Robert W. Heinz
Vice President, Florida Operations

Royster Company
P. O. Drawer 797
Mulberry, Florida 33860
(813) 425-1176

A **Superfos** Denmark Company

Royster

April 9, 1985

Mr. C. H. Fancy, Deputy Chief
Bureau of Air Quality Management
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301-8241

Subject: Royster Company Application For Permit To Construct To Modify An Existing Sulfuric Acid Plant

Dear Mr. Fancy:

Enclosed are three copies of Application to Construct Air Pollution Sources which are being sent to replace those sent on March 29, 1984. A fourth copy is being forwarded to Mr. Bill Thomas of the Southwest District office.

With the information sent to you on April 3, by John Koogler, which included the Air Quality Review, Best Available Control Technology Recommendations, and the modeling results the requirements for the application should be complete.

Your attention to this application has been much appreciated and hopefully the permit will be issued with no further requirements for information submittal.

Very truly yours,

T. R. Schmalz, P.E.
Manager, Engineering & Environmental Services

TRS:sk

cc: Bill Thomas, w/encl.
R. W. Heinz, Vice President
R. T. Van Arsdall, Plant Mgr.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

NORTHEAST DISTRICT
BRANCH OFFICE
825 NORTHWEST 23rd AVENUE
SUITE G
GAINESVILLE, FLORIDA 32601

DER
APR 11 1985
BAQM

BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

APPLICATION TO ~~OPERATE~~/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Sulfuric Acid Plant [ ] New[1] [x] Existing[1]

APPLICATION TYPE: [ ] Construction [ ] Operation [x] Modification

COMPANY NAME: Royster Company 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) Sulfuric Acid Plant

SOURCE LOCATION: Street SR 60, 1.5 miles east of Mulberry City Not Applicable

UTM: East 17-406.7 km North 3085.2 km

Latitude 27 ° 53 ' 16 "N Longitude 81 ° 56 ' 54 "W

APPLICANT NAME AND TITLE: R. W. Heinz, Vice President Florida Operations

APPLICANT ADDRESS: Post Office Drawer 797, Mulberry, Florida 33860

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Royster Company

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 provision 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 non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: R. W. Heinz

R. W. Heinz, Vice President Florida Operations
Name and Title (Please Type)

Date: 4/9/85 Telephone No. (813)425-1176

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

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 judgment, that

[1] See Florida Administrative Code Rule 17-2.100(57) and (104)

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, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed _____

T. R. Schmalz
Name (Please Type)

Royster Company
Company Name (Please Type)

P. O. Drawer 797, Mulberry, Florida 33860
Mailing Address (Please Type)

Florida Registration No. 13656 Date: _____ Telephone No. (813)425-1176

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.

Modification of an existing double absorption, contact sulfuric acid plant to implement the addition of electric co-generation equipment. Refer to attached addendum for complete details.

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction July 1, 1984 Completion of Construction October 31, 1985

C. Costs of pollution control system(s): (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.)

Total project cost of acid plant modifications exclusive of co-generation equipment is projected at approximately $8,000,000

None of this cost is directly related to pollution control purposes.

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

AC53-2584 Issued 12/16/74; Expired 9/16/75 Consent Order #74 dated 9/27/78
Consent Order, Case #75-1600 Leon County Dated 10/27/75
AO53-17115 Issued 3/1/79; Expired 2/1/84 AO53-6050 Issued 3/14/78; Expired 1/31/83
AO53-78016 Issued 1/31/84; Expires 1/15/89. AC53-6458A Issued 8/28/78; Expired 8/30/79

DETAILED DESCRIPTION OF SOURCE

ADDENDUM TO PAGE 2, ITEM A

The modifications to the existing sulfuric acid plant will consist of installation of a new 900 PSIG waste heat boiler with an attendant steam superheater, economizers for boiler feedwater pre-heating, and deaeration, and demineralization of boiler feedwater. A new electric motor driven main air blower will also be installed. Acid cooling will be accomplished by newly installed shell and tube heat exchangers and a new cooling tower will be provided to replace two existing towers and provide additional cooling required for the 100 percent condensation of the turbo-generator supplied steam. In addition new ring type improved catalyst will be installed in the third pass of the converter.

These modifications will in no way effect the process nor the emission rates from the plant. It is anticipated however that a higher rate of operation will be achievable due to the modifications. A process guarantee by Lurgi Corporation, the engineering/construct firm supplying the new equipment, stipulates an operating rate of 1,500 STPD 100% basis sulfuric acid is achievable at recovery efficiency of 99.7%, which is the same as our present operation. An additional stipulation is that all new equipment shall perform within design conditions at 1600 STPD.

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 50 ;

if power plant, hrs/yr_____; if seasonal, describe:_____

F. If this is a new source or major modification, answer the following questions. (Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? No

   a. If yes, has "offset" been applied? --

   b. If yes, has "Lowest Achievable Emission Rate" been applied? --

   c. If yes, list non-attainment pollutants. --

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. Yes

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. Yes

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? No

5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? No

H. Do "Reasonably Available Control Technology" (RACT) requirements apply to this source? No

   a. If yes, for what pollutants?_____

   b. If yes, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

Air Qualtiy Review and BACT recommendations are submitted as a separate package.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable:

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		
Sulfur	None	--	46,400	1
Air	None	--	365,654	2
Water	None	--	26,100	3

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lbs/hr): 438154

2. Product Weight (lbs/hr): 141,667 as 100% H_2SO_4

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

Name of Contaminant	Emission[1]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	
SO_2	283.3	1189.9	17-2.630	283.3	283.3	1189.9	4
Acid Mist	10.6	44.6	17-2.630	10.6	10.6	44.6	4
NOx	11.6	48.9	NA	NA	11.6	48.9	4

[1]See Section V, Item 2.

[2]Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3]Calculated from operating rate and applicable standard.

[4]Emission, if source operated without control (See Section V, Item 3).

D. Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
DC/DA Contact				
Sulfuric Acid	SO_2	99.7	NA	Test data
Process				
Brink HE & HV	Acid Mist	99.99	See Supplement 6	Test data
Demisters				

E. Fuels

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

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

Fuel Analysis:

Percent Sulfur: _____ Percent Ash: _____

Density: _____ lbs/gal Typical Percent Nitrogen: _____

Heat Capacity: _____ BTU/lb _____ BTU/gal

Other Fuel Contaminants (which may cause air pollution): _____

_____

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average NA Maximum _____

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

Waste heat boiler and cooling tower blowdown to impoundment area.

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

Stack Height: 200 ft. Stack Diameter: 7.0 ft.

Gas Flow Rate: 92380 ACFM 75272 DSCFM Gas Exit Temperature: 188 °F.

Water Vapor Content: 0 % Velocity: 40.0 FPS

SECTION IV: INCINERATOR INFORMATION

(NOT APPLICABLE)

Type of Waste	Type 0 (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste _____

Total Weight Incinerated (lbs/hr) _____ Design Capacity (lbs/hr) _____

Approximate Number of Hours of Operation per day _____ day/wk _____ wks/yr. _____

Manufacturer _____

Date Constructed _____ Model No. _____

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

Stack Height: _____ ft. Stack Diamter: _____ Stack Temp. _____

Gas Flow Rate: _____ ACFM _____ DSCFM* Velocity: _____ FPS

*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 devices:

Double catalyst, double absorption contact sulfuric acid plant with Brink HE and HV demisters.

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

Waste heat boiler blowdown and cooling tower blowdown to impoundment area.

NOTE: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

SECTION V: SUPPLEMENTAL REQUIREMENTS

(SEE ATTACHED SUPPLEMENTS)

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]

2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.

3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).

4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)

5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).

6. An 8 1/2" 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.

7. An 8 1/2" x 11" plot plan showing the 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 relevant portion of USGS topographic map).

8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

(BACT Recommendation under separate cover)

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

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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

Contaminant	Rate or Concentration

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

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

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

1.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

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:

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

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

3.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

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:[1]

d. Capital Costs:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

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:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

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

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

(Air Quality Review Under Separate Cover)

A. Company Monitored Data

1. _____no. sites _____ TSP _____( ) SO^{2}* _____ Wind spd/dir

Period of Monitoring ____/____/____ to ____/____/____
month day year month day year

Other data recorded _____

Attach all data or statistical summaries to this application.

*Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

a. Was inctrumentation EPA referenced or its equivalent? [ ] Yes [ ] No

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

1. _____ Year(s) of data from _____/_____/_____ to _____/_____/_____
month day year month day year

2. Surface data obtained from (location)_____

3. Upper air (mixing height) data obtained from (location)_____

4. Stability wind rose (STAR) data obtained from (location)_____

C. Computer Models Used

1. _____ Modified? If yes, attach description.

2. _____ Modified? If yes, attach description.

3. _____ Modified? If yes, attach description.

4. _____ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate	
TSP	_____	grams/sec
SO^2	_____	grams/sec

E. Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

F. Attach all other information supportive to the PSD review.

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.

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.

CONTACT SULFURIC ACID PLANT
MATERIAL BALANCE FOR
1700 STPD H_2SO_4 - 100% Basis

Stochiometry

(1) $S + O_2 \longrightarrow SO_2$

(2) $SO_2 + 1/2\ O_2 \longrightarrow SO_3$

(3) $SO_3 + H_2O \longrightarrow H_2SO_4$

(4) $S + 1\ 1/2\ O_2 + H_2O \longrightarrow H_2SSO_4$

Mole. Wts

$S = 32$

$O_2 = 32$

$H_2O = 18$

$H_2SO_4 = 98$

Air = 29

Material Balance

Parameters:

Furnace Exit Gas at 11.5% SO_2 by volume (molar)

Stack Gas at 4.0 #SO_2/T H_2SO_4 - 100% Basis

No dilution air

a. Sulfur

1700/24 x 32/98 x 2000 = 46,258 #/Hr S in Prod.

1700/24 x 32/64 x 4.00 = 142 #/Hr S in Stack

46,400 #/Hr S Input

b. Air

46,400/32 = 1450 mols S/Hr Input

From equation (1) 1450 mols S/Hr = 1450 mols SO_2/Hr.

At 11.5% SO_2 by volume (molar)

1450/0.115 = 12,609 mols gas (also air)

12,609 x 29 = 365,654 #/Hr air input

c. Water

46,400/32 = 1450 mols S

1450 mols (H_2O) x 18 = 26,100 #/Hr H_2O

CALCULATION OF EFFICIENCY
AND EMISSION

Emission Limits

SO_2 - 4.0 lb/ton

Mist - 0.15 lb/ton

Daily Emission

1700 TPD x 4.00 #/T = 6800 #/D SO_2

1700 TPD x 0.15 #/T = 255 #/D Acid Mist

Hourly Emission

6800/24 = 283 #/Hr SO_2

255/24 = 10.6 #/Hr Acid Mist

Annual Emission

350 day/year operating time

6800 x 350/2000 = 1190 TPY SO_2

255 x 350/2000 = 44.6 TPY Acid Mist

Sulfur Recovery Efficiency

From Supplement #1, Page 1

Sulfur Input 46,400 #/Hr

Sulfur In Product 46,258 #/Hr

$\frac{46,258}{46,400} \times 100 = 99.7\ \%$ S Recovery

Acid Recovery Efficiency

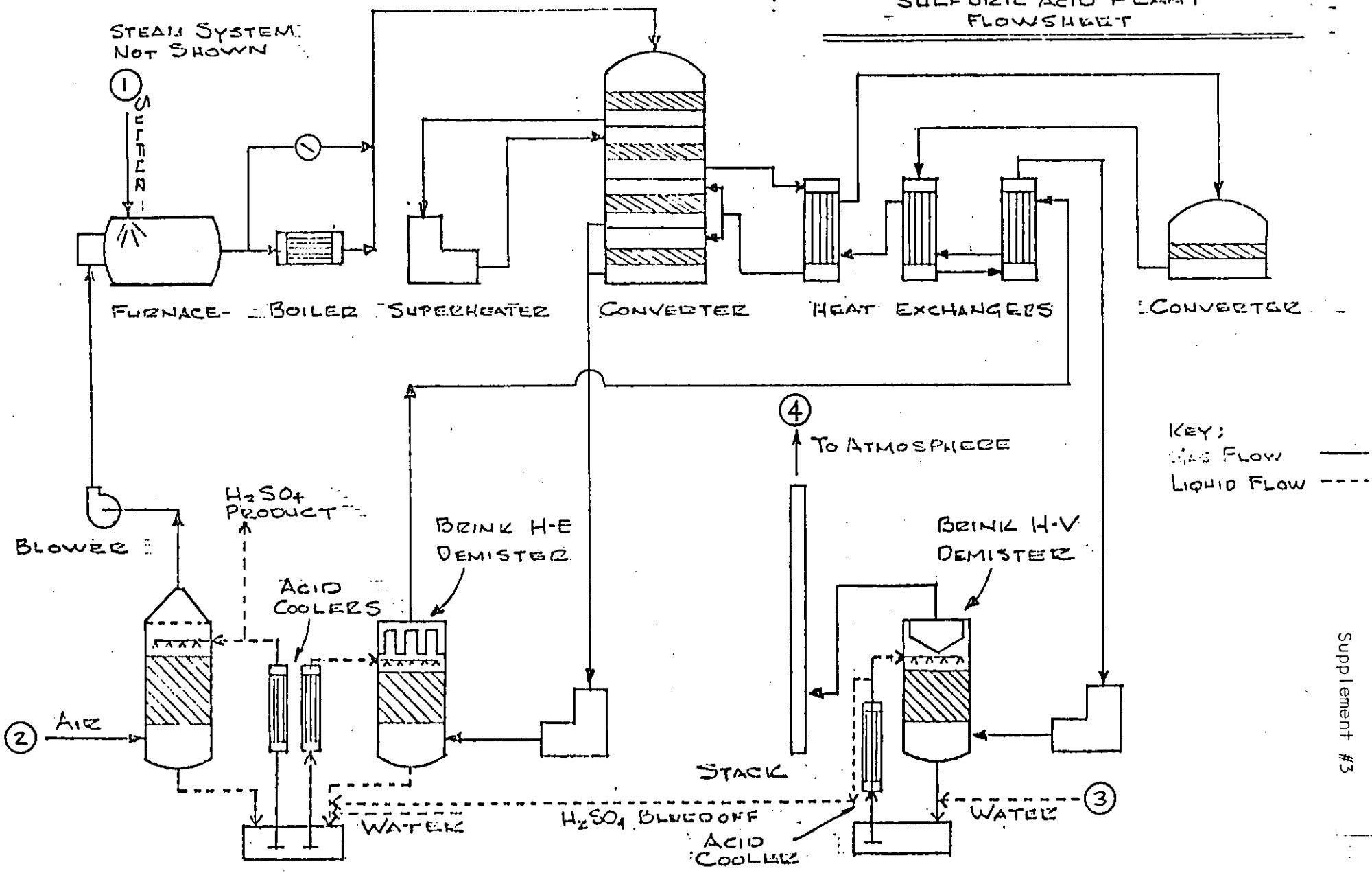
Acid Mist = 0.15 #/T H_2SO_4

$\frac{2000 - 0.15}{2000} = 99.99\%$ H_2SO_4 Recovery

Overall Plant Efficiency

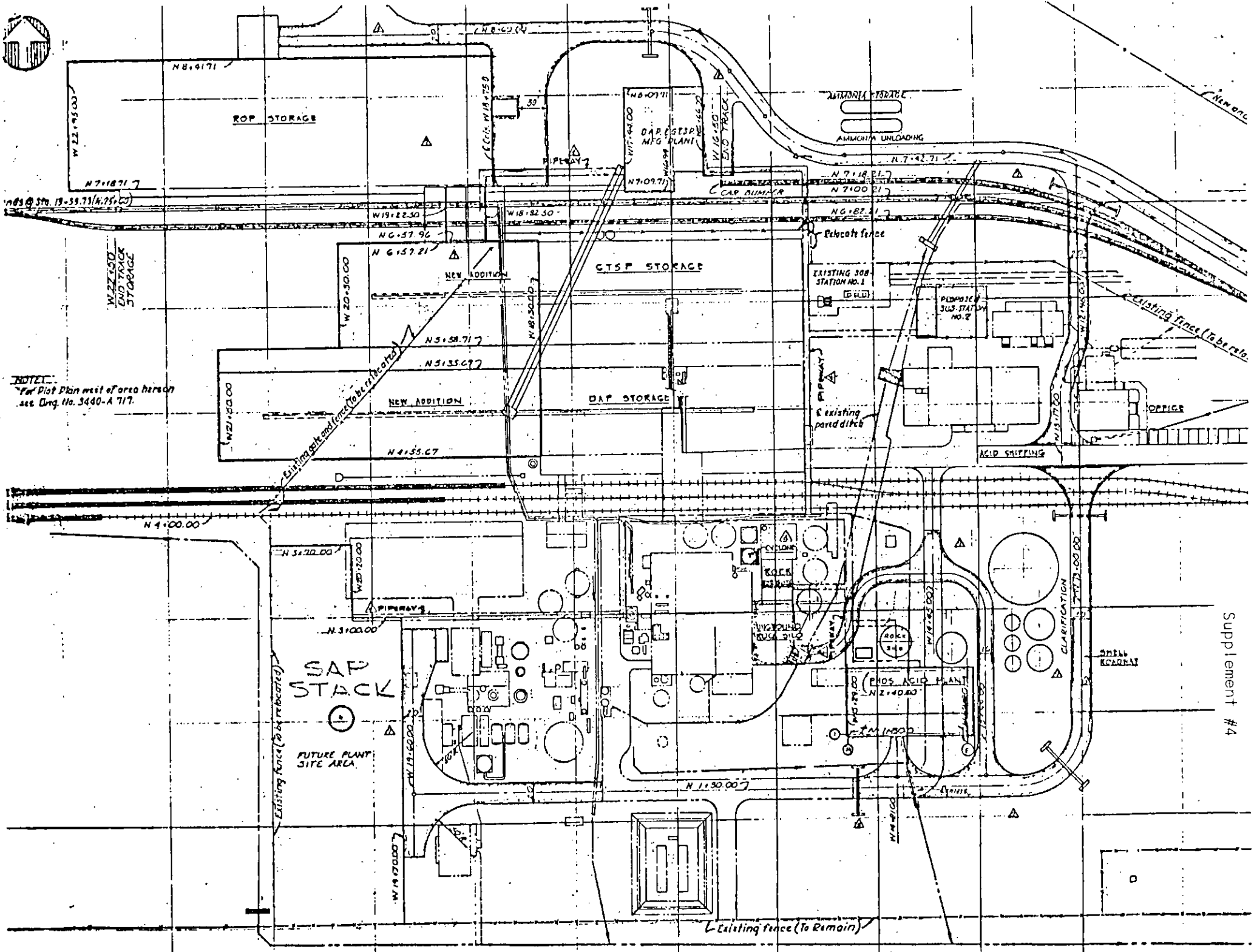
$0.997 \times 0.9999 \times 100 = 99.7\%$ Overall Recovery Efficiency

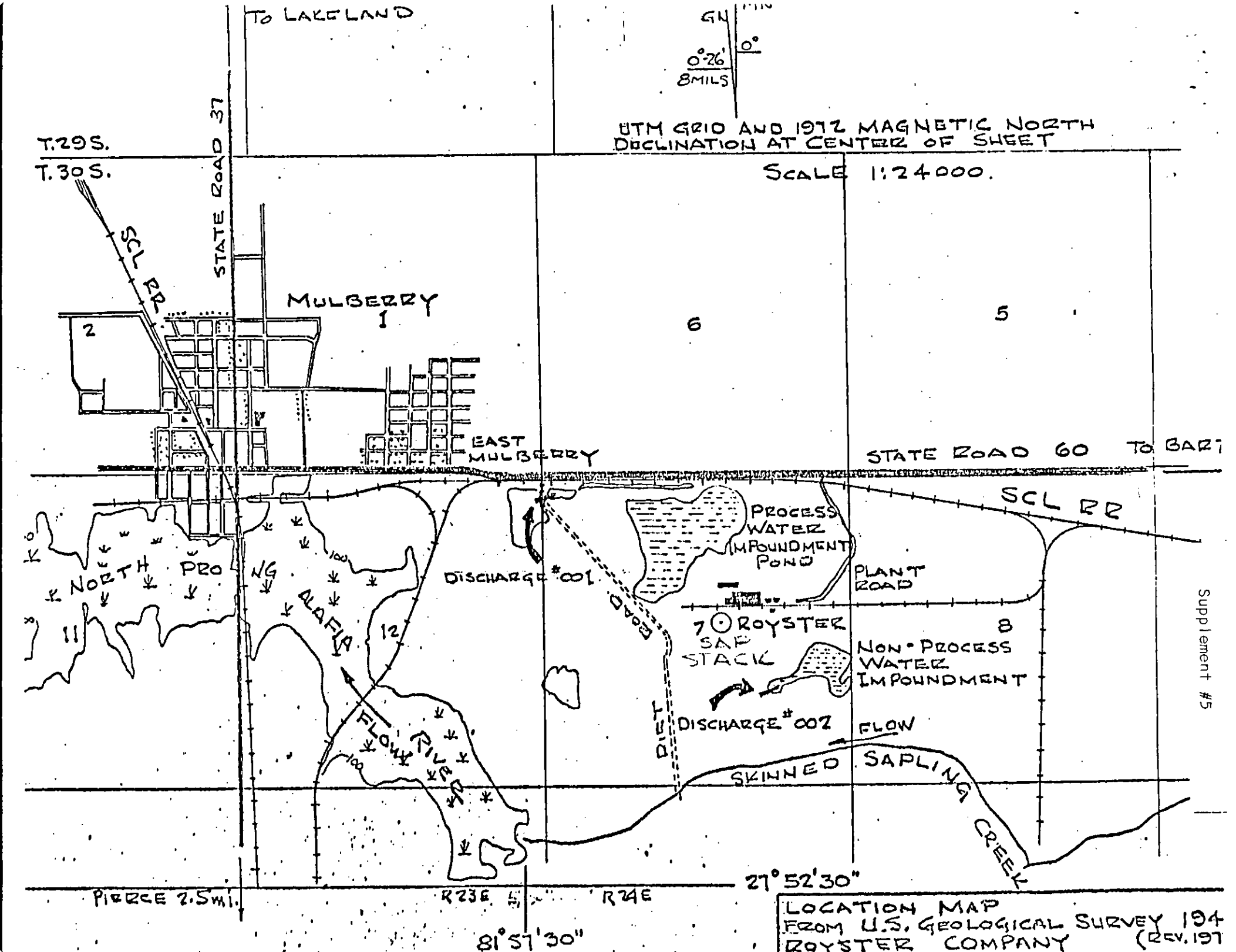
Royster Company
Double Contact/Double Absorption Sulfuric Acid Plant Flowsheet



Supplement #3

TRS
3-84


ROP STORAGE
DAP & GTSP MFG PLANT
AMMONIA STORAGE
AMMONIA UNLOADING
RAIL ROAD TRACK
CAR BUMPER
GTSP STORAGE
NEW ADDITION
DAP STORAGE
Relocate fence
EXISTING 308 STATION NO. 1
PROPOSED 303 STATION NO. 2
Existing fence (To be relo
OFFICE
Existing paved ditch
ACID SHIPPING
Existing gate and fence (To be relocated)
NOTE:
For Plot Plan west of area hereon see Dwg. No. 5440-A 717.
SAP STACK
FUTURE PLANT SITE AREA
Existing fence (To be relocated)
PIPEWAY
ROCK
CYCLONE
PHOS ACID PLANT
CLARIFICATION
TANKS
Existing fence (To Remain)
Supplement #4



LOCATION MAP
FROM U.S. GEOLOGICAL SURVEY 194
ROYSTER COMPANY (REV. 197

DESCRIPTION OF ACID MIST ELIMINATOR ON 2nd ABSORPTION TOWER:

Manufacturer: Monsanto Company

Model: Brink H-V

Size: 38 elements - 18.5" x 53" to handle 73,000 ACFM @ 8" W.C. P, 190°F

Separation Specification:
Will remove acid mist at 100% larger than 3 micron particles, 85% of particles 1-3 microns, 70% of particles 1/2 to 1 micron, less than 70% of particles smaller than 1/2 micron.