced (85 lb/ton). Several state and local agencies limited SO_2 emissions to 500 ppm from new sulfuric acid plants, but few such facilities had been put into operation (EPA, 1971).

Many sulfuric acid plants utilized some type of acid mist control prior to 1971, but several had no controls whatsoever. Uncontrolled acid mist emissions varied between 2 and 50 mg/scf, or from 0.4 to 9 lb of H_2SO_4/ton of 100 percent acid produced, the lower figure representing emissions from a plant burning high-purity sulfur. State and local regulatory agencies had only begun to limit acid mist emissions to more stringent levels; i.e., some agencies had adopted limits of 1 and 2 mg/scf, respectively, for new and existing plants (EPA, 1971).

It is estimated that SO_2 emissions from sulfuric acid plants totalled 528,000 Mg (580,000 tons) in 1971 and 245,000 Mg (269,000 tons) in 1976 (Mann, 1978). This represents a 54 percent drop in SO_2 emissions from this industry in the first 5 years after the promulgation of the NSPS for this pollutant.* By 1976 sulfuric acid plants, in compliance with the NSPS, represented 31 percent of the sulfuric acid industry capacity (Stanford Research Institute, 1977).

No corresponding data are available for the effect of the NSPS on total acid mist emissions from the industry.

3.2 Facilities Affected

The NSPS regulates sulfuric acid plants that were planned or under construction or modification as of August 17, 1971. Each sulfuric acid production unit (or "train") is the affected facility. The standards of performance apply to contact-process sulfuric acid and oleum facilities that burn elemental sulfur, alkylation acid, hydrogen sulfide, metallic sulfides, organic sulfides, mercaptans or acid sludge. The NSPS does not apply to metallurgical plants that use acid plants as control systems, or to chamber process plants or acid concentrators.

An existing sulfuric acid plant is subject to the promulgated NSPS if: (1) a physical or operational change in an existing facility causes an increase in the emission rate to the atmosphere of any pollutant to which the standard applies, or (2) if in the course of reconstruction of the facility, the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entire new facility that meets the NSPS.

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*It is not known what portion of this drop in SO_2 emissions is due to NSPS-controlled plants or to existing plants covered by State Implementation Plans (SIP).

3.3 Controlled Pollutants and Emission Levels

The pollutants to be controlled at sulfuric acid plants by the NSPS are defined by 40 CFR 60, Subpart H (as originally promulgated in 36 FR 24881 with subsequent modifications in 39 FR 20794) as follows:

1. Standard for sulfur dioxide

   (a) "On and after the date. . . no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which contain sulfur dioxide in excess of 2 kg per metric ton of acid produced (4 lb per ton), the production being expressed as 100 percent H_2SO_4."

2. Standard for acid mist

   (a) "On and after the date. . . no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any affected facility any gases which:

      (1) Contain acid mist, expressed as H_2SO_4, in excess of 0.075 kg per metric ton of acid produced (0.15 lb per ton), the production being expressed as 100 percent H_2SO_4.

      (2) Exhibit 10 percent opacity, or greater. Where the presence of uncombined water is the only reason for failure to meet the requirements of this paragraph, such failure will not be a violation of this section."

The values of these standards were derived from the following data sources:

1. A literature search revealed that over 20 dual-absorption ~~plants had been operating successfully in Europe for~~ several years using both elemental sulfur and roaster gas as feed and that three of these plants produced maximum SO_2 emissions ranging from 91 to 260 ppm SO_2 by volume, or from 0.6 kg of SO_2 per Mg of acid produced (1.2 lb/ton) to 1.6 kg of SO_2 per Mg of acid produced (3.1 lb/ton).

2. The two plants tested and evaluated by EPA engineers were a plant of typical dual-absorption design and a single-absorption spent-acid burning plant that used a sodium sulfite-bisulfite scrubbing process to recover SO_2 from tail gas.

The dual-absorption sulfuric acid plant was the first of its kind in the U.S. and was used by EPA as part of the best demonstrated control technology rationale for the NSPS for SO_2 emissions. Since 1971, 17 dual-absorption plants have been built in the U.S. with a total of 32 individual sulfuric acid units (or trains). This process has become the best demonstrated control technology for SO_2 control in the industry. No new sodium sulfite-bisulfite scrubbing units for SO_2 abatement have been installed on sulfuric acid plants built in the U.S.

Emission tests from both the original dual-absorption sulfuric acid plant and the single absorption plant with sodium sulfite-sodium bisulfite scrubbing, indicated that both operations were capable of maintaining SO_2 and acid mist emissions below 2.0 kg/Mg (4 lb/ton) and 0.075 kg/Mg (0.15 lb/ton), respectively, at full load operations. Additionally, control of acid mist below 0.075 kg/Mg (0.15 lb/ton) at these plants, resulted in no visible emissions from the stack, i.e., opacity was below 10 percent. Continuous stack monitoring at these plants indicated that at full load, the plants could be consistently operated so that SO_2 emissions would be kept within the limits of the performance standard (EPA, 1971). In Section 5.0 of this report, NSPS emission test results for SO_2 and acid mist are presented for all the new sulfuric acid units completed since the promulgation of the standard.

3.4 Testing and Monitoring Requirements

3.4.1 Testing Requirements

Performance tests to verify compliance with SO_2, acid mist and opacity standards for sulfuric acid plants must be conducted within 60 days after the plant has reached its full capacity production rate, but not later than 180 days after the initial start-up of the facility (40 CFR 60.8). The EPA reference methods to be used in connection with sulfuric acid plant testing include:

1. Method 8 for the concentrations of SO_2 and acid mist
2. Method 1 for sample and velocity traverses
3. Method 2 for velocity and volumetric flow rate
4. Method 3 for gas analysis.

For Method 8, each performance test consists of three separate runs each at least 60 minutes with a minimum sample volume of 1.15 dscm (40.6 dscf). The arithmetic mean of the three runs taken is the test result to which compliance with the standard applies (40 CFR 60.8).

The sulfuric acid production rate, expressed as Mg/hr of 100 percent H_2SO_4, is to be determined during each testing period by suitable methods and confirmed by a material balance over the production system. Sulfur dioxide and acid mist emissions in kg/Mg of 100 percent H_2SO_4 are determined by dividing the emission rate in kg/hr by the hourly 100 percent acid production rate.

3.4.2 Monitoring Requirements

SO_2 emissions in the tail gas from sulfuric acid plants are required to be continuously monitored. Continuous SO_2 monitoring instrumentation should be able to: (1) provide a record of performance and (2) provide intelligence to plant operating personnel such that suitable corrections can be made when the system is shown to be out of adjustment. Plant operators are required to maintain the monitoring equipment in calibration and to furnish records of SO_2 excess emission values to the Administrator of EPA or to the responsible State agency.

Measurement principles used in the gas analysis instruments are:

1. Infrared absorption
2. Colorimetric titration of iodine
3. Selective permeation of SO_2 through a membrane
4. Flame photometric measurement
5. Chromatographic measurement
6. Ultraviolet absorption.

The ultraviolet absorption system and the iodine titration method have received widespread application for SO_2 measurement in sulfuric acid plants subject to NSPS (Calvin and Kodras, 1976).

The continuous monitoring system is calibrated using a gas mixture of known SO_2 concentration as a calibration standard. Performance evaluation of the monitoring system is conducted using the SO_2 portion of EPA Method 8.

Excess SO_2 emissions are required to be reported to EPA (or appropriate state regulatory agencies) for all 3-hour periods of such emissions (or the arithmetic average of three consecutive 1-hour periods). Periods of excess emission are considered to occur when the integrated (or arithmetic average) plant stack SO_2 emission exceeds the standard of 2 kg/Mg (4 lb/ton) of 100 percent H_2SO_4 produced.

4.0 STATUS OF CONTROL TECHNOLOGY

4.1 Status of Sulfuric Acid Manufacturing Industry Since the Promulgation of the NSPS

4.1.1 Geographic Distribution

~~In 1971 there were 167 contact process sulfuric acid and oleum~~ plants in the U.S. By 1977 the number of plants had decreased to 150. Thirty-two sulfuric acid units subject to NSPS are included in these 150 plants. Table 4-1 provides a summary by EPA region of the number of units subject to NSPS and their design tonnage. Table 4-2 is a tabulation of the eight new units planned or under construction which will be coming on-line by 1980.

Figure 4-1 shows the geographical distribution of contact process sulfuric acid units completed since 1971. The heaviest concentration of new units is in Region IV (Southeast). The high concentration of sulfuric acid units constructed in Florida since 1971 can be explained by the presence of rich phosphate rock deposits. Eighty percent of the phosphate rock mined goes into the manufacture of phosphatic fertilizers, which is also the end use of 60 percent of the total U.S. sulfuric acid production (Bureau of Mines, 1975; 1978). Since most sulfuric acid is consumed near its point of manufacture, units with production dedicated for phosphate fertilizer manufacture will, usually, be located ~~near phosphate rock deposits~~.

4.1.2 Production

U.S. production of sulfuric acid in 1977 totalled approximately 30.9 million Mg (34 million short tons), representing an average

TABLE 4-1

SUMMARY OF NEW SULFURIC ACID PLANT COMPLETIONS SINCE THE PROMULGATION OF THE NSPS

EPA Region	Units In Production (1971-1977)	Plant Design Capacity[a] (100% H_2SO_4) Mg/day (TPD)	Percent of Total New Design Capacity
II	2	1,820 (2000)	4.6
IV	18	28,670 (31,500)	72.3
V	1	230 (250)	0.6
VI	4	5,370 (5900)	13.6
IX	1	1,640 (1800)	4.1
X	6	1,890 (2080)	4.8
Total	32	39,610 (43,530)	100.0
	Average	1200 (1300)	

[a] These units all use the double absorption process except one plant (one new unit and two existing units) in Region VI and one plant (two new units) in Region X which use a single absorption process with ammonia scrubbing. One new plant in Region V is currently retrofitting from single to double absorption.

TABLE 4-2

SULFURIC ACID PLANTS PLANNED OR UNDER CONSTRUCTION

Region	Company	Plant Location	No. of Units	Plant Capacity Mg/day (TPD)	Anticipated Startup Date	Source
III	Getty Oil	Delaware City, Del.	2	540 (600)[a]	1980	Hansen, 1978
IV	Occidental Chemical Co.	White Springs, Fla.	2	3640 (4000)[b]	Late 1979	Hansen, 1978
	Royster Co.	Mulberry, Fla.	1	720 (800)	Late 1979	Hansen, 1978
V	Shell Chemical Co.[c]	Wood River, Ill.	1	230 (250)	Fall, 1979	Williams, 1977
VI	American Cyanamid Co.	Fortier, La.	1	1460 (1600)	Fall, 1978	Chem. Eng., 1977
VII	U.S. Army Sunflower Arsenal	Lawrence, Kan.	1	270 (300)	1980	Hansen, 1978
		TOTAL	8	6860 (7500)		

[a] 2 - 270 Mg/day (300 TPD) units.

[b] 2 - 1820 Mg/day (2000 TPD) units.

[c] Retrofit of dual absorption system.

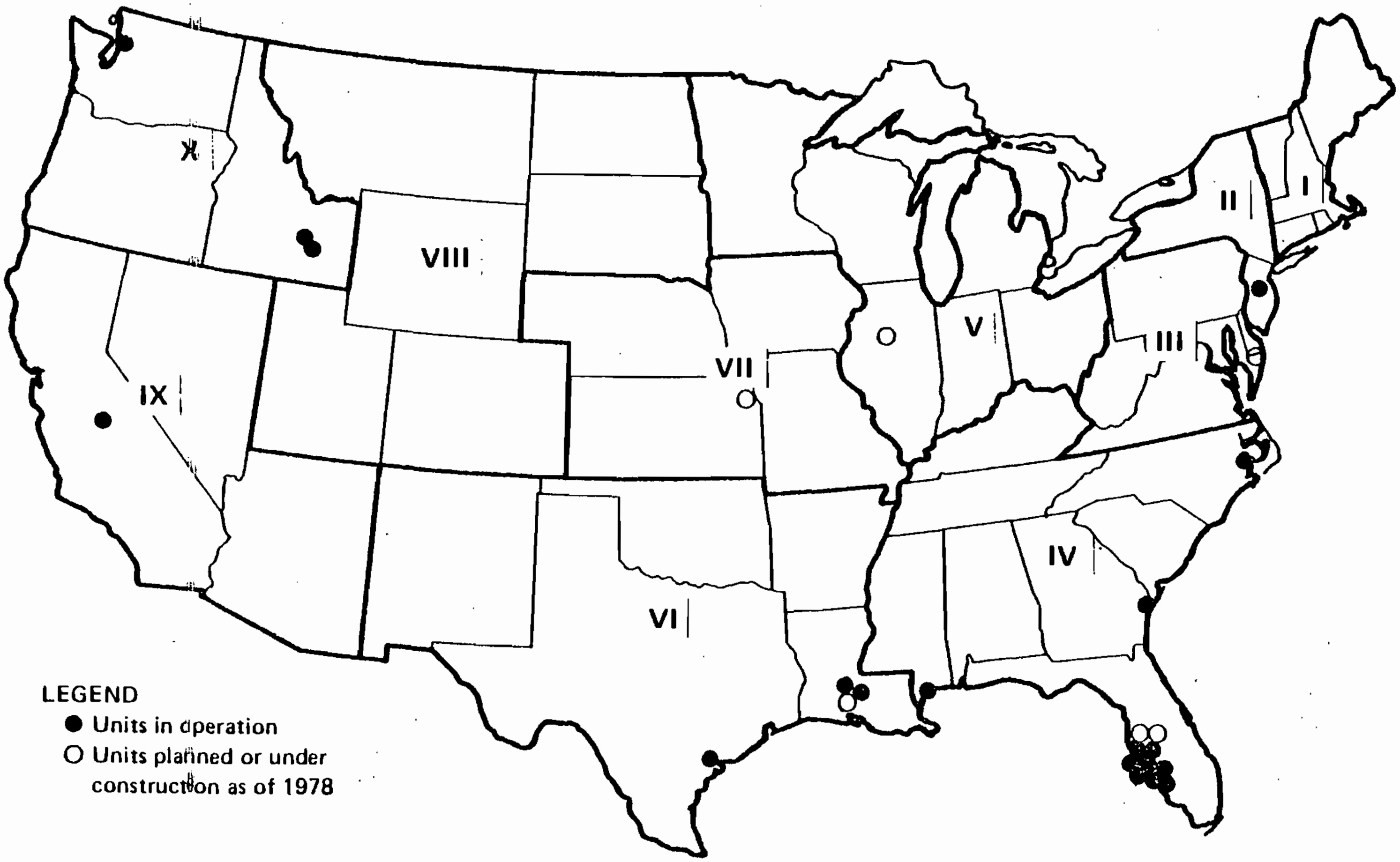


FIGURE 4-1
CONTACT PROCESS SULFURIC ACID PLANTS
COMPLETED IN THE U.S. SINCE 1971

yearly increase of 1.9 percent (575,000 Mg) since 1971 (Department of Commerce, 1976; Chemical and Engineering News, 1978). Figure 4-2 shows total annual production of sulfuric acid for 1971 to 1977, including production by the lead chamber process, which has almost been phased out of the industry (EPA, 1976). Production by the contact process alone represented 99.3 percent of total production in 1971 and increased to 99.8 percent in 1976 (Chemical and Engineering News, 1978). Table 4-3 shows the increase in sulfuric acid production by region from 1975 to 1976. Production in the South represented 70 percent of the U.S. total in 1976 (Department of Commerce, 1976).

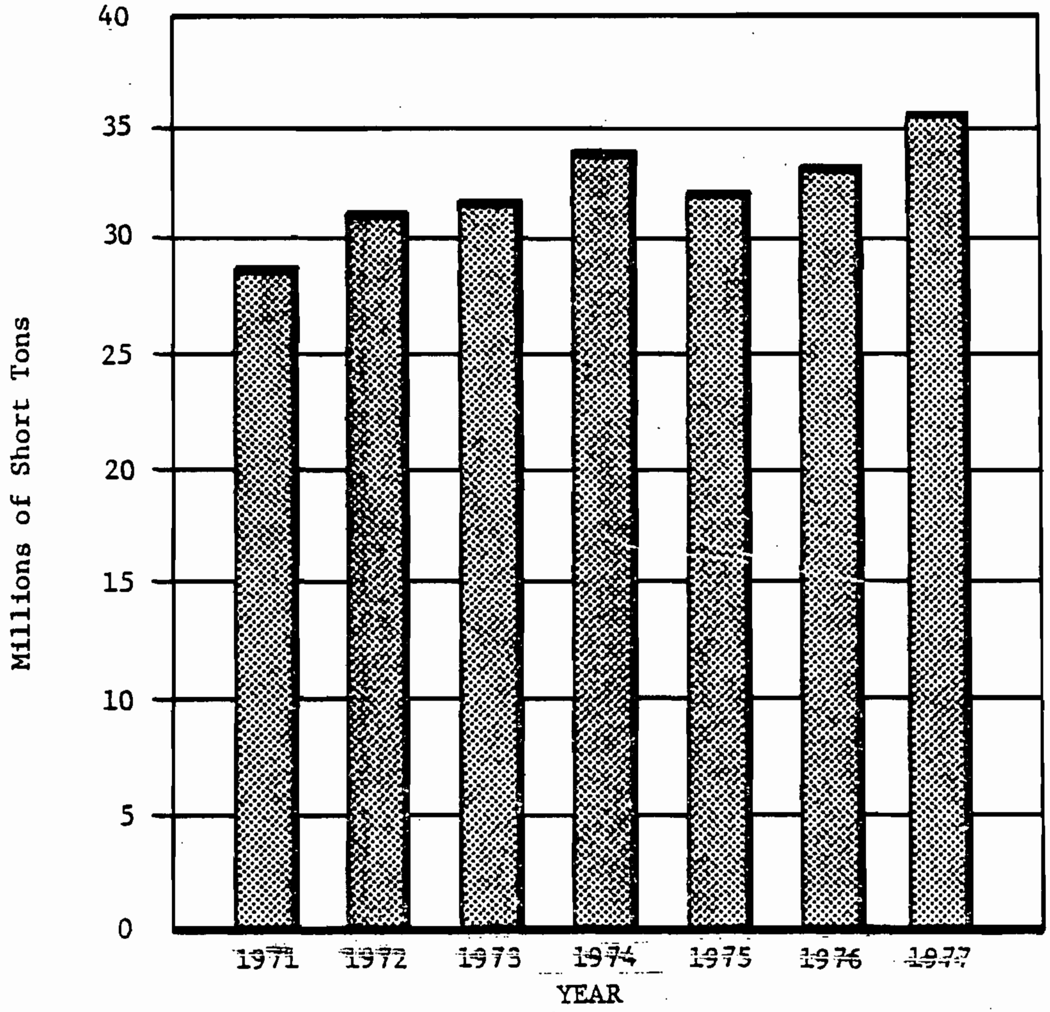
TABLE 4-3

SULFURIC ACID PRODUCTION
(Mg of 100% H_2SO_4)

Region	1975	1976	Change (%)	Total Production 1976(%)
Northeast	1,728.2	1,527.2	-12	5
North Central	2,804.4	2,636.9	-6	9
West	4,110.7	4,445.5	+8	16
South	19,640.9	20,667.9	+5	70

Source: Department of Commerce, 1976.

The growth of the sulfuric acid industry since the promulgation of the NSPS has been largely dominated by the growth in the phosphate fertilizer industry in the early and mid-seventies. Of the 32



SOURCE: Department of Commerce, 1976; 1977.

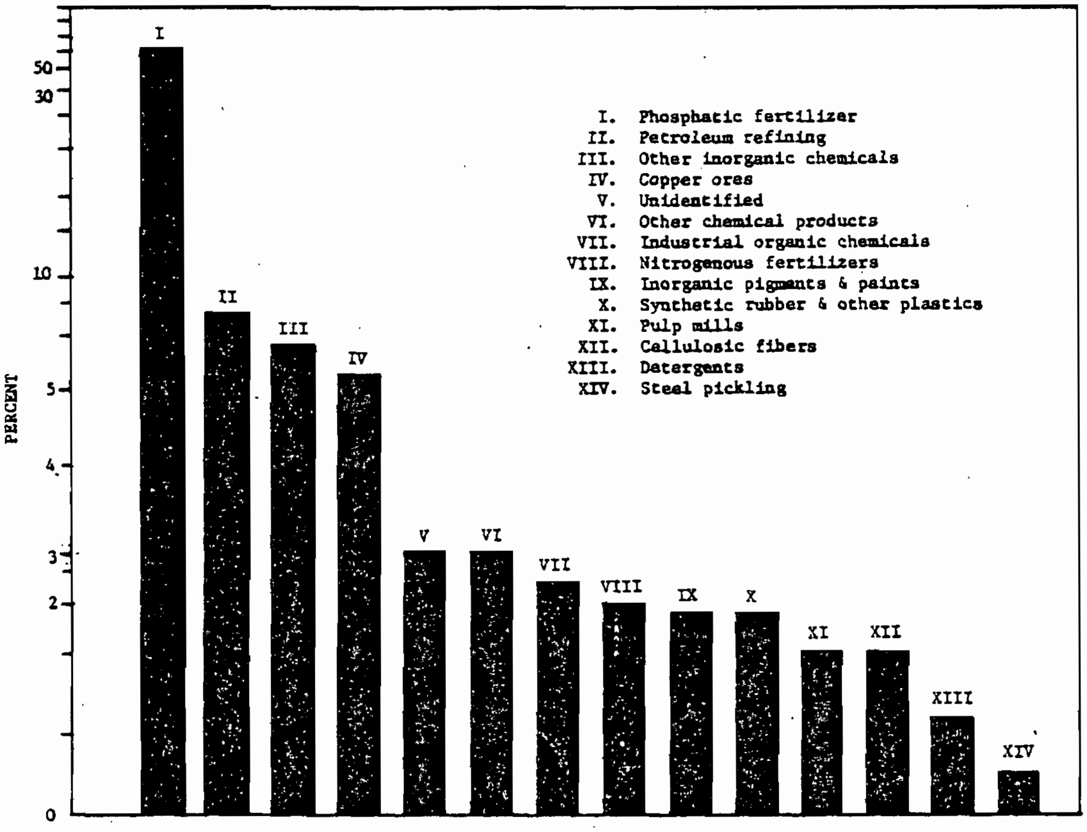
FIGURE 4-2
GROSS TOTAL PRODUCTION OF SULFURIC ACID:
1971 TO 1977

contact process sulfuric acid units subject to NSPS, the output of at least 24 units is dedicated to the acidulation of phosphate rock as the first step in the manufacture of wet process phosphate and acid superphosphate fertilizers.

About 68 percent of the contact process sulfuric acid is produced from elemental sulfur, representing approximately 85 percent of the total sulfur consumption in the U.S. The remaining acid is made from iron pyrites (4.5 percent); tail gas from smelters (9 percent); and hydrogen sulfide, spent alkylation acid, and acid sludge from petroleum refineries (18.5 percent).

Sulfuric acid is produced in various concentrations and in four grades: commercial, electrolyte or high purity, textile (having low organic content), and chemically pure (C.P.) or reagent grade. The various end uses of sulfuric acid are shown in Figure 4-3. In addition to the manufacturing of fertilizer, other major uses are petroleum refining (7 percent), other inorganic chemicals (6 percent), and copper ores (5 percent).

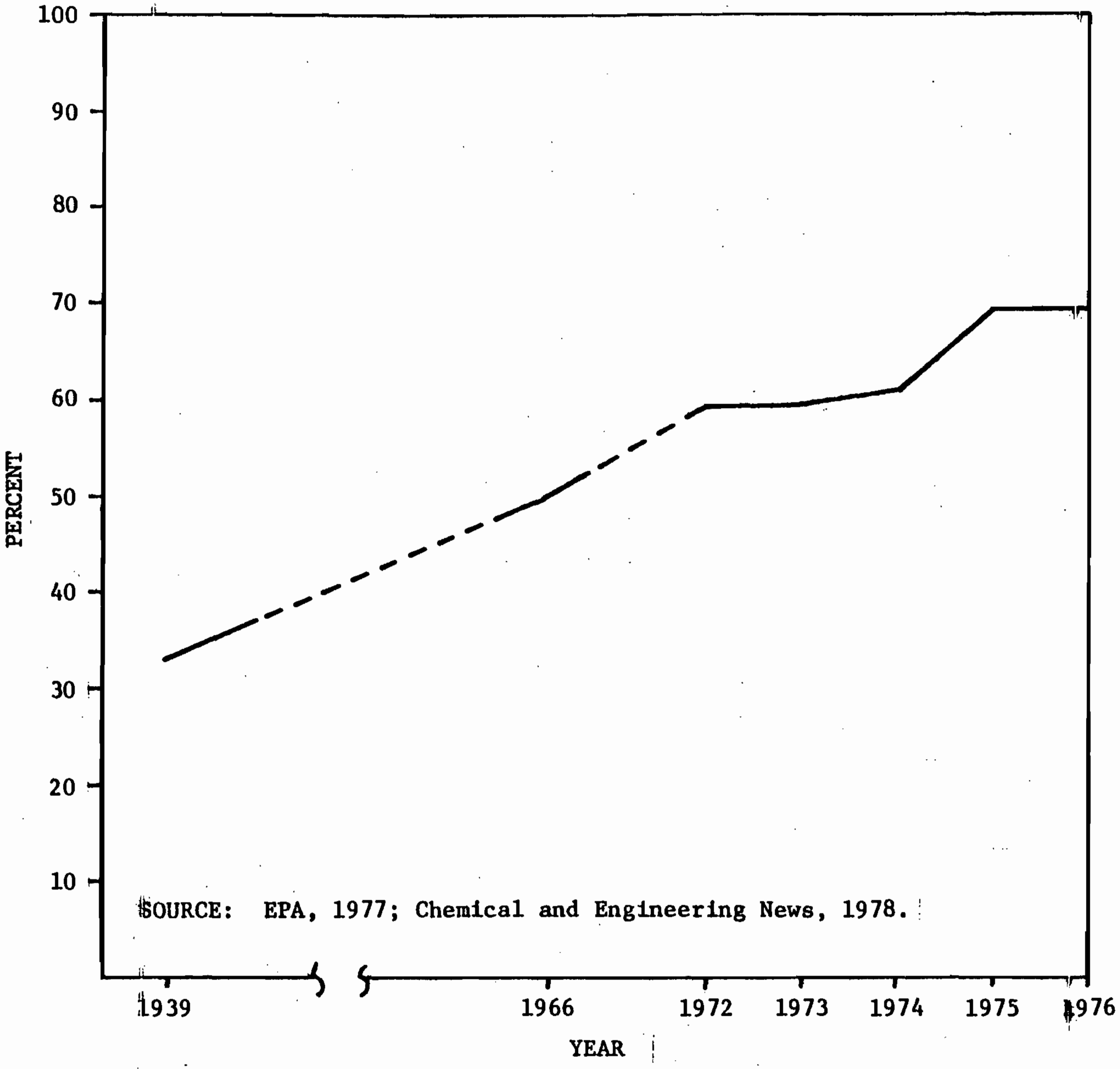
An increasing number of sulfuric acid consumers, specifically fertilizer manufacturers, produce their own sulfuric acid for captive use. The ratio of production for merchant sales (or shipments) to production for captive use decreased from 2:1 in 1939 and 1:1 in 1966 to 0.7:1 in 1973. This relationship is shown in Figure 4-4.



Note: Uses under 1% are: uranium & vanadium ore, other ore, other paper products, drugs, pesticides, other agricultural chemicals, explosives, water treating compounds, rubber & miscellaneous plastic products, nonferrous metals, other primary metals, and storage batteries (acid). There were no sulfuric acid exports in 1977.

SOURCE: Bureau of Mines, 1978.

FIGURE 4-3
SULFURIC ACID END USES



SOURCE: EPA, 1977; Chemical and Engineering News, 1978.

FIGURE 4-4
PERCENT OF TOTAL PRODUCTION OF SULFURIC ACID IN CAPTIVE USE

4.1.3 Industrial Trends

U.S. sulfuric acid production in 1968 was 25.9 million metric tons, and approximately 30.9 million metric tons in 1977. Production is expected to increase to 49 and 80 million metric tons by the years 1980 and 1990, respectively.

Tables 4-1, 4-2, 4-3 and Figure 4-1 show the strong trend towards siting sulfuric acid plants in the southern states. Over 86 percent of the new sulfuric acid design capacity is located in EPA Regions IV and VI. In 1971 EPA projected two new units to be coming on-line each year for the next several years (EPA, 1971). On the average, six new units have actually been completed each year since 1971. Of the total of 32 new units, 15 are located in Florida. Most of the sulfuric acid production units in the South are captive in nature with the output going into phosphate fertilizer production at the same plant complex. In 1976, over 70 percent of the total national production of new sulfuric acid was in the South. Therefore, based on the high phosphate rock concentrations (Department of the Interior, 1973) on the new construction in Region IV, and on the production trends of sulfuric acid (Figure 4-4), three of the four units projected to be coming on-line each year will most probably be located in the South.

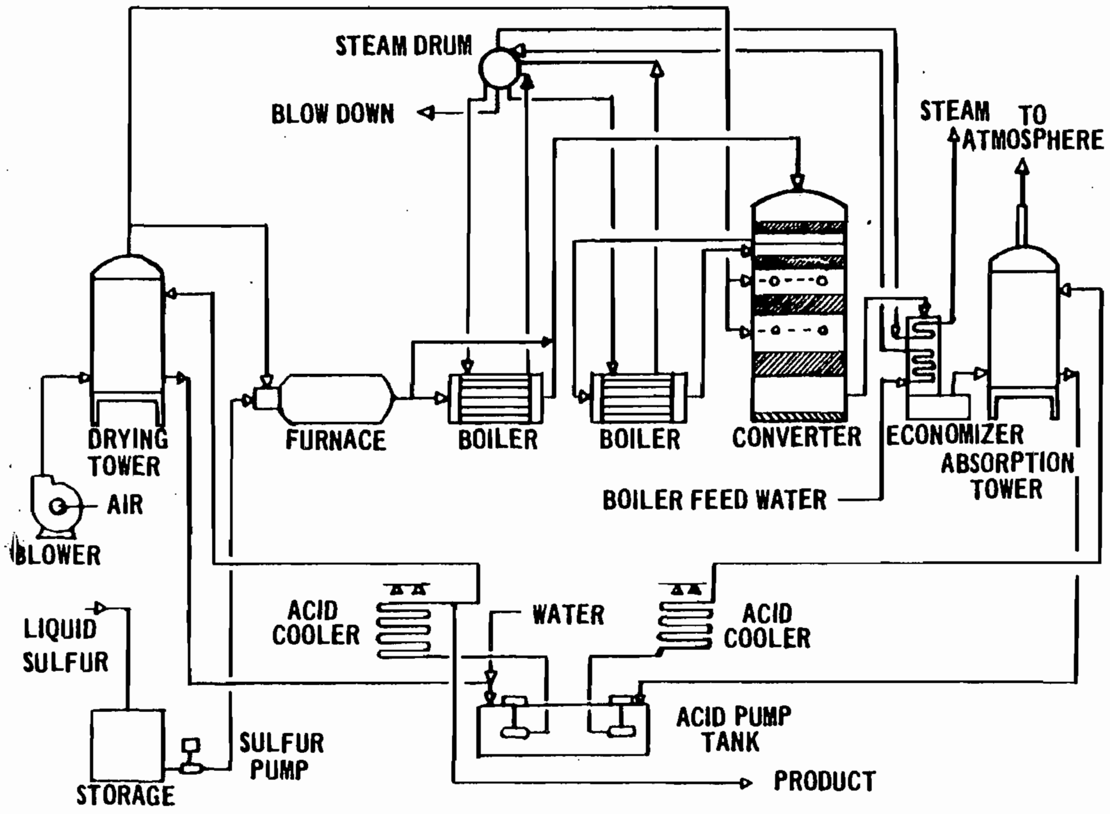
The location of sulfuric acid plants is not dependent on the location of sources of sulfur, but rather on the location of various industries associated with the use of sulfuric acid, i.e. the fertilizer and petroleum refining industries. The future supply of sulfur for new acid will lean more heavily on recovered sulfur from petroleum production and sulfur dioxide abatement and less on mined (Frasch) sulfur.

4.2 Contact Process for Sulfuric Acid Production

All contact sulfuric acid manufacturing processes incorporate three basic operations: (1) burning of sulfur or sulfur-bearing feedstocks to form SO_2, (2) catalytic oxidation of SO_2 to SO_3, and (3) absorption of SO_3 in a strong acid stream. The several variations in the process are due principally to differences in feedstocks. The least complicated systems are those that burn elemental sulfur. Where there are appreciable organics and moisture as in spent acid and acid sludge, additional operations are required to remove moisture and particulates prior to catalysis and absorption. The composition of feedstock can affect the sulfur conversion ratio, the volume of exhaust gases and the character and rate of pollutant releases.

4.2.1 Elemental Sulfur Burning Plants

Figure 4-5 is a schematic diagram of a contact sulfuric plant burning elemental sulfur. Sulfur is burned to form a gas mixture which is approximately 8 to 10 percent sulfur dioxide, 11 to 13 percent oxygen, and 79 percent nitrogen. Combustion air is predried by passing through a packed tower circulating 98 percent sulfuric acid. Air drying minimizes acid mist formation and resultant corrosion throughout the system.



SOURCE: EPA, 1971.

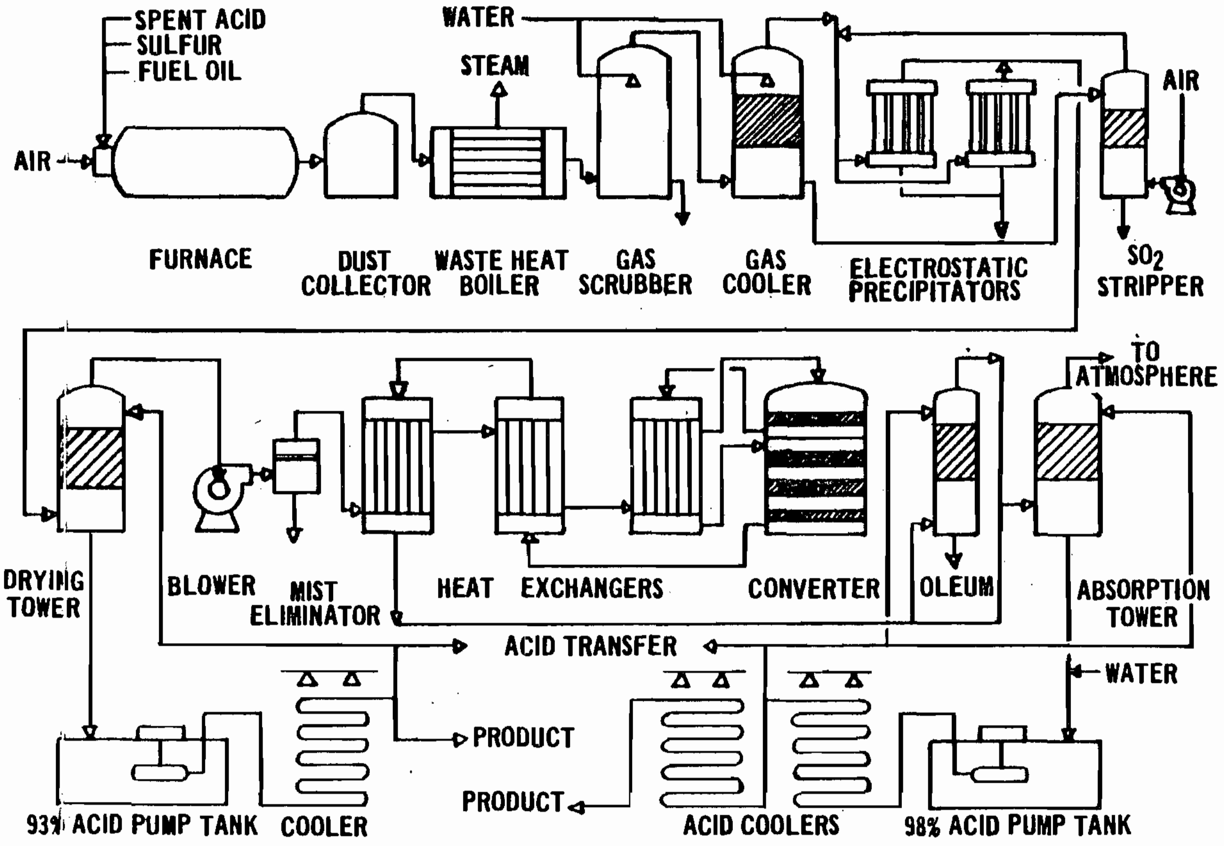
FIGURE 4-5
CONTACT-PROCESS SULFURIC ACID PLANT BURNING ELEMENTAL SULFUR

SO_2 is oxidized to SO_3 in the presence of a catalyst containing approximately 5 percent vanadium pentoxide. The temperature of the reacting gas mixture increases as the composition approaches equilibrium. Maximum conversion to SO_3 requires several conversion stages with intermediate gas cooling. The gas exiting the converter is cooled in an economizer to temperatures between 230° and 260°C, and SO_3 is absorbed in 98 percent sulfuric acid circulating in a packed tower. The acid content and temperature must be carefully controlled to prevent excessive SO_3 release.

If fuming sulfuric acid (oleum) is produced, the SO_3 containing gases are first passed through an oleum tower which is fed with acid from the 98 percent absorption system. The gas stream from the oleum tower is passed through the 98 percent acid absorber for recovery of residual sulfur trioxide.

4.2.2 Spent Acid and Other By-Product Plants

Where spent acid, sludge, and similar feedstocks are employed, the processes are more elaborate and expensive than sulfur-burning plants due to the fact that the sulfur dioxide containing gas stream is contaminated. Gases must be cleaned if high-quality acid is to be produced. This requires additional gas cleaning and cooling equipment to remove dust, acid mist, and gaseous impurities, along with excessive amounts of water vapor. Purification equipment consists of cyclones, electrostatic dust and mist precipitators, plus scrubbers and gas-cooling towers in various combinations. Figure 4-6



SOURCE: EPA, 1971.

FIGURE 4-6
CONTACT-PROCESS SULFURIC ACID PLANT
BURNING SPENT ACID

shows one possible configuration of a spent acid plant. The balance of the process following the drying tower is essentially the same as an elemental sulfur-burning plant.

A few plants burning only hydrogen sulfide or hydrogen sulfide plus elemental sulfur use a simplified version of the above process. Wet gases from the combustion chamber and waste heat boiler are charged directly to the converter with no intermediate treatment. Gases from the converter flow to the absorber, through which 70 to 93 percent sulfuric acid is circulating. In such a "wet gas" plant much of the sulfur trioxide from the converter is in the form of acid mist which is not absorbed in the absorption tower. High efficiency mist collectors are utilized both to recover product and to prevent excessive air pollution.

4.3 Emissions from Contact Process Sulfuric Acid Plants

4.3.1 Sulfur Dioxide

Mass SO_2 emissions vary inversely as a function of the sulfur conversion efficiency (i.e., fraction of SO_2 oxidized to SO_3). For sulfur burning plants, the inlet SO_2 concentration to the catalytic converters normally ranges between 7.5 and 8.5 percent but can be as high as 10.5 percent. Conversion efficiency depends upon the number of stages in the catalytic converter and, to a lesser extent, on the amount of catalyst.

Most plants built prior to 1960 had only three catalyst stages, and overall conversion efficiencies were approximately 95 to 96 percent. Sulfur burning plants built since 1960 generally have four stages* and efficiencies normally range between 96 and 98 percent. For three-stage plants, SO_2 release ranges between 28 and 35 kg/Mg and for four-stage plants, between 13 and 28 kg/Mg.

Spent acid plants followed the same design trend. Most three-stage plants were built prior to 1960 and four-stage plants have usually been built after 1960. Typical SO_2 concentrations in the converter feed, conversion efficiencies, and resultant emissions for plants burning sulfur, H_2S or primarily acid sludge are given in Table 4-4.

TABLE 4-4

SULFUR DIOXIDE CONVERSION EFFICIENCIES AND EMISSIONS FOR FOUR-STAGE CONVERTERS

Feedstock	Sulfur	Hydrogen Sulfide (with some other sulfur compounds)	Acid Sludge
SO_2 in converter feed, % by volume	7.5 to 8.5	7	6 to 8
Sulfur conversion to SO_3, % by weight	96 to 98		
SO_2 emissions, kg/Mg 100% acid	13 to 28	25 to 43	15 to 56
SO_2 emissions, ppm by volume	1500 to 4000	1500 to 4000	1500 to 4000

~~Source:~~ ~~EPA~~, ~~1971~~.

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*There have been a number of five-stage converters included in dual absorption plants built since 1971 (see Section 5.2.1).

Exit SO_2 concentrations from contact plants vary as a function of the SO_2 content of dry gases fed to the converter. Where SO_2 strength is relatively low, there is a significantly greater volume of gases handled per ton of acid produced.

A plant with 4.0 percent SO_2 in the dry gases to the converter will exhaust over two and one-half times the gas volume of a plant operating on a 10.0 percent SO_2 stream, i.e., 4600 sm^3/Mg* vs. 1700 sm^3/Mg.

The relationship between mass emission rate, sulfur conversion and SO_2 exit concentrations has been plotted in Figure 4-7 for plants of various SO_2 strengths. The curve can be used for uncontrolled single absorption plants and for those plants equipped with tail gas removal systems or with the dual absorption process. It can be seen that the NSPS of 4.0 lb per ton of acid requires 99.7 percent sulfur conversion (dual absorption) or an equivalent SO_2 exit gas concentration of 380 ppm. This conversion is achieved by the dual absorption technique. At 98 percent conversion, which is optimum for most single absorption contact plants, exit SO_2 concentrations can vary from 900 to 2500 ppm as the inlet SO_2 content varies from 4.0 to 10.0 percent.

4.3.2 Acid Mist Formation

The sulfuric acid liquid loading in the tail gas from the absorber in a contact process plant is classified into two broad areas based on the acid particle size: (1) spray, which is defined

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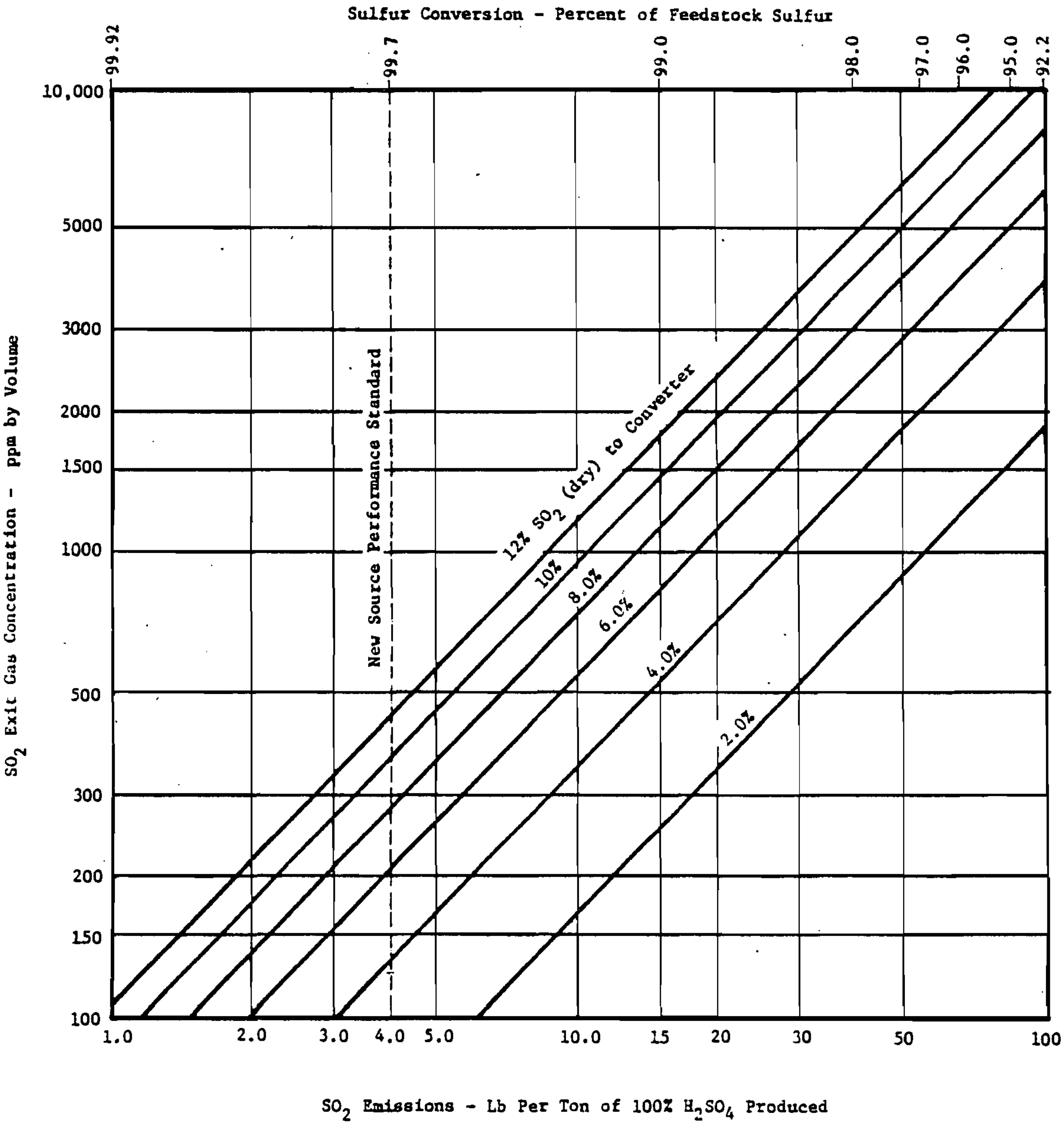
*Standard cubic meter per metric ton.



~~Source: EPA, 1976~~

FIGURE 4-7
SULFURIC ACID PLANT FEEDSTOCK SULFUR CONVERSION
VS. VOLUMETRIC AND MASS SO_2 EMISSIONS AT VARIOUS
INLET SO_2 CONCENTRATIONS BY VOLUME

as acid particles larger than 10 microns, and (2) mist, which is defined as acid particles smaller than 10 microns (Duros and Kennedy, 1978).*

Spray is primarily formed by mechanical generation of particles that are formed when a gas and liquid are mixed together. Examples of spray formation are liquid droplets formed by nozzles and liquid entrainment leaving a packed tower. A typical tower design in a modern acid plant will have a spray loading of 175 to 350 milligrams per actual cubic meter (mg/AM^3) under normal operating conditions.

Acid mist formation is more complex to define than spray. There are two primary mechanisms of acid mist formation. The first mechanism is the reaction between two vapors forming a liquid or solid (i.e., change of state where volume reactants is much greater than volume products). This is best exemplified by the reaction of sulfur trioxide and water vapors to form submicronic sulfuric acid mist.

$$H_2O_{(g)} + SO_{3(g)} \longrightarrow H_2SO_{4(\ell)}$$

The second mechanism of mist formation is vapor condensation in the bulk gas phase by lowering the gas stream temperature beyond the liquid dew point. The dew point of a sulfuric acid under typical conditions is about 300° to 350°F. However, because of the uncertainties of bulk phase temperature differences, nonideal conditions and wall effects, the gas stream temperature is normally maintained between 375° to 425°F. This is done to insure that acid mist is not present to attack metal equipment.

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*The EPA definition of acid mist (Method 8) includes both liquid sulfuric acid particles and SO_3 gas.

The formation of sulfuric acid mist in an acid plant is due to a combination of these mechanisms. When a gas stream containing SO_3, H_2SO_4 and H_2O vapor is cooled below the liquid dew point, the H_2SO_4 vapor condenses and the SO_3 vapor and H_2O vapor combine to form H_2SO_4, which also condenses. Submicronic mist particles will be formed when the gas is cooled faster than the condensable vapor can be removed by mass transfer (i.e., "shock cooling"). The conditions for "shock cooling" are present in the absorbing towers of an acid plant.

The practical key to controlling mist formation is to keep the H_2O content in a gas stream as low as possible. As an example of mist forming capability of extraneous water, 1 mg of water vapor carried through the plant has the potential to produce 190 mg/m^3 of submicronic acid mist (Duros and Kennedy, 1978). The water content of the gas stream can be increased by:

1. High organic content of contaminated elemental sulfur (sulfur burning plants only),
2. Acid mist carryover from upstream equipment,
3. Inadequate drying of the process air stream, and
4. Low absorbing tower acid strengths

At acid strengths below 98.5 percent, the acid begins to exert a measurable water vapor pressure. The optimum absorbing tower acid has the minimum vapor pressure of both water (minimizing mist formation problems) and sulfur trioxide (minimizing SO_3 slippage).

In oleum producing plants, greater quantities and a much finer mist are produced. From 85 to 95 weight percent of the particles are less than 2 microns in diameter as compared with about 30 percent less than 2 microns for 98 percent acid production. Acid mist emissions prior to control equipment range between 0.2 to 2 kg/Mg for sulfur burning contact plants producing no oleum to about 0.5 to 5 kg/Mg for spent acid burning plants producing oleum, based on an 8 percent SO_2 feed to the converter.

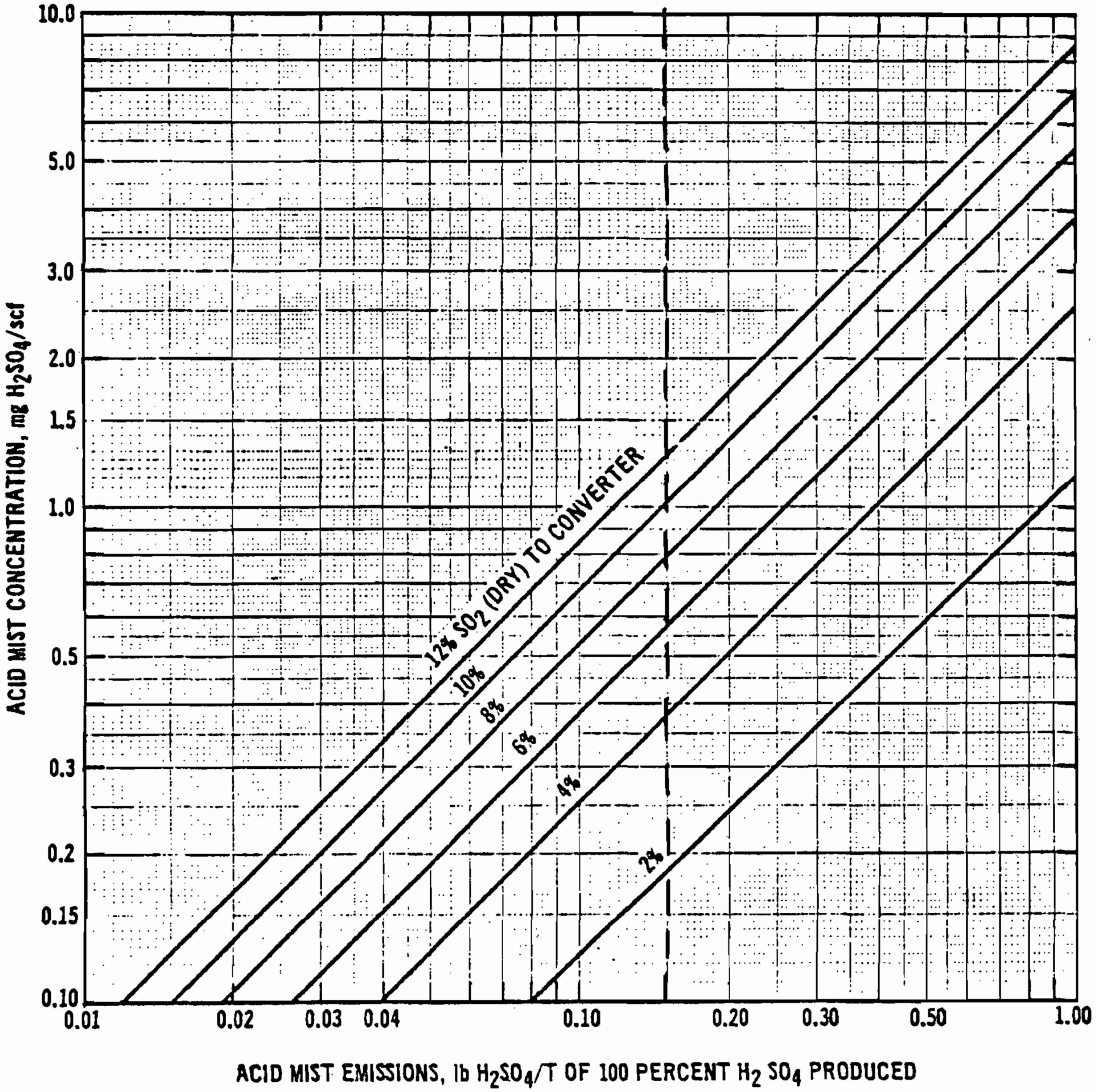
Spent acid plants characteristically form acid mist in the early stages of the process. This requires mist removal prior to drying and oxidation as well as from the tail gas after absorption.

"Wet gas" plants burning hydrogen sulfide deliberately form acid mist by not drying the process gas. Much of this mist is recovered as product acid with gas cooling equipment and high efficiency mist eliminators or electrostatic precipitators.

For a given mass emission rate, acid mist concentrations vary as a function of the exhaust gas volume and, thus, the SO_2 control of the gases fed to the converter. Figure 4-8 shows a relationship between mass emission rates and concentrations over a range of SO_2 strengths. The curves can be used with any gas stream before or after mist eliminators, provided there is no dilution.

4.3.3 Visible Emissions (Opacity)

Acid mist in exhaust gases creates visible emissions ranging from white to blue depending on particle size, concentration and



SOURCE: EPA, 1977.

FIGURE 4-8
SULFURIC ACID PLANT CONCENTRATIONS OF MIST FOR MASS STACK EMISSIONS PER UNIT OF PRODUCTION AT INLET SO_2 VOLUME CONCENTRATIONS

background. Where there is no control of mist, opacities generally range from 80 to 100 percent.

The effect of acid mist on opacity is more dependent on the size of the mist particle than on the quantity of mist. The smaller particles scatter light more, producing a denser plume. Nevertheless, it has been demonstrated that opacity of the plume from an efficient SO_3 absorber a function of acid mist concentration and that visible emissions can be eliminated by minimizing acid mist levels in the acid plant tail gas, through the use of a good mist eliminator. At the current NSPS acid mist control level, there are essentially no visible emissions.

4.3.4 Oxides of Nitrogen

Nitrogen oxides present in the converter gas also cause acid mist emissions, since they reduce the efficiency of the absorption tower. Nitrogen oxides may result from the fixation of atmospheric nitrogen in high temperature sulfur furnaces, or may be formed from nitrogen compounds in the feedstocks. Nitrogen oxides can be held to a reasonable minimum by using the same techniques which have been applied to steam generators. For instance, in the decomposition of spent acid containing nitrogen compounds, operation at furnace temperatures less than about 2000°F and a low oxygen content will generally keep nitrogen oxides concentrations below 100 ppm.

4.4 Control Technology Applicable to the NSPS Control of SO_2 Emissions from Contact Process Sulfuric Acid Plants

There are a few physical mechanisms and many chemical means of removing SO_2 from gas streams. Almost any soluble alkaline material will absorb a significant fraction of SO_2 even in a crude scrubber. For years, sulfur dioxide has been removed from many process gases where the SO_2 adversely affected the product. The problems of removing SO_2 from acid plant gases are principally that of finding the least expensive mechanism consistent with minimal formation of undesirable by-products. The control processes in use by the sulfuric acid industry (in those units installed since the promulgation of the NSPS), are reviewed below.

4.4.1 Dual Absorption Process

The dual absorption process (used partially as the basis of the rationale for the SO_2 NSPS) has become the SO_2 control system of choice by the sulfuric acid industry since the promulgation of the NSPS. This can be seen by examination of Table 4-5, which presents a tabulation of the new sulfuric acid units built since the promulgation of the NSPS together with their locations, design capacities, basic process design, and SO_2 and acid mist control technologies. Out of 32 new units built since the promulgation of the NSPS, 28 have employed the dual absorption process for SO_2 control. This process offers the following advantages over other SO_2 control processes:

- As opposed to single absorption with scrubbing, a greater fraction of the sulfur in the feed is converted to sulfuric acid.

TABLE 4-5

CONTACT PROCESS SULFURIC ACID PLANTS BUILT SINCE PROMULGATION OF THE NSPS

EPA Region	Company	State and Locality	Year Completed	No. of Units	Plant Design Capacity (100% H_2SO_4) Mg/day (TPD)	Process Design		Emissions Control System		Reference
						Single Absorption	Dual Absorption	SO_2	Acid Mist	
II		New Jersey								
	NL Industries, Inc.	Sayreville	1973	2	1,820 (2,000)		x	Process	Mist Eliminator	CDS[c], 1978
IV		Florida								
	Gardinier, Inc.	Tampa	1976	1	2,370 (2,600)		a	Process	Fiber Mist Eliminator	CDS, 1978
	Agrico. Chemical Inc.	So. Pierce	1975	2	3,800		x[b]	Process	York "S" Mist Eliminator	CDS, 1978
	CF Chemicals, Inc.	Bartow	1975	1	3,280 (2,000)		x	Process	Brink Fiber H-V Mist Eliminator	CDS, 1978
	CF Chemicals, Inc.	Plant City	1974	2	2,910 (3,200)		x	Process	Brink Fiber H-V Mist Eliminator	CDS, 1978
	W. R. Grace & Co.	Bartow	1976,1977	3	4,370 (4,800)		x	Process	Fiber Mist Eliminator	CDS, 1978
	International Mineral & Chemical Corp.	New Wales	1975	3	5,460 (6,000)		x	Process	Brink Fiber Mist Eliminator	CDS, 1978
	Occidental Petroleum Corp.	White Springs	1975	2	3,280 (3,600)		x[b]	Process	Parson-York Double Contact Mist Eliminator	CDS, 1978
		Georgia								
	American Cyanamid Co.	Savannah	1975	1	720 (800)		x	Process	Mist Eliminator	PEDCo., 1977
		Mississippi								
	Mississippi Chemical Corp.	Pascagoula	1975	1	1,370 (1,500)		x	Process	Bayer/Lurgi Mist Eliminator	CDS, 1978
		No. Carolina								
	Texas Gulf, Inc.	Lee Creek	1975	2	2,740 (3,000)		x	Process	Brink Fiber Mist Eliminator	CDS, 1978
V		Illinois								
	Anlin Chemical Corp.[a]	Wood River	1974	1	230 (250)	x		Molecular Sieve	Fiber Mist Eliminator	Williams, 1977
VI		Louisiana								
	Agrico. Chem. Co.	Donaldsonville	1974	2	3,090 (3,600)		x[b]	Process	York "S" 2 Stage Mesh Mist Eliminator	Spruiell, 1978
	Freeport Chem. Co.	Uncle Sam	1974	1	1,460 (1,600)		x	Process	Fiber Mist Eliminator	Spruiell, 1978
		Texas								
	Rohm & Haas	Deer Park		1	640 (700)	x		Ammonia Scrubbing	Fiber Mist Eliminator	Spruiell, 1978
IX		California								
	Valley Nitrogen Prod., Inc.	Helm	1975	1	1,640 (1,800)		x[b]	Process	Brink Fiber Mist Eliminator	Reynolds, 1977
X		Idaho								
	Beker Industries	Conda	1974	1	770 (850)		x	Process	Brink Fiber Mist Eliminator	Pfander, 1978
	J. R. Simplot Co.	Pocatello	1976	2	820 (900)	x		Ammonia Scrubbing	Brink Fiber Mist Eliminator	Pfander, 1978
		Washington								
	Allied Chem. Corp.	Anacortes		3	300 (330)		x[c]	Process	Fiber Mist Eliminator	Hooper, 1978
			TOTALS	32	39,610 (43,530)					
			AVERAGE		1,240 (1,360)					

[a] This facility was purchased by Shell Oil Co. in 1976; the plant is being modified to incorporate a double absorption process for SO_2 control.

[b] These units are of Parsons design, incorporating a 5-bed converter rather than the usual 4-bed converter.

[c] One of these units is of Parsons design (note [b]).

Source: MITRE Corp., 1978; PEDCO, Inc., 1977.

- There are no by-products.
- Contact acid plant operators are familiar with the operations involved.

Figure 4-9 is a process flowsheet of the dual absorption process. The SO_3 formed in the first three converter stages is removed in a primary absorption tower and the remainder of the gas is returned to the final conversion stage(s). Removal of a product of a reversible reaction

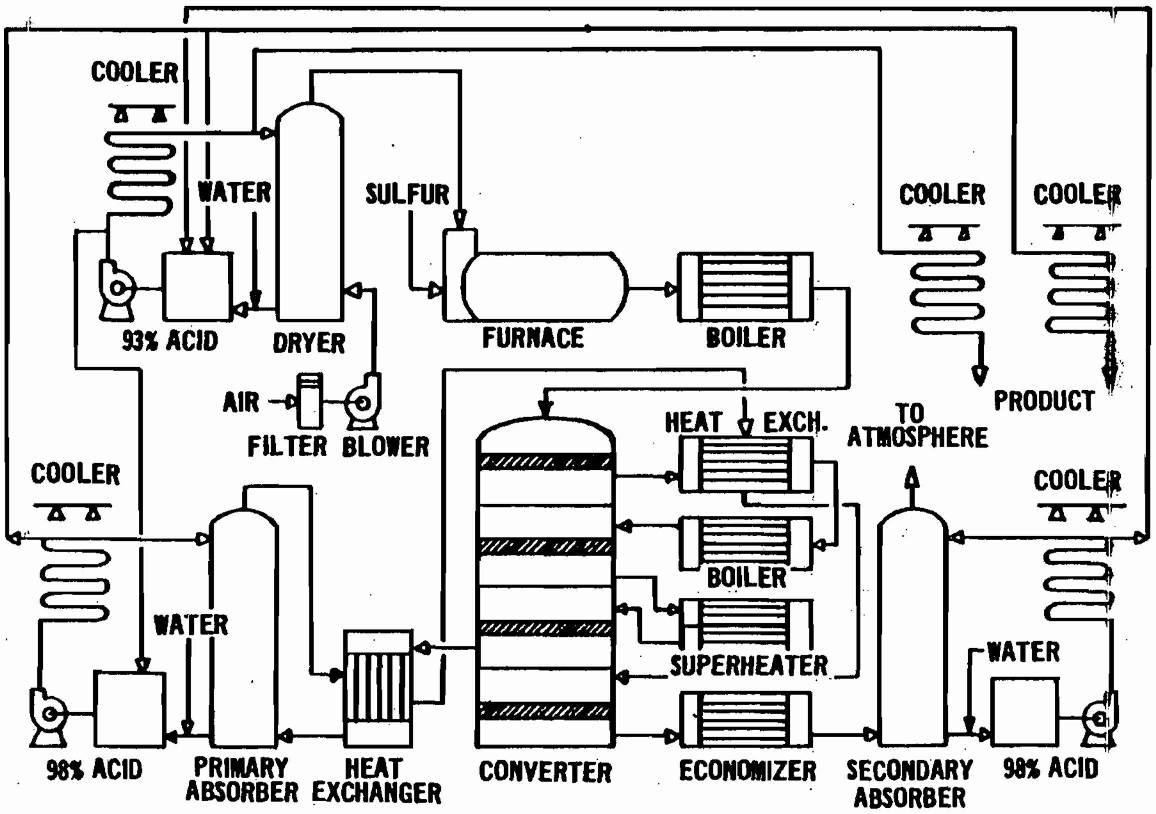
$$SO_2 + 1/2\ O_2 \rightarrow SO_3$$

drives the oxidation further toward completion approaching the reaction equilibrium expressed by:

$$K = \frac{(SO_3)}{(SO_2)\ (O_2)^{1/2}}$$

where K is the reaction equilibrium constant peculiar to the temperature of the reaction and the parenthetical entities are the molar quantities of the gases involved. The resulting SO_3 is absorbed in a secondary absorption tower obtaining at least 99.7 percent overall conversion of the sulfur to sulfuric acid.

The dual absorption process permits higher inlet SO_2 concentrations than normally used in single absorption plants since the second conversion step effectively handles the residual SO_2 from the first conversion step. Higher inlet SO_2 concentrations permit a reduction in equipment size which partially offset the cost of the additional equipment required for a dual absorption plant. The dual absorption equipment occupies little more space than a conventional plant, even though an additional absorber is required.



SOURCE: EPA, 1971.

FIGURE 4-9
DUAL ABSORPTION SULFURIC ACID PLANT
FLOW DIAGRAM

Spent acid or H_2S may be used as feedstock in a dual absorption process with appropriate conventional process gas pretreatment, i.e., particulate removal. The dual absorption process requires the same types of equipment as the conventional single absorber design. Although additional equipment is required, the on-stream production factor and manpower requirement are the same.

4.4.2 Sodium Sulfite - Bisulfite Scrubbing

Tail gas scrubbing systems are generally applicable to all classes of contact acid plants. They can provide simultaneous control of SO_2 and to some extent SO_3 and acid mist. To date only the sodium sulfite-bisulfite scrubbing process has been demonstrated to be capable of meeting the SO_2 limit in the most cost effective manner. Other control processes such as ammonia scrubbing can meet the standard, but costs are relatively highly dependent on the marketability of by-products, i.e., ammonium sulfate, for which there may be little demand.

In the Wellman-Power Gas process, the tail gases are first passed through a mist eliminator to reduce acid mist. Following mist removal, the SO_2 is absorbed in a three-stage absorber with a sodium sulfite solution. A sodium bisulfite solution results and is fed to a heated crystallizer where sodium sulfite crystals are formed and SO_2 gas and water vapor are released. The crystals are separated from the mother liquor and dissolved in the recovered condensate for recycle to the absorber. The recovered wet SO_2 is sent back to the acid plant.

In all processes employing sulfite-bisulfite absorption even without regeneration, some portion of the sulfite is oxidized to sulfate, from which the sulfur dioxide cannot be regenerated in the heating sequence. This sulfate must be purged from the system. In the Wellman-Power Gas process, some thiosulfate is also formed. Apparently the extent of oxidation is dependent on several factors such as the oxygen content of the gas stream, the temperature and residence time of the liquor in the recovery sections, and the presence of contaminants that may act as oxidation catalysts. Despite the effectiveness of the sodium sulfite-bisulfite scrubbing process, none of the sulfuric acid plants installed since the promulgation of the NSPS have employed this process for tail gas SO_2 control.

4.4.3 Ammonia Scrubbing

The ammonia scrubbing process uses anhydrous ammonia (NH_3) and water make-up in a two-stage scrubbing system to remove SO_2 from acid plant tail gas. Excess ammonium sulfite-bisulfite solution is reacted with sulfuric acid in a stripper to evolve SO_2 gas and produce an ammonium sulfate byproduct solution. The SO_2 is returned to the acid plant while the solution is treated for the production of fertilizer grade ammonium sulfate. The process is dependent on a suitable market for ammonium sulfate.

Since the promulgation of the NSPS for sulfuric acid plants, one new plant (two units) and a new unit added to an existing plant, are employing an ammonia scrubbing system for tail gas SO_2 emissions control.

4.4.4 Molecular Sieves

This process utilizes a proprietary molecular sieve system in which SO_2 is adsorbed on synthetic zeolites. The adsorbed material is desorbed by purified hot tail gas from the operating system and sent back to the acid plant.

Since the promulgation of the sulfuric acid plant NSPS, one new unit has incorporated a molecular sieve system for SO_2 control in the original design. However, extensive operational difficulties with this system have caused this plant to be retrofitted with a dual absorption system for SO_2 control.

4.5 Control Technology Applicable to the NSPS for Acid Mist Emissions from Contact Process Sulfuric Acid Plants

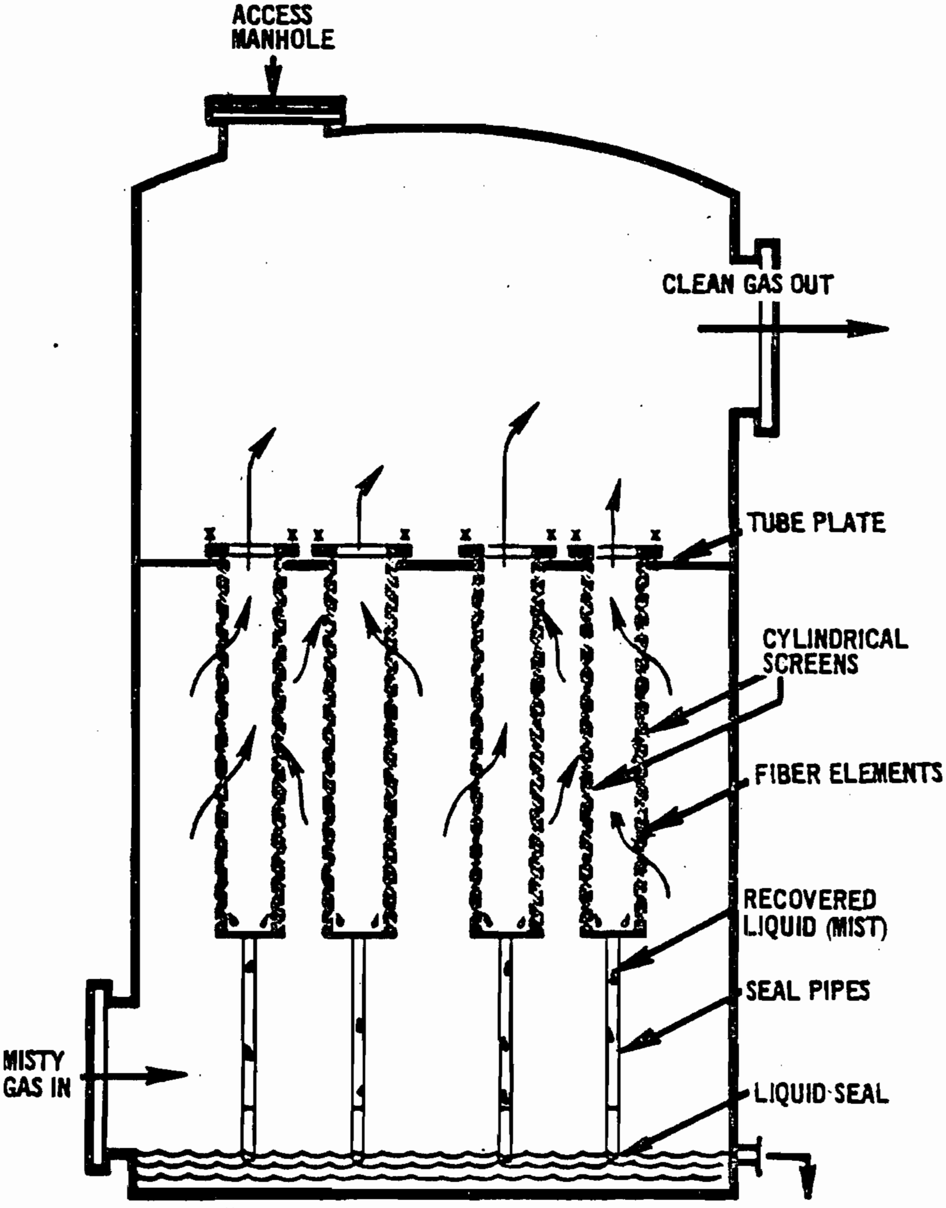
Effective control of stack gas acid mist emissions can be achieved by fiber mist eliminators and electrostatic precipitators (ESPs). Although ESPs are frequently used in the purification section of spent acid plants, there is no evidence that any have been installed to treat the stack gas of any new sulfuric acid plants. Even though ESPs do have the advantage of operating with a lower pressure drop than fiber mist eliminators (normally less than 1 inch of H_2O), lack of application of this equipment to new sulfuric acid units is probably due primarily to its relatively large size and resultant high installation cost compared to fiber mist eliminators and to the high maintenance cost required to keep the ESPs operating within proper tolerances in the acid environment which is corrosive to the mild steel equipment.

Fiber mist eliminators utilize the mechanisms of impaction and interception to capture large to intermediate size acid mist particles and of Brownian movement to effectively collect micron to submicron size particles. Fibers used may be chemically resistant glass or fluorocarbon. Fiber mist eliminators are available in three different configurations covering a range of efficiencies required for various plants having low to high acid mist loadings and coarse to fine mist particle sizes, respectively. The three fiber mist eliminator configurations are:

1. Vertical tube
2. Vertical panels
3. Horizontal dual pads.

4.5.1 Vertical Tube Mist Eliminators

Tubular mist eliminators consist of a number of vertically oriented tubular fiber elements installed in parallel in the top of the absorber on new acid plants and usually installed in a separate tank above or beside the absorber on existing plants. Each element consists of glass fibers packed between two concentric 316 stainless steel screens. In an absorber installation (see Figure 4-10) the bottom end cover of the element is equipped with a liquid seal pot to prevent gas bypassing. A pool of acid provides the seal in the separate tank design. Mist particles collected on the surface of the



SOURCE: EPA, 1977.

FIGURE 4-10
VERTICAL TUBE MIST ELIMINATOR INSTALLATION

fibers become a part of the liquid film which wets the fibers. The liquid film is moved horizontally through the fiber beds by the gas drag and is moved downward by gravity. The liquid overflows the seal pot continuously, returning to the process.

Tubular mist eliminators use inertial impaction to collect larger particles (normally greater than 3 microns) and use direct interception and Brownian movement to collect smaller particles. The low superficial velocity of gas passing through the fiber bed—6 to 12 meters/minute--provides sufficient residence time for nearly all of the small particles with random Brownian movement to contact the wet fibers, effecting removal from the gas stream. The probability that such a particle could pass through the bed following the resultant greatly lengthened travel path is very low.

Design volumetric flow rate through an element is about 28.3 sm^3/min, and the number of elements required for a given plant size can be determined from the standard cubic meters per minute handled at capacity. Depending on the size of the sulfuric acid plant, anywhere from 10 to 100 elements may be used; each element is normally 0.6 meters in diameter and 3 meters high.

Pressure drop across the element varies from 13 to 38 cm. of H_2O with a higher pressure drop required for a higher removal efficiency on particles smaller than 3 microns. The manufacturer of these elements guarantees a mist removal efficiency of 100 percent on particles larger than 3 microns and 90 to 99.8 percent on particles smaller than 3 microns with 99.3 percent being most common. These efficiencies can be achieved on the stack gas of sulfuric acid plants burning elemental sulfur or bound-sulfur feedstocks (spent acid, wet gas, etc.) and producing acid or oleum.

Because the vertical tube mist eliminator does not depend only upon impaction for mist removal, it can be turned down (operated at a volumetric flow rate considerably below design) with no loss in efficiency.

Available information indicates that the vertical tube mist eliminator is used in the great majority of new sulfuric acid units for acid mist control.

4.5.2 Vertical Panel Mist Eliminators

Panel mist eliminators use fiber panel elements mounted in a polygon framework closed at the bottom by a slightly conical drain pan equipped with an acid seal pot to prevent gas bypassing. The polygon top is surmounted by a circular ring which is usually installed in the absorption tower and welded to the inside of the absorption tower head. Each panel element consists of glass fibers packed between two flat parallel 316 stainless steel screens. In large high velocity towers, recent designs have incorporated double polygons, one inside the other, to obtain more bed area in a given tower cross section.

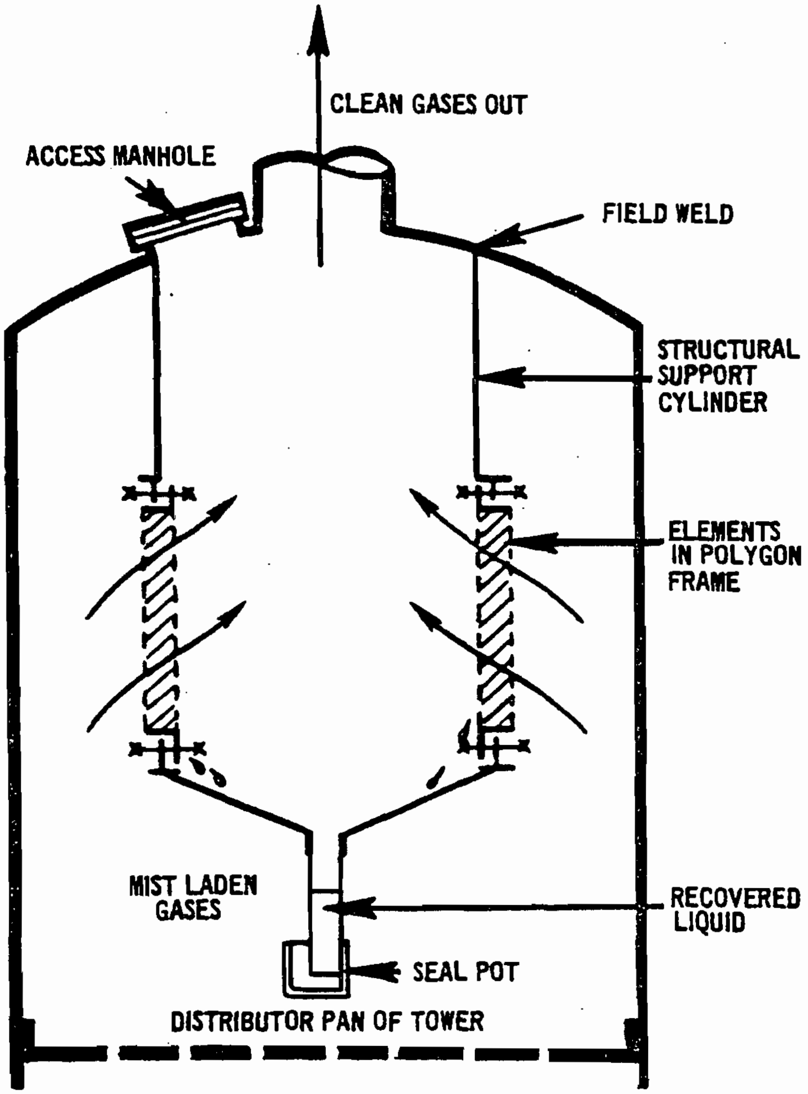
As in the high efficiency tubular mist eliminator above, the gas flows horizontally through the bed, but at a much higher superficial velocity (120 to 150 m/min) using the impaction mechanism for collection of the mist particles. Gas leaving the bed flows upward to the exit port, while the collected liquid drains downward across the pan and out through the seal pot back into the tower or to a separate drain system (see Figure 4-11).

The polygon may contain 10 to 48 vertical sides, each side normally consisting of an 18 1/2" x 53" panel. A smaller 18 1/2" x 26" panel is available for small plants, e.g., 32 Mg per day.

Pressure drop across the panel is usually about 8 inches of H_2O. The manufacturer of panel mist eliminators will usually guarantee an emission no higher than 2 mg/ft^3 (equivalent to 0.375 lb/ton of 100 percent H_2SO_4 produced) for a sulfur-burning plant producing oleum up to 20 percent in strength and/or acid.

Because of the large percentage of submicron (below 1 micron) mist present in the stack gas of a spent acid plant and of a plant producing oleum stronger than 20 percent, the vertical panel mist eliminator will usually give unsatisfactory performance for these plants when used for acid mist control in the tail gas. These units find application in new dual absorption plants for acid mist removal from the intermediate absorber in order to afford corrosion protection for downstream equipment.

Vertical panel mist eliminators normally operate with a liquid level in the acid seal pot below the conical drain pan. Although the velocity through the panels could be increased at lower throughputs



SOURCE: EPA, 1977.

FIGURE 4-11
VERTICAL PANEL MIST ELIMINATOR INSTALLATION

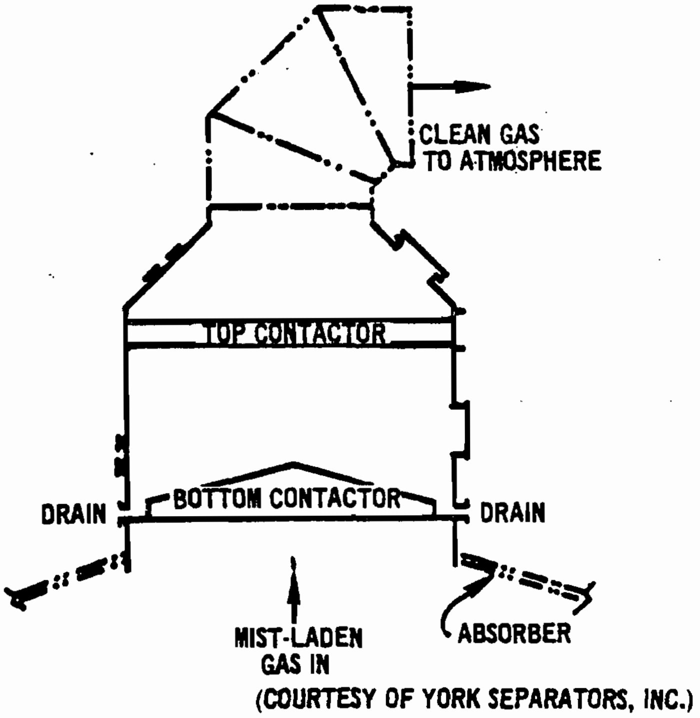
by raising the liquid level to cover the lower part of each panel, this would not be good practice since it would cause reentrainment of spray by the gas passing over the liquid level in the basket.

4.5.3 Horizontal Dual Pad Mist Eliminators

Two circular fluorocarbon fiber beds held by stainless steel screens are oriented horizontally in a vertical cylindrical vessel one above the other, so that the coarse fraction of the acid mist is removed by the first pad (bottom contactor) and the fine fraction by the other (top contactor), as shown in Figure 4-12. The bottom contactor consists of two plane segmented sections installed at an angle to the horizontal to facilitate drainage and give additional area for gas contact. The assembly may be located adjacent to--or positioned on--an absorption tower.

This unit uses the high velocity impaction mist collection mechanism, as does the panel mist eliminator; however, the collected acid drains downward through the pads countercurrent to the gas flow producing a scrubbing action as well. Collected acid may be drained from external connections or returned directly to the absorber through liquid seal traps.

Total pressure drop across both pads is usually about 23 cm. of H_2O. The superficial velocity through the unit is 2.7 to 3.0 m/s. Hence, the diameter of the cylindrical shell and the pads is determined from the volume of gas handled. Height requirements for the unit depend upon whether it is located adjacent to or positioned on



SOURCE: EPA, 1977.

FIGURE 4-12
HORIZONTAL DUAL PAD MIST ELIMINATOR

the absorber, but are roughly 1.5 to 2 times the diameter of the unit.

As with the panel mist eliminator, the dual pad unit will reduce acid mist emissions to 2 mg/ft^3 (0.375 lb/ton of 100 percent H_2SO_4) or less, provided the plant burns sulfur and does not produce oleum stronger than 20 percent, and provided that a particle size distribution curve shows that this level can be met.

5.0 INDICATIONS FROM NSPS COMPLIANCE TEST RESULTS

5.1 Test Results from EPA Regional Sources

The Metrek Division of The MITRE Corporation conducted a survey of all 10 EPA regions to gather available NSPS compliance test data for each of the 10 industries under review (MITRE Corporation, 1978). This survey yielded test data on 20 new sulfuric acid units. Data included average SO_2 and acid mist emissions and 100 percent sulfuric acid production rates for these units. In all cases, the sulfuric acid production rate was at the unit design maximum (the actual production rates usually exceeded the nominal design rates by 5 to 10 percent). Only a few values of opacity readings were reported as compared with the total number of tests.

Telephone contacts with EPA regional personnel and, in some cases, with sulfuric acid plant operators yielded NSPS compliance test data on an additional 12 new sulfuric acid units. In all, 29 sets of data were obtained representing 32 new sulfuric acid units (in two cases, the NSPS tests were run on two or more new units combined). Insofar as is known, the test data obtained represent all of the sulfuric acid units completed from 1971 through 1977, and subject to NSPS.

~~5.2 Analysis of NSPS Test Results~~

The results of the NSPS compliance tests for the 32 new sulfuric acid units are tabulated in Table 5-1 and displayed in Figures 5-1 and 5-2 for SO_2 and acid mist emissions, respectively. Table 5-2

TABLE 5-1

NSPS COMPLIANCE TEST RESULTS FOR SULFURIC ACID PLANTS

EPA Region	Company	Plant Location	Nominal Unit Size (100% H_2SO_4) Mg/day/TPD	Average SO_2 Emissions kg/Mg of 100% H_2SO_4 (lb/ton)	Average Acid Mist Emissions kg/Mg of 100% H_2SO_4 (lb/ton)	Actual Plant Product Rate During NSPS Test Mg/day 100% H_2SO_4 (TPD)	Measured Opacity During Test (Percent)	Reference
II	NL Industries, Inc.	Sayreville, N.J.	910 (1000)	0.71 (1.42)	0.018 (.035)	845 (929)	0	Mistry et al., 1975
			910 (1000)	1.9 (3.7)	0.062 (.123)	808 (888)	0	Mistry et al., 1975
IV	Agrico Chemical, Inc.	So. Pierce, Fla.	1640 (1800)	1.11 (2.22)	0.055 (0.109)	1629 (1790)		CDS, 1978
	CF Chemicals, Inc.	Bartow, Fla.	1800 (2000)	0.56 (1.12)	0.010 (0.021)	1781 (1957)		CDS, 1978
	CF Chemicals, Inc.	Plant City, Fla.	1460 (1600)	0.76 (1.52)	0.058 (0.116)	1562 (1717)		CDS, 1978
			1460 (1600)	1.26 (2.52)	0.026 (0.052)	1277 (1403)		CDS, 1978
	Gardinier, Inc.	Tampa, Fla.	2370 (2600)	0.97 (1.94)	0.036 (0.071)	2424 (2664)	0-5	Garrett, 1978
			1460 (1600)	0.87 (1.73)	0.030 (0.061)	1616 (1776)	0-5	Garrett, 1978
	W.R. Grace Co.	Bartow, Fla.	1460 (1600)	0.16 (0.32)	0.03 (0.06)	1547 (1700)		CDS, 1978
			1460 (1600)	1.03 (2.16)	0.02 (.04)	1535 (1687)		Wu, 1978
			1460 (1600)	1.2 (2.3)	0.07 (0.13)	1643 (1805)		Wu, 1978
	IMC Chemical Corp.	Mulberry, Fla.	1800 (2000)	0.73 (1.45)	0.008 (0.016)	2457 (2700)		CDS, 1978
			1800 (2000)	0.79 (1.58)	0.008 (0.016)	2366 (2600)		CDS, 1978
			1800 (2000)	0.65 (1.30)	0.011 (0.022)	2503 (2750)		CDS, 1978
	Occidental Petroleum Corp.	White Springs, Fla.	1640 (1800)	1.62 (3.23)	0.071 (0.142)	1756 (1930)		CDS, 1978
			1640 (1800)	0.47 (0.93)	0.066 (0.127)	1641 (1803)		CDS, 1978
	Am. Cyanamid Co.	Savannah, Ga.	730 (800)	1.17 (2.33)	0.030 (0.059)	779 (856)		Gardner, 1978
	Mississippi Chemical Corp.	Pascagoula, Miss.	1370 (1500)	0.48 (0.95)	0.064 (0.128)	1387 (1524)		CDS, 1978
	Texasgulf, Inc.	Lee Creek, N.C.	1370 (1500)	0.85 (1.70)	0.023 (0.046)	1474 (1620)		CDS, 1978
			1370 (1500)	0.91 (1.82)	0.037 (0.073)	1313 (1443)		CDS, 1978
V	Anlin Corp.[a]	Wood River, Ill.	230 (250)	1.85 (3.69)	0.072 (0.144)	219 (241)		Cohen, 1978
VI	Agrico Chemical, Inc.	Donaldsonville, La.	1640 (1800)	0.55 (1.10)	0.037 (.073)	1830 (2011)	<10	Shonk, 1978
	Agrico Chemical, Inc.		1640 (1800)	0.55 (1.11)	0.042 (0.085)	1677 (1843)	<10	Shonk, 1978
	Freeport Chemical Co.	Convent, La.	1460 (1600)	1.0 (1.99)	0.08 (0.15)	1694 (1862)		Spruiell, 1978
	Rohm & Haas, Inc.	Deer Park, Tx.	640 (700)	1.16 (2.32)	0.041 (0.082)	716 (787)	9.2	Spruiell, 1978
IX	Valley Nitrogen Producers, Inc.	Helms, Calif.	1640 (1800)	0.40 (0.79)	0.04 (.07)		<5	Reynolds, 1978
X	Beker Industries, Inc.	Conda, Idaho	770 (850)	1.56 (3.02)	0.053 (0.105)	1001 (1100)		Pfander, 1978
	J.R. Simplot Co.	Pocatello, Idaho	810 (900)[b]	0.53 (1.05)[b]	0.046 (0.092)[b]	853 (938)[b]		Pfander, 1978
	Allied Chemical Corp.	Anacortes, Wash.	300 (330)	1.70 (3.41)[c]	0.04 (0.07)[c]	222 (244)	5	Snowden & Alguard, 1976

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[a] This facility was purchased by Shell Oil Co. in 1976; the plant is being modified to incorporate a double absorption process for SO_2 control.

[b] Total output of two units.

[c] Average of three units.

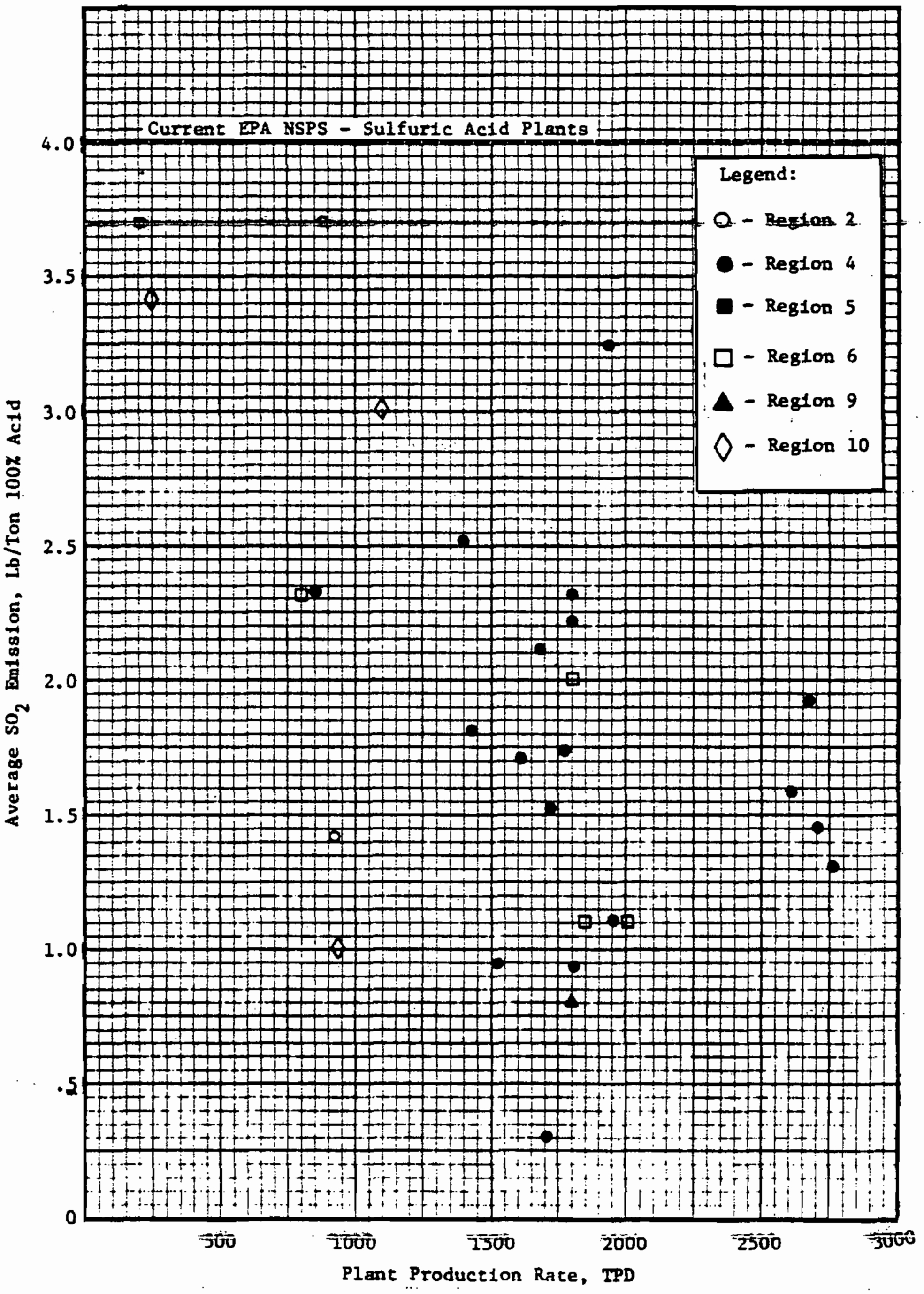

FIGURE 5-1
CONTACT PROCESS SULFURIC ACID PLANTS
NSPS COMPLIANCE TEST RESULTS
SO_2 EMISSIONS

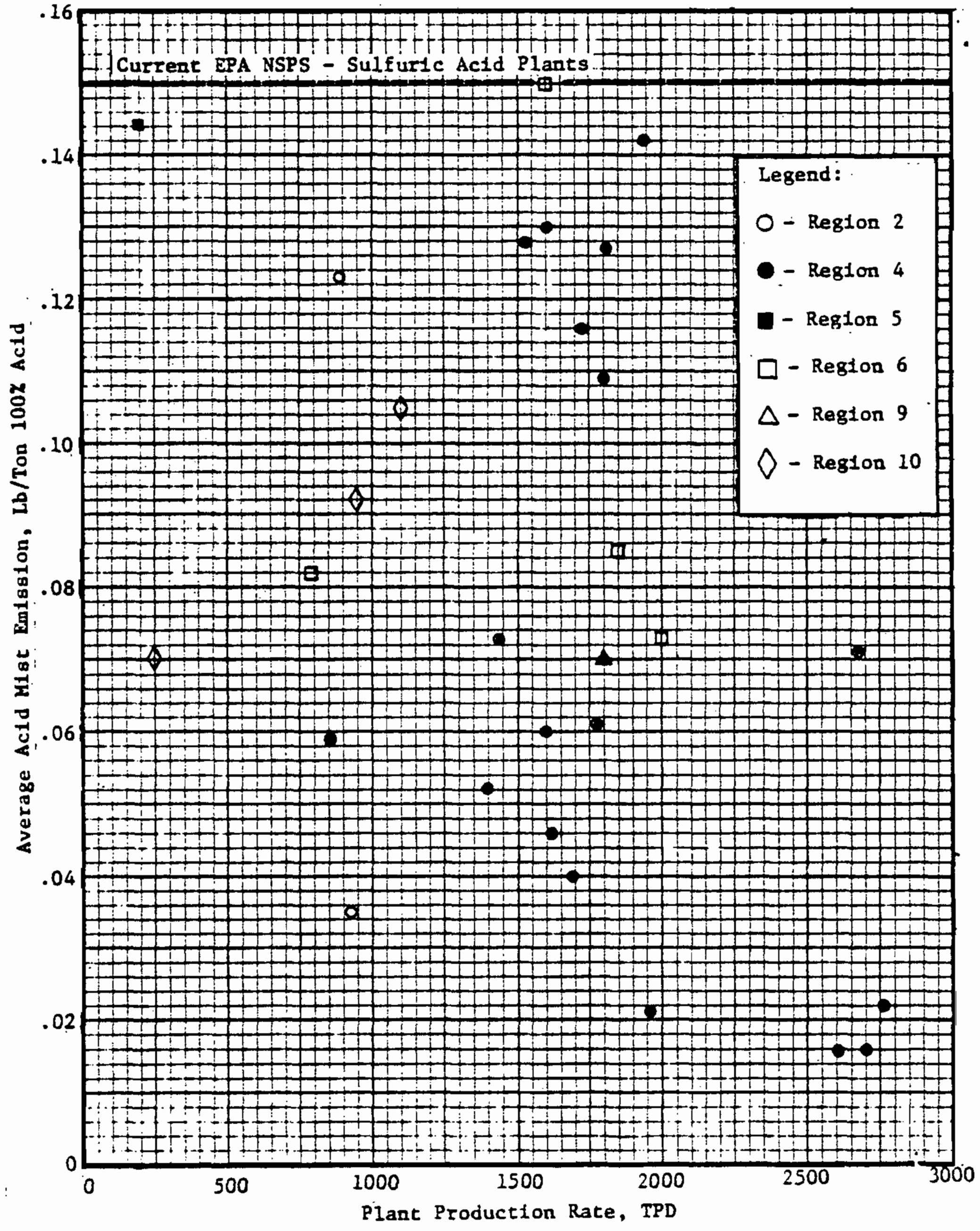

FIGURE 5-2
CONTACT PROCESS SULFURIC ACID PLANTS
NSPS COMPLIANCE TEST RESULTS
ACID MIST EMISSIONS

TABLE 5-2

NSPS COMPLIANCE TEST RESULTS FOR NEW SULFURIC ACID PLANTS BREAKDOWN BY EMISSIONS LEVEL

SO_2			Acid Mist		
NSPS Test Results (lb/ton)	No. of Results	% of Total	NSPS Test Results (lb/ton)	No. of Results	% of Total
3.0 to 4.0	5	17	0.13 to 0.15	3	10
2.0 to 3.0	6	21	0.11 to 0.13	5	17
1.0 to 2.0	14	48	0.09 to 0.11	2	7
0 to 1.0	4	14	0.07 to 0.09	6	21
	29	100	0.05 to 0.07	6	21
			0.03 to 0.05	3	10
			0.01 to 0.03	4	14
				29	100

presents a percentage breakdown of NSPS SO_2 and acid mist emission results at various levels below the respective control levels.

5.2.1 Control Technology Used to Achieve Compliance

All 32 units tested showed compliance with the NSPS SO_2 and acid mist control levels. Of the 32 units tested, 28 achieved compliance with the SO_2 standard through use of the dual absorption process. Of the remaining four units, three use ammonia scrubbing and one employs a molecular sieve process* to meet the standard. All of the new units use mist eliminators to achieve acid mist control. The bulk of these control units are vertical tube mist eliminators. Only nine values of opacity were reported (all meeting the NSPS standard). It is assumed that all of the new plants were meeting the opacity standard during the compliance tests since opacity is directly related to acid mist concentration.

In one vendor's modification of the dual absorption process (the R.M. Parsons Co., Pasadena, California), the usual four-bed catalytic converter was replaced with a five-bed unit, i.e., three beds are used for SO_2 conversion prior to the interpass or primary absorption tower, followed by two beds being utilized for further SO_2 conversion before the final absorber. This method is intended to achieve 99.8 to 99.9 percent conversion to SO_3 equivalent to approximately 0.5 kg/Mg (1.0 lb/ton) SO_2 emission level in the tail gas. Eight new dual absorption units incorporating this design have

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*Due to operational difficulties, the molecular sieve operation is currently being replaced by a dual absorption plant.

been installed (Field, 1978). The Parsons units are identified in Table 4-5. Inspection of Table 5-1 indicates that the Parsons units show a range of SO_2 emissions from 0.4 kg/Mg (0.8 lb/ton) to 1.7 kg/Mg (3.4 lb/ton), with the average being approximately 1.0 kg/Mg (2.0 lb/ton). Based on NSPS compliance test results, it appears that the SO_2 emission levels obtained from these five-bed units have not been able to reach the original design levels.

5.2.2 Statistical Analysis of NSPS Compliance Test Data

The arithmetic mean and 95 percent confidence interval has been calculated for the dual absorption plant NSPS test results. The arithmetic mean for SO_2 is 0.9 kg/Mg (1.8 lb/ton) with a 95 percent confidence interval of ±0.15 kg/Mg (±0.3 lb/ton). The arithmetic mean for acid mist emissions is 0.04 kg/Mg (0.08 lb/ton) with a 95 percent confidence interval of ±0.01 kg/Mg (±0.02 lb/ton). The wider 95 percent confidence limits for acid mist emissions are indicative of a greater spread in acid mist emission results (as can be seen by comparing Figures 5-1 and 5-2).

5.2.3 Validity of NSPS Test Data

The 26 data points obtained for dual absorption plants equipped with high efficiency acid mist eliminators show a rather large spread for SO_2 control levels, i.e., SO_2 emission values range from a low of 0.16 kg/Mg (0.32 lb/ton) to a high of 1.9 kg/Mg (3.7 lb/ton). Additionally, the corresponding acid mist emission values range from a low of 0.008 kg/Mg (0.016 lb/ton) to a high of 0.071 kg/Mg (0.14 lb/ton). All data were obtained using the standard EPA Method 8.

It is not clear why the use of this test method should have produced such a wide variation in the test results for plants with identical control technologies. Region IV believes that at least part of the observed variation may be due to differences in test contractor's techniques (Rom, 1978). In this regard, discussion with EPA personnel in the Quality Assurance Branch (QAB) of the Environmental Monitoring and Support Laboratory indicate areas where the original Method 8* (used in testing all of new sulfuric acid units subject to NSPS) could yield misleading SO_2 and acid mist results. Detailed studies of the original Method 8 by QAB indicated that the isopropanol (IPA) used in the test could contain trace quantities of peroxide, which, if present, would react with SO_2 during the test procedure to form SO_3, yielding lower SO_2 and higher acid mist values in the tail gas. Additionally, when the test contractor performed the impinger train leak check, upon release of the applied vacuum, a fine spray of hydrogen peroxide solution could deposit on the filter, causing the $SO_2 \longrightarrow SO_3$ conversion mechanism to be set into motion during the tail gas sampling period. This again could result in misleading levels of SO_2 and acid mist in the tail gas (Midgett, 1978).

The revised Method 8 has attempted to remedy these defects in the original test.* This method requires that the IPA be tested for

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*Method 8 was revised effective August 18, 1977.

peroxides. If the latter are found, the IPA batch must either be discarded or treated to remove the peroxide. Since operator technique is the controlling factor in minimizing errors due to the leak check, the revised Method 8 provides a warning to the test equipment operator to avoid this pitfall by careful manipulation of the equipment.

In summary, it would seem reasonable to have some question about the validity of the SO_2 and acid mist results obtained from the NSPS compliance tests made prior to August 1977 on the grounds of the reliability of the test method itself.

5.2.4 Comparison of NSPS Compliance Test Data with Day-to-Day Emission Control Performance

MITRE has made a number of inquiries of sulfuric acid plants that are operating units subject to NSPS to ascertain whether the compliance test data for these units represent the current day-to-day emission control levels. A literature search had indicated that NSPS emission controlled plants (dual absorption) could be expected to operate (after an initial startup period with fresh catalyst) with SO_2 emissions in the 1 to 1.5 kg/Mg (2 to 3 lb/ton) range. One recent literature reference indicated that a new sulfuric acid unit with an NSPS SO_2 test value of 0.56 kg/Mg (1.12 lb/ton) in 1975, was currently averaging 1.5 kg/Mg (3.0 lb/ton) SO_2 emissions (PEDCo, 1977). Another reference indicated that a typical dual absorption plant with an average SO_2 NSPS compliance test result of 0.85 kg/Mg (1.70 lb/ton) was operating at an average SO_2 emission level of 1.15 kg/Mg (2.3 lb/ton) (EPA, 1976).

Data obtained from one new dual absorption sulfuric acid unit points up the effect of plant and catalyst aging on the SO_2 emission level. These data are tabulated in Table 5-3.

TABLE 5-3

EFFECT OF PLANT AND CATALYST AGE ON SO_2 EMISSION LEVEL[a]

Date	Source of Data	SO_2 Emissions kg/Mg (lb/ton)
9/17/75	NSPS Compliance Test (EPA Method 8)	0.47 (0.93)
10/22/76	Dupont Continuous SO_2 Monitor[b]	1.30 (2.59)
4/4/77	Dupont Continuous SO_2 Monitor[b]	1.43 (2.85)
3/28/78	Dupont Continuous SO_2 Monitor[b]	1.6 (3.2)

[a] This is an 1800 ton/day (100 percent H_2SO_4) plant.
[b] Results of Dupont continuous monitor checked concentrations, when converted to kg/Mg of 100 percent acid, checked to within 1 percent of EPA Method 8.

Source: Mullins, 1978.

This plant (a total of two units subject to NSPS) is stated to operate at an SO_2 emission level of 1.25 to 1.50 kg/Mg (2.5 to 3.0 lb/ton) on a day-to-day basis (Mullins, 1978).

Another plant which had an SO_2 NSPS test result of 0.48 kg/Mg (0.95 lb/ton) indicated that this result was obtained with fresh catalyst and that the day-to-day operating value of SO_2 emissions averaged 0.5 to 1.0 kg/Mg (1 to 2 lb/ton) (Stark, 1978).

In summary, indications from the literature and from contacts with sulfuric acid plant operators are that low NSPS compliance test

SO_2 emission values do not necessarily reflect day-to-day plant operating levels. These levels appear to realistically lie in the 1 to 1.5 kg/Mg (2 to 3 lb/ton) range for dual absorption units. There is a definite trend towards increased SO_2 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 the NSPS of 2 kg/Mg (4 lb/ton), it appears that SO_2 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, being 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 wide spread observed in NSPS compliance test values is probably a result of variations in these factors or quite possibly errors in the test method itself (as discussed in Section 5.2.3).

5.2.5 Emission Control Performance Based on Excess Emissions Reports

It was not possible to evaluate excess emissions reports with regard to sulfuric acid plant SO_2 and acid mist control performance, since a very limited number of reports were available.

5.3 Indications of the Need for a Revised Standard

5.3.1 SO_2 Standard

At this time, there is not sufficient justification for revision of the present SO_2 NSPS, based on the following considerations:

- The current best demonstrated control technology (the dual absorption process) is identical in basic design to that used as the rationale for the original SO_2 standard.

- While the SO_2 NSPS compliance test data averages close to 1 kg/Mg (2 lb/ton) with a number of values in the 0.5 kg/Mg (1 lb/ton) to 1 kg/Mg (2 lb/ton) range, an analysis of these data indicates that:

  1. There may be some question about the validity of the low values of SO_2 emissions based on defects in the original EPA Method 8.

  2. Actual plant experience shows that the low NSPS values do not necessarily reflect the day-to-day operating SO_2 emission levels which tend to rise toward the standard as the conversion catalyst ages.

- According to a prime manufacturer of dual absorption plants, in order to guarantee performance at the present level, a margin of safety is built into the unit design to compensate for the effects of plant and catalyst aging, fluctuating feed rates and other deviations from ideal operating conditions. Construction of new plants to meet an appreciably lower SO_2 NSPS involves greatly increased capital costs, since a margin of safety would have to be built into the new plant to meet performance guarantees (Donovan et al. 1977).

- A trend toward higher levels of SO_2 in the gas feed to the converter, i.e., 12 percent SO_2 or higher may develop in the industry, since there is appreciable energy savings due to the additional heat recovery available from the highly exothermic conversion reaction. Meeting an SO_2 emission standard appreciably lower than 2 kg/Mg (4 lb/ton) in this situation would be extremely difficult without extensive (and expensive) equipment additions to the plant.

Other considerations, including economic factors, that militate against a change in the present SO_2 NSPS are discussed in Section 6.0.

5.3.2 Acid Mist NSPS (and Related Opacity Standard)

At this time, there is not sufficient justification for revision of the present acid mist (and opacity) NSPS, based on the following considerations:

- The current best demonstrated control technology (the high efficiency acid mist eliminator) is identical to that used as the rationale for the original acid mist standard.
- The NSPS compliance test data showed a wide scatter, with an appreciable number of the acid mist emission values close to the control limit. The scatter observed in these values may be due to the defects in the original EPA Method 8 which tended to introduce variability in the acid mist levels obtained.
- Making the acid mist standard more stringent is not believed to be practicable because of the need to provide a margin of safety due to in-plant operating fluctuations. Variation in the sulfur feedstock, leaks, or improper inlet air drying tower operation can introduce moisture (the controlling factor in the production of acid mist) into the system, increasing the production of acid mist. It should be noted that acid mist control is far more vulnerable to operating fluctuations which deviate from standard plant operating conditions than sulfur dioxide control.
- Manufacturers of acid mist eliminators guarantee maximum stack emission of 1 mg/scf (0.15 lb/ton) for high-efficiency units. These manufacturers do not guarantee any form of visible emission limitation, but acid mist emissions of 1 mg/scf normally result in stack plumes of less than 10 percent opacity (Serne and Weisenberg, 1976).

6.0 ANALYSIS OF POSSIBLE REVISIONS TO THE STANDARD

6.1 Effect of NSPS Revision on Sulfuric Acid Production Economics

The SO_2 emissions in a dual absorption plant are primarily determined by the efficiency of the catalytic converter system. Acid mist emissions are controlled by plant operators' attention to control of residual moisture in the SO_2-laden inlet gas to the system and to efficient absorber and acid mist eliminator operation. NSPS compliance test values of these emissions, which are appreciably below the present control levels, are, as has been shown in Sections 5.2 and 5.3, not necessarily representative of the levels achievable by a particular plant on a day-to-day basis. Additional capital and/or operating expense would be entailed by plants using the present best demonstrated control technology in order to reduce NSPS control levels appreciably below the present values.

Additional capital expense required to control emissions below the present NSPS levels would be involved for a scrubber installation to further reduce SO_2 in the tail gas from the dual absorption system or an additional acid mist eliminator in series with the present unit to further reduce acid mist.

As shown in Section 5.0, NSPS SO_2 levels for new plants tested predominantly in the 1 to 1.25 kg/Mg (2 to 2.5 lb/ton) range. Making the standard more stringent in order to accomplish reduction of SO_2 emissions appreciably below the present NSPS control level on a day-to-day basis, can probably be achieved by increasing sulfuric acid plant operating expense significantly. Since SO_2 emissions are directly affected by the level of catalyst activity, the former should be able to be maintained at levels comparable to the observed NSPS compliance test values, if fresh catalyst with the maximum activity were to arbitrarily replace older material in the converter beds at frequent intervals. The economics of a catalyst replacement program have been developed and applied to the cost of producing sulfuric acid in a dual absorption plant, as described below.

In the four-bed catalytic converter system in a typical dual absorption plant, the first bed exposed to the inlet gas experiences the greatest rate of activity decrease due to dirt and traces of catalyst poisons, with beds two and three suffering progressively less loss of activity due to these contaminants. These beds have an average service life of 3 to 5 years. The final catalyst bed, which treats the SO_2-laden gas from the first absorption tower, can have a service life of 10 to 15 years. Normal plant practice is to progressively elevate these catalyst beds during the plant turnaround periods so that the overall average bed life is 5 to 7 years.

The basic information used in the catalyst replacement cost calculations is summarized in Table 6-1, and the results of the calculations are shown in Table 6-2.

Based on a sulfuric acid manufacturing cost of $36/Mg, the incremental increase of 55 cents/Mg for the catalyst replacement program outlined above, represents only a 1.4 percent increase. With

TABLE 6-1

BASIC DATA USED IN CATALYST REPLACEMENT COST CALCULATIONS

Items	Source
• 1000 Mg/day dual absorption plant	Design Basis
• 4 Bed Converter	Design Basis
• First three beds (Beds 1, 2 and 3) - Average life of 3-5 years, Final bed (Bed 4) - Average life of 10-15 years	Sheputis, 1978
• Average catalyst makeup rate (first bed) is 10 percent per year due to screening and attrition losses	Sheputis, 1978
• Catalyst loading of 140 liters/daily Mg of acid at 10.5% SO_2 in inlet gas to converter	Monsanto Enviro-Chem, 1974
• Total catalyst replacement cost is $3/liter installed	Sheputis, 1978
• Total sulfuric acid manufacturing cost is $36/Mg (direct and fixed costs)	Hansen, 1978
• Average pretax profit for merchant sulfuric acid is $3/Mg	EPA, 1977

TABLE 6-2

EFFECT OF CATALYST REPLACEMENT ON COST OF PRODUCTION OF SULFURIC ACID IN A DUAL ABSORPTION PLANT

ASSUMPTIONS

- In order to maintain overall catalyst activity at a level to obtain SO_2 conversion equivalent to emission of 1 to 1.25 kg/Mg of 100 percent acid (2 to 2.5 lb/ton), replace catalyst beds on the following schedule:

  Bed 1: Complete replacement once a year (a net replacement of 90 percent of the original bed).

  Bed 2: Complete replacement once every 2 years.

  Bed 3: Complete replacement once every 3 years.

  Bed 4: Complete replacement once every 10 years.

- Each bed holds 25 percent of the total catalyst loading.

- Plant operates 350 days per year.

Bed No.	Annual Catalyst Volume Replaced (liters)	Annual Catalyst Replacement Cost, $	Mg/Yr of 100% Acid Produced	Annual Catalyst Replacement Cost $/Mg of Acid Produced
1	31,500	94,500	350,000	0.27
2	17,500	52,500	350,000	0.15
3	11,700	35,100	350,000	0.10
4	3,500	10,500	350,000	0.03
Totals		192,600		0.55

a present FOB plant selling price for 100 percent merchant acid of approximately \$50/Mg (Gulf Coast area) (Chemical Marketing Reporter, 1978), an incremental increase of 55 cents/Mg for catalyst replacement represents only 1 percent of the selling price. However, the effect of this cost on pretax profit, based on an average pretax profit of \$3/Mg, is much more drastic, i.e., 55 cents/Mg for annual catalyst replacement represents an approximate 20 percent reduction in pretax profit. An adverse economic penalty to the sulfuric acid industry would seem to be indicated by this approach.

A serious problem raised by the catalyst replacement program outlined above would be the need to dispose of the highly toxic spent vanadium pentoxide catalyst waste generated. This material is not considered valuable enough to rework by the major processors. Some of the catalyst disposed of at present is reworked by several marginal processors (Sheputis, 1978).

6.2 Effect of New Sulfuric Acid Plant Construction on the NSPS

As mentioned in Section 4.2, the rate of completion of new sulfuric acid units during the 1971-1977 period was approximately 5 per year. During the 1978-1980 period, the number of new sulfuric acid units announced or under construction has slowed to approximately 3 per year. This slowdown in new growth is due primarily to the present imbalance in the demand-supply situation in the phosphate fertilizer industry. Based on anticipated growth in the phosphate fertilizer industry, an estimate for the 1981 to 1984 period of four new sulfuric acid units completed per year has been used as a basis for calculating the total SO_2 and acid mist emissions at various emission levels for the 16 new units projected to be completed during this period. The results of these calculations are shown in Tables 6-3 and 6-4.

A study of Table 6-3 indicates that reducing the NSPS control level for SO_2 emissions from the present 2 kg/Mg (4 lb/ton) to 1 kg/Mg (2 lb/ton), a 50 percent reduction, would reduce the total SO_2 emissions for sulfuric acid plants regulated by the NSPS by approximately 6000 Mg/yr (7000 tons/yr) in 1984. Correspondingly, a study of Table 6-4 indicates that reduction of the NSPS acid mist control levels from the present 0.075 kg/Mg (0.15 lb/ton) to 0.05 kg/Mg (0.10 lb/ton), a 33 1/3 percent reduction, would reduce the total acid emissions for these sulfuric acid plants by approximately 150 Mg/yr (170 tons/yr) in 1984.

As a further comparison of the potential impact of SO_2 emissions from sulfuric acid units projected to be built between 1981 and 1984, data from projections of SO_2 emissions from all stationary sources in 1984 were used to calculate the effect of sulfuric acid plant SO_2 NSPS reduction. Total SO_2 emissions from stationary sources in 1984 (based on all existing NSPS and state standards in effect in 1975) are indicated to be approximately 33 x 10^6 Mg/yr (EPA, 1976). With the present sulfuric acid NSPS of 2 kg/Mg (4 lb/ton), the percent SO_2 emission contribution of the projected 16 new units in 1984 would be 0.04 percent. Correspondingly, with an NSPS

TABLE 6-3

PROJECTED CUMULATIVE SO_2 EMISSIONS FROM NEW CONTACT SULFURIC ACID PLANTS ADDED BETWEEN 1981 AND 1984[a]

Control Level kg/Mg (lb/ton)	Projected Emissions Mg/yr (ton/yr)[b]				Percent of Total Annual SO_2 Emissions of NSPS Plants in 1984[c]
	1981	1982	1983	1984	
2.0 (4.0)	3,060(3,360)	6,120(6,720)	9,180(10,080)	12,230(13,440)	27.6
1.75 (3.5)	2,680(2,940)	5,350(5,880)	8,030(8,820)	10,700(11,760)	25.0
1.5 (3.0)	2,290(2,520)	4,590(5,040)	6,880(7,560)	9,170(10,080)	22.2
1.25 (2.5)	1,910(2,100)	3,820(4,200)	5,730(6,300)	7,640(8,400)	18.8
1.0 (2.0)	1,530(1,680)	3,060(3,360)	4,590(5,040)	6,120(6,720)	16.0

[a] Four contact process double-absorption sulfuric acid plants (average production capacity of 1100 Mg/day (1200 tons/day) of 100% H_2SO_4 each) are projected to be installed per year from 1981-1984, inclusive.

[b] Calculations based on a 350-day work year.

[c] Total annual SO_2 emissions of 42 existing NSPS H_2SO_4 units in 1984 (at present 4.0 lb/ton control level) is 33,000 Mg/yr^2 (35,300 tons/yr).

TABLE 6-4

PROJECTED CUMULATIVE ACID MIST EMISSIONS FROM NEW CONTACT SULFURIC ACID PLANTS ADDED BETWEEN 1981 and 1984[a]

Control Level kg/Mg (lb/ton)	Projected Emissions Mg/yr (ton/yr)[b]				Percent of Total Annual Acid Mist Emissions of NSPS Plants in 1984[c]
	1981	1982	1983	1984	
0.075 (0.15)	115(126)	229(252)	344(378)	459(504)	27.6
0.07 (0.14)	108(119)	217(238)	325(357)	433(476)	26.4
0.065 (0.13)	99(109)	197(217)	297(326)	395(434)	24.7
0.06 (0.12)	93(102)	185(203)	278(305)	369(406)	23.5
0.055 (0.11)	83(91)	166(182)	248(273)	331(364)	21.6
0.05 (0.10)	76(84)	153(168)	229(252)	306(336)	20.3

[a] Four contact process double-absorption sulfuric acid plants (average production capacity of 1100 Mg/day (1200 tons/yr) of 100% H_2SO_4 each) are projected to be installed per year from 1981-1984, inclusive.

[b] Calculations based on a 350-day work year.

[c] Total annual acid mist emissions of 42 existing NSPS units in 1984 (at present 0.15 lb/ton control level) is 1200 Mg/yr (1325 tons/yr).

of 1 kg/Mg (2 lb/ton), the percent SO_2 emission contribution of the projected 16 new units in 1984 would be 0.02 percent. The national impact of a more stringent SO_2 NSPS would be marginal due to the very small decrease in SO_2 emissions (resulting from a tighter standard) from the sulfuric acid plants projected to be built during the 1981 through 1984 period.

7.0 FINDINGS AND RECOMMENDATIONS

The primary objective of this report has been to assess the need for revision of the existing NSPS for sulfuric acid plants, including review of the SO_2 and acid mist standards. The existing opacity standard is directly related to the acid mist standard and is not reviewed separately. The findings and recommendations developed in these two areas are presented below.

7.1 Findings

7.1.1 SO_2 NSPS

7.1.1.1 Process Emission Control Technology.

- The current best demonstrated control technology, the dual absorption process, is identical in basic design to that used as the rationale for the original SO_2 standard. The dual absorption process is in use in over 90 percent of all sulfuric acid production units installed since the promulgation of the SO_2 NSPS for sulfuric acid plants and will be installed in all new plants built through 1980.

- While the overall average SO_2 emission obtained in the NSPS compliance test results is 0.9 kg/Mg (1.8 lb/ton), the wide range shown in this data, from a low of 0.16 kg/Mg (0.32 lb/ton) to a high of 1.9 kg/Mg (3.7 lb/ton) for dual absorption plants, may be partially due to defects in the original Test Method 8 or to variations in test operator technique. The average SO_2 emission level obtained in the NSPS compliance tests for dual absorption plants is about one order of magnitude lower than the emission level obtained from uncontrolled single absorption plants.

- The dual absorption process, while yielding low NSPS compliance test SO_2 emission levels, can not maintain these levels on a day-to-day basis. The SO_2 emission level is a function of catalyst conversion efficiency which drops as the catalyst ages.

7.1.1.2 Economic Considerations.

- In order to guarantee SO_2 emission control performance at the present NSPS level, vendors of the dual absorption process plants incorporate a sufficient margin of safety in the plant design, consistent with reasonable investment cost, to compensate for the effects of plant and catalyst aging, fluctuating feed rates and other deviations from ideal operating conditions. Making the present SO_2 NSPS more stringent would involve greatly increased capital costs since sulfuric acid plant vendors would have to redesign for lower SO_2 emission rates in order to retain this margin of safety.

- More frequent conversion catalyst replacement (as compared with present practice) in order to maintain a more stringent SO_2 control level than the present standard in sulfuric acid plants subject to NSPS would represent a substantial drop in pretax profits (20 percent or more).

- Projections over the 4-year period, 1981 through 1984, for the 16 new sulfuric acid plants expected to be built during this period indicate that there would be only a 0.02 percent drop in SO_2 emission contribution from these plants to the total U.S. annual SO_2 emissions if the present SO_2 standard were dropped from 2 kg/Mg (4 lb/ton) to 1 kg/Mg (2 lb/ton).

7.1.2 Acid Mist NSPS (and Related Opacity Standard)

- The current best demonstrated control technology, the high efficiency acid mist eliminator, is identical to that used as the rationale for the original acid mist standard. This technology is in use in all sulfuric acid plants built since the promulgation of the acid mist NSPS for sulfuric acid plants.

- While the average acid mist emission obtained in the NSPS compliance test results is 0.04 kg/Mg (0.08 lb/ton), the wide range shown in this data, from a low of 0.008 kg/Mg ~~(0.016 lb/ton) to a high of 0.071 kg/Mg (0.14 lb/ton) for~~ high efficiency acid mist eliminator control, may be partially due to defects in the original EPA Method 8 which tended to introduce variability in the acid mist levels obtained.

- An appreciable number (approximately 25 percent) of the NSPS compliance test results obtained for acid mist emissions are within 75 to 100 percent of the present NSPS acid mist control level. This may be indicative of the vulnerability of sulfuric acid plants to in-plant operating fluctuations such as variation in the sulfur feedstock, leaks, or improper inlet air drying tower operations, all of which introduce moisture (the controlling factor in the formation of acid mist) into the system, thus increasing the acid mist emissions.

- Manufacturers of acid mist eliminators guarantee maximum stack emissions of 1 mg/scf (~0.15 lb/ton) for high efficiency units under normal operating conditions. While there is a 10-percent opacity limitation for stack plumes under the present NSPS, no guarantee is provided for any form of visible emission limitation. However, available data indicate that acid mist emissions of 1 mg/scf will result in stack plumes of less than 10 percent opacity.

7.2 Recommendations

7.2.1 SO_2 NSPS

At this time there is not sufficient justification for revision of the SO_2 NSPS for sulfuric acid plants, based on the following considerations:

- The best demonstrated control technology, the dual absorption process, is in use in all new sulfuric acid plants.

- SO_2 emission levels achieved in the NSPS compliance tests which were significantly lower than the standard are not representative of day-to-day plant operations. These levels tend to rise toward the standard as the conversion catalyst ages. The dual absorption process can not adjust the SO_2 emission levels to compensate for the loss of catalyst activity.

- The national impact of a more stringent SO_2 NSPS would be marginal due to the very small decrease in SO_2 emissions (resulting from a tighter standard) from the sulfuric acid plants projected to be built during the 1981 through 1989 period.

7.2.2 Acid Mist NSPS (and Related Opacity Standard)

At this time there is not sufficient justification for revision of the acid mist (and opacity) NSPS based on the following considerations:

- The best demonstrated control technology (the high efficiency acid mist eliminator) is in use in all new sulfuric acid plants.
- The need exists to retain a margin of safety for maintenance of the present acid mist NSPS control level since there is always a possibility of in-plant operating fluctuations which deviate from standard sulfuric acid plant operations and introduce unexpected amounts of moisture into the system.
- Control of acid mist emissions at the present NSPS level, results in essentially no visible emissions, i.e., less than 10 percent opacity.

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TECHNICAL REPORT DATA

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16. ABSTRACT

This report reviews the current Standards of Performance for New Stationary Sources: Subpart H. It includes a summary of the current standards, the status of current applicable control technology, and the ability of plants to meet the current standards. Recommendations are made for future studies needed of unresolved issues.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
~~sulfuric acid~~ manufacturing process performance standards regulations		13B
18. DISTRIBUTION STATEMENT Release Unlimited	19. SECURITY CLASS *(This Report)* Unclassified	21. NO. OF PAGES 87
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Environmental Protection
Agency

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Office of Air Quality Planning and Standards
Research Triangle Park NC 27711

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To: ______ Loctn.: ______
To: ______ Loctn.: ______
To: ______ Loctn.: ______
From: ______ Date: ______

TO: District Managers

ATTN: Air Engineers and Local Programs

FROM: Victoria Martinez VM

DATE: August 24, 1979

SUBJECT: Best Available Control Technology (BACT) Pursuant to Chapter 17-2.03 FAC

Attached for your information is a copy of the BACT determination by the Florida Department of Environmental Regulation for New Wales Chemicals, Inc. Sulfuric Acid Plants No. 4 and No. 5, to be located in Polk County. The control technology established by the BACT determination is:

SO_2:	Emission not to exceed 4.0 #/ton of 100% H_2SO_4/attainable with a double absorption system.
Sulfuric Acid Mist:	Emissions not to exceed 0.15 #/ton of 100% H_2SO_4/attainable with a high efficiency demister
Opacity:	Not greater than 10 percent
Test Method:	As prescribed in EPA NSPS, 40 CFR, Part 60, Subpart H.

Information regarding the determination may be obtained by writing Victoria Martinez, Department of Environmental Regulation, 2600 Blair Stone Road, Twin Towers Office Building Tallahassee, Florida 32301.

VM/es

Attachment

cc: Jim Estler

State of Florida

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To: ______ Loctn.: ______

From: ______ Date: ______

TO: Jacob D. Varn
Secretary

FROM: J. P. Subramani, Chief JPSubramani
Bureau of Air Quality Management

DATE: August 20, 1979

SUBJECT: BACT Determination - New Wales Chemicals, Inc.
Sulfuric Acid Plants No. 4 and No. 5, to be located in Polk County

Facility: Two identical double absorption sulfuric acid plants with a combined process input rate of 1320 tons/day of sulfur.

BACT Determination Requested by the Applicant:

Pollutant	
SO_2:	4 lbs/ton 100% H_2SO_4 acid produced
Sulfuric Acid Mist:	0.15 lbs/ton 100% H_2SO_4 acid produced

Date of Receipt of a Complete BACT Application:

June 5, 1979

Date of Publication in the Florida Administrative Weekly:

August 6, 1979

Date of Publication in a Newspaper of General Circulation:

August 8, 1979, The Ledger, Lakeland, Florida

Study Group Members:

A BACT determination on a sulfuric acid plant was completed April 16, 1979. There has been no significant technological improvement since that date. Thus the same BACT applies and a study group is not needed.

EPA's New Source Performance Standards (NSPS) for Sulfuric Acid Plants:

Pollutant	Rate of Concentration
SO_2:	4 #/ton of 100 H_2SO_4
Sulfuric Acid Mist:	0.15 #/ton of 100% H_2SO_4

BACT Determination by the Florida Department of Environmental Regulation:

SO_2:	Emission not to exceed 4.0 #/ton of 100% H_2SO_4/attainable with a double absorption system.
Sulfuric Acid Mist:	Emissions not to exceed 0.15 #/ton of 100% H_2SO_4/attainable with a high efficiency demister.
Opacity:	Not greater than 10 percent.
Test Method:	As prescribed in EPA NSPS, 40 CFR, Part 60, Subpart H.

Justification of DER Determination:

There has been no significant technological improvements since December 1978 when EPA reviewed its NSPS for this type of source. Although lower emissions than NSPS are attainable the selection of NSPS as BACT allows for the normal decrease in efficiency with the passage of time.

Details of the Analysis May be Obtained by Contacting:

Victoria Martinez, BACT Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Twin Towers Office Building
Tallahassee, Florida 32301

Recommendation from: Bureau of Air Quality Management

by: ______________________
J. P. Subramani

Date: AUGUST 20, 1979

Approved by: Jacob D. Varn
Jacob D. Varn

Date: 21ST AUGUST 1979

JDV/es

Attachment

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From: ______________ Date: ______________

JUN 1979
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AQM

TO: Victoria Martinez, BACT Coordinator

FROM: Bob Garrett, Air Engineer, Tampa RRG

DATE: June 5, 1979

SUBJECT: BACT for New Wales Expansion

Enclosed is a copy of New Wale's application for:

1. Sulfuric Acid Plants #4 and #5, new construction
2. DAP Plants #2 and #3, new construction

We have requested them for a PSD determination which they are in the process of preparing presently.

It is almost a certainty that the magnitude of these new sources will exceed the "Baseline", but we will not have proof of this until they submit the results of the PSD study. In the interests of expediting these permits, should we proceed with the BACT process or wait for PSD.

RRG/rkt

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

78 085 001

April 18, 1979

Mr. W. W. Vierday, Manager
Licensing Affairs
Florida Power Corporation
Post Office Box 14042
St. Petersburg, Florida 33733

Dear Mr. Vierday:

Enclosed with this letter are updated tables to be incorporated with the PSD reports for the fly ash handling system for units 1 and 2. Originally submitted in separate reports to both the EPA and DER (ESE-August, 1978) the new tables reflect the addition of sources 4 and 5, the vacuum blower vents, to the initial three sources already modeled.

The methodology used for this addendum is identical to that of the two reports. It includes the use of Tampa meteorological data for the years 1971-75 and the highest, second-highest concentrations from the CRSTER model. To pinpoint the maximum air quality and PSD impacts at the plant boundary lines, the PTMTP-W model was used. The annual averaged concentration tables produced by the CRSTER model showed an impact of less than one microgram per cubic meter, so that the AQDM was not rerun.

The first attached sheet contains the revised air quality and PSD results from Table 5.1 and 5.2 in the original reports. The only noticeable change was in the 24-hour impacts, where an additional impact of from 12 to 13 ug/m^3, due to new sources 4 and 5, is added onto the original values. As can be seen, no problems are anticipated in meeting any regulations.

For completeness, I have attached the new CRSTER and PTMTP-W runs. The maximum impact still occurs on Day 15, 1973 as it did before. All baseline runs are also included.

If you have any additional questions or comments, please don't hesitate to call us.

Very truly yours,

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

Steven R. Marks

Steven R. Marks
Environmental Meteorologist

SRM:lp

P.O. BOX 13454 GAINESVILLE, FLORIDA 32604 904/372-3318

Table 5.1. Maximum TSP Ambient Air Quality Results* (ug/m^3).

	Annual		24-Hour	
	EPA	DER	EPA	DER
All Sources (1980's)	39	39	63	63
AAQS	60	60	150	150

* Includes a background concentration of 35 ug/m^3.

Table 5.2. PSD Results -- Total Suspended Particulates

	Class I		Class II	
	EPA	FDER	EPA	FDER
Maximum Annual Average Increment	<<1	<<1	4	4
Allowable Annual-Average Increment	5	5	19	19
Maximum 24-Hour Increment	2	2	27	26
Allowable 24-Hour Increment	10	10	37	37

```
PLANT NAME: FPC CR FLY ASH               POLLUTANT:   TSP      EMISSION UNITS: GM/SEC     AIR QUALITY UNITS: GM/M**3
TAMPA MET DATA, 1971-75,RURAL
CRYSTAL RIVER UNITS 1&2 ASH HANDLING SYSTEM
ALL PROPOSED SOURCES

               MET FILE     REQUESTED
              STN NO. YR   STN NO. YR
 SURFACE      12842  71    12842  71
 UPPER AIR    12842  71    12842  71
PLANT LOCATION: RURAL
NO TAPE OUTPUT
MET DATA WILL NOT BE PRINTED

DAY-- 1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
      1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
      1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
      1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
      1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
      1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
      1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
      1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1


 * * * * * * * * * * * * * * * * * * * * N O T E * * * * * * * * * * * * * * * * * * * *

          ALL TABLES, INCLUDING SOURCE CONTRIBUTION, THAT CONTAIN "ANNUAL" IN THE HEADING ARE BASED ONLY ON THOSE DAYS

          MARKED BY "1" IN THE ABOVE TABLE
```

```
  REC. DISTANCES(KM)=   2.00   2.20   5.10   9.00  20.00

 STACK #  1--VACUUM BLOWER VENTS
 STACK #  2--FLY ASH TRANSFER SILO
 STACK #  3--FLY ASH TRANSFER SILO
 STACK #  4--FLY ASH STORAGE SILO

  STACK     MONTH        EMISSION RATE          HEIGHT    DIAMETER  EXIT VELOCITY    TEMP        VOLUMETRIC FLOW
                           (GMS/SEC)           (METERS)   (METERS)     (M/SEC)      (DEG.K)        (M**3/SEC)

    1        ALL            0.2770                2.44      0.25        16.18        339.00            0.82

    2        ALL            0.6659                2.44      0.20        37.19        339.00            1.17

    3        ALL            0.0064               10.70      0.59         0.46        339.00            0.13

    4        ALL            0.1120               28.30      0.48        13.72        339.00            2.48
```

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YEAR= 71

                        SECOND HIGHEST 24-HOUR CONCENTRATION AT EACH RECEPTOR
 RANGE        2.0 KM                   2.2 KM                   2.4 KM                   4.0 KM                   20.0 KM
DIR
   1   5.2394E-06 ( 28)       4.7743E-06 ( 28)       4.3702E-06 ( 28)       2.4931E-06 ( 28)       3.6415E-07 ( 28)
   2   4.5982E-06 (228)       3.9985E-06 (228)       3.5166E-06 (228)       1.7167E-06 ( 24)       1.7112E-07 ( 24)
   3   3.5784E-06 (197)       3.0142E-06 (197)       2.7154E-06 (197)       1.4740E-06 (197)       1.5724E-07 (112)
   4   3.6477E-06 (116)       3.1837E-06 (116)       2.8091E-06 (116)       1.3328E-06 (116)       1.9590E-07 (254)
   5   1.0448E-05 ( 82)       9.4167E-06 ( 82)       8.5406E-06 ( 82)       4.6694E-06 ( 82)       6.4709E-07 ( 82)
   6   8.2223E-06 (119)       7.4355E-06 (119)       6.7851E-06 (119)       4.0008E-06 (119)       5.0381E-07 ( 23)
   7   4.3366E-06 ( 31)       3.7625E-06 ( 31)       3.3930E-06 ( 31)       1.5396E-06 ( 31)       2.3948E-07 (196)
   8   4.9065E-06 (167)       4.2844E-06 (167)       3.7827E-06 (167)       1.8020E-06 (167)       1.8482E-07 (167)
   9   5.9119E-06 ( 91)       5.2506E-06 ( 91)       4.7110E-06 ( 91)       2.4232E-06 ( 73)       2.9652E-07 (166)
  10   7.8534E-06 (195)       6.9572E-06 (195)       6.2201E-06 (195)       3.1900E-06 (195)       3.9123E-07 (195)
  11   5.1311E-06 (324)       4.5832E-06 (324)       4.1240E-06 (324)       2.1676E-06 (324)       2.5924E-07 (324)
  12   7.7746E-06 (123)       6.8760E-06 (123)       6.1439E-06 (123)       3.1763E-06 (123)       3.2001E-07 (141)
  13   6.3855E-06 (107)       5.8514E-06 (107)       5.3795E-06 (107)       3.1043E-06 (107)       4.3562E-07 (107)
  14   9.1646E-06 (194)       8.2934E-06 (194)       7.3804E-06 (194)       3.8293E-06 (194)       4.1222E-07 ( 70)
  15   8.1194E-06 ( 70)       7.2504E-06 ( 70)       6.5241E-06 ( 70)       3.4235E-06 ( 70)       4.2852E-07 ( 70)
  16   9.4998E-06 ( 18)       8.5563E-06 ( 18)       7.7498E-06 ( 18)       4.1409E-06 ( 18)       5.4471E-07 (259)
  17   6.3607E-06 ( 13)       5.7317E-06 ( 13)       5.1939E-06 ( 13)       2.7769E-06 ( 13)       3.6565E-07 ( 98)
  18   1.4691E-05 (129)       1.3228E-05 (129)       1.1989E-05 (129)       6.5087E-06 (129)       1.0715E-06 (171)
  19   7.4150E-06 (191)       6.7360E-06 (191)       6.1489E-06 (191)       3.4339E-06 (191)       4.5690E-07 (191)
  20   3.7538E-06 (342)       3.3774E-06 (342)       3.0582E-06 (342)       1.6599E-06 (342)       2.1730E-07 (342)
  21   6.6859E-06 (329)       5.8890E-06 (329)       5.2419E-06 (329)       2.6578E-06 (329)       3.5334E-07 (329)
  22   7.0929E-06 (311)       6.3480E-06 (311)       5.7323E-06 (311)       3.1397E-06 (311)       5.0453E-07 (311)
  23   8.9817E-06 (270)       7.8333E-06 (270)       6.9060E-06 (270)       3.2699E-06 ( 47)       4.3399E-07 ( 47)
  24   1.1702E-05 (359)       1.0295E-05 (359)       9.1481E-06 (359)       4.8161E-06 (  2)       5.7806E-07 (  2)
  25   9.4490E-06 (290)       8.4506E-06 (290)       7.6227E-06 (290)       4.1361E-06 (290)       6.3421E-07 (290)
  26   9.8071E-06 (161)       8.9222E-06 (161)       8.1702E-06 (161)       4.7961E-06 (161)       8.7875E-07 (161)
  27   1.3471E-05 (265)       1.1953E-05 (265)       1.0698E-05 (265)       5.4961E-06 (265)       6.6984E-07 (265)
  28   1.3511E-05 (235)       1.2314E-05 (235)       1.1269E-05 (235)       6.2855E-06 (306)       6.7820E-07 (235)
  29   9.0366E-06 (258)       8.1993E-06 (258)       7.4627E-06 (258)       4.0575E-06 ( 11)       4.5225E-07 (279)
  30   1.1372E-05 (185)       1.0213E-05 (185)       9.2373E-06 (185)       4.9365E-06 (348)       6.7150E-07 (185)
  31   1.0893E-05 (345)       9.7639E-06 (345)       8.8130E-06 (345)       4.7161E-06 (345)       6.1059E-07 (345)
  32   8.2607E-06 (361)       7.4322E-06 (361)       6.7323E-06 (361)       3.6791E-06 (361)       5.1168E-07 (361)
  33   1.0861E-05 (203)       9.7445E-06 (  5)       8.6892E-06 (  5)       4.3236E-06 (  5)       5.3160E-07 (193)
  34   7.3207E-06 ( 88)       6.6073E-06 ( 88)       5.9960E-06 ( 88)       3.2493E-06 ( 88)       3.9190E-07 ( 88)
  35   5.6669E-06 ( 61)       5.0083E-06 ( 61)       4.4677E-06 ( 61)       2.2605E-06 ( 61)       2.8831E-07 (254)
  36   7.7600E-06 (237)       7.0992E-06 (237)       6.5197E-06 (237)       3.7632E-06 ( 25)       4.9176E-07 ( 25)
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  PLANT NAME: EPC CR FLY ASH              POLLUTANT:    TSP      EMISSION UNITS: GM/SEC      AIR QUALITY UNITS: GM/M**3

YEARLY SECOND MAXIMUM 24-HOUR CONC=  1.3701E-05  DIRECTION=  25  DISTANCE=  2.0 KM  DAY=246

YEAR= 72



                              SECOND HIGHEST 24-HOUR CONCENTRATION AT EACH RECEPTOR
  RANGE        2.0 KM                      2.2 KM                      2.4 KM                      4.6 KM                      20.0 KM
DIR
   1   4.3865E-06 (  9)        3.9550E-06 (  9)        3.5886E-06 (  9)        1.9758E-06 (  9)        2.7716E-07 (  9)
   2   6.9596E-06 (105)        6.1855E-06 (105)        5.5430E-06 (105)        2.8609E-06 (105)        3.3994E-07 (105)
   3   5.7629E-06 ( 56)        5.2083E-06 ( 56)        4.7354E-06 ( 56)        2.6261E-06 ( 56)        3.7052E-07 ( 56)
   4   6.0575E-06 (  3)        5.9476E-06 (  3)        5.5504E-06 (  3)        2.7698E-06 (  3)        3.0773E-07 (  4)
   5   6.8748E-06 (221)        6.0942E-06 (221)        5.4478E-06 (221)        2.7942E-06 (106)        3.4747E-07 (106)
   6   5.3450E-06 (239)        4.7097E-06 (239)        4.1871E-06 (239)        2.0389E-06 (239)        2.4584E-07 ( 37)
   7   8.8223E-06 ( 58)        7.9352E-06 (180)        7.0767E-06 (180)        3.5529E-06 (180)        3.8083E-07 (180)
   8   5.7675E-06 (181)        5.0634E-06 (181)        4.4914E-06 (181)        2.2032E-06 (181)        2.6434E-07 (180)
   9   6.8645E-06 (144)        6.0308E-06 (144)        5.3525E-06 (144)        2.6369E-06 (144)        3.0546E-07 (144)
  10   5.5977E-06 ( 84)        5.0228E-06 ( 84)        4.5385E-06 ( 84)        2.4482E-06 ( 84)        4.0921E-07 ( 84)
  11   5.0200E-06 (144)        4.3877E-06 (144)        3.8727E-06 (144)        1.9709E-06 ( 84)        2.3156E-07 ( 84)
  12   7.1090E-06 (  5)        6.3045E-06 (  5)        5.6374E-06 (  5)        2.8498E-06 (  5)        3.0442E-07 (  5)
  13   4.5222E-06 ( 63)        4.0696E-06 ( 63)        3.6868E-06 ( 63)        2.0140E-06 ( 63)        2.7870E-07 ( 63)
  14   1.2927E-05 (184)        1.1170E-05 (184)        1.0117E-05 (184)        5.5273E-06 (184)        7.7691E-07 (184)
  15   5.7540E-06 ( 93)        5.2084E-06 ( 93)        4.7415E-06 ( 93)        2.6432E-06 ( 93)        3.2900E-07 ( 51)
  16   6.9335E-06 ( 78)        6.2299E-06 ( 78)        5.6310E-06 ( 78)        2.9732E-06 ( 78)        3.2572E-07 ( 78)
  17   4.7689E-06 (300)        4.3106E-06 (300)        3.9183E-06 (300)        2.1600E-06 (300)        2.8783E-07 (300)
  18   7.0539E-06 (281)        6.3174E-06 (281)        5.6992E-06 (281)        3.0045E-06 (313)        4.0203E-07 (281)
  19   5.6577E-06 ( 25)        5.0998E-06 ( 25)        4.6224E-06 ( 25)        2.4753E-06 ( 25)        2.8112E-07 ( 25)
  20   3.8951E-06 (263)        3.4924E-06 (263)        3.1534E-06 (263)        1.6915E-06 (263)        2.1834E-07 (263)
  21   6.5514E-06 ( 53)        5.8968E-06 ( 53)        5.3429E-06 ( 53)        3.0675E-06 ( 55)        4.0757E-07 ( 53)
  22   7.6989E-06 (279)        6.9096E-06 (279)        6.2299E-06 (279)        3.3476E-06 (279)        4.4659E-07 (279)
  23   8.7726E-06 (267)        7.8571E-06 ( 59)        7.1675E-06 ( 59)        3.9917E-06 ( 59)        6.3101E-07 (289)
  24   8.6781E-06 (339)        7.6687E-06 (339)        6.8365E-06 (339)        3.3947E-06 (339)        3.9155E-07 (147)
  25   1.3701E-05 (246)        1.2134E-05 (246)        1.0882E-05 (246)        5.9398E-06 (219)        7.4575E-07 (219)
  26   1.0094E-05 (257)        9.1835E-06 ( 59)        8.4021E-06 ( 59)        4.7313E-06 ( 59)        5.6234E-07 (257)
  27   1.1610E-05 ( 57)        1.0622E-05 ( 57)        9.7510E-06 ( 57)        5.2706E-06 (306)        6.1722E-07 (306)
  28   9.0328E-06 (242)        8.0344E-06 (242)        7.2030E-06 (242)        3.6833E-06 (242)        4.4673E-07 (231)
  29   1.0050E-05 (260)        8.9186E-06 (260)        7.9763E-06 (260)        4.0094E-06 (260)        5.9769E-07 (290)
  30   1.0388E-05 (262)        9.2696E-06 (262)        8.3360E-06 (262)        4.3907E-06 (262)        7.2306E-07 ( 61)
  31   8.6927E-06 ( 15)        7.8939E-06 ( 15)        7.2037E-06 ( 15)        4.0224E-06 ( 15)        5.7932E-07 (244)
  32   7.5280E-06 (333)        6.8449E-06 (333)        6.2525E-06 (333)        3.5049E-06 (333)        4.6910E-07 (333)
  33   8.0588E-06 (158)        7.1909E-06 (158)        6.4636E-06 (158)        3.3699E-06 (158)        4.4122E-07 ( 22)
  34   5.2434E-06 ( 13)        4.6300E-06 ( 13)        4.1272E-06 ( 13)        2.1735E-06 (136)        2.8831E-07 (136)
  35   4.6383E-06 (159)        4.1650E-06 (159)        3.7603E-06 (159)        2.0423E-06 (159)        2.3434E-07 (186)
  36   5.3196E-06 ( 30)        4.7132E-06 ( 30)        4.2135E-06 ( 30)        2.1541E-06 ( 30)        2.6235E-07 ( 30)
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  PLANT NAME: EPC CR FLY ASH            POLLUTANT:   TSP     EMISSION UNITS: GM/SEC     AIR QUALITY UNITS: GM/M**3

YEARLY SECOND MAXIMUM 24-HOUR CONC=  2.5677E-05  DIRECTION=  31  DISTANCE=  2.0 KM  DAY= 15

YEAR= 73



                         SECOND HIGHEST 24-HOUR CONCENTRATION AT EACH RECEPTOR
  RANGE        2.0 KM                         2.2 KM                         2.4 KM                         4.0 KM                         20.0 KM
DIR
   1    4.6116E-06 (127)        4.9976E-06 (127)        3.6711E-06 (127)        1.8678E-06 (127)        2.0869E-07 (127)
   2    5.0362E-06 (365)        4.4510E-06 (365)        3.9701E-06 (365)        1.9032E-06 (146)        1.6762E-07 (146)
   3    3.8529E-06 (140)        3.4590E-06 (140)        3.1163E-06 (140)        1.6875E-06 (187)        2.1827E-07 (187)
   4    5.1167E-06 ( 56)        4.4330E-06 ( 56)        3.8859E-06 ( 56)        2.0208E-06 (197)        2.9276E-07 ( 80)
   5    8.2295E-06 (129)        7.3197E-06 (129)        6.5635E-06 (129)        3.3794E-06 (129)        3.9894E-07 (129)
   6    5.8786E-06 (209)        5.2192E-06 (187)        4.6769E-06 (187)        2.5918E-06 (161)        3.6872E-07 (161)
   7    8.1614E-06 (114)        7.3010E-06 (114)        6.5768E-06 (114)        3.4313E-06 (114)        3.8209E-07 (114)
   8    3.3461E-06 (322)        2.9873E-06 (322)        2.6851E-06 (322)        1.3840E-06 (322)        1.4376E-07 (322)
   9    6.1294E-06 (168)        5.4616E-06 (168)        4.9061E-06 (168)        2.5662E-06 (168)        3.1458E-07 (168)
  10    5.4236E-06 (141)        4.7519E-06 (141)        4.2075E-06 (141)        2.0511E-06 (141)        2.3858E-07 (161)
  11    4.9514E-06 (139)        4.3821E-06 (139)        3.9255E-06 (139)        2.1164E-06 (139)        2.4469E-07 (222)
  12    1.0339E-05 (362)        9.1926E-06 (362)        8.2384E-06 (362)        4.1497E-06 (362)        6.3382E-07 (268)
  13    1.1742E-05 (363)        1.0233E-05 (363)        9.0160E-06 (363)        4.2631E-06 (363)        5.0328E-07 (118)
  14    9.5771E-06 (167)        8.5767E-06 (167)        7.7356E-06 (167)        4.1043E-06 (167)        5.2298E-07 (167)
  15    1.1226E-05 (319)        1.0221E-05 (319)        9.3474E-06 (319)        5.2821E-06 (319)        7.2429E-07 (319)
  16    5.0717E-06 (  7)        4.3980E-06 (  7)        3.8586E-06 (  7)        1.9519E-06 (125)        2.4127E-07 (125)
  17    6.7874E-06 (175)        6.0771E-06 (175)        5.4755E-06 (175)        2.8433E-06 (175)        3.3509E-07 ( 53)
  18    6.0185E-06 (297)        5.2892E-06 (297)        4.6968E-06 (297)        2.3255E-06 (297)        2.7631E-07 ( 25)
  19    6.1306E-06 (326)        5.7122E-06 (333)        5.0987E-06 (333)        2.6157E-06 (278)        3.3903E-07 (278)
  20    6.1459E-06 (343)        5.4342E-06 (343)        4.8479E-06 (343)        2.4405E-06 (343)        2.5611E-07 ( 13)
  21    6.6132E-06 (299)        5.9238E-06 (299)        5.3443E-06 (299)        3.0432E-06 ( 37)        4.3546E-07 ( 37)
  22    7.5893E-06 (135)        6.9589E-06 (135)        6.4013E-06 (135)        3.7271E-06 (135)        5.5720E-07 (135)
  23    5.4128E-06 (316)        4.7754E-06 (316)        4.2522E-06 (316)        2.1824E-06 (183)        2.8847E-07 (183)
  24    9.9067E-06 (242)        8.8118E-06 (242)        7.9019E-06 (242)        4.0890E-06 (242)        5.0888E-07 (262)
  25    9.9462E-06 (205)        8.0597E-06 (205)        7.2399E-06 (205)        3.7997E-06 (237)        4.8705E-07 (205)
  26    1.1299E-05 (327)        1.0960E-05 (327)        9.0287E-06 (327)        4.7004E-06 (327)        5.7321E-07 (327)
  27    8.6237E-06 (107)        7.6057E-06 (107)        6.7732E-06 (107)        3.3909E-06 (107)        4.1851E-07 (232)
  28    1.0412E-05 (290)        9.3216E-06 (290)        8.4058E-06 (290)        4.4628E-06 (290)        5.6193E-07 (290)
  29    1.1423E-05 (257)        1.0239E-05 (257)        9.2409E-06 (257)        4.8990E-06 (257)        6.0627E-07 (257)
  30    9.2154E-06 (304)        8.2692E-06 (304)        7.4560E-06 (304)        3.9881E-06 (304)        5.1389E-07 (304)
  31    2.5677E-05 ( 15)        2.3407E-05 ( 15)        2.1430E-05 ( 15)        1.2155E-05 ( 15)        1.7439E-06 ( 15)
  32    8.6030E-06 (255)        7.7420E-06 (255)        6.9709E-06 (255)        3.7881E-06 (256)        5.5963E-07 (256)
  33    6.5289E-06 (207)        5.8462E-06 (207)        5.2705E-06 (207)        2.7832E-06 (207)        3.8023E-07 (252)
  34    8.1938E-06 (150)        7.2616E-06 (150)        6.4969E-06 (150)        3.3715E-06 (150)        4.3911E-07 (150)
  35    7.8280E-06 ( 40)        6.9935E-06 ( 40)        6.1483E-06 ( 40)        3.1096E-06 ( 40)        3.8328E-07 ( 73)
  36    7.4780E-06 (149)        6.6032E-06 (149)        5.8836E-06 (149)        3.2979E-06 (134)        5.2098E-07 (146)
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 PLANT NAME: ELK CREEK ASH          POLLUTANT:   TSP     EMISSION UNITS: GM/SEC     AIR QUALITY UNITS: GM/M**3

YEARLY SECOND MAXIMUM 24-HOUR CONC=  1.2831E-05  DIRECTION=  25  DISTANCE=  2.0 KM  DAY= 61

YEAR= 71


                   SECOND HIGHEST 24-HOUR CONCENTRATION AT EACH RECEPTOR
 RANGE       2.0 KM                   2.2                        2.4 KM                     4.0 KM                    20.0 KM
DIR
   1   6.4325E-06 ( 28)         5.6960E-06 ([illegible])   5.0885E-06 ( 28)         2.5889E-06 ( 28)         2.9225E-07 ( 28)
   2   3.6453E-06 ( 78)         3.2444E-06 ([illegible])   4.9116E-06 ( 76)         1.5197E-06 ( 78)         1.5504E-07 ( 28)
   3   4.5537E-06 (125)         3.9262E-06 ([illegible])   3.5593E-06 (125)         1.9056E-06 (125)         2.2694E-07 (271)
   4   4.9563E-06 ( 30)         4.3887E-06 ([illegible])   3.9128E-06 ( 30)         1.9557E-06 ( 30)         2.2256E-07 ( 43)
   5   3.7664E-06 ( 90)         3.3148E-06 ([illegible])   2.9452E-06 ( 90)         1.4575E-06 ( 90)         1.6137E-07 ( 90)
   6   3.9137E-06 ( 87)         3.4488E-06 ([illegible])   3.0693E-06 ( 87)         1.5415E-06 ( 87)         1.7773E-07 (144)
   7   8.0174E-06 (210)         7.3142E-06 ([illegible])   6.7014E-06 (210)         3.8343E-06 (210)         5.6074E-07 (210)
   8   4.6598E-06 (231)         4.1253E-06 ([illegible])   3.6860E-06 (231)         1.8873E-06 (231)         2.3719E-07 (231)
   9   8.4474E-06 (228)         7.0258E-06 (228)           6.9248E-06 (228)         3.8102E-06 (  6)         5.0584E-07 ( 61)
  10   5.6571E-06 (271)         5.0680E-06 (271)           4.5731E-06 (271)         2.4431E-06 (271)         3.1037E-07 (271)
  11   5.7138E-06 (113)         5.1701E-06 (113)           4.7045E-06 (113)         2.6137E-06 (113)         3.6811E-07 (113)
  12   4.5383E-06 (242)         4.0787E-06 (242)           3.6910E-06 (242)         2.0102E-06 (242)         2.9069E-07 (351)
  13   5.5554E-06 ( 19)         5.0339E-06 ( 19)           4.5864E-06 ( 19)         2.5675E-06 ( 19)         3.0779E-07 (189)
  14   8.1956E-06 (190)         7.7247E-06 (190)           7.0580E-06 (190)         3.9884E-06 (190)         5.6980E-07 (190)
  15   9.3046E-06 ( 51)         8.4280E-06 ( 51)           7.6729E-06 ( 51)         4.2287E-06 ( 51)         5.3987E-07 ( 51)
  16   8.1609E-06 (363)         7.0983E-06 (363)           7.0359E-06 (363)         3.9460E-06 (363)         5.2574E-07 (363)
  17   7.7955E-06 (291)         7.0572E-06 (291)           6.4221E-06 (291)         3.3716E-06 (290)         4.1334E-07 (290)
  18   6.3902E-06 (325)         5.6796E-06 (325)           5.0899E-06 (325)         2.6229E-06 (325)         3.6791E-07 (169)
  19   5.9373E-06 (364)         5.2896E-06 (364)           4.7497E-06 (364)         2.4738E-06 (364)         2.9401E-07 (364)
  20   5.9970E-06 (204)         5.3477E-06 (204)           4.8371E-06 (204)         2.5669E-06 (204)         2.8730E-07 (204)
  21   1.1230E-05 (239)         1.0155E-05 (239)           9.2342E-06 (239)         5.0907E-06 (239)         6.7512E-07 (239)
  22   7.7281E-06 (237)         6.9410E-06 (116)           6.2307E-06 (116)         3.2317E-06 (116)         4.3880E-07 (212)
  23   9.7969E-06 (315)         8.7901E-06 (315)           7.9531E-06 (315)         4.3575E-06 (315)         6.3390E-07 (315)
  24   9.4165E-06 (352)         8.6132E-06 (352)           7.8376E-06 (352)         4.2868E-06 (301)         5.4927E-07 (352)
  25   1.2831E-05 ( 61)         1.1557E-05 ( 61)           1.0491E-05 (127)         5.7119E-06 ( 61)         7.4927E-07 (117)
  26   7.6403E-06 (306)         6.7936E-06 (306)           6.0925E-06 (306)         3.1773E-06 (306)         4.0037E-07 (306)
  27   1.1242E-05 (257)         1.0174E-05 (257)           [illegible]600E-06 (257) 5.1261E-06 (257)         7.0419E-07 (257)
  28   8.6343E-06 (167)         7.8711E-06 (167)           7.[illegible]072E-06 (167) 3.7172E-06 (139)       4.9484E-07 (309)
  29   1.0972E-05 (197)         9.9011E-06 (197)           9.9023E-06 (197)         5.0357E-06 (197)         8.1732E-07 ( 69)
  30   9.3160E-06 (245)         8.3810E-06 (245)           7.5919E-06 (245)         4.0966E-06 (245)         5.2693E-07 (245)
  31   6.2170E-06 (238)         5.5934E-06 ([illegible])   5.065[illegible]E-06 (238) 2.6705E-06 (  4)       3.7040E-07 (309)
  32   7.8891E-06 (123)         6.9853E-06 (123)           6.23[illegible]E-06 (123) 3.2805E-06 (359)        4.2976E-07 (359)
  33   6.8358E-06 (213)         6.0996E-06 (213)           5.4996E-06 (213)         3.0353E-06 (213)         5.4508E-07 (213)
  34   9.6087E-06 (359)         8.7326E-06 (359)           7.9769E-06 (359)         4.4998E-06 (359)         6.4108E-07 (359)
  35   6.5347E-06 ( 21)         5.8265E-06 (190)           5.2580E-06 (190)         2.8130E-06 (190)         3.6252E-07 (190)
  36   5.2686E-06 ( 47)         4.7378E-06 ( 47)           4.2884E-06 ( 47)         2.3196E-06 ( 47)         2.9859E-07 ( 47)
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  PLANT NAME: FPC CR FLY ASH             POLLUTANT:   TSP     EMISSION UNITS: GM/SEC    AIR QUALITY UNITS: GM/M**3

YEARLY SECOND MAXIMUM 24-HOUR CONC=  1.4602E-05  DIRECTION=  27  DISTANCE=  2.0 KM  DAY=255

YEAR= 75



                  SECOND HIGHEST 24-HOUR CONCENTRATION AT EACH RECEPTOR
  RANGE       2.0 KM                    2.2 KM                    2.4 KM                    4.0 KM                    20.0 KM
DIR
   1   6.7060E-06 (110)         5.9234E-06 (110)         5.2819E-06 (110)         2.6715E-06 (110)         3.7940E-07 (133)
   2   4.5645E-06 ( 81)         3.9890E-06 (133)         3.6167E-06 (133)         1.9851E-06 (133)         2.6708E-07 ( 81)
   3   6.3340E-06 ( 76)         5.7189E-06 ( 76)         5.1457E-06 ( 76)         2.7015E-06 ( 76)         3.3623E-07 ( 76)
   4   6.3170E-06 ( 66)         5.6555E-06 ( 66)         5.1014E-06 ( 66)         2.7323E-06 ( 66)         3.6171E-07 ( 66)
   5   4.8496E-06 (191)         4.2472E-06 (191)         3.7581E-06 (191)         1.9946E-06 ( 66)         2.3529E-07 (190)
   6   7.6283E-06 (351)         6.9954E-06 (351)         6.4365E-06 (351)         3.7442E-06 (351)         5.5713E-07 (351)
   7   4.1902E-06 ( 91)         3.6338E-06 ( 91)         3.2487E-06 ( 91)         1.6609E-06 ( 91)         2.0025E-07 (192)
   8   5.4721E-06 ( 91)         4.8706E-06 (118)         4.3730E-06 (118)         2.2529E-06 (118)         2.4257E-07 (118)
   9   7.6234E-06 (180)         6.8973E-06 (180)         6.2739E-06 (180)         3.4556E-06 (180)         3.4144E-07 (  6)
  10   4.5274E-06 (159)         3.9957E-06 (159)         3.5587E-06 (159)         1.7585E-06 (159)         1.7841E-07 (159)
  11   3.1081E-06 ( 95)         2.7873E-06 ( 95)         2.5171E-06 ( 95)         1.3511E-06 ( 95)         1.7458E-07 ( 95)
  12   8.3657E-06 (297)         7.5196E-06 (297)         6.8047E-06 (297)         3.6938E-06 (297)         4.9678E-07 (297)
  13   8.7827E-06 ( 73)         7.8794E-06 ( 73)         7.1292E-06 ( 73)         3.5567E-06 (335)         4.5795E-07 (311)
  14   9.1564E-06 (299)         8.2295E-06 (299)         7.4302E-06 (299)         4.0008E-06 (299)         5.2384E-07 (299)
  15   9.0524E-06 (165)         7.9924E-06 (165)         7.1239E-06 (165)         3.8806E-06 (207)         5.6508E-07 (207)
  16   1.0215E-05 (180)         9.1121E-06 (180)         8.1856E-06 (180)         4.4036E-06 (203)         6.0674E-07 (129)
  17   1.2193E-05 (356)         1.1050E-05 (356)         1.0066E-05 (356)         5.6546E-06 ( 18)         8.0215E-07 ( 18)
  18   9.9050E-06 ( 90)         8.8451E-06 ( 90)         7.9504E-06 ( 90)         4.1449E-06 ( 90)         4.7748E-07 ( 90)
  19   8.5668E-06 (297)         7.8188E-06 (297)         7.1668E-06 (297)         3.8718E-06 (354)         5.9603E-07 (297)
  20   6.0174E-06 (326)         5.4056E-06 (326)         4.8852E-06 (326)         2.5813E-06 (326)         2.8475E-07 (326)
  21   9.6195E-06 (123)         8.8391E-06 (248)         8.0501E-06 (248)         4.4712E-06 (248)         6.1520E-07 (248)
  22   6.4169E-06 (252)         5.7212E-06 (252)         5.1494E-06 (252)         2.7605E-06 (252)         4.9347E-07 (353)
  23   9.9681E-06 ( 17)         8.8290E-06 ( 17)         7.8869E-06 ( 17)         3.9894E-06 ( 17)         4.6705E-07 (302)
  24   1.2627E-05 (183)         1.1246E-05 (183)         1.0099E-05 (183)         5.3070E-06 (183)         6.7598E-07 (147)
  25   1.1160E-05 (213)         1.0245E-05 (213)         9.2282E-06 (213)         4.8984E-06 (213)         5.9084E-07 (238)
  26   9.4932E-06 (321)         8.4241E-06 (321)         7.5580E-06 (229)         3.9498E-06 (309)         5.0134E-07 (349)
  27   1.4602E-05 (255)         1.3132E-05 (255)         1.1882E-05 (255)         6.3613E-06 (255)         7.5884E-07 (255)
  28   1.2931E-05 (249)         1.1569E-05 (249)         1.0476E-05 (249)         5.5286E-06 (249)         6.8662E-07 (249)
  29   1.1837E-05 (157)         1.0660E-05 (157)         9.6613E-06 (157)         5.2535E-06 (157)         6.8032E-07 (311)
  30   7.3311E-06 (219)         6.5535E-06 (219)         5.9028E-06 (219)         3.1333E-06 (219)         4.0456E-07 (219)
  31   8.0768E-06 ( 75)         7.3155E-06 ( 75)         6.6709E-06 ( 75)         3.6530E-06 (161)         4.9125E-07 (161)
  32   1.3912E-05 (231)         1.2655E-05 (231)         1.1565E-05 (231)         6.5074E-06 (231)         8.8430E-07 (231)
  33   7.2920E-06 (  4)         6.4772E-06 (  4)         5.8064E-06 (  4)         3.0283E-06 (  4)         3.8549E-07 (  4)
  34   8.4080E-06 (209)         7.3816E-06 (209)         6.5671E-06 (  9)         3.4371E-06 (  9)         4.2141E-07 (  9)
  35   4.6108E-06 (203)         4.2823E-06 (203)         3.9734E-06 (203)         2.4100E-06 (126)         3.0873E-07 (126)
  36   4.2065E-06 (100)         3.6749E-06 (100)         3.2435E-06 (100)         1.6784E-06 (137)         2.2402E-07 (118)
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CR HORST MAY 15, 1973--FLY ASH INCR.

      1.        7.0

* * * S O U R C E S * * *
     NO.      Q (G/SEC)   HP (M)  TS (DEG-K)   VS (M/SEC)  D(M)  VF(M**3/SEC)   R (KM)     S (KM)

      1.        0.67        2.4     339.0        37.2       0.20        0.0    334.200   3204.200        FLY ASH TRANSFER SILO
      2.        0.01       10.7     339.0         0.5       0.59        0.0    334.200   3204.200        FLY ASH TRANSFER SILO
      3.        0.11       28.3     339.0        13.7       0.48        0.0    334.200   3204.200        FLY ASH STORAGE SILO
      4.        0.55        2.4     339.0        16.2       0.25        0.0    334.200   3204.200        VACUUM BLOWER VENTS
      5.       49.01      152.0     422.0        42.1       4.57        0.0    334.200   3204.200        CR1,ESP,1980'S
      6.       59.41      153.0     422.0        44.8       4.88        0.0    334.200   3204.200        CR2,ESP,1980'S
      7.      168.13      182.9     403.0        27.4       6.86        0.0    334.700   3205.300        CR4&5,ESP,1980'S
      8.        0.10       12.8     315.0         9.1       0.68        0.0    334.700   3205.300        EMERGING RECLAIM HOPPER
      9.        0.21       12.8     315.0         9.1       0.99        0.0    334.800   3205.300        CRUSHER HOUSE
     10.        0.35       12.8     315.0         9.1       0.62        0.0    334.700   3205.300        SILO DUST COLLECTORS
     11.        0.55       45.7     315.0         9.1       1.13        0.0    334.700   3205.300        FLY ASH SILOS
     12.        0.08        3.0     315.0         9.1       0.44        0.0    334.700   3205.300        FLY ASH VACUUM PUMP
     13.        0.06        6.4     315.0         9.1       0.52        0.0    334.600   3203.900        TRANSFER POINT 25
     14.        0.06       12.8     315.0         9.1       0.52        0.0    334.680   3203.900        TRANSFER POINT 26
     15.        0.06       12.8     315.0         9.1       0.52        0.0    335.000   3204.100        TRANSFER POINT 27

* * * R E C E P T O R S * * *
     NO.     RREC(KM)   SREC(KM)       Z (M)
                                  Km
      1.    332.590   3205.550  2.1   0.0
      2.    332.510   3205.610  2.2   0.0
      3.    332.440   3205.680  2.3   0.0
      4.    332.360   3205.740  2.4   0.0
      5.    332.280   3205.810  2.5   0.0
      1.       330.         1.0         7       1025.       278.0        0.0
      2.       332.         1.0         7       1037.       276.0        0.0
      3.       128.         2.1         6       1049.       278.0        0.0
      4.       130.         1.0         6       1061.       277.0        0.0
      5.       135.         1.0         6       1074.       277.0        0.0
      6.       139.         1.0         6       1086.       277.0        0.0
      7.       129.         1.5         6       1098.       277.0        0.0
      8.       132.         1.0         5        100.       278.0        0.0
      9.       127.         1.0         4        280.       281.0        0.0
     10.       197.         2.6         4        461.       287.0        0.0
     11.       252.         2.1         3        641.       289.0        0.0
     12.       299.         3.1         3        822.       290.0        0.0
     13.       244.         4.1         3       1002.       291.0        0.0
     14.       270.         4.6         3       1183.       291.0        0.0
     15.       273.         6.2         4       1183.       293.0        0.0
     16.       266.         6.2         4       1183.       294.0        0.0
     17.       293.         4.6         4       1183.       291.0        0.0
     18.       287.         2.1         5       1183.       288.0        0.0
     19.       271.         2.1         5       1184.       286.0        0.0
     20.       252.         1.5         6       1184.       285.0        0.0
     21.       254.         1.5         6       1185.       284.0        0.0
     22.       253.         1.5         6       1185.       284.0        0.0
     23.       249.         1.0         6       1186.       284.0        0.0
     24.       250.         1.0         6       1186.       283.0        0.0
```

BEST AVAILABLE COPY

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 AVERAGE CONCENTRATIONS FOR  24 HOURS.

* * * R E C E P T O R   N U M B E R * * *

                  1.           2.           3.           4.           5.

SOURCE       PARTIAL CONCENTRATIONS (G/M**3)

     1.      1.659E-05 1.600E-05 1.509E-05 1.460E-05 1.391E-05
     2.      1.132E-07 1.082E-07 1.015E-07 9.753E-08 9.234E-08
     3.      2.991E-07 3.065E-07 3.057E-07 3.117E-07 3.129E-07
     4.      1.519E-05 1.458E-05 1.370E-05 1.321E-05 1.253E-05
     5.      0.0       0.0       0.0       0.0       0.0
     6.      0.0       0.0       0.0       0.0       0.0
     7.      0.0       0.0       0.0       0.0       0.0
     8.      2.821E-25 1.108E-23 5.899E-22 8.680E-21 1.575E-19
     9.      1.141E-25 4.434E-24 2.353E-22 3.559E-21 6.691E-20
    10.      1.024E-24 4.011E-23 2.131E-21 3.130E-20 5.669E-19
    11.      3.861E-25 1.629E-23 9.225E-22 1.436E-20 2.709E-19
    12.      3.833E-25 1.489E-23 7.851E-22 1.145E-20 2.061E-19
    13.      8.365E-07 8.014E-07 7.809E-07 7.509E-07 7.254E-07
    14.      4.584E-07 4.372E-07 4.500E-07 4.316E-07 4.279E-07
    15.      1.402E-08 1.454E-08 1.688E-08 1.725E-08 1.867E-08

              TOTAL CONCENTRATION (G/M**3)

             3.350E-05 3.225E-05 3.044E-05 2.942E-05 2.802E-05
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← edge of property
2.5 km

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CR FLY ASH DAY 136, 1974--EPER BASELINE

        1.        7.0

* * * S O U R C E S * * *
     NO      Q (G/SEC)  HP (M)  TS (DEG-K)  VS (M/SEC)  D(M)  VF(M**3/SEC)  R (KM)    S (KM)

        1.     58.80     152.0     416.0        35.7       4.57        0.0  334.200  3204.200        CR1,ISP,1974
        2.     77.20     153.0     416.0        38.7       4.88        0.0  334.200  3204.200        CR2,ISP,1974

* * * R E C E P T O R S * * *
     NO.     RREC(KM)  SREC(KM)     Z (M)

        1.   332.590  3205.550        0.0
        2.   332.510  3205.610        0.0
        3.   332.440  3205.680        0.0
        4.   332.360  3205.740        0.0
        5.   332.280  3205.810        0.0
        1.       89.       3.1        6     1539.     293.0       0.0
        2.      124.       3.1        6     1539.     293.0       0.0
        3.      126.       5.1        5     1540.     294.0       0.0
        4.      127.       5.1        5     1541.     294.0       0.0
        5.      131.       3.6        5     1541.     294.0       0.0
        6.      128.       3.1        4       49.     294.0       0.0
        7.      126.       4.6        3      236.     295.0       0.0
        8.      127.       6.2        4      423.     298.0       0.0
        9.      120.       5.1        3      611.     299.0       0.0
       10.      131.       5.1        3      798.     301.0       0.0
       11.      131.       5.1        3      985.     303.0       0.0
       12.      154.       4.6        2     1172.     304.0       0.0
       13.      129.       4.6        2     1360.     305.0       0.0
       14.       56.       5.1        3     1547.     302.0       0.0
       15.       27.       4.6        4     1547.     301.0       0.0
       16.       58.       8.2        4     1547.     297.0       0.0
       17.       92.       6.7        4     1547.     295.0       0.0
       18.      127.       3.6        4     1547.     295.0       0.0
       19.       87.       3.6        4     1547.     295.0       0.0
       20.       99.       3.6        4     1537.     294.0       0.0
       21.       86.       4.1        4     1524.     294.0       0.0
       22.      105.       3.6        4     1512.     294.0       0.0
       23.       75.       2.6        5     1500.     294.0       0.0
       24.       61.       2.6        5     1488.     294.0       0.0
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 AVERAGE CONCENTRATIONS FOR  24 HOURS.

***R E C E P T O R   N U M B E R***

              1.         2.         3.         4.         5.

SOURCE        PARTIAL CONCENTRATIONS (G/M**3)

    1.       6.728E-07 7.272E-07 7.757E-07 8.223E-07 8.664E-07
    2.       6.639E-07 7.259E-07 7.815E-07 8.371E-07 8.915E-07

              TOTAL CONCENTRATION (G/M**3)


             1.336E-06 1.452E-06 1.557E-06 1.659E-06 1.758E-06
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CR FLY ASH DAY 243, 1974, EPA BASELINE

        1.          7.0

* * * S O U R C E S * * *
      NO.      Q (G/SEC)   HP (M)  TS (DEG-K)  VS (M/SEC) D(M)  VF(M**3/SEC)  R (KM)    S (KM)

        1.       39.20      152.0      416.0       35.7       4.57        0.0  334.200  3204.200          CR1,TSP,1977
        2.       33.86      153.0      422.0       44.8       4.88        0.0  334.200  3204.200          CR2,TSP,1977

* * * R E C E P T O R S * * *
      NO.     RREC(KM)  SREC(KM)      Z (M)

        1.    332.590  3205.550       0.0
        2.    332.510  3205.610       0.0
        3.    332.440  3205.680       0.0
        4.    332.360  3205.740       0.0
        5.    332.280  3205.810       0.0
        1.       158.         2.6         6      1789.     300.0        0.0
        2.        93.         3.1         6      1772.     300.0        0.0
        3.       144.         2.1         6      1755.     299.0        0.0
        4.       141.         1.0         7      1738.     298.0        0.0
        5.        98.         2.1         6      1721.     298.0        0.0
        6.       133.         3.1         6      1704.     298.0        0.0
        7.       122.         3.6         5       163.     299.0        0.0
        8.       125.         3.1         4       364.     301.0        0.0
        9.       122.         3.1         3       565.     303.0        0.0
       10.       137.         3.1         2       766.     304.0        0.0
       11.       153.         4.1         2       967.     304.0        0.0
       12.       122.         2.1         1      1167.     306.0        0.0
       13.       268.         4.1         2      1368.     304.0        0.0
       14.        20.         2.1         1      1569.     307.0        0.0
       15.       274.         3.6         2      1569.     306.0        0.0
       16.        16.         3.1         3      1569.     306.0        0.0
       17.        58.         3.1         4      1569.     305.0        0.0
       18.       267.         2.1         4      1569.     304.0        0.0
       19.       225.         3.1         4      1572.     302.0        0.0
       20.       221.         3.1         4      1590.     302.0        0.0
       21.       345.         5.7         4      1608.     301.0        0.0
       22.       316.         2.6         4      1626.     299.0        0.0
       23.        56.         2.1         4      1644.     299.0        0.0
       24.        50.         2.1         4      1662.     299.0        0.0
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BEST AVAILABLE COPY

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 AVERAGE CONCENTRATIONS FOR  24 HOURS.

* * * R E C E P T O R   N U M B E R * * *

              1.          2.          3.          4.          5.

SOURCE       PARTIAL CONCENTRATIONS (G/M**3)

     1.      5.317E-07 5.312E-07 5.285E-07 5.263E-07 5.228E-07
     2.      3.872E-07 3.861E-07 3.818E-07 3.814E-07 3.795E-07

              TOTAL CONCENTRATION (G/M**3)

             9.189E-07 9.174E-07 9.103E-07 9.077E-07 9.023E-07
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WD 328,1972,BASELINE AND 1980'S,CLASS 1 AREA

        1.        7.0

* * * S O U R C E S * * *
     NO      Q (G/SEC)  HP (M) TS (DEG-K)  VS (M/SEC) D(M) VF(M**3/SEC)  R (KM)    S (KM)

        1.     58.80     152.0     416.0       35.7       4.57       0.0  334.200  3204.200       CR1,TSP,1974
        2.     77.20     153.0     416.0       38.7       4.88       0.0  334.200  3204.200       CR2,TSP,1974

* * * R E C E P T O R S * * *
     NO.     RREC(KM)  SREC(KM)     Z (M)

        1.   331.000  3184.100       0.0
        2.   331.500  3184.100       0.0
        3.   332.000  3184.100       0.0
        4.   332.500  3184.100       0.0
        5.   333.000  3184.100       0.0
        6.   333.500  3184.100       0.0
        7.   334.000  3184.100       0.0
        8.   334.500  3184.100       0.0
        9.   335.000  3184.100       0.0
       10.   335.500  3184.100       0.0
       11.   336.000  3184.100       0.0
       12.   336.500  3184.100       0.0
       13.   337.000  3184.100       0.0
       14.   337.500  3184.100       0.0
       15.   338.000  3184.100       0.0
       16.   338.500  3184.100       0.0
       17.   339.000  3184.100       0.0
       18.   339.500  3184.100       0.0
       19.   340.000  3184.100       0.0
       20.   340.500  3184.100       0.0
       21.   341.000  3184.100       0.0
       22.   341.500  3184.100       0.0
       23.   342.000  3184.100       0.0
       24.   342.500  3184.100       0.0
       25.   343.000  3184.100       0.0
       26.   343.500  3184.100       0.0
       27.   344.000  3184.100       0.0
        1.      359.       4.6         5       892.       283.0         0.0
        2.      354.       4.1         5       891.       283.0         0.0
        3.      346.       3.6         4       891.       281.0         0.0
        4.      347.       4.6         4       890.       281.0         0.0
        5.      351.       3.6         4       890.       281.0         0.0
        6.      358.       3.6         4       890.       281.0         0.0
        7.      336.       4.1         4       889.       280.0         0.0
        8.      337.       4.1         4       889.       280.0         0.0
        9.       10.       4.1         4       888.       282.0         0.0
       10.       11.       4.6         4       888.       285.0         0.0
       11.       21.       3.6         4       887.       286.0         0.0
       12.        4.       5.1         4       887.       288.0         0.0
       13.      359.       5.1         4       886.       289.0         0.0
       14.      356.       6.2         4       886.       290.0         0.0
       15.        7.       6.7         4       886.       290.0         0.0
       16.      338.       7.2         4       886.       289.0         0.0
       17.        2.       5.1         4       886.       288.0         0.0
       18.      357.       3.1         5       883.       287.0         0.0
       19.      357.       4.1         4       877.       286.0         0.0
       20.      359.       5.1         4       871.       285.0         0.0
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21.           6.        3.1          5      865.     284.0        0.0
22.         355.        3.1          6      859.     283.0        0.0
23.          25.        3.1          5      853.     283.0        0.0
24.         351.        4.1          5      846.     283.0        0.0
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 AVERAGE CONCENTRATIONS FOR  24 HOURS.

* * * R E C E P T O R   N U M B E R * * *

             1.        2.        3.        4.        5.        6.        7.        8.        9.       10.       11.       12.

SOURCE      PARTIAL CONCENTRATIONS (G/M**3)

    1.     3.023E-07 3.341E-07 3.561E-07 3.674E-07 3.866E-07 4.415E-07 5.317E-07 6.132E-07 6.281E-07 5.601E-07 4.491E-07 3.492E-07
    2.     3.275E-07 3.656E-07 3.920E-07 4.047E-07 4.241E-07 4.806E-07 5.744E-07 6.591E-07 6.734E-07 5.997E-07 4.799E-07 3.709E-07

            TOTAL CONCENTRATION (G/M**3)


           6.298E-07 6.997E-07 7.481E-07 7.721E-07 8.108E-07 9.220E-07 1.106E-06 1.272E-06 1.301E-06 1.160E-06 9.290E-07 7.201E-07

* * * R E C E P T O R   N U M B E R * * *

            13.       14.       15.       16.       17.       18.       19.       20.       21.       22.       23.       24.

SOURCE      PARTIAL CONCENTRATIONS (G/M**3)

    1.     2.873E-07 2.572E-07 2.421E-07 2.305E-07 2.118E-07 1.789E-07 1.407E-07 1.197E-07 1.335E-07 1.799E-07 2.361E-07 2.718E-07
    2.     3.014E-07 2.662E-07 2.480E-07 2.348E-07 2.155E-07 1.823E-07 1.448E-07 1.263E-07 1.449E-07 1.973E-07 2.588E-07 2.966E-07

            TOTAL CONCENTRATION (G/M**3)


           5.687E-07 5.234E-07 4.902E-07 4.653E-07 4.273E-07 3.613E-07 2.855E-07 2.460E-07 2.784E-07 3.773E-07 4.948E-07 5.684E-07

* * * R E C E P T O R   N U M B E R * * *

            25.       26.       27.

SOURCE      PARTIAL CONCENTRATIONS (G/M**3)

    1.     2.676E-07 2.250E-07 1.624E-07
    2.     2.905E-07 2.431E-07 1.748E-07

            TOTAL CONCENTRATION (G/M**3)


           5.581E-07 4.681E-07 3.372E-07
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WD 328,1972,BASELINE AND 1980'S,CLASS 1 AREA

       1.        7.0

* * * S O U R C E S * * *
     NO      Q (G/SEC)  HP (M) TS (DEG-K)  VS (M/SEC) D(M) VF(M**3/SEC)  R (KM)    S (KM)

       1.      39.20     152.0     416.0      35.7      4.57       0.0  334.200  3204.200       CR1,TSP,1977
       2.      33.86     153.0     422.0      44.8      4.88       0.0  334.200  3204.200       CR2,TSP,1977

* * * R E C E P T O R S * * *
     NO.     RREC(KM)  SREC(KM)    Z (M)

       1.    331.000  3184.100      0.0
       2.    331.500  3184.100      0.0
       3.    332.000  3184.100      0.0
       4.    332.500  3184.100      0.0
       5.    333.000  3184.100      0.0
       6.    333.500  3184.100      0.0
       7.    334.000  3184.100      0.0
       8.    334.500  3184.100      0.0
       9.    335.000  3184.100      0.0
      10.    335.500  3184.100      0.0
      11.    336.000  3184.100      0.0
      12.    336.500  3184.100      0.0
      13.    337.000  3184.100      0.0
      14.    337.500  3184.100      0.0
      15.    338.000  3184.100      0.0
      16.    338.500  3184.100      0.0
      17.    339.000  3184.100      0.0
      18.    339.500  3184.100      0.0
      19.    340.000  3184.100      0.0
      20.    340.500  3184.100      0.0
      21.    341.000  3184.100      0.0
      22.    341.500  3184.100      0.0
      23.    342.000  3184.100      0.0
      24.    342.500  3184.100      0.0
      25.    343.000  3184.100      0.0
      26.    343.500  3184.100      0.0
      27.    344.000  3184.100      0.0
       1.       359.        4.6         5      892.     283.0       0.0
       2.       354.        4.1         5      891.     283.0       0.0
       3.       346.        3.6         4      891.     281.0       0.0
       4.       347.        4.6         4      890.     281.0       0.0
       5.       351.        3.6         4      890.     281.0       0.0
       6.       358.        3.6         4      890.     281.0       0.0
       7.       336.        4.1         4      889.     280.0       0.0
       8.       337.        4.1         4      889.     280.0       0.0
       9.        10.        4.1         4      888.     282.0       0.0
      10.        11.        4.6         4      888.     285.0       0.0
      11.        21.        3.6         4      887.     286.0       0.0
      12.         4.        5.1         4      887.     288.0       0.0
      13.       359.        5.1         4      886.     289.0       0.0
      14.       356.        6.2         4      886.     290.0       0.0
      15.         7.        6.7         4      886.     290.0       0.0
      16.       338.        7.2         4      886.     289.0       0.0
      17.         2.        5.1         4      886.     288.0       0.0
      18.       357.        3.1         5      883.     287.0       0.0
      19.       357.        4.1         4      877.     286.0       0.0
      20.       359.        5.1         4      871.     285.0       0.0
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         21.          6.         3.1          5        865.       284.0        0.0
         22.        355.         3.1          6        859.       283.0        0.0
         23.         25.         3.1          5        853.       283.0        0.0
         24.        351.         4.1          5        846.       283.0        0.0
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  AVERAGE CONCENTRATIONS FOR  24 HOURS.

* * * R E C E P T O R   N U M B E R * * *

                1.         2.         3.         4.         5.         6.         7.         8.         9.        10.        11.        12.

SOURCE       PARTIAL CONCENTRATIONS (G/M**3)

    1.       2.015E-07 2.227E-07 2.374E-07 2.449E-07 2.578E-07 2.943E-07 3.544E-07 4.088E-07 4.187E-07 3.734E-07 2.994E-07 2.328E-07
    2.       1.200E-07 1.355E-07 1.462E-07 1.509E-07 1.572E-07 1.767E-07 2.100E-07 2.401E-07 2.450E-07 2.182E-07 1.745E-07 1.343E-07

              TOTAL CONCENTRATION (G/M**3)


             3.215E-07 3.583E-07 3.836E-07 3.958E-07 4.150E-07 4.710E-07 5.644E-07 6.489E-07 6.637E-07 5.916E-07 4.740E-07 3.672E-07

* * * R E C E P T O R   N U M B E R * * *

               13.        14.        15.        16.        17.        18.        19.        20.        21.        22.        23.        24.

SOURCE       PARTIAL CONCENTRATIONS (G/M**3)

    1.       1.915E-07 1.715E-07 1.614E-07 1.537E-07 1.412E-07 1.193E-07 9.382E-08 7.981E-08 8.901E-08 1.199E-07 1.574E-07 1.812E-07
    2.       1.080E-07 9.399E-08 8.639E-08 8.104E-08 7.408E-08 6.277E-08 5.038E-08 4.511E-08 5.323E-08 7.327E-08 9.594E-08 1.094E-07

              TOTAL CONCENTRATION (G/M**3)


             2.995E-07 2.655E-07 2.478E-07 2.347E-07 2.153E-07 1.821E-07 1.442E-07 1.249E-07 1.422E-07 1.932E-07 2.533E-07 2.907E-07

* * * R E C E P T O R   N U M B E R * * *

               25.        26.        27.

SOURCE       PARTIAL CONCENTRATIONS (G/M**3)

    1.       1.784E-07 1.500E-07 1.083E-07
    2.       1.066E-07 8.877E-08 6.353E-08

              TOTAL CONCENTRATION (G/M**3)


             2.850E-07 2.388E-07 1.718E-07
```

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DAY 120, 1972---CLASS 1

        1.        7.0

* * * S O U R C E S * * *
      NO      Q (G/SEC)  HP (M) TS (DEG-K)  VS (M/SEC) D(M) VF(M**3/SEC)  R (KM)    S (KM)

        1.       0.67       2.4     339.0       37.2      0.20       0.0   334.200  3204.200        FLY ASH TRANSFER SILO
        2.       0.01      10.7     339.0        0.5      0.59       0.0   334.200  3204.200        FLY ASH TRANSFER SILO
        3.       0.11      28.3     339.0       13.7      0.48       0.0   334.200  3204.200        FLY ASH STORAGE SILO
        4.       0.55       2.4     339.0       16.2      0.25       0.0   334.200  3204.200        VACUUM BLOWER VENTS
        5.      49.01     152.0     422.0       42.1      4.57       0.0   334.200  3204.200        CR1,TSP,1980'S
        6.      59.41     153.0     422.0       44.8      4.88       0.0   334.200  3204.200        CR2,TSP,1980'S
        7.     168.13     182.9     400.0       27.4      6.86       0.0   334.700  3205.300        CR4&5,TSP,1980'S
        8.       0.10      12.8     315.0        9.1      0.68       0.0   334.700  3205.300        EMERGING RECLAIM HOPPER
        9.       0.21      12.8     315.0        9.1      0.99       0.0   334.800  3205.300        CRUSHER HOUSE
       10.       0.35      12.8     315.0        9.1      0.62       0.0   334.700  3205.300        SILO DUST COLLECTORS
       11.       0.55      49.7     315.0        9.1      1.13       0.0   334.700  3205.300        FLY ASH SILOS
       12.       0.08       3.0     315.0        9.1      0.44       0.0   334.700  3205.300        FLY ASH VACUUM PUMP
       13.       0.06       6.4     315.0        9.1      0.52       0.0   334.600  3203.900        TRANSFER POINT 25
       14.       0.06      12.8     315.0        9.1      0.52       0.0   334.680  3203.900        TRANSFER POINT 26
       15.       0.06      12.8     315.0        9.1      0.52       0.0   335.000  3204.100        TRANSFER POINT 27

* * * R E C E P T O R S * * *
      NO.     RREC(KM)  SREC(KM)     Z (M)

        1.    331.000   3184.100      0.0
        2.    331.500   3184.100      0.0
        3.    332.000   3184.100      0.0
        4.    332.500   3184.100      0.0
        5.    333.000   3184.100      0.0
        6.    333.500   3184.100      0.0
        7.    334.000   3184.100      0.0
        8.    334.500   3184.100      0.0
        9.    335.000   3184.100      0.0
       10.    335.500   3184.100      0.0
       11.    336.000   3184.100      0.0
       12.    336.500   3184.100      0.0
       13.    337.000   3184.100      0.0
       14.    337.500   3184.100      0.0
       15.    338.000   3184.100      0.0
       16.    338.500   3184.100      0.0
       17.    339.000   3184.100      0.0
       18.    339.500   3184.100      0.0
       19.    340.000   3184.100      0.0
       20.    340.500   3184.100      0.0
       21.    341.000   3184.100      0.0
       22.    341.500   3184.100      0.0
       23.    342.000   3184.100      0.0
       24.    342.500   3184.100      0.0
       25.    343.000   3184.100      0.0
       26.    343.500   3184.100      0.0
       27.    344.000   3184.100      0.0
        1.        323.        3.6       4         438.       295.0       0.0
        2.        308.        2.6       4         453.       294.0       0.0
        3.        307.        3.6       4         467.       294.0       0.0
        4.        329.        5.7       4         482.       293.0       0.0
        5.        337.        5.7       4         496.       291.0       0.0
        6.        356.        4.6       4         510.       290.0       0.0
        7.        359.        4.6       4         525.       290.0       0.0
```

```
     8.        16.       5.1        4      539.      289.0       0.0
     9.       360.       5.7        4      554.      290.0       0.0
    10.         4.       5.7        4      568.      289.0       0.0
    11.       356.       6.2        4      583.      290.0       0.0
    12.       356.       5.7        3      597.      292.0       0.0
    13.       354.       6.2        4      612.      293.0       0.0
    14.       349.       6.7        4      626.      292.0       0.0
    15.       336.       6.2        4      626.      293.0       0.0
    16.       326.       6.7        4      626.      292.0       0.0
    17.       348.       5.1        4      626.      290.0       0.0
    18.        12.       5.7        4      637.      289.0       0.0
    19.       356.       3.1        5      662.      288.0       0.0
    20.       359.       2.6        6      688.      286.0       0.0
    21.         9.       1.5        6      713.      286.0       0.0
    22.         2.       1.5        5      738.      286.0       0.0
    23.         1.       1.5        5      764.      285.0       0.0
    24.        12.       3.1        5      789.      284.0       0.0
```

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AVERAGE CONCENTRATIONS FOR  24 HOURS.

* * * R E C E P T O R   N U M B E R * * *

             1.        2.        3.        4.        5.        6.        7.        8.        9.       10.       11.       12.

SOURCE      PARTIAL CONCENTRATIONS (G/M**3)

    1.     3.137E-08 6.256E-08 2.003E-07 3.216E-07 2.843E-07 2.526E-07 2.916E-07 3.075E-07 2.185E-07 1.255E-07 8.374E-08 5.580E-08
    2.     1.861E-10 3.695E-10 1.178E-09 1.891E-09 1.672E-09 1.487E-09 1.714E-09 1.808E-09 1.290E-09 7.486E-10 5.040E-10 3.388E-10
    3.     2.436E-09 4.308E-09 1.323E-08 2.149E-08 2.000E-08 1.878E-08 2.147E-08 2.218E-08 1.609E-08 9.867E-09 6.895E-09 4.714E-09
    4.     2.624E-08 5.259E-08 1.686E-07 2.706E-07 2.388E-07 2.117E-07 2.444E-07 2.578E-07 1.830E-07 1.049E-07 6.993E-08 4.658E-08
    5.     8.651E-08 7.402E-08 9.418E-08 1.461E-07 2.213E-07 2.989E-07 3.573E-07 3.971E-07 4.276E-07 4.355E-07 4.000E-07 3.326E-07
    6.     8.852E-08 7.625E-08 9.686E-08 1.489E-07 2.236E-07 3.019E-07 3.641E-07 4.103E-07 4.471E-07 4.589E-07 4.244E-07 3.555E-07
    7.     2.116E-07 1.633E-07 1.636E-07 2.208E-07 3.275E-07 4.682E-07 6.187E-07 7.556E-07 8.733E-07 9.672E-07 1.006E-06 9.556E-07
    8.     3.308E-09 2.715E-09 7.230E-09 1.923E-08 2.631E-08 2.267E-08 2.116E-08 2.438E-08 2.562E-08 1.901E-08 1.144E-08 7.804E-09
    9.     7.493E-09 5.393E-09 1.144E-08 3.353E-08 5.250E-08 4.808E-08 4.308E-08 4.857E-08 5.329E-08 4.266E-08 2.609E-08 1.737E-08
   10.     1.160E-08 9.539E-09 2.549E-08 6.783E-08 9.274E-08 7.978E-08 7.433E-08 8.568E-08 9.006E-08 6.682E-08 4.015E-08 2.735E-08
   11.     1.129E-08 8.518E-09 1.865E-08 4.779E-08 6.796E-08 6.524E-08 6.634E-08 7.458E-08 7.515E-08 5.710E-08 3.776E-08 2.762E-08
   12.     4.090E-09 3.415E-09 9.487E-09 2.544E-08 3.461E-08 2.926E-08 2.683E-08 3.101E-08 3.275E-08 2.412E-08 1.415E-08 9.453E-09
   13.     3.078E-09 2.182E-09 5.048E-09 1.527E-08 2.217E-08 1.881E-08 1.768E-08 2.074E-08 2.043E-08 1.338E-08 7.868E-09 5.381E-09
   14.     2.663E-09 1.793E-09 3.255E-09 1.054E-08 1.730E-08 1.592E-08 1.402E-08 1.622E-08 1.682E-08 1.175E-08 6.888E-09 4.693E-09
   15.     3.098E-09 2.189E-09 1.849E-09 5.446E-09 1.393E-08 1.713E-08 1.422E-08 1.438E-08 1.678E-08 1.533E-08 9.594E-09 5.902E-09

            TOTAL CONCENTRATION (G/M**3)

           4.935E-07 4.691E-07 8.203E-07 1.356E-06 1.645E-06 1.850E-06 2.177E-06 2.468E-06 2.498E-06 2.353E-06 2.146E-06 1.857E-06
* * * R E C E P T O R   N U M B E R * * *

            13.       14.       15.       16.       17.       18.       19.       20.       21.       22.       23.       24.

SOURCE      PARTIAL CONCENTRATIONS (G/M**3)

    1.     3.543E-08 2.600E-08 2.286E-08 2.022E-08 1.576E-08 1.040E-08 6.148E-09 4.366E-09 5.356E-09 8.558E-09 1.266E-08 1.589E-08
    2.     2.179E-10 1.616E-10 1.426E-10 1.261E-10 9.823E-11 6.481E-11 3.831E-11 2.720E-11 3.336E-11 5.330E-11 7.883E-11 9.895E-11
    3.     3.091E-09 2.330E-09 2.067E-09 1.829E-09 1.425E-09 9.396E-10 5.554E-10 3.943E-10 4.835E-10 7.726E-10 1.143E-09 1.435E-09
    4.     2.956E-08 2.168E-08 1.906E-08 1.685E-08 1.314E-08 8.670E-09 5.126E-09 3.640E-09 4.466E-09 7.135E-09 1.055E-08 1.325E-08
    5.     2.690E-07 2.300E-07 2.066E-07 1.778E-07 1.350E-07 8.758E-08 5.141E-08 3.718E-08 4.736E-08 7.760E-08 1.167E-07 1.487E-07
    6.     2.889E-07 2.464E-07 2.195E-07 1.874E-07 1.415E-07 9.140E-08 5.356E-08 3.885E-08 4.982E-08 8.197E-08 1.236E-07 1.577E-07
    7.     8.280E-07 6.843E-07 5.773E-07 5.102E-07 4.488E-07 3.635E-07 2.579E-07 1.599E-07 9.755E-08 8.473E-08 1.218E-07 1.971E-07
    8.     5.459E-09 3.575E-09 2.543E-09 2.170E-09 1.978E-09 1.668E-09 1.218E-09 7.686E-10 4.684E-10 3.917E-10 5.380E-10 8.478E-10
    9.     1.233E-08 8.135E-09 5.620E-09 4.647E-09 4.239E-09 3.659E-09 2.756E-09 1.785E-09 1.074E-09 8.148E-10 1.034E-09 1.632E-09
   10.     1.913E-08 1.252E-08 8.905E-09 7.596E-09 6.923E-09 5.839E-09 4.263E-09 2.691E-09 1.640E-09 1.371E-09 1.883E-09 2.968E-09
   11.     1.986E-08 1.338E-08 9.782E-09 8.457E-09 7.727E-09 6.515E-09 4.756E-09 3.001E-09 1.828E-09 1.529E-09 2.100E-09 3.310E-09
   12.     6.535E-09 4.215E-09 2.952E-09 2.499E-09 2.275E-09 1.920E-09 1.402E-09 8.853E-10 5.397E-10 4.513E-10 6.200E-10 9.770E-10
   13.     3.509E-09 2.285E-09 1.791E-09 1.608E-09 1.374E-09 1.008E-09 6.274E-10 3.751E-10 3.238E-10 4.697E-10 7.465E-10 1.035E-09
   14.     3.123E-09 2.021E-09 1.540E-09 1.373E-09 1.194E-09 9.000E-10 5.733E-10 3.382E-10 2.669E-10 3.654E-10 5.859E-10 8.346E-10
   15.     4.103E-09 2.671E-09 1.791E-09 1.454E-09 1.313E-09 1.108E-09 8.003E-10 4.935E-10 2.992E-10 2.702E-10 3.990E-10 6.294E-10

            TOTAL CONCENTRATION (G/M**3)

           1.528E-06 1.260E-06 1.082E-06 9.443E-07 7.827E-07 5.852E-07 3.911E-07 2.547E-07 2.115E-07 2.665E-07 3.944E-07 5.464E-07

* * * R E C E P T O R   N U M B E R * * *

            25.       26.       27.

SOURCE      PARTIAL CONCENTRATIONS (G/M**3)
```

```
  1.      1.688E-08 1.551E-08 1.297E-08
  2.      1.051E-10 9.660E-11 8.077E-11
  3.      1.524E-09 1.401E-09 1.171E-09
  4.      1.407E-08 1.293E-08 1.081E-08
  5.      1.601E-07 1.490E-07 1.260E-07
  6.      1.702E-07 1.587E-07 1.344E-07
  7.      2.859E-07 3.549E-07 3.783E-07
  8.      1.207E-09 1.474E-09 1.546E-09
  9.      2.388E-09 3.009E-09 3.251E-09
 10.      4.224E-09 5.158E-09 5.413E-09
 11.      4.713E-09 5.757E-09 6.043E-09
 12.      1.391E-09 1.698E-09 1.782E-09
 13.      1.207E-09 1.194E-09 1.039E-09
 14.      1.600E-09 1.014E-09 8.973E-10
 15.      8.644E-10 1.000E-09 9.860E-10

           TOTAL CONCENTRATION (G/M**3)


          6.656E-07 7.128E-07 6.848E-07
```

12.17.23

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

BOB GRAHAM
GOVERNOR

JACOB D. VARN
SECRETARY

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

August 24, 1979

Mr. Thomas L. Craig,
Vice President & General
Manager
New Wales Chemicals, Inc.
P. O. Box 1035
Mulberry, Florida 33860

Subject: Best Available Control Technology (BACT) for New Wales Chemicals, Inc. Sulfuric Acid Plants No. 4 & No. 5, to be located in Polk County

Dear Mr. Craig:

The Department of Environmental Regulation has reviewed the BACT Application submitted by you, and determined Best Available Control Technology (BACT) for the above referenced soruce as follows:
source

SO_2:	Emission not to exceed 4.0 #/ton of 100% H_2SO_4/attainable with a double absorption system.
Sulfuric Acid Mist:	Emissions not to exceed 0.15 #/ton of 100% H_2SO_4/attainable with a high efficiency demister.
Opacity:	Not greater than 10 percent.
Test Method:	As prescribed in EPA NSPS, 40 CFR, Part 60, Subpart H.

The complete BACT determination document is attached.

Sincerely,

Victoria Martinez for WES

Victoria Martinez,
BACT Coordinator

VM/es

Attachment

12.17.23

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

BOB GRAHAM
GOVERNOR

JACOB D. VARN
SECRETARY

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

August 24, 1979

Mr. Brian Mitchell
Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30308

Subject: Best Available Control Technology (BACT) Determination for: New Wales Chemicals, Inc. Sulfuric Acid Plants No. 4 & No. 5, to be located in Polk County

Dear Mr. Mitchell:

The Florida Department of Environmental Regulation has determination Best Available Control Technology (BACT) for the above referenced source as follows:

SO_2	Emission not to exceed 0.15 #/ton of 100% H_2SO_4/attainable with a double absorption system.
Sulfuric Acid Mist:	Emissions not to exceed 0.15 #/ton of 100% H_2SO_4/attainable with a high efficiency demister.
Opacity:	Not greater than 10 percent
Test Method:	As prescribed in EPA NSPS, 40 CFR, Part 60, Subpart H.

A complete copy of the BACT determination is attached.

Sincerely,

Victoria Martinez by WCS

Victoria Martinez
BACT Coordinator

VM/es

Attachment

State of Florida

DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices
And/Or To Other Than The Addressee

To: ______ Loctn.: ______
To: ______ Loctn.: ______
To: ______ Loctn.: ______
From: ______ Date: ______

TO: J.P. Subramani

ATTN: Victoria Martinez

THRU: Dan A. Williams DAWilliams

FROM: Robert R. Garrett RRGarrett

DATE: March 28, 1979

SUBJECT: W.R. Grace and Co. BACT

The application is for two sulfuric acid plants with a combined process rate of 5800 tons per day of 100% sulfuric acid.

FAC 17-2.05 (6)B(2) addresses new sufluric acid plants and limits acid mist to 0.15 lbs and SO_2 to 4 lbs per ton of 100% H_2SO_4. Plume opacity is limited to 10%.

The S.W. District has 3 types of controls for these plants which are currently in operation. Lime rock scrubbers, ammonia scrubbers, and double contact/double absorption units. The new plants all use the DC/DA process which easily meets the NSPS emission limits. Graces' application is for this type of control strategy.

Stack test results show a range of 1.16 lbs/ton of H_2SO_4 for the newer plants to nearly 4 lbs/ton for the older plants not under NSPS regulations. Acid mists range from 0.03 to 0.08 lbs/ton H_2SO_4. With proper demisting opacities are usually 0%. The NSPS of FAC 17-2 limits, I feel are reasonably restrictive and should be adopted as BACT.

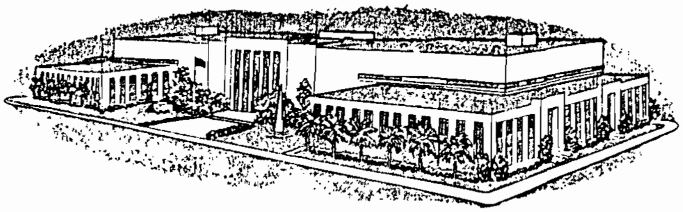
Although EPA's 340/1-77-008 manual of "Sulfuric Acid Plants" mentioned a molecular sieve as a variable control device, our district has had one example proving it to be a total failure.

I recommend the double contact/double adsorption process with a quality demister be used as BACT for H_2SO_4 plants and the new source performance standards as set forth in 17-2.05 (6)B(2) be adopted as reasonable emission limits.

RRG/ln

5/2/79

H6 - Rev 7/76



COUNTY of HILLSBOROUGH

MAR 1979
RECEIVED
BUREAU
AQM

MEMORANDUM

March 13, 1979

To Victoria Martinez

From Joe Griffiths, Env. Prot. Comm JG

Subject: BACT Determination - Sulphuric Acid Plant

It seems that since a new source performance standard for sulphuric acid plants exist that there is little reason to attempt to determine a best available control technology considering double absorption is virtuallly the best method available. However, if we were concerned with a lowest achievable emission rate then this would merit a stricter standard.

I am not aware of control equipment capable of achieving a lower emission rate considering economics, which must be considered when determining BACT, and therefore recommend 4.0 lbs/ton of 100% H_2SO_4 for SO_2 and 0.15 lbs/ton of 100% H_2SO_4 for acid mist as the limit with a double absprption system as the control device.

I do have a question concerning placement of the monitors for the ambient air program and would like the justification used for site selections. I also hope that W. R. Grace will be required to keep at least one ambient SO_2 monitor in operation after construction of the facility, and perhaps station No. 2 would be the one to keep. One monitor placed in a suspected 'hot spot' would be wise considering the amount of SO_2 and acid mist being released in Polk County and the fact that electric power companies will be returning to higher sulfur fuels.

JG/fd

State of Florida

DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee

To: ____________ Loctn.: ____________
To: ____________ Loctn.: ____________
To: ____________ Loctn.: ____________
From: ____________ Date: ____________

ST. JOHNS RIVER SUBDISTRICT - JACKSONVILLE

RECEIVED
MAR 1979
BUREAU
AQM

TO: Victoria Martinez

FROM: John Ketteringham

DATE: March 21, 1979

SUBJECT: BACT Determination - W. R. Grace & Company Sulfuric Acid Plants; Nos. 7 and 8

Reference your I.O.M., March 1, 1979:

The documentation is adequate and the proposed project appears to comply with Chapter 17-2.05 6 B (1)(b), although visible emissions are not addressed.

We concur that the application sets forth systems and equipment that are considered Best Available Control Technology in accordance with Chapter 17-2.03 F.A.C. and appear to meet standards of performance for new stationary sources.

We note that the engineer of record is not identified, form PERM 12-2 requires no signature and there is not transmittal letter.

JK:hd

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices
And/Or To Other Than The Addressee

To: Loctn.:
To: Loctn.:
To: Loctn.:
From: Date:

TO: Victoria Martinez

THRU: Walter Starnes WLS

FROM: John Symes JS

SUBJ: BACT - Grace (Bartow Works) Sulfuric Acid Plants #7 and #8.

The dual absorption-dual oxidation stages of new acid plants are used for the reduction of sulfur dioxide emissions.

Most new plants are able to operate between 3.0 to 3.5 pounds sulfur dioxide per ton of 100% acid produced.

Two sets of acid mist eliminators are used, one between the two absorption stages and one for final effluent. The high-efficiency Brinks "candle" type (long vertical body and narrow diameter (about 10/1 ratio)) are able to control acid mist emissions to between 0.05 to 0.10 pounds per ton of 100% acid produced at 90-100% capacity.

Another part of acid mist control is cautious operating practices, and close control of section temperatures to prevent mechanical production of mists which the mist eliminators cannot remove due to size. This is the reason for the stack opacity limit.

Test values furnished by New Wales, whose plants are approximately the same size, indicate acid mist rates may be exceeded when capacity operation goes over 110% of design rate.

I have no suggestions as to how these may be incorporated into a BACT as it has essentially been accomplished in 17-2 rules already for new source acid plants such as these will be.

JS/ca

IGHWAY 301 NORTH
A, FLORIDA 33610

BOB GRAHAM
GOVERNOR

JACOB D. VARN
SECRETARY

DAVID PUCHATY
DISTRICT MANAGER

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHWEST DISTRICT

TO WHOM IT MAY CONCERN: Publication Date______________________

The Florida Department of Environmental Regulation has received an application for a permit to construct sulfuric acid plants, no. 4 and 5, a source of air pollution, at New Wales Chemicals, Inc., Hwy 640 & County Line Road, Polk County. BACT and PSD are required.

This application has been submitted by New Wales Chemicals, Inc. pursuant to Chapter 17-2, Florida Administrative Code, of the Department's rules regarding the control emissions which may affect the maintenance of National Air Quality Standards.

Copies of the aforementioned application, the technical analysis performed by the Department's staff and their proposed decision are available for public inspection at the following location(s):

The Florida Department of Environmental Regulation
Southwest District Office
7601 Highway 301 North
Tampa, Fla. 33610

Persons wishing to comment on any aspect of this action are required to submit their comments in writing to the address above within thirty (30) days of publication of this Notice.

THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL
REGULATION

7601 HIGHWAY 301 NORTH
TAMPA, FLORIDA 33610

BOB GRAHAM
GOVERNOR

JACOB D. VARN
SECRETARY

DAVID PUCHATY
DISTRICT MANAGER

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHWEST DISTRICT

Polk County AP
New Wales Chemicals, Inc.
July 30, 1979

Mr. A. L. Giradin
Environmental Services Supervisor
New Wales Chemicals, Inc.
P.O. Box 1035
Mulberry, Fla. 33860

Dear Mr. Giradin:

Enclosed are your applications to construct (2) DAP plants which will terminate their processing per your request of 7/23/79.

I am told by our administrative sfaff that the $20.00 permit fee cannot be returned or transferred to other permit applications due to the processing work already expended on them.

In discussing your plans for expansion with our BACT coordinator in Tallahassee, Ms. Martinez recommends that you proceed with the public notice for the sulfuric acid plants to release the BACT approval.

Sincerely yours,

Robert R. Garrett, P.E.
Air Engineer

RRG/rkt

DATE ______________________

Mrs. Liz Cloud
Florida Administrative Weekly
Department of State
The Capitol
Tallahassee, Florida 32304

RE: Receipt of an Application
for BACT Determination

Dear Mrs. Cloud:

Please publish the attached notice in the August 6, 1979
Date
issue of the Florida Administrative Weekly.

Should you have any questions, please call me at SC 522-7270
or (813) 985-7402 .
Phone Number

Sincerely,

Robert R. Garrett
District Air Engineer
Or
District Manager

Attachment

cc: Geneva Hartsfield (2 copies)
2600 Blair Stone Road
Twin Towers Office Building
Tallahassee, Florida 32301

THE DEPARTMENT OF ENVIRONMENTAL REGULATION announces receipt

on April 11, 1979 of an application for determination of
Date

Best Available Control Technology to minimize air pollutant

emissions from 2 sulfuric acid plants . Information regarding the
Type of Facility (New Wales, Polk County)
application may be obtained by writing to:

P. David Puchaty District Manager or other

Dan A. Williams District Officer

Address Southwest District

7601 N. Hwy. 301, Tampa, Fla. 33610

Phone Number (813) 985-7402 .

Garrett RRG
Please handle
DW

New Wales Chemicals, Inc.
A Subsidiary of International Minerals & Chemical Corporation
IMC
P.O. Box 1035 • Mulberry, Florida 33860 • Phone: (813) 428-2531

D.E.R.
JUL 23 1979
SOUTHWEST DISTRICT
TAMPA

July 23, 1979

Mr. R. R. Garrett
Florida Department of Environmental Regulation
7601 Highway 301
Tampa, Florida 33610

Dear Bob:

New Wales Chemicals recently submitted to your office applications to construct two (2) diammonium phosphate plants. Since the submittal of the two applications, New Wales has changed the scope of its plans regarding the DAP plant construction. We, therefore, respectfully request that the applications be withdrawn from consideration and returned to New Wales. With respect to the fees which accompanied the applications, we will shortly submit construction applications for a single DAP plant and another dry product loadout. At this time we will request that these fees be applied to the two new permit applications.

Thank you for your consideration on this matter and should any question arise, please contact us immediately.

A. L. Girardin III

A. L. Girardin, III
Environmental Services Supervisor

ALG:rc

cc: T. L. Craig
C. A. Pflaum

PAID
4-10-79
AC53-19050

DER
APR 10 1979
SOUTHWEST DISTRICT
TAMPA

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

Source Type: ☒ **Air Pollution** ☐ **Incinerator**

Application Type: ☒ **Construction** ☐ **Operation** ☐ **Modification** ☐ **Renewal of DER Permit No.** ______

Company Name: NEW WALES CHEMICALS, INC. **County:** POLK

Identify the specific emission point source(s) addressed in this application (i.e.: Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired): CONTACT SULFURIC ACID PLANT WITH DOUBLE ABSORPTION (05)

Source Location: Street: HWY. 640 & COUNTY LINE RD. **City:** MULBERRY

UTM: East 396.6 **North** 3078.9

Latitude: ___° ___' ___"N. **Longitude:** ___° ___' ___"W.

Appl. Name and Title: THOMAS L. CRAIG, VICE PRESIDENT AND GENERAL MANAGER

Appl. Address: P. O. BOX 1035 MULBERRY, FL. 33860

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative of* NEW WALES CHEMICALS, INC.

I certify that the statements made in this application for a CONSTRUCTION permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provisions of Chapter 403, Florida Statutes, and all the rules and regulations of the Department and revisions thereof. I also understand that a permit, if granted by the Department, will be nontransferable and I will promptly notify the Department upon sale or legal transfer of the permitted establishment.

THOMAS L. CRAIG
Name of Person Signing (please Type or Print)

Thomas L Craig VICE PRES. & GEN. MGR.
Signature of the Owner or Authorized Representative and Title

Date: 4-6-79 **Telephone No.:** 813-428-2531

*Attach a letter of authorization.

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgement, that the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the Department. It is also agreed that the undersigned will furnish the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signature: Craig A Pflaum

Name: CRAIG A. PFLAUM
(Please Type)

Mailing Address: P. O. BOX 1035
MULBERRY, FL. 33860

Company Name: NEW WALES CHEMICALS, INC.

Telephone No.: 813-428-2531

Florida Registration Number: 18595

Date: 4-6-79

(Affix Seal)

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

NEW SOURCE 2000 TPD DESIGN MONSANTO ENVIROCHEM DOUBLE ABSORPTION SULFURIC ACID PLANT. PLANT DESIGN WILL ACHIEVE NEW SOURCE PERFORMANCE STANDARDS FOR SULFURIC ACID PLANTS.

B. *Schedule of Project Covered in this Application (Construction Permit Application Only).*

Start of Construction: JUNE 30, 1980 Completion of Construction: JUNE 30, 1983

C. Costs of Construction. (Note: show breakdown of estimated costs only for individual components/units of the project serving pollution control purpose. Information on actual costs shall be furnished with the application for operation permit.)

ESTIMATED COST OF DOUBLE VS. SINGLE ABSORPTION PLUS INSTALLATION OF BRINKS DEMISTERS, WATER REUSE FACILITIES, CONTINUOUS MONITOR FOR SO2 AND ACCESS COMPLIANCE MONITORING IS $5,000,000.00

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

NONE

E. Is the emission point considered to be a New* or Existing* source, as defined in Chapter 17-2.02(5) & (6), Florida Administrative Code?
X New ____ *Existing*

F. Is this application associated with or part of a Development of Regional Impact (DRI) pursuant to Chapter 380, Florida Statutes, and Chapter 22F-2, Florida Administrative Code? ____ Yes X No

G. Normal Equipment Operating Time: hrs/day: 24 ; days/wk: 7 ; wks/yr: 50 ; if seasonal, describe: ____

*Note

New Source: any source which came into existence, began operation or construction, or received a permit for the latter on or after January 18, 1972.

Existing Source: any source in existence, operating or under construction (or with a permit to construct) prior to January 18, 1972.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES

(other than incinerators)

A. Raw Materials and Chemicals Used in Your Process:

Description	Utilization Rate lbs./hr.	Relate to Flow Diagram
MOLTEN SULFUR	660 TPD	SULFUR BURNER

B. Process Rate:

1) Total Process Input Rate (lbs./hr.): 660 TPD SULFUR

2) Product Weight (lbs/hr): 2000 TPD H_2SO_4

C. Airborne Contaminants Discharged:

Name of Contaminant	Actual Discharge*		Allowed Discharge Rate Per Ch. 17-2, F.A.C.**	Allowable Discharge*** (lbs./hr.)	Relate to Flow Diagram
	lbs./hr.	T/yr.			
SO_2	≦ 4 TPD		4# SO_2/TON H_2SO_4	–	STACK
H_2SO_4 MIST	≦ 0.15	TPD	0.15# MIST/TON	H_2SO_4	STACK

D. Control Devices:

Name and Type (Model and Serial No.)	Contaminant	Efficiency†	Range of Particles Size Collected (in microns)	Basis for Efficiency††
DOUBLE ABSORPTION	SO_2	99.7	NA	DESIGN
TOWERS WITH BRINKS	H_2SO_4 MIST	100%	>3 MICRONS	"
HV MIST ELIMINATORS		85-97%	1-3 MICRONS	"
		50-85%	<1/2 MICRON	"

*Estimate only if this is an application to construct.

**Specify units in accordance with emission standards prescribed within Section 17-2.04, F.A.C. (e.g. Section 17-2.04(6)(e)1.a. specifies that new fossil fuel steam generators are allowed to emit particulate matter at a rate of 0.1 lbs. per million BTU heat input computed as a maximum 2-hour average.)

***Using above example for a source with 260 million BTU per hour heat input: $\frac{0.1 \text{ lbs}}{\text{MMBTU}} \times \frac{260 \text{ MMBTU}}{\text{hr.}} = 26$ lbs./hr.

†See Supplemental Requirements, page 5, number 2.

††Indicate whether the efficiency value is based upon performance testing of the device or design data.

E. Fuels: NA

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg./hr.	Max./hr.	

*Units: Natural Gas - MMCF/hr.; Fuel Oils, Coal - lbs./hr.

Fuel Analysis:

Percent Sulfur: ______ Percent Ash: ______

Density: ______ lb./gal.

Heat Capacity: ______ BTU/lb. ______ BTU/gal.

Other Fuel Contaminants: ______

F. If applicable, indicate the percent of fuel used for space heating: Annual Average: ______ Maximum: ______

G. Indicate liquid or solid wastes generated and method of disposal:

ALL BLOWDOWN REUSED IN KINGSFORD OPERATION

H. Emission Stack Geometry and Flow Characteristics (provide data for each stack):

Stack Height: 199 ft. Stack Diameter: 8.5 ft.

Gas Flow Rate: 120,000 ACFM Gas Exit Temperature: 160 °F

Water Vapor Content: 0 %

SECTION IV: INCINERATOR INFORMATION

NOT APPLICABLE

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Lbs./Hr. Incinerated							

Description of Waste: ______

Total Weight Incinerated (lbs./hr.): ______ Design Capacity (lbs./hr.): ______

Approximate Number of Hours of Operation per Day: ______, days/week: ______

Manufacturer: ______

Date Constructed: ______ Model No.: ______

	Volume (ft.)^3	Heat Release (BTU/hr.)	Fuel		Temp. (°F)
			Type	BTU/hr.	
Primary Chamber					
Secondary Chamber					

Stack Height: ____________ft. Stack Diameter: ____________ Stack Temp.: ____________°F

Gas Flow Rate: ____________ACFM ____________DSCFM*

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of Pollution Control Device: ☐ Cyclone ☐ Wet Scrubber ☐ Afterburner

☐ Other (Specify): ____________

Brief Description of Operating Characteristics of Control Device: ____________

Ultimate Disposal of Any Effluent Other Than That Emitted From the Stack (scrubber water, ash, etc.): ____________

SECTION V: SUPPLEMENTAL REQUIREMENTS

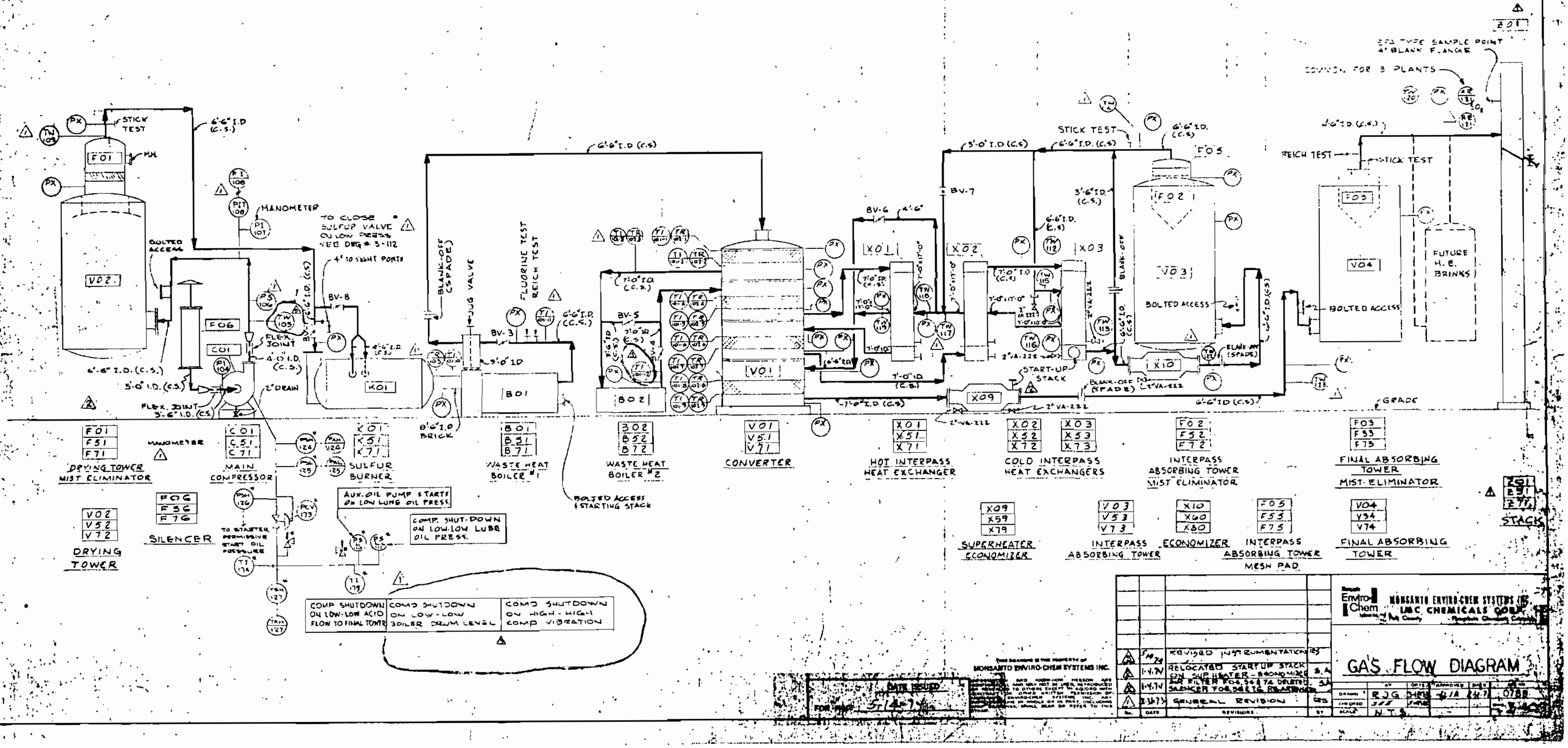
Please Provide the Following Supplements Required For All Pollution Sources:

1. Total process input rate and product weight - show derivation.
2. Efficiency estimation of control device(s) - show derivation. Include pertinent test and/or design data.
3. An 8½" x 11" flow diagram, which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
4. An 8½" x 11" plot plan of facility showing the exact location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.
5. An 8½" x 11" plot plan showing the exact location of the establishment, and points of airborne emissions in relation to the surrounding area, residences and other permanent structures and roadways. (Example: Copy of USGS topographic map.)
6. Description and sketch of storm water control measures taken both during and after construction.
7. An application fee of $20.00, unless exempted by Chapter 17-4.05(3), FAC, made payable to the Department of Environmental Regulation.
8. With construction permit application, include design details for control device(s). Example: for baghouse, include cloth to air ratio; for scrubber, include cross-sectional sketch; etc.
9. Certification by the P.E. with the operation permit application that the source was constructed as shown in the construction permit application.

BEST AVAILABLE COPY

NOTES:

1. ☐ INDICATES ENVIRO-CHEM EQUIPMENT ITEM NOS.
2. INSTRUMENT SYMBOLS ARE IN ACCORDANCE WITH ISA-S5.1.
3. BV INDICATES BUTTERFLY VALVES.
4. THIS DIAGRAM IS TYPICAL FOR PLANTS 01, 02 & 03.
5. ITEMS FURNISHED BY COMPRESSOR VENDOR.



THIS DRAWING IS THE PROPERTY OF MONSANTO ENVIRO-CHEM SYSTEMS INC.

DATE ISSUED
FOR 5-14-74

No.	DATE	REVISIONS	BY
4	5-14-74	REVISED INSTRUMENTATION	RS
3	1-4-74	RELOCATED START UP STACK ON SUP HEATER - ECONOMIZER	SA
2	1-4-74	AIR FILTER F04, 54 & 74 DELETED SILENCER F06, 56 & 76 REARRANGED	SA
1	2-14-73	GENERAL REVISION	RS

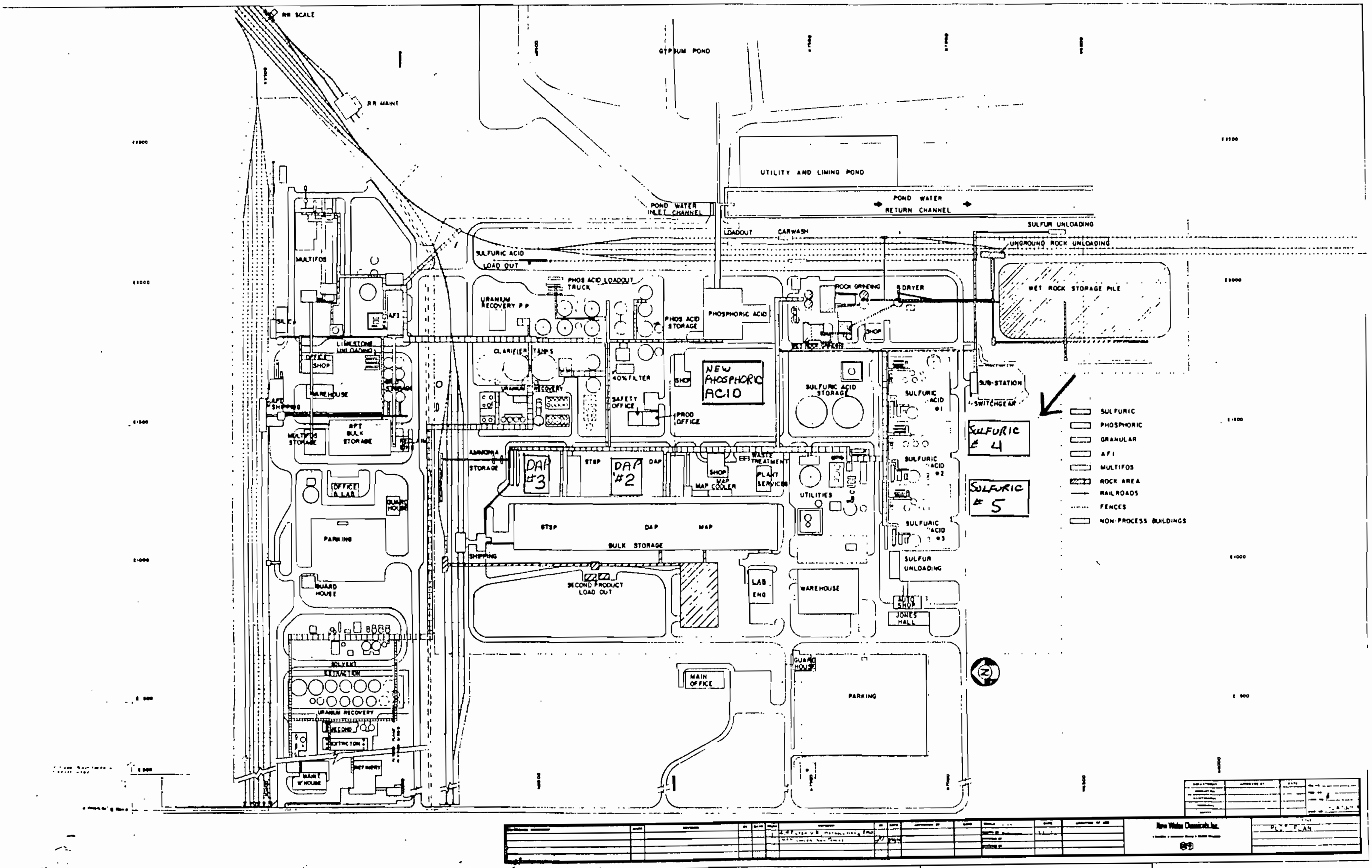
Enviro-Chem
MONSANTO ENVIRO-CHEM SYSTEMS INC.
IMC CHEMICALS CORP.
Polk County

GAS FLOW DIAGRAM

	BY	DATE	APPROVED	DATE
DRAWN	RJG	3-1-73		
CHECKED				
SCALE	N.T.S.			

0788

BEST AVAILABLE COPY



HARRY L. CARROLL
Vice President
Florida

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

November 22, 1978

Mr. T. L. Craig
Vice President & General Manager
New Wales Chemicals, Inc.
Post Office Box 1035
Mulberry, Florida 33860

Dear Tom:

This letter is your authorization to sign on behalf of New Wales Chemicals, Inc. the various applications for permits, specifically the applications for operating permits from the Florida Department of Environmental Regulation.

Very truly yours,

Harry Carroll

Harry L. Carroll

t

Post Office Box 3807 • Lakeland, Florida 33802 • (813) 646-5061

STATE OF FLORIDA

DEPARTMENT OF STATE • DIVISION OF CORPORATIONS

I certify from the records of this office that IMC CHEMICALS CORP., changed its name to; NEW WALES CHEMICALS, INC., is a corporation organized under the Laws of the State of Delaware, authorized to transact business within the State of Florida, qualified on the 1st day of June, 1977, under the new name.

I further certify that said corporation has paid all fees due this office through December 31, 1977 and its status is active.

GIVEN under my hand and the Great Seal of the State of Florida, at Tallahassee, the Capital, this the 1st day of June 1977.

SECRETARY OF STATE

PAID
4-10-79 ff
AC53-19044

D.E.R.
APR 10 1979
SOUTHWEST DISTRICT
TAMPA

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

Source Type: [X] **Air Pollution** [ ] **Incinerator**

Application Type: [X] **Construction** [ ] **Operation** [ ] **Modification** [ ] **Renewal of DER Permit No.** ________

Company Name: NEW WALES CHEMICALS, INC. **County:** POLK

Identify the specific emission point source(s) addressed in this application (i.e.: Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired): CONTACT SULFURIC ACID PLANT WITH DOUBLE ABSORPTION (04)

Source Location: Street: HWY. 640 & COUNTY LINE RD. **City:** MULBERRY

UTM: East 396.6 **North** 3078.9

Latitude: ___ ° ___ ' ___ "N. **Longitude:** ___ ° ___ ' ___ "W.

Appl. Name and Title: THOMAS L. CRAIG, VICE PRESIDENT AND GENERAL MANAGER

Appl. Address: P. O. BOX 1035 MULBERRY, FL. 33860

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative of* NEW WALES CHEMICALS, INC.

I certify that the statements made in this application for a CONSTRUCTION permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provisions of Chapter 403, Florida Statutes, and all the rules and regulations of the Department and revisions thereof. I also understand that a permit, if granted by the Department, will be nontransferable and I will promptly notify the Department upon sale or legal transfer of the permitted establishment.

THOMAS L. CRAIG
Name of Person Signing (please Type or Print)

Thomas L Craig VICE PRES. & GEN. MGR.
Signature of the Owner or Authorized Representative and Title

Date: 4-6-79 **Telephone No.:** 813-428-2531

*Attach a letter of authorization.

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgement, that the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the Department. It is also agreed that the undersigned will furnish the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signature: Craig A. Pflaum

Name: CRAIG A. PFLAUM
(Please Type)

Mailing Address: P. O. BOX 1035
MULBERRY, FL. 33860

Company Name: NEW WALES CHEMICALS, INC.

Telephone No.: 813-428-2531

Florida Registration Number: 18595

Date: 4-6-79

(Affix Seal)

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

NEW SOURCE 2000 TPD DESIGN MONSANTO ENVIROCHEM DOUBLE ABSORPTION SULFURIC ACID PLANT. PLANT DESIGN WILL ACHIEVE NEW SOURCE PERFORMANCE STANDARDS FOR SULFURIC ACID PLANTS.

B. **Schedule of Project Covered in this Application (Construction Permit Application Only).**

Start of Construction: JUNE 30, 1980 *Completion of Construction:* JUNE 30, 1983

C. Costs of Construction. (Note: show breakdown of estimated costs only for individual components/units of the project serving pollution control purpose. *Information on actual costs shall be furnished with the application for operation permit.*)

ESTIMATED COST OF DOUBLE VS. SINGLE ABSORPTION PLUS INSTALLATION OF BRINKS DEMISTERS, WATER REUSE FACILITIES, CONTINUOUS MONITOR FOR SO2 AND ACCESS COMPLIANCE MONITORING IS $5,000,000.00

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

NONE

E. Is the emission point considered to be a New* or Existing* source, as defined in Chapter 17-2.02(5) & (6), Florida Administrative Code?
_X_ New ___ Existing

F. Is this application associated with or part of a Development of Regional Impact (DRI) pursuant to Chapter 380, Florida Statutes, and Chapter 22F-2, Florida Administrative Code? ___ Yes _X_ No

G. Normal Equipment Operating Time: hrs/day: 24 ; days/wk: 7 ; wks/yr: 50 ; if seasonal, describe:

*Note

New Source: any source which came into existence, began operation or construction, or received a permit for the latter on or after January 18, 1972.

Existing Source: any source in existence, operating or under construction (or with a permit to construct) prior to January 18, 1972.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES

(other than incinerators)

A. Raw Materials and Chemicals Used in Your Process:

Description	Utilization Rate lbs./hr.	Relate to Flow Diagram
MOLTEN SULFUR	660 TPD	SULFUR BURNER

B. Process Rate:

1) Total Process Input Rate (lbs./hr.): 660 TPD SULFUR

2) Product Weight (lbs/hr): 2000 TPD H_2SO_4

C. Airborne Contaminants Discharged:

Name of Contaminant	Actual Discharge*		Allowed Discharge Rate Per Ch. 17-2, F.A.C.**	Allowable Discharge*** (lbs./hr.)	Relate to Flow Diagram
	lbs./hr.	T/yr.			
SO_2	≦ 4 TPD		4# SO_2/TON H_2SO_4	-	STACK
H_2SO_4 MIST	≦ 0.15	TPD	0.15# MIST/TON	H_2SO_4	STACK

D. Control Devices:

Name and Type (Model and Serial No.)	Contaminant	Efficiency†	Range of Particles Size Collected (in microns)	Basis for Efficiency††
DOUBLE ABSORPTION	SO_2	99.7	NA	DESIGN
TOWERS WITH BRINKS	H_2SO_4 MIST	100%	>3 MICRONS	"
HV MIST ELIMINATORS		85-97%	1-3 MICRONS	"
		50-85%	<1/2 MICRON	"

*Estimate only if this is an application to construct.

**Specify units in accordance with emission standards prescribed within Section 17-2.04, F.A.C. (e.g. Section 17-2.04(6)(e)1.a. specifies that new fossil fuel steam generators are allowed to emit particulate matter at a rate of 0.1 lbs. per million BTU heat input computed as a maximum 2-hour average.)

***Using above example for a source with 260 million BTU per hour heat input: $\frac{0.1 \text{ lbs}}{\text{MMBTU}} \times \frac{260 \text{ MMBTU}}{\text{hr.}} = 26$ lbs./hr.

†See Supplemental Requirements, page 5, number 2.

††Indicate whether the efficiency value is based upon performance testing of the device <u>or</u> design data.

E. Fuels: NA

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg./hr.	Max./hr.	

*Units: Natural Gas - MMCF/hr.; Fuel Oils, Coal - lbs./hr.

Fuel Analysis:

Percent Sulfur: ________ Percent Ash: ________

Density: ________ lb./gal.

Heat Capacity: ________ BTU/lb. ________ BTU/gal.

Other Fuel Contaminants: ________

F. If applicable, indicate the percent of fuel used for space heating: Annual Average: ________ Maximum: ________

G. Indicate liquid or solid wastes generated and method of disposal:

ALL BLOWDOWN REUSED IN KINGSFORD OPERATION

H. Emission Stack Geometry and Flow Characteristics (provide data for each stack):

Stack Height: 199 ft. Stack Diameter: 8.5 ft.

Gas Flow Rate: 120,000 ACFM Gas Exit Temperature: 160 °F

Water Vapor Content: 0 %

SECTION IV: INCINERATOR INFORMATION

NOT APPLICABLE

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Lbs./Hr. Incinerated							

Description of Waste: ________

Total Weight Incinerated (lbs./hr.): ________ Design Capacity (lbs./hr.): ________

Approximate Number of Hours of Operation per Day: ________ , days/week: ________

Manufacturer: ________

Date Constructed: ________ Model No.: ________

	Volume (ft.)^3	Heat Release (BTU/hr.)	Fuel		Temp. (°F)
			Type	BTU/hr.	
Primary Chamber					
Secondary Chamber					

Stack Height: ____________ ft. Stack Diameter: ____________ Stack Temp.: ____________ °F

Gas Flow Rate: ____________ ACFM ____________ DSCFM*

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of Pollution Control Device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (Specify): ____________

Brief Description of Operating Characteristics of Control Device: ____________

Ultimate Disposal of Any Effluent Other Than That Emitted From the Stack (scrubber water, ash, etc.): ____________

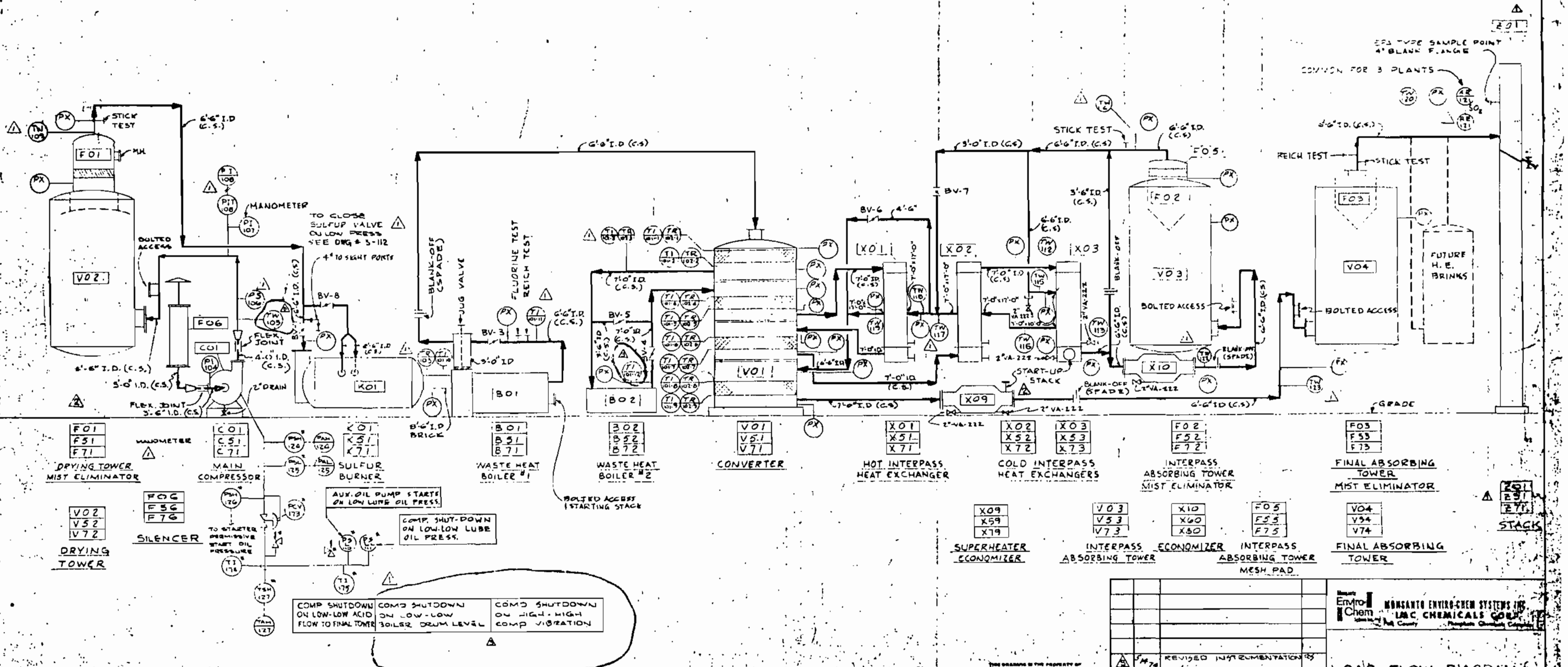
SECTION V: SUPPLEMENTAL REQUIREMENTS

Please Provide the Following Supplements Required For All Pollution Sources:

1. Total process input rate and product weight - show derivation.
2. Efficiency estimation of control device(s) - show derivation. Include pertinent test and/or design data.
3. An 8½" x 11" flow diagram, which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
4. An 8½" x 11" plot plan of facility showing the exact location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.
5. An 8½" x 11" plot plan showing the exact location of the establishment, and points of airborne emissions in relation to the surrounding area, residences and other permanent structures and roadways. (Example: Copy of USGS topographic map.)
6. Description and sketch of storm water control measures taken both during and after construction.
7. An application fee of $20.00, unless exempted by Chapter 17-4.05(3), FAC, made payable to the Department of Environmental Regulation.
8. With construction permit application, include design details for control device(s). Example: for baghouse, include cloth to air ratio; for scrubber, include cross-sectional sketch; etc.
9. Certification by the P.E. with the operation permit application that the source was constructed as shown in the construction permit application.

NOTES:

1. ☐ INDICATES ENVIRO-CHEM EQUIPMENT ITEM NOS.
2. INSTRUMENT SYMBOLS ARE IN ACCORDANCE WITH ISA-S5.1.
3. BV INDICATES BUTTERFLY VALVES.
4. THIS DIAGRAM IS TYPICAL FOR PLANTS 01, 02 & 03.
5. * ITEMS FURNISHED BY COMPRESSOR VENDOR.



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DATE ISSUED
FOR FAB 5-14-74

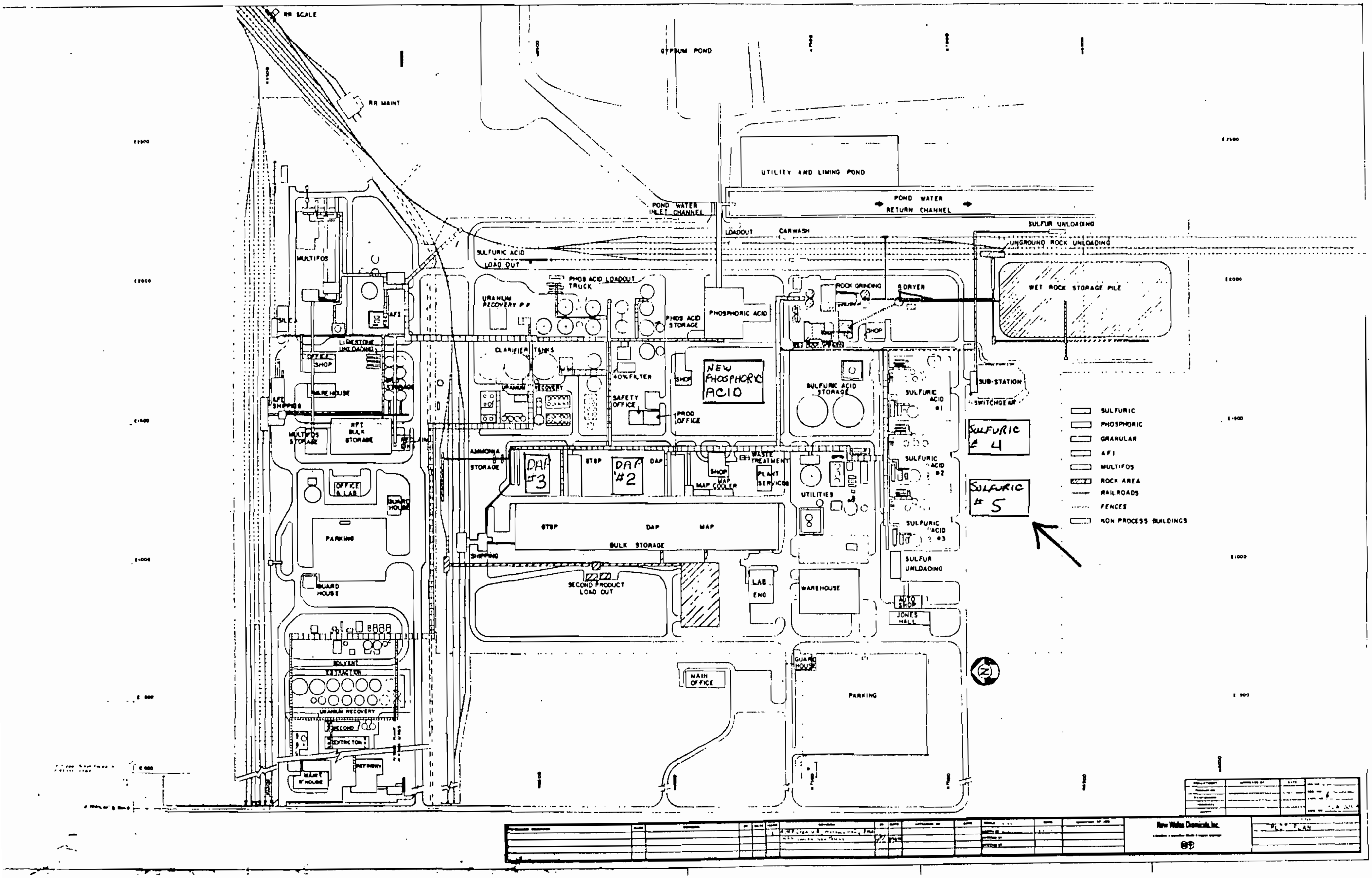
No.	DATE	REVISIONS	BY
4	5-14-74	REVISED INSTRUMENTATION	RS
3	1-4-74	RELOCATED START UP STACK C/N SUP HEATER-ECONOMIZER	S.A.
2	1-4-74	AIR FILTER F04, 54 & 74 DELETED. SILENCER F06, 56 & 76 REARRANGED	S.A.
1	3-14-73	GENERAL REVISION	RS

Monsanto Enviro-Chem
MONSANTO ENVIRO-CHEM SYSTEMS INC.
IMC CHEMICALS CORP.
Polk County
Phosphate Chemicals Complex

GAS FLOW DIAGRAM

	BY	DATE	APPROVED	DATE	JOB NO.
DRAWN	RJG	3-12-73	H/A	4-4-73	0788
CHECKED	JRF	3-15-73			DWG. NO. S-40
SCALE	N.T.S.				

BEST AVAILABLE COPY



HARRY L. CARROLL
Vice President
Florida

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

November 22, 1978

Mr. T. L. Craig
Vice President & General Manager
New Wales Chemicals, Inc.
Post Office Box 1035
Mulberry, Florida 33860

Dear Tom:

This letter is your authorization to sign on behalf of New Wales Chemicals, Inc. the various applications for permits, specifically the applications for operating permits from the Florida Department of Environmental Regulation.

Very truly yours,

Harry L. Carroll

t

Post Office Box 3807 • Lakeland, Florida 33802 • (813) 646-5081

STATE OF FLORIDA

DEPARTMENT OF STATE • DIVISION OF CORPORATIONS

I certify from the records of this office that IMC CHEMICALS CORP., changed its name to; NEW WALES CHEMICALS, INC., is a corporation organized under the Laws of the State of Delaware, authorized to transact business within the State of Florida, qualified on the 1st day of June, 1977, under the new name.

I further certify that said corporation has paid all fees due this office through December 31, 1977 and its status is active.

GIVEN under my hand and the Great
Seal of the State of Florida, at
Tallahassee, the Capital, this the
1st day of June
1977.

SECRETARY OF STATE