STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICATION FOR DETERMINATION OF BEST AVAILABLE CONTROL TECHNOLOGY FOR AIR POLLUTION SOURCES

SOURCE STATUS: (X) New ( ) Modification (Expansion of Sulfuric Complex)

Company Name: W R. Grace & Co. County: Polk

Source Identification: No. 7 Sulfuric Acid Plant

Source Location: Street: S.R. 60 City: Betw. Bartow & Mulberry

UTM: East 409.490 m North 3,086,880 m

Appl. Name and Title: Jean R. Terry, Vice President

Appl. Address: P. O. Box 471, Bartow, FL 33830

Appl. Phone: 813/533-2171

DEPARTMENT USE ONLY

Date Appl. Received:

Notice of Receipt:

Newspaper: Date:

Florida Administrative Weekly Date:

BACT Determination:

Declared by Secretary: Date:

BACT:

NOTICE OF DETERMINATION

Newspaper: Date:

Florida Administrative Weekly Date:

I. DETAILED DESCRIPTION OF SOURCE

A. Describe the manufacturing process at the facility and the unit operation to be controlled. Discuss the source of emissions, existing control devices, the expected improvement in performance, and state whether the project will result in compliance with ambient air quality standards or applicable PSD increments. Attach additional sheet if necessary.

No. 7 Sulfuric Acid Plant is a typical double absorption system designed by Monsanto Enviro-Chem Systems, Inc., virtually identical to existing plants Nos. 4, 5 and 6, and of equal capacity. It will comply fully with D.E.R. Regulations governing SO_2 and Mist emissions, just as the existing plants always did.

B. For this source indicate any previous DER permits, orders, and notices; including issuance dates and expiration dates.

N.A.

C. Raw materials, fuels, and chemicals used:

DESCRIPTION	HOURLY USE	CONTAMINANTS TYPE	% WT.	RELATION TO FLOW DIAGRAM
Sulfur	48,000 lbs.	Sulfur	99.75	to Sulfur burner

D. Process Rate

1. Total Process Input Rate: 48,000 lbs./hr.
2. Product Output Rate: 143,000
3. Operating Time:

a. Hrs./Day: 24 b. Days/Wk: 7 c. Wks./Yr.: 50 d. Seasons:

II. BEST AVAILABLE CONTROL TECHNOLOGY DATA

A. Emission limitations for any pollutants emitted from the source pursuant to 17-2 F.A.C.?

Yes (X) No ( )

CONTAMINANT	RATE OR CONCENTRATION
SO_2	4.0 lbs./ton of 100% H_2SO_4
Acid Mist	0.15 lbs./ton of 100% H_2SO_4

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

Yes (X) No ( )

CONTAMINANT	RATE OR CONCENTRATION
SO_2	4.0 lbs./ton of 100% H_2SO_4
Acid Mist	0.15 lb./ton of 100% H_2SO_4

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

Yes (X) No ( )

CONTAMINANT	RATE OR CONCENTRATION
SO_2	4.0 lbs./ton
Acid Mist	0.15 lbs./ton

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

CONTAMINANT	RATE OR CONCENTRATION
SO_2	3 - 4 lbs./ton
Acid Mist	0.09-0.15 lb./ton

E. Describe the existing control and treatment technology (If any) N.A.

1. Control Device:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:
5. Useful Life:
6. Operating Costs:
7. Energy:
8. Maintenance Cost:
9. Emissions

*Explain method of determining E., 3. above.

CONTAMINANT	RATE OR CONCENTRATION	
	Before Device	After Device

10. Stack Parameters

a. Height: Ft.

b. Diameter: Ft.

c. Flow Rate: ACFM

d. Temperature: °F

e. Velocity: FPS

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

1. Double (SO_2) Absorption System:

a. Control Device: Two cold and one hot interpass exchangers, acid coolers, absorbing tower-pump-tank assembly, H. E. mist eliminator, SO_2 recorder.

b. Operating Principles: Remove the SO_3 content of gases leaving the 3rd SO_2 converter by passing them thru 98% H_2SO_4 in the absorbing tower. Reheat them and pass them thru the second catalylic conversion tank & absorbing tower, high efficiency mist eliminator, into a stack.

c. Efficiency: 99.3%

d. Capital Cost: $3,400,000

e. Life: 10 yrs.

f. Operating Cost: 600,000

g. *Energy: not appreciable

h. Maintenance Cost: 250,000

i. Availability of construction materials and process chemicals: good

j. Applicability to manufacturing processes: good

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. 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:

*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:

G. Describe the control technology selected:

1. Control Device: Double Absorption and H.E. Mist Eliminator
2. Efficiency: 99.3%
3. Capital Cost: $3,400,000
4. Life: 10 yrs.
5. Operating Cost: 600,000
6. Energy: N.A.
7. Maintenance Cost: 250,000
8. Manufacturer: Monsanto Enviro-Chem., Inc.
9. Other locations where employed on similar processes: In virtually all new plants of the Florida Phosphate Industry.

a.

(1) Company: Central Farmers Co-Op.

(2) Mailing Address: P. O. Box 1480

(3) City: Bartow

(4) State: Florida

(5) Environmental Manager: W. Shimming

(6) Telephone No.: 813/533-3181

(7) Emissions: SO_2 and Acid Mist

CONTAMINANT	RATE OR CONCENTRATION
SO_2	3-4 lbs./ton of acid
Acid Mist	0.15 lb./ton of acid
	(see their Annual Report)

(8) Process Rate: near design of 2,000 TPD as 100% H_2SO_4

b.

(1) Company: Agrico

(2) Mailing Address: P. O. Box 1110

(3) City: Mulberry (4) State: Florida

(5) Environmental Manager: Harold Long

(6) Telephone No.: 813/428-1431

(7) Emissions: SO_2 and acid mist

CONTAMINANT	RATE OR CONCENTRATION
SO_2	3-3.5 lbs./ton of 100% H_2SO_4
Acid Mist	0.1-0.13 lb./ton
	(see their Annual Report)

(8) Process Rate: 1600-1800 TPD

c.

(1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:

CONTAMINANT	RATE OR CONCENTRATION

(8) Process Rate:

d.

(1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:

CONTAMINANT	RATE OR CONCENTRATION

(8) Process Rate:

e.

(1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:

CONTAMINANT	RATE OR CONCENTRATION

(8) Process Rate:

10. Reason for selection and description of systems: Double SO_2 absorption is the best control system known to the Phosphate Industry as well as EPA. It provides the highest conversion of SO_2 to H_2SO_4 (approx. 99.98%) and does not create a by-product of sulfate salts to be disposed of.

11. Emissions:

CONTAMINANT	RATE OR CONCENTRATION
SO_2	3 to 4 lbs./ton
Acid Mist	0.10-.15 lb./ton

12. Stack Parameters:

a. Height: 200 Ft.

b. Diameter: 5.0 Ft.

c. Flow Rate: 110000 CFM

d. Temperature: 165 °F

e. Velocity: 93 FPS

13. Fuels: N.A.

TYPE	HOURLY USE*.		HOURLY HEAT INPUT MILLION BTU/HR.	
	AVG.	MAX.	AVG.	MAX.
-				

TYPE	DENSITY	%S	%N	%ASH
-				

*Gaseous: Cu. Ft./Hr.; Liquid & Solid: Lbs./Hr.

14. Wastes generated, disposal method, cost of disposal:

Virtually none. The small amount of salts contained in cooling water tower blowdown join other surface waters from the chemical complex and pass thru more than 10 acres of deep settling ponds made of old mining cuts before being released at the Chemical Complex outflow sampling station.

H. Discuss the social 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.

There is no social impact.

The environmental impact is quite small, and will not increase the ambient SO_2 concentration to anywhere near the D. E. R. Standards.

Please see the enclosed copy of "Ambient Air SO_2 Monitoring Network," prepared by Sholtes & Koogler, Environmental Consultants in Gainesville, and covering the period of January 1977-January 1978. (Four additional copies of this study have been mailed to your Department last week, together with our application for a Construction Permit.)

III. ADDITIONAL ATTACHED INFORMATION

A. Show derivation of total process input rate and product weight. Weigh sulfur; measure H_2SO_4 product tanks.

B. Show derivation of efficiency estimation. SO_2 out of S burner is compared to stack SO_2

C. 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 exist, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.

D. An 8½" x 11" plot plan showing the exact location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

E. 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.

F. Attach all 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.

E.P.A. "Review of Standards" for new sulfuric acid plants, latest draft dated December 8, 1978.

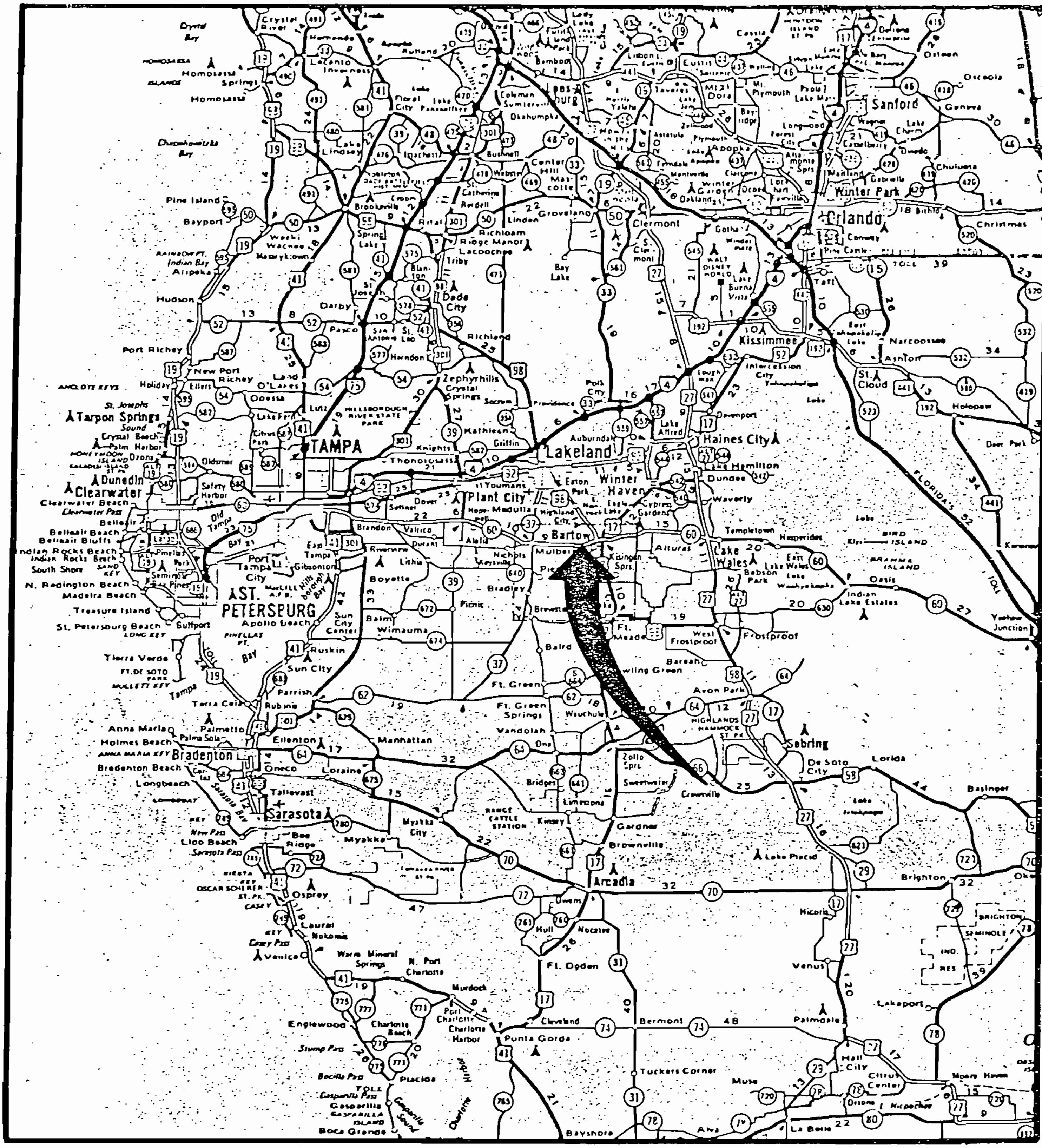


Figure 1. Location of the W. R. Grace Phosphate Fertilizer Complex.

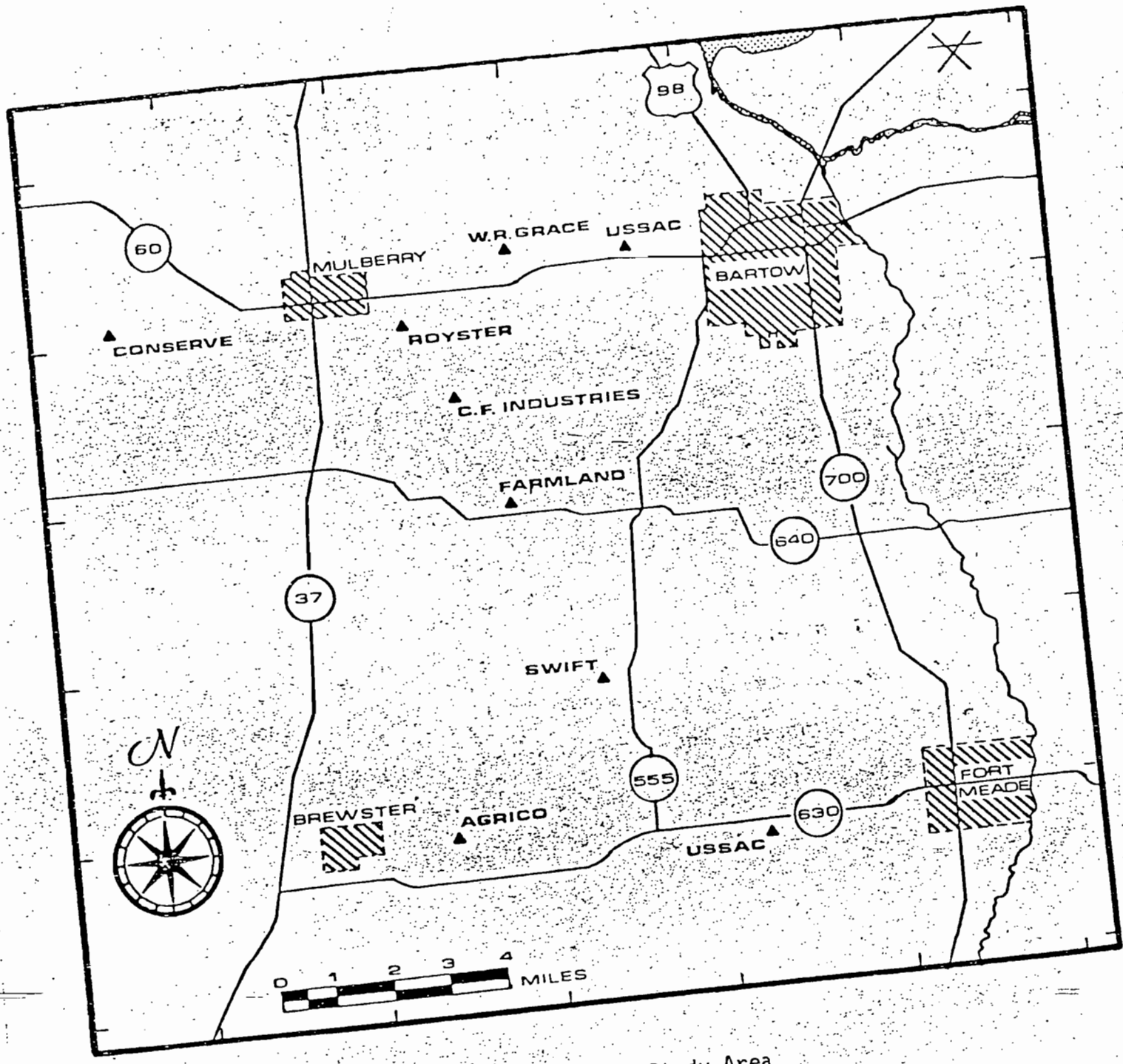


Figure 2. Study Area

W. R. GRACE & CO.

TITLE

PLANT PLAN: PROPOSED T-TRAIN

PAGE 1 OF 3 | STD. NO. F-111

DATE 1964 | REV. 1-17-79

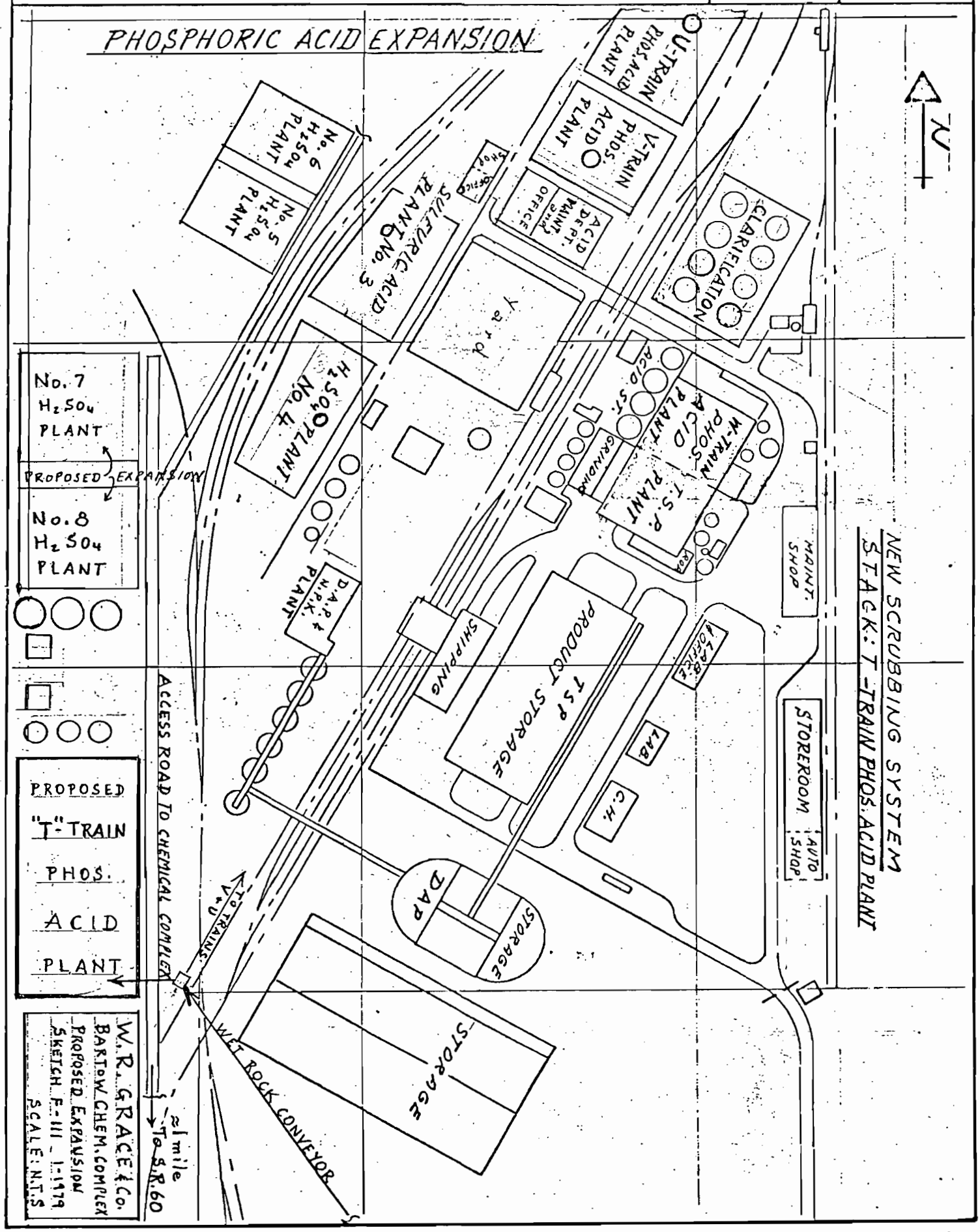


Figure 3

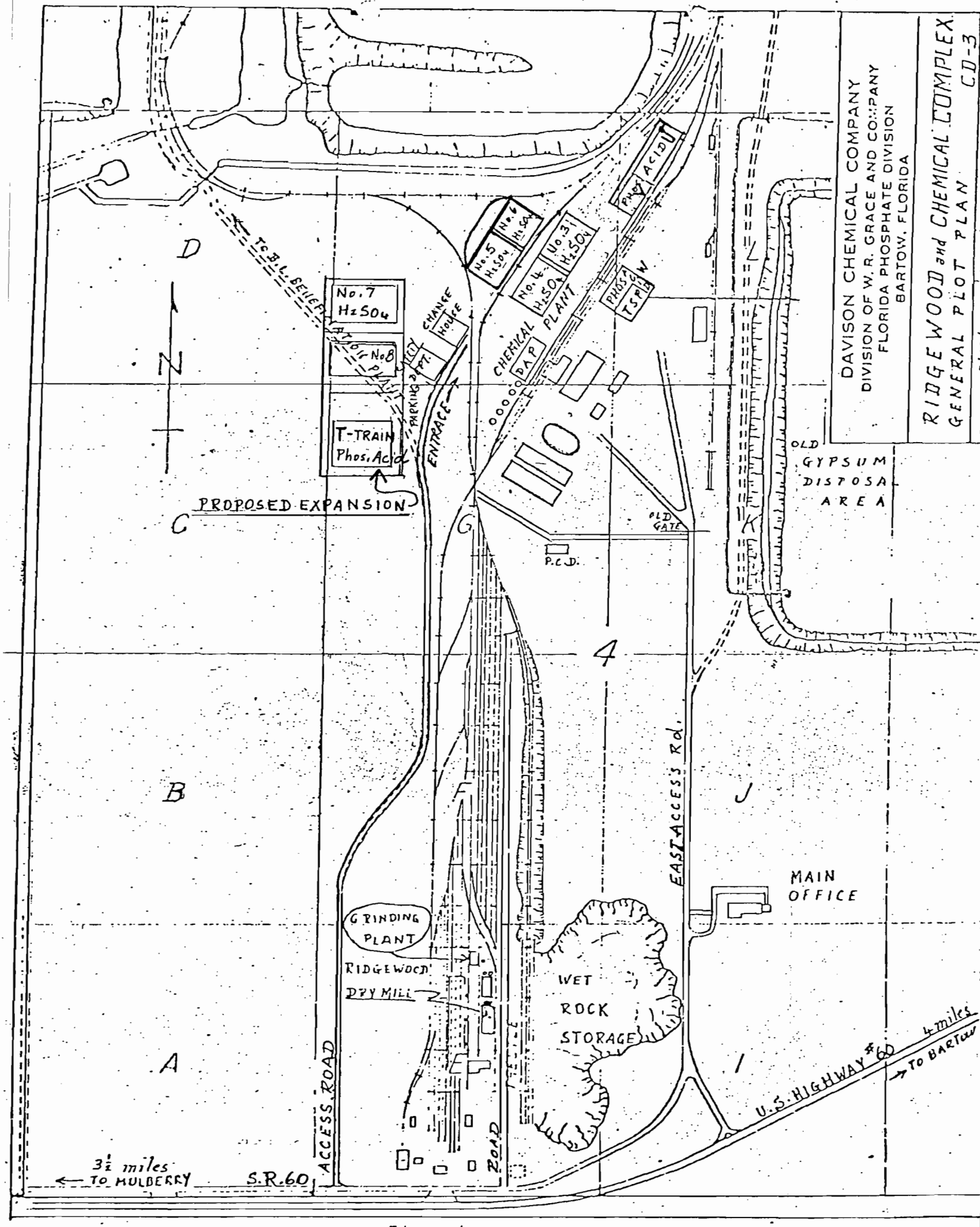
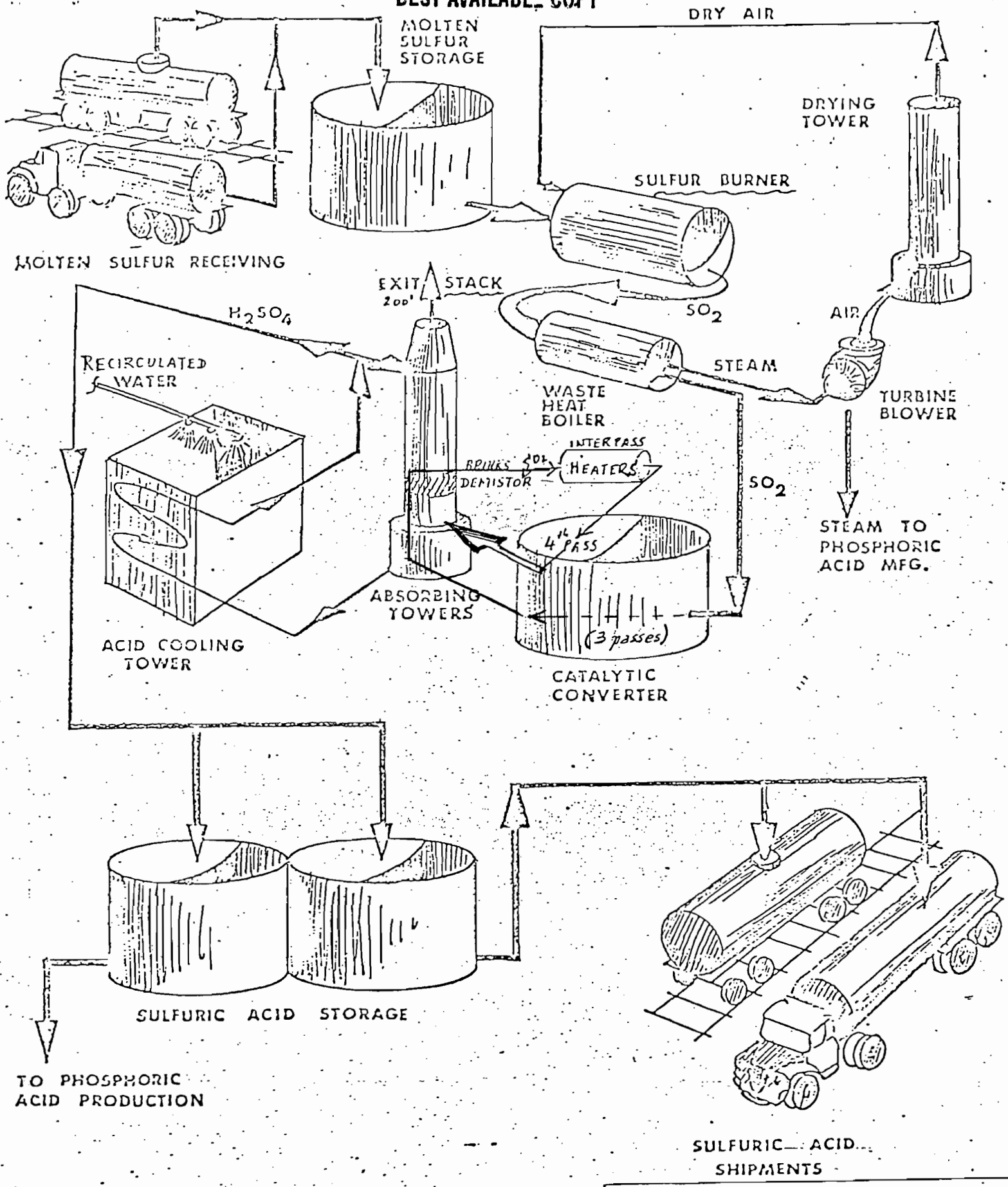

DAVISON CHEMICAL COMPANY
DIVISION OF W. R. GRACE AND COMPANY
FLORIDA PHOSPHATE DIVISION
BARTOW, FLORIDA
RIDGEWOOD and CHEMICAL COMPLEX
GENERAL PLOT PLAN
CD-3
N
No. 7 H2SO4
No. 8 H2SO4
No. 5 H2SO4
No. 6 H2SO4
No. 3 H2SO4
No. 4 H2SO4
CHEMICAL PLANT
CHANGE HOUSE
PARKING
ENTRANCE
T-TRAIN Phos. Acid
PROPOSED EXPANSION
DAP
PHOS ACID
TSP
OLD GYPSUM DISPOSAL AREA
OLD GATE
P.C.D.
EAST ACCESS Rd.
MAIN OFFICE
GRINDING PLANT
RIDGEWOOD DRY MILL
WET ROCK STORAGE
ACCESS ROAD
U.S. HIGHWAY 60
4 miles TO BARTOW
3½ miles TO MULBERRY
S.R. 60
A
B
C
D
F
G
J
K
4

Figure 4

SULFURIC ACID MANUFACTURING



W. R. GRACE & Co.
BARTOW WORKS
Nos. 4-8 H_2SO_4 PLANTS
Sketch No. 410, rev. 1/1979

Figure 5

Attachment A

Attachment to Page 5, Paragraph G.

Sulfur is burned in a furnace in a moving stream of pre-dried air. The resulting SO_2 air mixture flows over the first 3 passes, completing conversion of SO_2 to SO_3 to a degree of approximately 96% conversion, approaching and limited by the theoretical equilibrium conditions of the reaction at the exit temperature of the third pass. The SO_3 content of the gas is removed by the absorption of the SO_3 in 98% sulfuric acid in the interpass absorbing tower.

The unconverted 4% of the SO_2, with the SO_3 content removed, is reheated and passed over the fourth pass of the converter where a more favorable reaction equilibrium will prevail because of the low SO_3 content in the reaction zone, allowing an overall conversion of approximately 99.7%. The gas will then pass through the final absorbing tower to remove the SO_3 resulting from the reaction in the fourth pass of the converter. The gases will then pass through a Brink mist eliminator prior to being vented out the stack.

The final stack gas will contain less than 4 lbs. of SO_2 per ton of sulfuric acid produced and less than 0.15 lbs. of mist per ton of sulfuric acid produced.

Fig. 6

DU PONT Instruments

460 SO_2 Analyzer System

- Complete system for continuous monitoring of sulfur dioxide concentrations.
- Full scale range as low as 100 ppm.
- Rugged and reliable with time-proven Du Pont 400 Photometric Analyzer and sampling system.
- High temperature operation minimizes corrosion.
- Selective — with no interference from H_2O, NO_2, NO, CO_2, SO_3 or particulates.

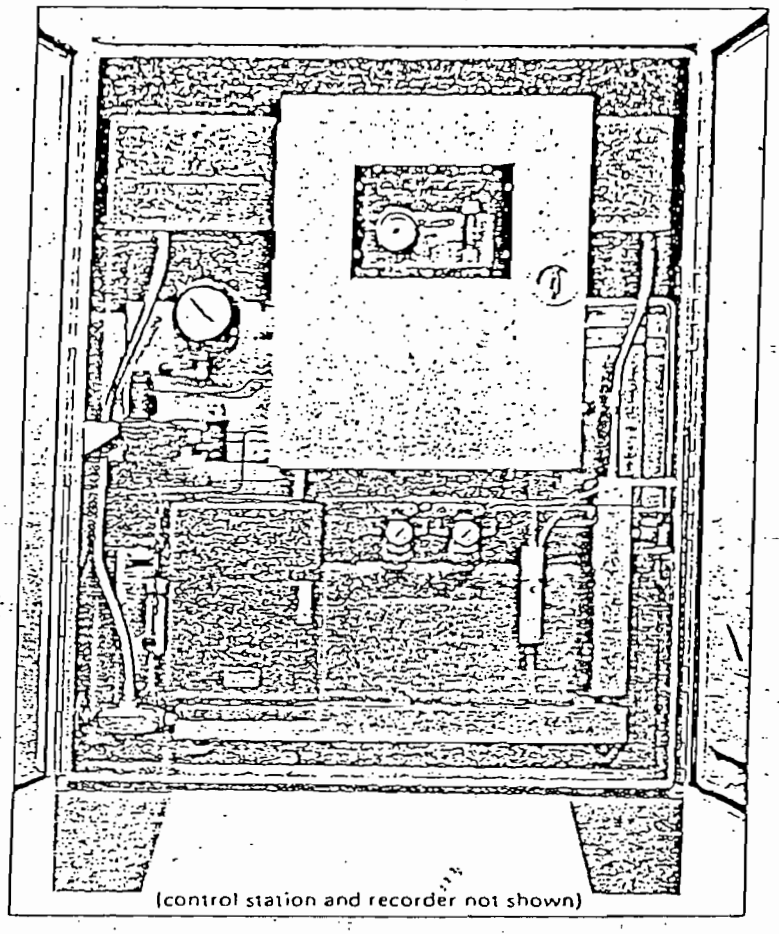
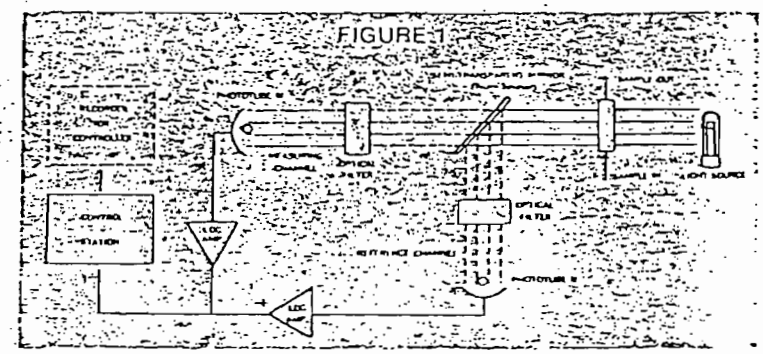

(control station and recorder not shown)

FIGURE 1



The Du Pont 460 Analyzer System combines a proven process analyzer with sample system technology to provide an integrated analysis system for continuous monitoring of stack emission for SO_2. It is widely recognized for accuracy and low maintenance. The system has been field tested over a four-year period and is being used successfully at power generating stations, sulfuric acid plants, nonferrous smelters, sulfur recovery operations and sulfite pulp mills.

Principle of Operation

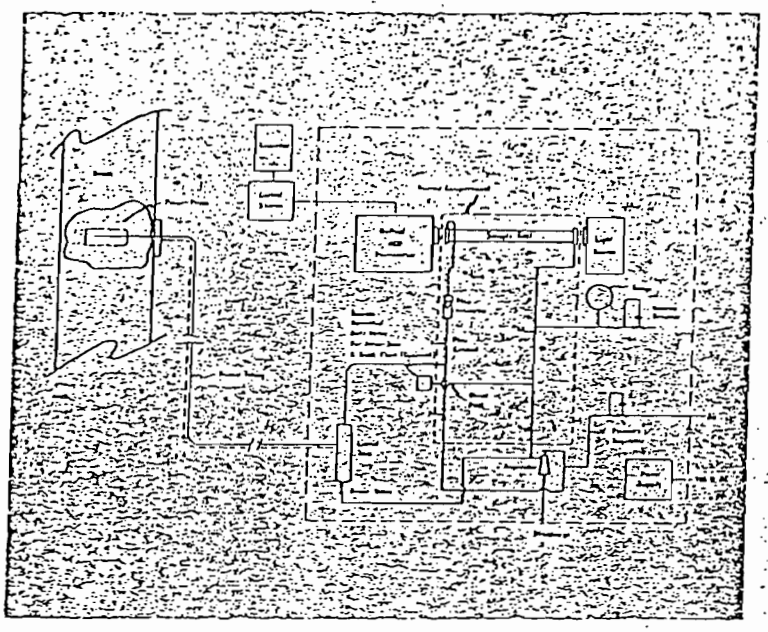
The analysis, based on measurement of the strong ultraviolet absorption of SO_2, uses the proven Du Pont 400 Photometric Analyzer. The patented split-beam configuration and log amplifiers (Figure 1) measure differential light absorption at two wavelengths and provide an electrical output linear with concentration. The measuring wavelength is strongly absorbed by the SO_2; the reference wavelength is not absorbed. Interference from any NO_2 in the sample is minimized since NO_2 absorbs almost equally at each of these wavelengths. There is no interference from particulates or other common stack gas constituents.

The Du Pont-designed sample handling system (Figure 2) employs an air aspirator of "Teflon"® TFE resin to draw a sample continuously from the stack. Insulated and heated tubing of "Teflon"® FEP resin is generally used for the sample line. The sample handling components, including the sample cell, are kept at elevated temperatures to avoid condensation and the associated problems of corrosion and nonrepresentative sampling. A

Fig. 7

vacuum-break system holds the sample cell pressure constant.

Dual range, such as 0-300/0-3000 ppm SO_2, and multiple sampling point options are available. These features are particularly useful when the analyzer is used for monitoring scrubber efficiency.



Rugged Construction and Minimum Maintenance

The Du Pont 460 Analyzer System is a rugged, proven system designed for easy installation and high reliability. The system is enclosed in an epoxy-painted, weather-proof cabinet, containing the photometer, power supply and sample system. The control station and recorder are typically mounted on a control panel in a remote location.

Specifications (Typical Values)

Ranges: 100 ppm to 100% SO_2 full scale (specify when ordering)

Speed of Response: 15 seconds or less

Analyzer Output: Linear with concentration, 0-10 mv standard, others available.

Reproducibility: 1% of full scale

Accuracy: ±2% of full scale

Zero Standardization: Manual or Automatic

Calibration: An optical calibration filter corresponding to a fixed SO_2 concentration is provided. (Span gases may be used if desired.)

Utility Requirements: 115V, 60 Hz, 2000 watts maximum. (50 Hz available) Compressed air at 30-80 psig.

Electrical Classification: General Purpose. (Systems designed for Class 1, Group D, Division 1 or 2 are also available.)

Installation: The analyzer module would typically be installed near the sample source, usually at ground level. The control-recorder components can be installed either adjacent to the analyzer cabinet or in a control room up to 1000 feet away.

Technical Service

United States and Canada: Start-up assistance is provided. Arrangements can also be made for regular maintenance calls by Du Pont service engineers. Du Pont application engineering services are available to assist in the proper choice of analyzer configurations for specific requirements.

Outside U. S. and Canada: Arrangements can be made for special service and technical assistance.

Quotations and More Information

Contact Du Pont Company, Instrument Products Division, Wilmington, Delaware 19898. Phone: (302) 453-2711; or, Monrovia, California 91016. Phone (213) 357-2111.

In Europe, Instrument Products Division, Du Pont, 636 Friedberg/Hessen, Postfach 1410, Fed. Rep. of Germany, phone: 06031-4661. Other offices are in Hitchin, England; Milan; Paris; Mexico City; Caracas and Sao Paulo.

DUPONT Instruments

Fig. 8

BRINK MIST ELIMINATOR

The Brink Mist Eliminator was originally developed to solve air pollution problems where existing methods were either inadequate or too expensive. After several years of investigation and experimentation, a practical packed fiber bed was developed. While fiber beds had been studied before, no one had taken such a thoroughly scientific approach which resulted in a completely predictable and reproducible high efficiency system.

The Brink Mist Eliminator is the only equipment of this type which utilizes the Brownian movement of particles in the low and sub-micron ranges to effect such high collection efficiencies. For this reason, the high efficiency mist eliminator is actually more efficient at lower rates (no turn down problem) and on smaller particles. Efficiencies as high as 99.98% can be achieved depending on design and economics.

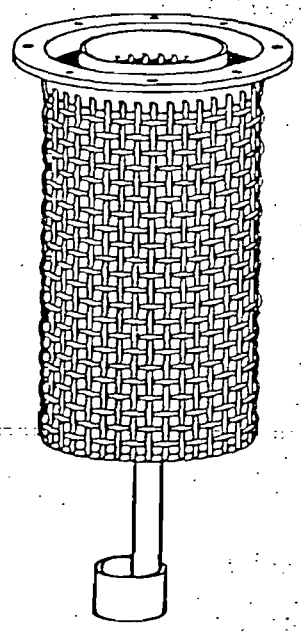
The only type of equipment which approaches the Brink Mist Eliminator in efficiency is the electrostatic precipitator. In most cases, the Brink Mist Eliminator is much less expensive and far more versatile.

BRINK EQUIPMENT LINE

The Brink equipment line also includes filters, coalescers, test units and mist samplers. Besides the elements, complete systems with tanks and accessories can be designed and supplied.

BRINK MIST SAMPLING EQUIPMENT AND SERVICE

The Brink Mist Samplers and Cascade Impactors are available for sale with complete instructions. They are also available for rent and use by the customer. A mist sampling service is offered in which our engineers run mist tests on process or effluent gas streams in the customer's plant and give a full report of the results. Small fiber bed test units are also available for rent for actual performance testing on small side streams.



BRINK MIST ELIMINATOR (H-E SERIES)

High efficiency at all capacities. Essentially 100% collection efficiency on particles larger than 3 microns. Up to 99.98% collection, depending on design, on the remaining particles 3 microns and smaller. No efficiency loss in turn down to zero flow. Moderate pressure drops. Continuous operation. Low operating and maintenance costs. Handles flows to 100,000 ACFM and higher.

Fig. 9

DRAFT ONLY

DEC 8 1978

ENVIRONMENTAL PROTECTION AGENCY

[40 CFR PART 60]

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES: SULFURIC ACID PLANTS

Review of Standards

AGENCY: Environmental Protection Agency (EPA)

ACTION: Review of Standards

SUMMARY: EPA has reviewed the standards of performance for sulfuric acid plants (40 CFR 60.80). The review is required under the Clean Air Act, as amended August 1977. The purpose of this notice is to announce EPA's decision to not revise the standards at this time and to solicit comments on this decision.

DATES: Comments must be received by (60 days after publication in the FEDERAL REGISTER).

ADDRESS: Send comments to: Mr. Don Goodwin (MD-13), Emission Standards and Engineering Division, Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

FOR FURTHER INFORMATION CONTACT: Mr. Robert Ajax, telephone: (919) 541-5271. The document "A Review of Standards of Performance for New Stationary Sources - Sulfuric Acid Plants" (EPA report number to be assigned) is available upon request from Mr. Robert Ajax (MD-13), Emission Standards and Engineering Division, Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

RECEIVED IN DEC. 1976

[Section 111(b)(1)(B)]. This notice announces that EPA has completed a review of the standard of performance for sulfuric acid plants and invites comment on the results of this review.

FINDINGS

Industry Growth

Since the proposal, 32 contact process sulfuric acid units have been constructed. Of these, at least 24 units result from growth in the phosphate fertilizer industry and are dedicated to the acidulation of phosphate rock, mainly in the Southern U.S.

In 1976, over 70 percent of the total national production of new sulfuric acid was in the South. It is projected that three of the four units predicted to be coming on line each year will most probably be located in the South.

Best Demonstrated Control Technology ("B.A.C.T.")

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 promulgation of the NSPS. Twenty-eight of the 32 sulfuric acid production plants subject to the standard

(signed by)
by: "ADMINISTRATOR"