Kleeman Engineering, Inc.
404 North Andrews Avenue • Fort Lauderdale, Florida 33301
CHEMICAL & ENVIRONMENTAL ENGINEERS
305/~~467-6708~~ • 305/735-8614
733-5067 (12/4/85)

JUN 1981
BUREAU
A Q M

May 29, 1981

Fla. Dept. of Environmental Regulation
Twin Towers Office Bldg.
2600 Blair Stone Rd.
Tallahassee, Fla. 32301

Attention: Mr. Clair Fancy, Chief, Air Permitting Section

Re: Osceola Farms Co. - Pahokee, Fla.
Boiler #6 Construction Permit Application

Dear Mr. Fancy:

Attached you will find two copies of the referenced Boiler Construction Permit Application.

I am also attaching a check for the $20.00 permit application fee.

Osceola Farms Co. is ready to install this Boiler, which they will need for the next grinding season before the end of this year.

We will appreciate your efforts in expediting the processing of the application and hope that it may be possible for the permit to be issued by the end of June.

Thank you very much for your help and cooperation.

Sincerely,

Frank S. Kleeman

Frank S. Kleeman, P.E.
Environmental Consultant

Attachments: 2 copies of permit application
Check for $20.00
1 copy of ESE Modeling study

cc: DER Ft. Myers Office
Palm Beach County Health Dept.
Osceola Farms Co.

DER PERMIT APPLICATION TRACKING SYSTEM MASTER RECORD

FILE#SW0000043777 COE# DER PROCESSOR:THOMAS DER OFFICE:TLH
FILE NAME:OSCEOLA FARMS CO. DATE FIRST REC: 06/02/81 APPLICATION TYPE:AC
APPL NAME:A. L. FANJUL APPL PHONE:(305)924-7391 PROJECT COUNTY:50
ADDR:P. O. BOX 679 CITY:PAHOKEE ST:FLZIP:33476
AGNT NAME:F. S. KLEEMAN AGNT PHONE:(305)467-6708
ADDR:404 N. ANDREWS AVE. CITY:FT. LAUDERDALE ST:FLZIP:33301

ADDITIONAL INFO REQ: / / / / / / REC: / / / / / /
APPL COMPLETE DATE: / / COMMENTS NEC:Y DATE REQ: / / DATE REC: / /
LETTER OF INTENT NEC:Y DATE WHEN INTENT ISSUED: / / WAIVER DATE: / /

HEARING REQUEST DATES: / / / / / /
HEARING WITHDRAWN/DENIED/ORDER -- DATES: / / / / / /
HEARING ORDER OR FINAL ACTION DUE DATE: / / MANUAL TRACKING DESIRED:N
: THIS RECORD HAS BEEN SUCESSFULLY ADDED 06/02/81 14:24:25
FEE PD DATE#1:06/02/81 $0020 RECEIPT#00033574 REFUND DATE: / / REFUND $
FEE PD DATE#2: / / $ RECEIPT# REFUND DATE: / / REFUND $
APPL:ACTIVE/INACTIVE/DENIED/WITHDRAWN/TRANSFERRED/EXEMPT/ISSUED:AC DATE:06/02/81
REMARKS:

June 2 – hand-delivered for C. Fancy:
- two applications w/tech. data
- one report of air quality analysis

copies already sent by applicant to P.B. Co. Health Dept + DER - Ft. Myers.

COPIES MADE - 6
- Ed P. (1)
- Modeling (1)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

Nº 33574

RECEIPT FOR APPLICATION FEES AND MISCELLANEOUS REVENUE

Received from ____________ Date ____________

Address ____________ Dollars $ ____________

Applicant Name & Address ____________

Source of Revenue ____________

Revenue Code ____________ Application Number ____________

By ____________

AC50-043777

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

JUN 1981 BUREAU A Q M

SOURCE TYPE: Bagasse Boiler [X] New[1] [ ] Existing[1]

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

COMPANY NAME: Osceola Farms Co. COUNTY: Palm Beach

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peeking Unit No. 2, Gas Fired) Bagasse-fired Boiler - Traveling Grate Stoker Type

SOURCE LOCATION: Street U.S. Rte. 98 City Pahokee

UTM: East Zone 17 544.2 North 2968.0

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

APPLICANT NAME AND TITLE: Alexander L. Fanjul, Vice President

APPLICANT ADDRESS: P.O. Box 679 Pahokee, Fla. 33476

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Osceola Farms Co.

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: Alexander L. Fanjul

Alexander L. Fanjul, Vice President
Name and Title (Please Type)

Date: 5-29-81 Telephone No. (305) 924-7391

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 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: Frank S. Kleeman

Frank S. Kleeman, P.E.
Name (Please Type)

(Affix Seal)

Kleeman Engineering, Inc.
Company Name (Please Type)

404 N. Andrews Ave. Ft. Lauderdale, Fla. 33301
Mailing Address (Please Type)

Florida Registration No. 13622 Date: 5-29-81 Telephone No. (305) 467-6708

[1]See Section 17-2.02(15) and (22), Florida Administrative Code, (F.A.C.)

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.

This project involves the installation of a new 150,000 lbs/hr steam, traveling grate stoker-type Boiler #6. The Boiler is designed to burn bagasse only, but can also burn auxiliary fuel oil. The pollution control facilities consists of a Joy Turbulaire Impingement Scrubber, Size 90, Type D. Full compliance with the applicable emission standards is anticipated.

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

Start of Construction 6-15-81 Completion of Construction 11-15-81

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.)

Equipment	$60,000
Installation	40,000
Total	$100,000

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

None for this source.

E. 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

F. Normal equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 18 ; if power plant, hrs/yr ___ ;

if seasonal, describe:

Approx. 128 days November - March

Maximum 137 days

G. 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? Yes
   a. If yes, has "offset" been applied? No
   b. If yes, has "Lowest Achievable Emission Rate" been applied? No
   c. If yes, list non-attainment pollutants.
      Volatile Organic Carbons
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) requirements 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

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

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

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

Description	Contaminants Type	Contaminants % Wt	Utilization Rate - lbs/hr	Relate to Flow Diagram
Bagasse	S	0.2	79,970 (Wet ?	(moisture content ?) A
Fuel Oil #6	S	1.0	192	B

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

1. Total Process Input Rate (lbs/hr): 80,162
2. Product Weight (lbs/hr): 150,000 Steam

C. Airborne Contaminants Emitted: See enclosed calculation sheets.

Name of Contaminant	Emission[1] Maximum lbs/hr	Emission[1] Actual T/yr	Allowed Emission[2] Rate per Ch. 17-2, F.A.C.	Allowable[3] Emission lbs/hr	Potential Emission[4] lbs/hr	Potential Emission[4] T/yr	Relate to Flow Diagram
Particulates	52.6	80.8	See calculations	57.9	640.3 (6)	988 (984)	E
SO_x	83.8 (132)	129	" "	258	83.8	129	E
NO_x	48.5	74.5	" "	N/A	48.5	74.5	E
Hydrocarbons	80.02	123	" "	N/A	80.02	123	E
CO	80.1	123	" "	N/A	80.1	123	E

What ?

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

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles[5] Size Collected (in microns)	Basis for Efficiency (Sec. V, It[5])
Joy Turbulaire	Particulates	93.9%	5% under 10	See
Impingement Scrubber			20% under 20	Calculation
Size 90 Type D			75% over 20	Sheet
14 ft. dia.				

[1] See Section V, Item 2.

[2] Reference applicable emission standards and units (e.g., Section 17-2.05(6) Table II, E. (1), F.A.C. – 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)

[5] If Applicable

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Bagasse	79,970	80,000	288.0×10^6
Fuel Oil #6	192	384	7.2×10^6

*Units Natural Gas, MMCF/hr; Fuel Oils, barrels/hr; Coal, lbs/hr

Fuel Analysis: Fuel Oil / Bagasse; Fuel Oil / Bagasse

Percent Sulfur: 1.0 / 0.2 — Percent Ash: 0.05 / 1.1

Density: 8.0 / - lbs/gal — Typical Percent Nitrogen: - / 0.3

Heat Capacity: 18,850 / 3,600 BTU/lb — 150,800 BTU/gal

Other Fuel Contaminants (which may cause air pollution): Carbon Monoxide, hydrocarbons

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

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

Scrubber water goes to 40 acre pond.

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

Stack Height: 72 ft. — Stack Diameter: 6 ft.

Gas Flow Rate: 115,000 ACFM — Gas Exit Temperature: 150 °F.

Water Vapor Content: 25 % — Velocity: 65 FPS

SECTION IV: INCINERATOR INFORMATION

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. ______

9. An application fee of $20, unless exempted by Section 17-4.05(3), F.A.C. 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

A. 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
N/A	

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy) [x] Yes [ ] No

Contaminant	Rate or Concentration
Particulates (bagasse)	0.15 lb/10^6 Btu
Particulates (Fuel Oil)	0.10 lb/10^6 Btu
SO_2	0.8 lb/10^6 Btu

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

Contaminant	Rate or Concentration
Particulates (bagasse)	0.20 lb/10^6 Btu
Particulates (Fuel oil)	0.10 lb/10^6 Btu
SO_2	1.0% Low Sulfur Fuel Oil

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

1. Control Device/System: Joy Turbulaire Impingement Scrubbers
2. Operating Principles: See enclosed data
3. Efficiency:* 93.9%
4. Capital Costs: $100,000 per Boiler
5. Useful Life: 10 years
6. Operating Costs:
7. Energy: approx. 6" W.C. pressure drop
8. Maintenance Cost:
9. Emissions: See calculations

Contaminant	Rate or Concentration
See calculations	

*Explain method of determining D 3 above.

10. Stack Parameters

a. Height: 72 ft. b. Diameter: 6 ft.

c. Flow Rate: 115,000 ACFM d. Temperature: 150 °F

e. Velocity: 65 FPS

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

1.

a. Control Device: Turbulaire Scrubber (Spray Impingement)

b. Operating Principles: Impaction of large particules on water surface, removal of small particles by Venturi effect; inertial separation of droplets from gas by use of swirl vanes

c. Efficiency*: 90%

d. Capital Cost: 100,000.00

e. Useful Life: 10 years

f. Operating Cost: Proportional to pressure drop

g. Energy*: 350

h. Maintenance Cost: Low

i. Availability of construction materials and process chemicals: Readily available, require a vertical cylindrical steel shell with conical top and conical hoppers. Water required is available.

j. Applicability to manufacturing processes: Applicable to processes emitting a wide range of particle sizes. Widely used by Sugar Cane Industry for pollution control.

k. Ability to construct with control device, install in available space, and operate within proposed levels: Applications throughout industry have shown that they can be easily installed at the same time as new boilers. Sugar mills have ample space to allow retrolitting with duct modificati All plants meet particulate emission limits with those Scrubbers.

2.

a. Control Device: Venturi Scrubbers

b. Operating Principles: Intimate contact between particulate laden gases and water spray throat of venturi. Could be horizontal or vertical.

c. Efficiency*: 90%

d. Capital Cost: 200,000

e. Useful Life: 10

f. Operating Cost: Probably two or three times moı than Turbulaire Scrubbers

g. Energy**: 750

h. Maintenance Costs: Low

i. Availability of construction materials and process chemicals: Readily available. More water required than Turbulaire Scrubbers. Water can be recirculated and also used to flood cane fi

j. Applicability to manufacturing processes: Can be used but has to be preceded by dust collector to remove large particles.

k. Ability to construct with control device, install in available space, and operate within proposed levels: There are no limitations related to construction and installations. Will meet particulate emission levels with higher pressure drops.

*Explain method of determining efficiency.

**Energy to be reported in units of electrical power — KWH design rate.

3.

a. Control Device: Fabric Filter

b. Operating Principles: Dust laden gases are passed through fabric filter-bags where a fi cake is developed. Dust particles are removed from the gas stream as the gases aı passed through the filter cake area.

c. Efficiency*: 99%

d. Capital Cost: 150,000.00

e. Life: Non-predictable due to fire hazards.

f. Operating Cost: Proportional to pressure drop.

g. Energy: 300 KwH

h. Maintenance Cost: Very high.

*Explain method of determining efficiency above.

(1) Company: Sugar Cane Growers Cooperative of Florida

(2) Mailing Address: P.O. Box 86

(3) City: Belle Glade,

(4) State: Florida

(5) Environmental Manager: Mr. Enrique Arias

(6) Telephone No.: (305) 996-5556

(7) Emissions: 1975-76-1979-80 Compliance Tests

CONTAMINANT	RATE OF CONCENTRATION
Particulate (Average All Boilers:1975-76)	0.162 lbs/10^6 BTU (x)
Particulate (Average All Boilers:1976-77)	0.142 lbs/10^6 BTU (x)
Particulate (Average All Boilers:1977-78)	0.138 lbs/10^6 BTU (x)
Particulate (Average All Boilers:1978-79)	0.146 lbs/10^6 BTU (x)
Particulate (Average All Boilers:1979-80)	0.134 lbs/10^6 BTU (x)

(x) These boilers are burning mostly residue.

(8) Process Rate: 135,340 lbs/hour of Residue per day of crop.
118,433 lbs/hour of Bagasse per day of Crop
- Average -

(1) United States Sugar Corporation (Bryant)

(2) Mailing Address: P.O. Drawer 1207

(3) City: Clewiston

(4) State: Florida 33440

(5) Environmental Manager: Mr. A.R. Mayo

(6) Telephone No.: (813) 983-8121

(7) Emissions: 1975-76 to 1979-80 Compliance Test

CONTAMINANT	RATE OF CONCENTRATION
Particulate (Average All Boilers:1975-76)	0.106 lb./10^6 BTU
Particulate (Average All Boilers:1976-77)	0.113 lb./10^6 BTU
Particulate (Average All Boilers:1977-78)	0.126 lb./10^6 BTU
Particulate (Average All Boilers:1978-79)	0.133 lb./10^6 BTU
Particulate (Average All Boilers:1979-80)	0.223 lb./10^6 BTU

(8) Process Rate: 327,675 lbs. of Bagasse per hour per day of crop (Average)

(5) Environmental Manager: Mr. A. R. Mayo

(6) Telephone No.: (813) 983-8121

(7) Emissions*: 1975-76-77-78-79-80 Compliance Tests

Contaminant	Rate or Concentration
Particulate (Average 3 Boilers) 1975-76	0.166 lbs/10^6BTU
~~Particulate (Average 4 Boilers) 1976-77~~	~~0.192 lbs/10^6BTU~~
Particulate (Average 5 Boilers) 1977-78	0.188 lbs/10^6BTU
Particulate (Average 4 Boilers) 1978-79	0.193 lbs/10^6BTU
~~Particulate (Average 5 Boilers) 1979-80~~	~~0.24 lbs /10^6BTU~~

(8) Process Rate*: 340,250 lbs of bagasse per hour per day of crop (Average)

10. Reason for selection and description of systems:

The selected Joy Turbulaire spray impingement scrubber is currently employed by a majority of the Sugar Mill bagasse burning boilers to meet existing state particulate emission rates for existing and new boilers.

The Technical Staff of the Department of Pollution Control determined that the Joy Scrubbers proposed by the Florida Sugar Cane League constitute latest technology. (See Letter Attached)

In the case of the new boiler #5 installed at Bryant Mill U.S.S. Corporation the Department of Environmental Regulations determined that this selected system is capable of meeting and lowering the existing emission rate for new boilers.

The selected system is the most economical to install and to operate.

The existing four bagasse burning boilers at Atlantic Sugar Association are served by Joy Turbulaire Spray Impingement Scrubbers with the Fan down stream of the Scrubber.

The system consists of one Joy Turbulaire Scrubber size 90 (14'-0" diameter) type D receiving the hot gases from the boiler and with the fan down stream. One set of water sprays will be installed ahead of the Scrubber inlet for quenching. The pressure drop will be changed by changing the nozzle opening. The liquid rate could be changed readily. All controls will be the same as the ones on the existing Scrubbers with the newest improvements availables.

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

KEI

Kleeman Engineering, Inc.

404 N. ANDREWS AVE. FT. LAUDERDALE, FLA. 33301

CHEMICAL & ENVIRONMENTAL ENGINEERS

(305) 467-6708

ADDENDUM CALCULATIONS
APPLICATION FOR PERMIT TO
CONSTRUCT

FOR: OSCEOLA FARMS Co.
BOILER #6

Item B-1 Derivation of Process Weight

Fuel Oil Burned (#6) 192 lbs./hr.

Bagasse Burned 79,970 lbs./hr.

Calculated on Btu basis as follows:

Steam Generated 150,000 lbs/hr.

Btu Value of Steam 1069 Btu/lb.

Btu Value of Fuel Oil 18,850 Btu/lb.

Furnace Efficiency 55 % SEE MANUFACTURER'S CALCULATION SHEET

Btu Value of Bagasse 3600 Btu/lb.

Heat Output = 150,000 x 1069 = 160.4×10^6 Btu/hr.

Heat Input = $\frac{160.4 \times 10^6}{.55}$ = 291.6×10^6 Btu/hr.

Heat Input from Oil = 192 x 18,850 = 3.6×10^6 Btu/hr.

Heat Input from Bagasse = 291.6×10^6 - 3.6×10^6 = 288.0×10^6 Btu/hr.

Bagasse Burned = $\frac{288,000,000}{3600}$ = 79,970 Lbs/hr.

Total Process Weight = 79,970 + 192 = 80,162 Lbs/hr.

Bagasse Burned Daily = $\frac{79,970 \times 24}{2000}$ = 959.6 Tons/day

Oil Burned Daily = $\frac{192 \times 24}{2000}$ = 2.3 Tons/day

Section C Emissions Calculations

Particulate Emissions: Stack tests were conducted on Boiler #5 by So. FLA. ENVIRONMENTAL TESTING on 12-31-79.

Particulate Emissions were determined as follows:

		Lbs/Hr Steam Generated	Lbs/Hr Oil Used
Run No. 1	47.4 lbs/hr		
Run No. 2	44.8 " "		
Run No. 3	39.2 " "		
Average	43.8 lbs/hr	125,000	160

$\frac{43.8}{} \times \frac{150,000}{125,000}$ = 52.6 lbs/hr @ 150,000 lbs/hr design cap.

$\frac{52.6 \times 24 \times 128}{2000}$ = ~~81.3~~ 80.8 Tons/yr Particulates

Sulfur Oxide Emissions:

SO_2 Emissions, in Lbs/ton Bagasse burned = ~~0~~ 8 X %S

1-582 / 1 X $\frac{\sout{79,970}\ 80,000 \times}{2000}$ X 0 X 0.2 = ~~80.0~~ ~~160~~ 134 lbs/hr SO_2 from Bagasse

SO Emissions, in Lbs/1000 gallons Residual Oil burned = 157 x %S

$\frac{\sout{192}\ 384}{8.0\ lbs/gal}$ = gal/hr Oil burned ~~24.0~~ (48) 123.0 #/hr

$\frac{\sout{24.0}\ 48}{1000}$ X 157 X 2.0 %S = ~~3.8~~ 15.2 7.6 lbs/hr SO_2 from Oil

Total SO Emissions = ~~80.0~~ ~~160.0~~ 134 ~~14.2~~ 142 149.2 ~~3.8~~ 7.6 = ~~83.8~~ 141.6 lbs/hr

$\frac{\sout{83.8}\ \sout{163.8}\ 141.6 \times 24 \times 128}{2000}$ = ~~12.9~~ ~~251.6~~ 217.5 tons/yr total SO_2 Emissions

NO_x Emissions:

NO_x Emissions, in Lbs/ton Bagasse burned = 1.20

$\frac{79,970 \times 1.20}{2000}$ = 48.0 lbs/hr NO_x from Bagasse

NO_x Emissions, in Lbs/1000 gal Residual Oil burned = ~~22~~ .60

$$\frac{\sout{1.92}\ 384}{8.0 \text{ lbs/gal}} = \sout{24}.0\ 48 \text{ gal/hr Oil burned}$$

$$\frac{\sout{24}.0\ 48}{1000} \times \sout{22}\ 60 = \sout{0.5}\ 2.9 \text{ lbs/hr } NO_x \text{ from Oil}$$

Total NO_x Emissions = 48.0 + ~~0.5~~ 2.9 = ~~48.5~~ 50.9 lbs/hr

$$\frac{48.5 \times 24 \times 128}{2000} = \sout{74.5}\ 78.2 \text{ tons/yr}$$

Section D Calculation of Scrubber Efficiency

Inlet Particulates loading to the scrubber (SAME TYPE AS FOR BOILER #6) was calculated utilizing emission tests performed on Boiler #4 by ENV. SCIENCE + ENG. on 1969-70 SEASON.

Test No. ______ Date ______ ______________ lbs/hr

Test No. ______ Date ______ ______________ lbs/hr

Test No. ______ Date ______ ______________ lbs/hr

Average (at 96,000 lbs/hr Steam production) = 550 lbs/hr

Average Emissions from Boiler #5 Scrubber = 43.8 lbs/hr @ 125,000 lbs/hr steam production

$$43.8 \times \frac{96,000}{125,000} = 33.6 \text{ lbs/hr @ } 96,000 \text{ lbs/hr steam prod.}$$

$$\text{Scrubber Efficiency} = \frac{550 - 33.6}{550} \times 100 = 93.9\ \%$$

16 lbs/ton bagasse × 79970/2000 = 639.8 #/hr PM emission from bagasse

.13 × 24 / 1000 = 0.3 lbs/hr from oil 639.8 + 0.3 = 640.2

$$\frac{640.2 - \sout{65.8}\ 52.6}{640.2} = \sout{0.92}\ 0.918\ \sout{= 0.92} = 91.8\ \%$$

Section C Emissions Calculations (continued)

Hydrocarbon Emissions:

From Bagasse = 2.0 lbs/ton

~~79,970~~ 80,000 / 2000 X 2.0 = 80.0 lbs/hr. HC from Bagasse

From Oil = 1.0 lb/1000 gal.

~~24~~ 48 / 1000 X 1.0 = ~~0.02~~ 0.05 lbs/hr. from Oil

Total HC = 80.0 + ~~0.02~~ 0.05 = ~~80.02~~ 80.05 lbs/hr.

80.02 X 24 X 128 / 2000 = 123 tons/yr. Hydrocarbons

CO Emissions:

From Bagasse = 2.0 lbs/ton

79,970 / 2000 X 2.0 = 80.0 lbs/hr. from Bagasse

From Oil = 5.0 lbs/1000 gal.

~~24.0~~ 48 / 1000 X 5.0 = 0.1 lbs/hr. from Oil

80.0 + 0.1 = 80.1 LBS/HR CO TOTAL

80.1 X 24 X 128 / 2000 = 123 Tons/yr. Carbon Monoxide

Uncontrolled Emissions

Particulates:

From Bagasse = 16 lbs/ton

79,970 / 2000 X 16 = 640 lbs/hr.

From Oil = 13 lbs/1000 gal.

~~24~~ 48 / 1000 X 13 = ~~0.3~~ 0.6 lbs/hr.

Total = 640 + 0.3 = ~~640.3~~ 640.6 lbs/hr.

~~643.3~~ ~~640.3~~ 640.6 X 24 X 128 / 2000 = ~~988~~ 984 tons/yr. Particulates

CALCULATION SHEET

Section C

ALLOWABLE ...

Total Btu value of steam 215 PSIA 500°F = 1267 Btu/lb

Btu value of feed water 230°F = 198 Btu/lb

Net Btu value of steam = 1069 Btu/lb

Steam production rate = 150,000 lb/hr

Furnace efficiency = 55 %

Heat input to furnace $\frac{150,000 \times 1069}{.55}$ = 291.6×10^6 Btu/hr

Heat input from fuel oil 150,800 (Btu/gal) × ~~24~~ 48 (gal/hr) = ~~3.6×10^6~~ 7.2 $\times 10^6$ Btu/hr

Heat input from bagasse = 288.0×10^6 Btu/hr

Allowable particulates for oil ~~3.6~~ 7.2 × 0.1/10^6 Btu = ~~0.3~~ ~~0.4~~ 0.7 lb/hr

Allowable particulates for bagasse (new boilers) 288.0 × ~~0.2~~ 0.15/10^6 Btu = ~~57.6~~ 43.2 lb/hr

Allowable particulates for bagasse (existing boilers) ________ × 0.3/10^6 Btu = — lb/hr

Total allowable particulates 57.9 lb/hr

Osceola Farms (Mr. Carlos Alonso)
(Mr. J.P. Orsenigo)
A.N.(PID) Raw Lab TJG

RILEY | RILEY STOKER CORPORATION
POST OFFICE BOX 547, WORCESTER, MASS. 01613
A SUBSIDIARY OF THE RILEY COMPANY

FUELS LABORATORY

TEST REPORT

RECEIVED MAR 1 1979

Laboratory No. 22,129 **Sample of** Bagasse **Date Rec'd** 1/30/79

Received From Osceola Farms Co. (Sugar Cane Growers) Pahokee, Fla

Sample Data Bagasse Sample #1 1/23/79

Contract No. (641-91110) [redacted] **Field Sample By** Customer

Air Drying Loss 56.7 %

Proximate Analysis	As Rec'd	Dry	Ultimate Analysis	As Rec'd	Dry
Moisture	58.2 %	------	Moisture	%	-------
Volatile	36.5 %	87.5 %	Carbon	%	48.3 %
Ash	0.5 %	1.1 %	Hydrogen	%	6.0 %
Fixed Carbon	4.8 %	11.4 %	Nitrogen *	%	0.32 %
	100.0 %	100.0 %	Oxygen (diff.)	%	44.08 %
British Thermal Units	3,394	8,120	Sulfur	%	0.2 %
Fusibility of Ash			Ash	%	1.1 %
Initial Deformation		F		100.0 %	100.0 %
Softening		F	Free Swelling Index		
Fluid		F	Grindability Index		

(*Skinner & Sherman)

Date February 26, 1979 Thomas J. Gallagher

PM40-11777 A SUBSIDIARY OF THE RILEY COMPANY

SUMMARY PERFORMANCE SHEET

Purchaser: OSCEOLA FARMS CO. — Drwg. No.: PL-104 Rev. 3

Location: Florida -U.S.A. — Design Pressure: 325 Psig.

Fuel			Bagasse			
Steam	M lb/hr		150			
Pressure superheater outlet	psig		250			
Temperature steam superheater outlet	F		500			
Pressure boiler drum	psig		290			
Excess air leaving	%		45			
Gas entering air heater	M lb/hr		379.6			
Gas leaving air heater	M lb/hr		379.6			
Air entering air heater	M lb/hr		297.4			
Air leaving air heater	M lb/hr		297.4			
Temp feed entering unit	F		210			
Temp feed leaving econ.	F					
Temp air entering unit	F		80			
Temp air leaving air heater	F		535			
Temp gas leaving furnace	F		1630			
Temp gas leaving boiler	F		800			
Temp gas leaving economizer	F					
Temp gas leaving air heater	F		509			
Ditto corrected for leakage	F					
Draft in furnace	in. H2O		0.20			
Gas side loss thru boiler	in. H2O		4.27			
Gas side loss thru suphtr.	in. H2O		0.09			
Gas side loss thru economizer	in. H2O					
Gas side loss thru air heater	in. H2O		1.39			
Gas side loss thru flues	in. H2O		1.42			
Gas side loss thru dust collector	in. H2O					
Total Gas side						
Air side loss thru air heater	in. H2O		3.51			
Air side loss thru ducts	in. H2O		1.42			
Air side loss thru burners	in. H2O					
Air side loss thru grate	in. H2O		6.13			
Air side loss,	in. H2O					
Total Air side						
Total Air & Gas loss	in. H2O		18.43			
Pressure loss Drum to SHO	psi		40			
Fuel Burned	lb/hr		83980			
Fnce. Liberation	BTU/cu. ft. hr		26075			
Net Heat Release	BTU/sq. ft. hr		83341			
Heat Release in grate	BTU/sq. ft. hr		896533			
Boiler efficiency	%		54.28			

DISTRAL, S.A.
ET-80-104

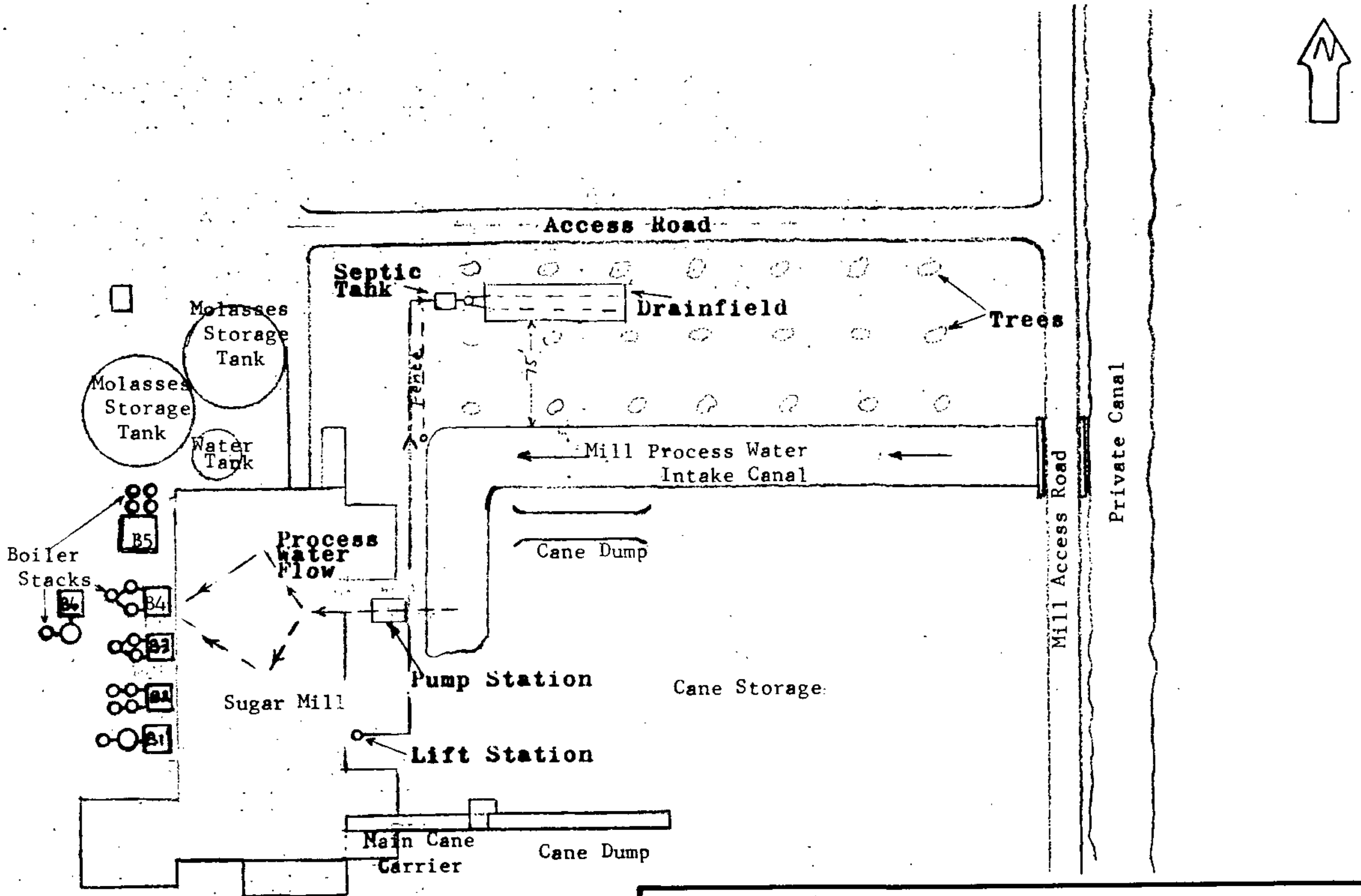
SUMMARY PERFORMANCE SHEET - PART TWO

Purchaser: OSCEOLA FARMS CO.
FLORIDA - U.S.A.

Fuel			Bagasse				
Steam	M lb/hr		150				
Heat Losses							
Dry gas	%		10.87				
Hydrogen and moisture in fuel	%		27.59				
Moisture in air	%		0.26				
Unburned combustible	%		5.10				
Radiation	%		0.40				
Unaccounted	%						
Manufacturers margin	%		1.50				
Total losses	%		45.72				
Efficiency	%		54.28				

Performance based on fuel specified below:

Kind							
Grindability (Hardgrove)							
Maximum moisture	%						
Surface Moisture	%						
Size							
Gas press. at burner							
PROXIMATE ANALYSIS							
Moisture	%						
Volatile matter	%						
Fixed carbon	%						
Ash	%						
Softening temperature of ash	°F						
ULTIMATE ANALYSIS		Bagasse					
Per cent by		weight					
Ash		1.06					
S		0.04					
H_2		2.68					
C		21.18					
CH_4							
C_2H_4							
C_2H_6							
CO							
CO_2							
H_2O		56.00					
N_2							
O_2		19.04					
Btu/lb as fired		3603					
Btu/cu ft at 60 F-30" Hg							



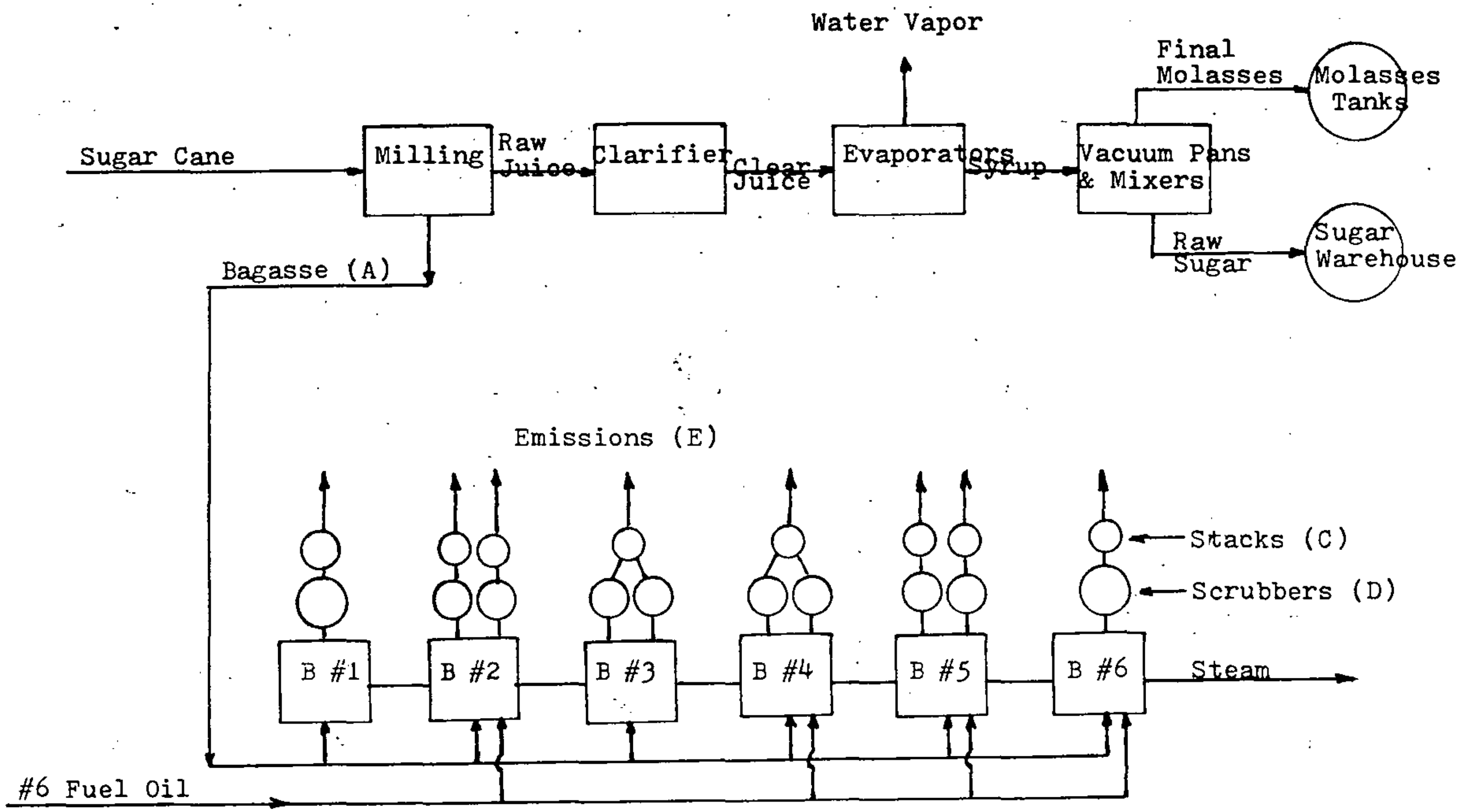
OSCEOLA FARMS CO. Pahokee, Fla.

SCALE: 1" = 100'	APPROVED BY: FSK	DRAWN BY
DATE: 5-25-81		REVISED

PLOT PLAN

Kleeman Engineering, Inc. Ft. Lauderdale, Fla.

DRAWING NUMBER

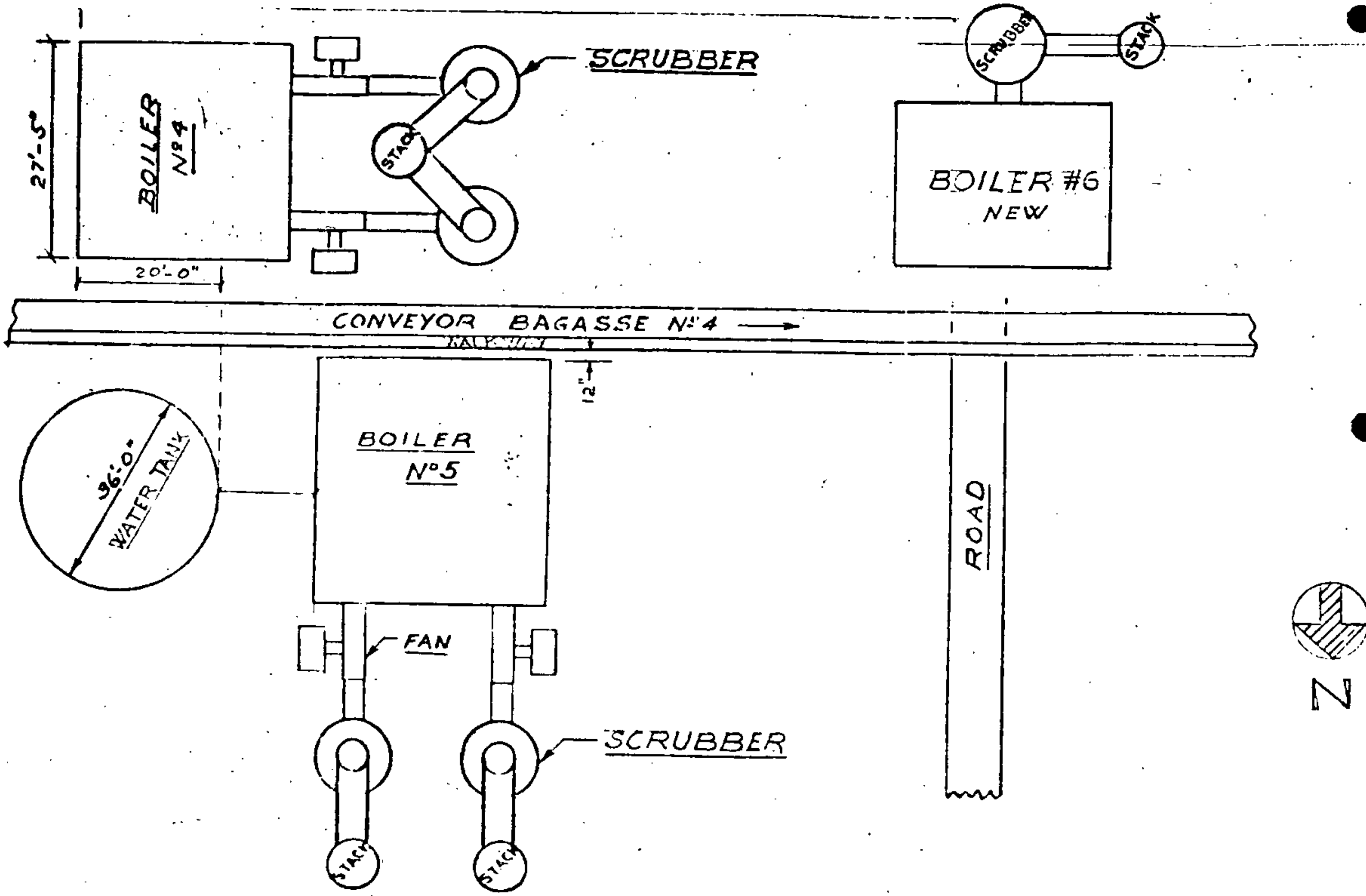


OSCEOLA FARMS CO. PAHOKEE, FLA.

SCALE:
APPROVED BY:
DRAWN BY
DATE: 5-25-81
REVISED

PROCESS FLOW DIAGRAM

Kleeman Engineering, Inc. Ft. Lauderdale
DRAWING NUMBER

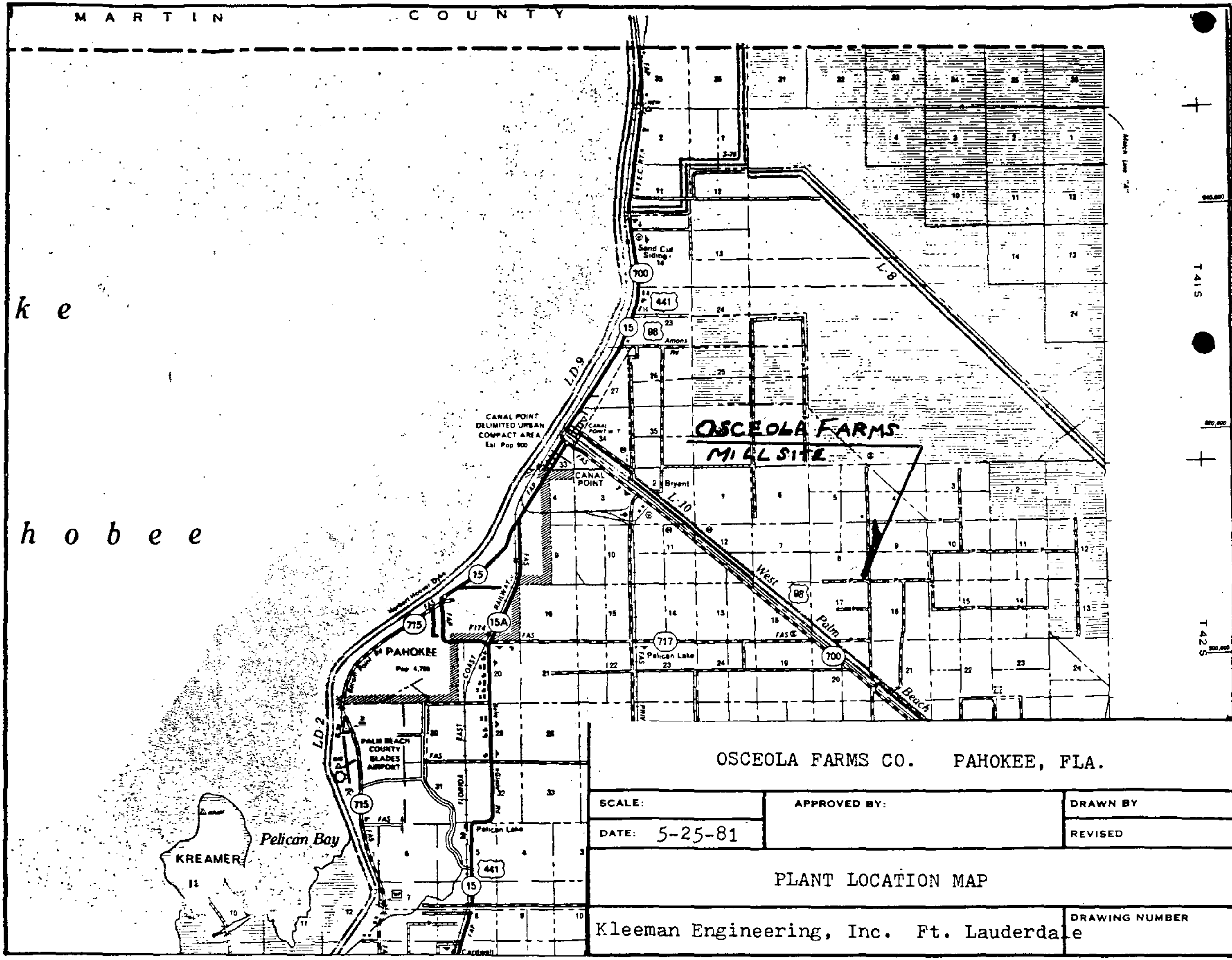


OSCEOLA FARMS CO.

LOCATION OF NEW Nº6 BOILER

5-13-81

DRAWN: R.L.



OSCEOLA FARMS CO. PAHOKEE, FLA.

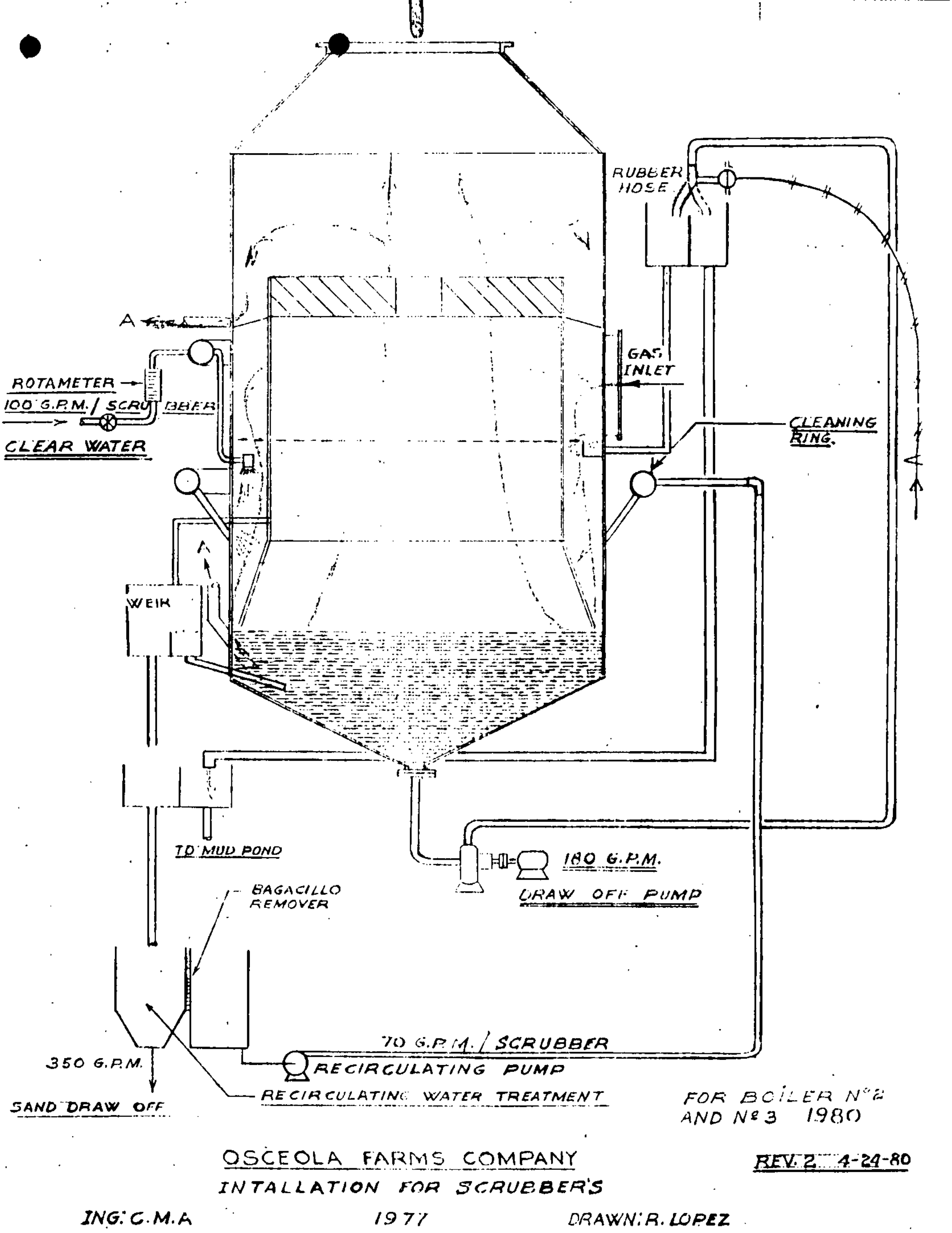
SCALE:	APPROVED BY:	DRAWN BY
DATE: 5-25-81		REVISED

PLANT LOCATION MAP

Kleeman Engineering, Inc. Ft. Lauderdale

DRAWING NUMBER

8½X11 PRINTED ON NO. 1000H CLEARPRINT


RUBBER HOSE
A
GAS INLET
ROTAMETER
100 G.P.M. / SCRUBBER
CLEAR WATER
CLEANING RING.
WEIR
TO MUD POND
180 G.P.M.
DRAW OFF PUMP
BAGACILLO REMOVER
70 G.P.M. / SCRUBBER
RECIRCULATING PUMP
350 G.P.M.
SAND DRAW OFF
RECIRCULATING WATER TREATMENT
FOR BOILER Nº2 AND Nº3 1980
OSCEOLA FARMS COMPANY
REV. 2 4-24-80
INTALLATION FOR SCRUBBER'S
ING: C.M.A
1977
DRAWN: R. LOPEZ

October 24, 1977 – other Attach

INSTALLATION, OPERATING, AND MAINTENANCE INSTRUCTIONS

FOR

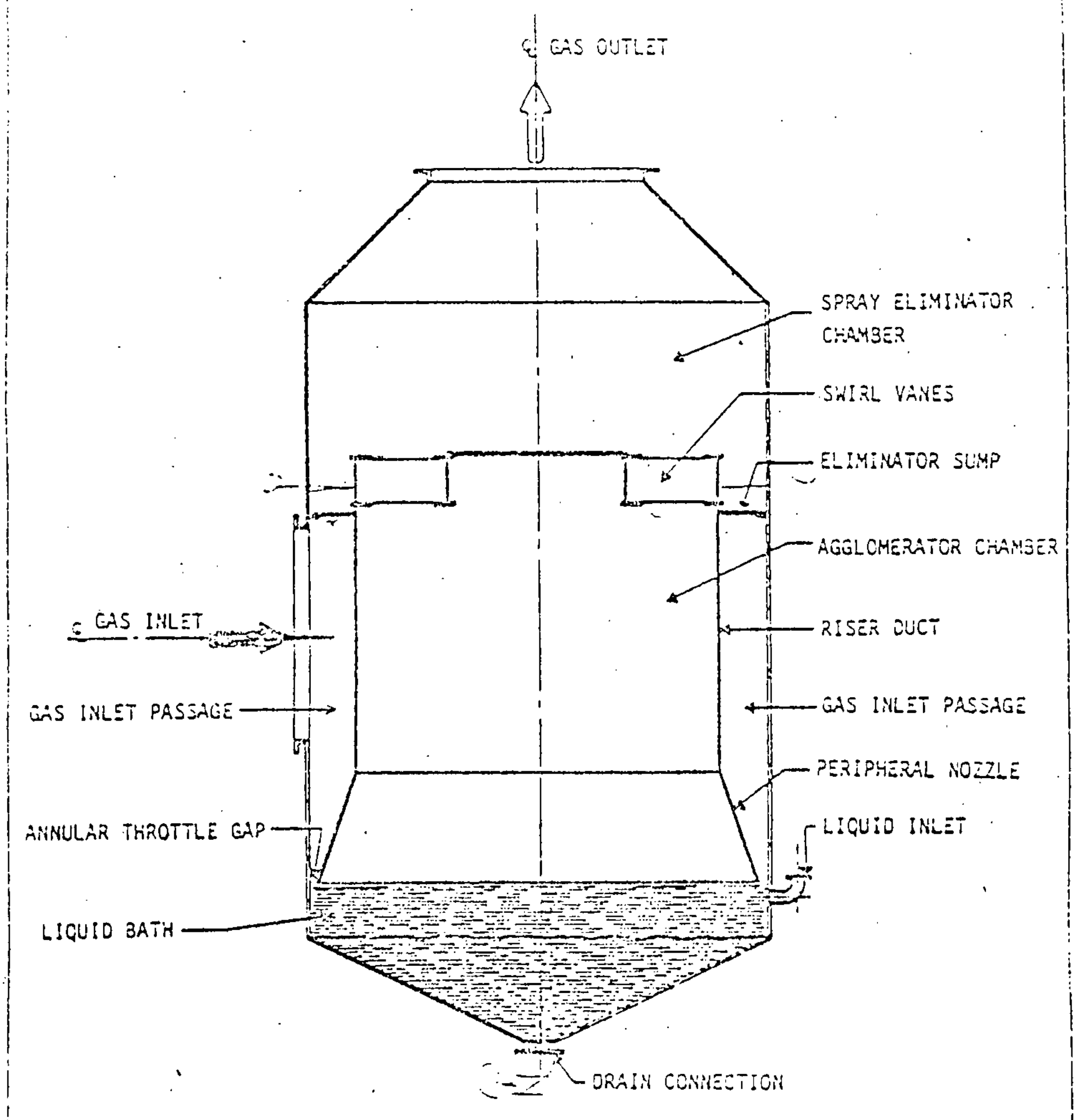
TURBULAIRE© SCRUBBER

TYPE D

J O Y   M A N U F A C T U R I N G   C O M P A N Y
Western Precipitation Division
1000 W. Ninth St.
Los Angeles, California 90015

CONTENTS

FIGURES



SECTION THRU SCRUBBER
(Weir Box Not Shown)

Figure 1. Turbulaire® Scrubber, Type D-3, Sizes 20 thru 64

DESCRIPTION

The Type D Turbulaire© Scrubber (Figure 1) consists of a vertical cylindrical shell with conical top and conical hopper on the lower end. The scrubber is divided into two chambers; the agglomerator chamber and the eliminator chamber.

The agglomerator chamber is in the lower portion of the scrubber and consists of the hopper with liquid bath, the gas inlet passage with conical throttle and the liquid level regulating assembly.

The eliminator chamber is above the agglomerator chamber and consists of a set of swirl vanes and a sump preceding the gas outlet.

TYPE & SIZE DESIGNATION

1 D B MS R 32

- 1 — Number of Units
- D — Design Type
- B — Hopper Type
- MS — Shell Material
- R — Shell Lining if specified
- 32 — Size

The scrubber has the gas inlet located radially on the side of the shell and the gas outlet at the top center. The agglomerator cylinder is surrounded by the gas inlet passage. The shell and the peripheral nozzle of the agglomerator chamber form an annular throttling gap at the bottom of the gas inlet passage. The normal operating level of the scrubbing liquid bath is just below the throttling gap.

Swirl vanes are mounted in the top of the agglomerator cylinder. A horizontal plate joining the agglomerator with the shell forms the eliminator sump. Weep holes drain the liquid from the eliminator sump into the scrubbing liquid bath in the hopper.

A liquid level regulating assembly is mounted on the lower exterior region of the shell. This assembly consists of a gas lock release pipe, weir box with liquid level control, and a seal pipe with overflow. The liquid inlet is located just above the hopper. Access doors are provided in the hopper and in the upper region of the shell.

Construction material for the standard scrubber is mild steel. Optional materials of construction may be: mild steel lined with rubber, lead or coated with epoxy resin; 304 or 306 stainless steel; and fiber reinforced polyester.

FIELD INSTALLATION

Field installation of the scrubber is as follows:

1. Set the unit on the foundation and attach the anchor bolts. Level unit by shimming between unit and foundation.

NOTE: Vertical and horizontal alignment of the scrubber is important to ensure an even circumferential dimension between the peripheral nozzle and quiescent liquid level.

2. Connect the inlet and outlet flues to the unit. It is recommended that inspection doors, adjacent to the scrubber, be included in the customer's flues.

NOTE: Dynamic and dead load forces from customer's fan, equipment and flues must not be transmitted to the scrubber equipment.

3. Attach the sight glass and weir box to the scrubber, then connect the seal pipe overflow to a drain line.

4. Connect the hopper outlet to a drain line. The drain line should contain a valve for flow balancing purposes.

PREPARATION OF THE SCRUBBER FOR OPERATION

The scrubber is designed to operate under the conditions in the operating data sheet in the front of the manual.

Prior to turning on the flue gas, liquid flow and liquid level should be established as follows:

1. Remove the weir box cover.

2. Turn on the liquid supply. By means of a flow meter or other measuring device, adjust the flow of the inlet liquid until the rate prescribed on the data sheet is attained.

3. Open the valve at the hopper outlet and establish a flow of liquid adequate to remove the slurry from the hopper.

4. Raise or lower the liquid level control as required until the liquid in the scrubber reaches and maintains a steady level, approximately 1/2-inch below the peripheral nozzle. This level is indicated by a red line painted on the weir box. Tighten the clamp which secures the level control in place.

NOTE: The liquid level control and liquid inlet rate may require adjustment to comply with rated pressure drop and outlet gas conditions.

5. Replace the weir box cover. The scrubber is now ready to receive flue gas.

If the tank is lined with lead, rubber, epoxy resins or other material which may deteriorate at high temperatures, the temperature of the inlet gas must be adjusted within limits compatible with these materials as noted after operating instruction.

NOTE: Unless otherwise recommended, 95% to 99% of the slurry should be removed through the valve at the hopper outlet. Only 1% to 5% should be removed through the weir box overflow pipe.

OPERATION

Operation of the scrubber requires only that the fan be turned on to move flue gas through the scrubber.

As flue gas enters the scrubber through the inlet, its speed is increased to the desired operating velocity as it passes through the throttling gap. The dust-laden gas is then discharged at high velocity and penetrates deeply into the liquid bath wherein the dust combines with the liquid to form a slurry which is discharged through the hopper outlet valve. The turbulence resulting from the entrance of the high velocity gas into the scrubbing bath is sufficient to produce a dense spray. This spray is removed from the gas by the swirl vanes.

The scrubber should continue to operate at constant efficiency if the gas volume, temperature and dust load do not change. If there is an increase in the dust load, it may be necessary to increase the flow rate of the scrubbing liquid, in which case, the hopper outlet valve must be adjusted to maintain the operating liquid level. A decrease in the dust load will permit decreasing the scrubbing liquid flow rate.

The efficiency of the unit may be increased by: increasing pressure drop through unit, cooling inlet gases if necessary, and increasing the inlet liquid rate, described as follows:

1. Increase pressure drop through the unit by restricting the nozzle opening or by increasing the gas flow through the unit.

The nozzle opening can be restricted by adding material to the nozzle opening and thus cut down the size of the opening. The opening is designed so that at the gas density and volume specified, the required pressure drop should be obtained. Sometimes the gas density or the volume are not that which is calculated and, if the pressure drop is low, it is necessary to close down on the opening. This is fairly easily accomplished and, by doing this, the velocity of the jet is increased into the liquid pool and, therefore, increases the efficiency of the unit.

The volume of air should never exceed the maximum allowable outlet gas volume as specified on the data sheet. This maximum volume cannot be exceeded without entraining some of the scrubbing liquid, and carrying it into the outlet flue.

Gas flow through the unit can be increased by opening the fan dampers or by introducing infiltration air into the flue through a damper.

If the scrubber is operating well below the maximum outlet gas volume, the simplest way to increase the pressure drop through the unit is to increase the fan delivery until the design pressure drop is reached.

2. Introduce liquid sprays ahead of the scrubber inlet to humidify the gases entering the scrubber. This system is employed whenever inlet gas temperatures are high enough to damage the lining of the shell. Changing the specified water flow to the spray nozzles is not recommended since this will change inlet gas density beyond scrubber design limits.

3. Increase the inlet liquid rate. This will also bring the temperatures of the gas down to saturation quickly. However, as the liquid rate is increased, the liquid level control will have to be reset until equilibrium conditions are maintained without gas passing through the unit. Increase of the liquid rate will give lower outlet gas temperatures and also lower outlet liquid temperatures.

MAINTENANCE

Although the scrubber should operate continuously with minimum maintenance some may be required. This includes: removing any build-up of dust on the peripheral nozzle which would impair operation, and periodically cleaning out the scrubber and liquid seal pipe to prevent clogging of the outlet.

In addition, situations may be encountered which may impair the operation of the scrubber:

1. Plugging of the Overflow Pipe
   Occasionally on some dusts (generally those associated with fluorides), there may be some plugging of the overflow pipe which leads from the scrubber to the weir box. This plugging is due to settling out or deposition of particles in the pipe and can generally be relieved by one or two methods.

   One method is to periodically clean out the pipe with a reamer or a scraper of some sort. For those scrubbers with rubber, lead, or plastic lining, care should be taken that the lining is not pierced.

   Another method is to increase the velocity of liquid through the pipe by closing down on the cross sectional area. This is accomplished by laying pieces of tubing in the overflow pipe and building up enough tubing so that the cross sectional area of the pipe is gradually reduced. The velocity of liquid for materials which tend to settle out should be a minimum of 2 to 3 fps or higher.

2. Cold Weather Operation
   During periods of cold weather, care must be taken to prevent freezing of the liquid in the scrubber and in the supply lines. It may be necessary to insulate one or both. During periods of shutdown, the scrubber and liquid lines should be drained unless some method is employed to keep temperatures above the freezing point.

AUTOMATIC CONTROL RECOMMENDATION

An automatic liquid level control system is available as an optional extra from Western Precipitation Division.

The system consists of the following components:

a. Displacer type level control unit (Magnetrol)

b. Solenoid valve

c. Strainer

d. Piping and pipe fittings as required for field assembly.

The system is normally shipped loose for field assembly by the customer. Hook-up connections are provided on the hopper and the scrubber body.

OPERATION

The liquid level control unit uses a solid block displacer - heavier than the liquid - which is suspended from a helical spring. A rising liquid level imparts buoyancy to the displacer, lessening the load on the spring, thus, the displacer moves upward. A magnetic sleeve connected to the displacer also moves upward inside a non-magnetic enclosing tube, attracting a permanent magnet attached to a mercury switch (or pneumatic pilot valve). This actuates and closes the solenoid valve, and make-up water to the scrubber is shut-down. As the liquid level recedes, the magnetic sleeve and displacer drops allowing the magnet and switch element to return to the normal operating level. This actuates and opens the solenoid valve allowing flow of makeup water to the scrubber.

Thus, there is no possibility of excessive high or low liquid levels in the scrubber.

A cross is provided in the line to allow periodic flushing and cleanout of the system.

This information is provided to give a general idea of the dust collection mechanisms employed by Western Precipitation scrubbers as well as some of our competitors.

[redacted] so that it is directed downward toward the liquid level located immediately under peripheral nozzle which provides the venturi. The unusual aerodynamics in the gap area causes liquid to be sucked from the surface of the water. Thus the water is propelled in a direction which sends droplets across the high velocity zone immediately below the venturi and in a horizontal direction perpendicular to the downward moving gas flow such that the same conditions experienced in the classical venturi scrubber are achieved. Once in the high velocity gas stream, these droplets are shredded into very fine droplets whose size decreases with increased gas velocity. [redacted]

[redacted]. Of course higher gas velocities caused by reductions in the size of the scrubbing gap cause higher pres sure doprs. For this purpose dust collection efficiency is presented a a function of the scrubber pressure drop. Both dust particles and water droplets are surrounded by a gas boundary layer which cushions the impact. Because of this buffer, the finer dust particles can dodge the droplets by following the gas streamlines around them. Increased momemtum, obtained by higher impact velocity, is required to penetrate this boundary layer and effect collision. Obviously the smaller the mass (or size) of the particle, the higher the necessary velocity requi for the penetration. For this reason, increases in pressure drop are required to maintain a constant efficiency as particle size drops.

The same classical venturi impaction principle can be achieved in the Type "D" "TURBULAIRE" Scrubber even with low liquid levels, if scrubbi liquid is added to the venturi region via sprays. The liquid flows down the walls to the venturi area. As the gas accelerates to pass through the convergence zone of the venturi, it rips liquid from the lip of the converging wall and atomizes this liquid, as well as any droplets in the gas stream, into a great number of fine droplets. It is in this zone that the dust is impacted into the droplets due to the high relative velocity of the dust particle to the droplets.

Up to a point, higher water flow rates increase the number of fine dro lets, thus increasing the dust collection efficiency. Inadequate wate supply results in not only lower probability of collision, but also causes incomplete water coverage of the venturi zone so that high velocity dust particles may have few or even no droplets to collide with, thus reducing the overall efficiency of the scrubber. The effect of liquid to gas ratio in the scrubbing zone can be generally depicted in Fig. #1.

In order to present a more concrete example, Fig. #1 is shown with specific scrubber pressure drops, dust concentrations, and efficiencies with values in the range which may be experienced ~~at Weyerhaeuser's plant.~~ However, the values are not exact and should not be interpreted as engineering data. The subject graph is a plot of dust collection efficiency as a function of liquid flow rate to the venturi with scrubber pressure drops of 5" and 10" water gauge as parameters. As indicated the higher pressure drop produces a higher dust collection efficiency which corresponds to an outlet dust loading of .05 grains/DSCF. As shown, the efficiency rises rapidly from 0/0 at no liquid flow rate until it asymtotically approaches an efficiency of 95% at a liquid flow rate of approximately 200 GPM. From this point the efficiency remains essentially constant as liquid rate is increased until the liquid flow is so high that the venturi is flooded and inefficient use is made of the dust particle velocity and liquid. At the lower scrubber pressure drop of 5" the trend of the efficiency vs liquid rate curve is similar, but dust collection efficiency is always less than that of the 10" pressure drop. Employing this set of curves will allow a better understanding and evaluation of our present situation in regard to quantity of spray liquor provided to the venturi. If only 90 GPM of liquor is used, the full 10" pressure drop will be required to produce the guaranteed outlet dust loading of .1 grain/DSCF, and if only a 5" pressure drop is used across the scrubber, the efficiency will drop way below that required to meet the code. In the case where the liquid rate is increased to 200 GPM, the outlet dust loading will decrease significantly to .05 grain/DSCF at the higher 10" water gauge pressure drop. However, since the efficiency at the higher irrigation rate will be more than adequate, this would allow a reduction in pressure drop to 5" water gauge, while still meeting [illegible] 0.1 grains and also reap the benefit of lower fan power consumption due to the lower scrubber pressure drop. Although the values of the parameters just discussed may not be wholly accurate, the general relationship of pressure drop, dust collection efficiency, and liquid flow rate is accurate enough to show the general relationships so that both the economies and inefficiencies of the various operating points can be easily understood.

Because of the inefficiencies resulting from using a minimum quantity of spray liquid we recommend the use of the higher liquid rate. The only reasonable way to achieve these higher flows is to utilize recycle slurry from the scrubber sump. The maximum flow available from the drag chain tank is 90 GPM, with the drag tank hold time maintained above 40 minutes. This flow rate is inadequate for efficient use of the scrubber pressure drop. There may be a concern for the possibility of large chunks of char clogging the 9/16" diameter spray nozzle orifice should the "MULTICLONE" fail in some way. The installation of a simpler, low pressure drop, line strainer (with large 3/8" diameter perforations) in the appropriate slurry pipelines would prevent this. This device would have a manual backwash to purge any large debris and would require maintenance only during the infrequent times when a failure occurred. Should there be a catastrophic failure that plugged the strainer, the sprays would still operate 90 GPM of fluid from the drag chain tank during the corrective period.

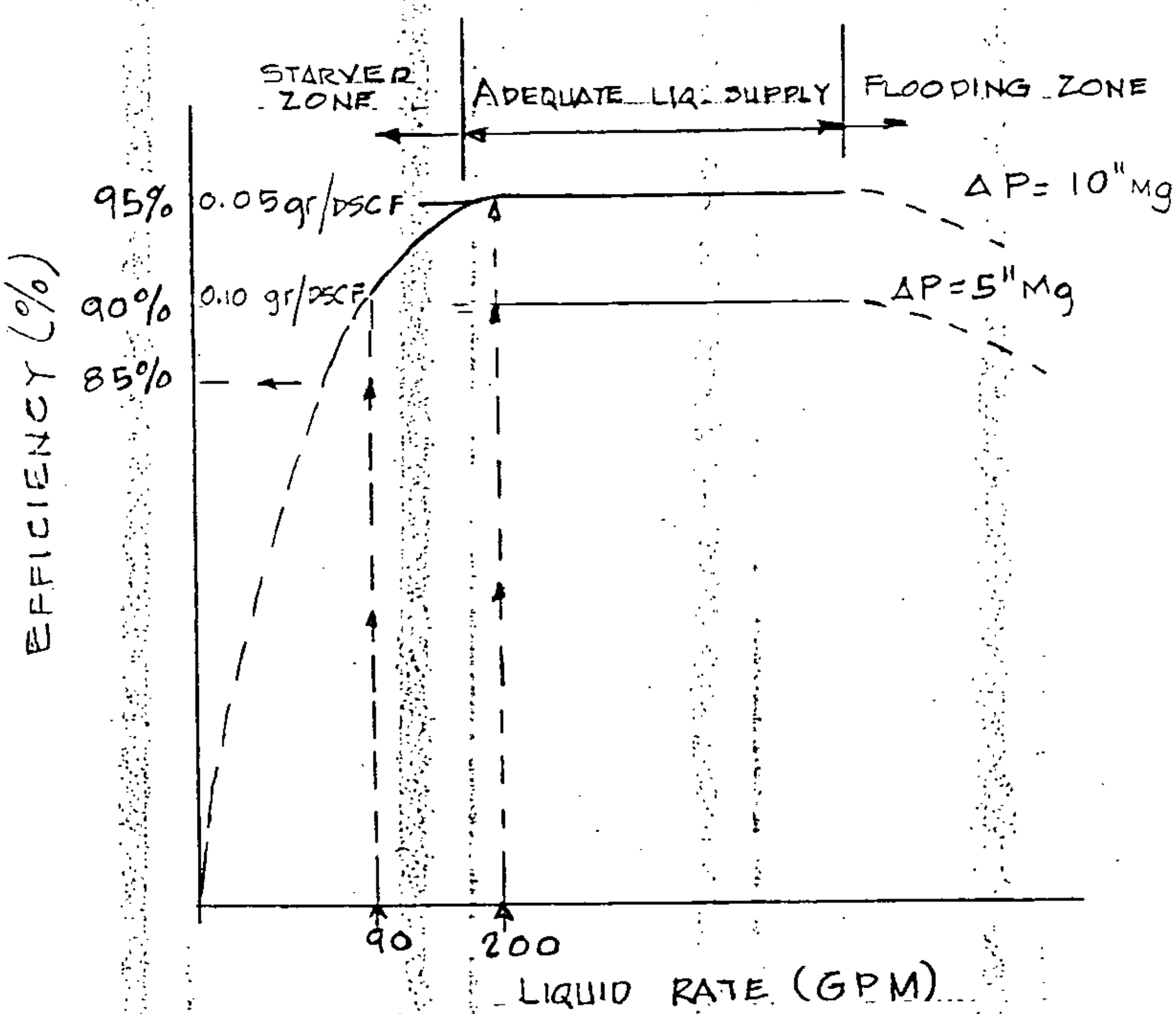
The sprays serve another purpose also in that the water washes the internal gap area especially in the zone just above the gap where plugging has sometimes been experienced due to low liquid quantities when hot gases above 300°F are being scrubbed. The splashing of dirty water at the dry/wet interface with low liquid quantities has allowed the solids to be baked onto the hot surfaces, leaving a residual crust composed of the solids. This soon builds up a formidable deposit. The high flushing rate of the cleaning sprays provides adequate continuous flushing of the surface so that no thin films of liquid ever occur.

Several other modifications have been made to the Type "D" Scrubber to improve its reliability even under very difficult conditions. One change has been the replacements of the weep holes in the eliminator vane which provided drainage of liquor back from the demister sump by several large 3" diameter pipes which seal below the liquid level in the scrubber hopper. These pipes are of adequate size to quickly pass any large debris back into the sump region, thus keeping the demister sump from plugging and flooding.

In cases where plugging has developed in the scrubber sump, higher liquid velocities have been employed to eliminate the accumulation and eventual bridging of solids at the sump discharge nozzle. This has been achieved by increasing the flow through the discharge nozzle by the addition of a recycle pump. The recycle pump delivers liquid to the sump nozzle which has been located to provide a maximum of agitation in the trouble zone. These high recycle rates have also been effective in causing sufficient agitation so that any floaters at the liquid surface can be wetted and swept down to the discharge nozzle.

FIGURE Nº 1

EFFICIENCY VS LIQUID AT VENTURY



WESTERN PRECIPITATION DIVISION
JOY MANUFACTURING COMPANY
4565 COLORADO BOULEVARD
LOS ANGELES, CALIFORNIA 90039
Phone: (213) 240-2300

February 8, 1974

Florida Sugar Cane League, Inc.
P.O. Box 1148
Clewiston, Florida 33440

Attention: Mr. J. Nelson Fairbanks
Vice President & General Manager

$[\frac{2-0.07}{2}] = 96.5\%$
$[\frac{2-0.08}{2}] = 96\%$

Gentlemen:

Confirming our conversations of January 30, 1974, we wish to present, herewith, the guarantees we are prepared to make to any member of the Sugar Cane League on the performance of our Type D "TURBULAIRE" Scrubber when used in conjunction with bagasse fired boilers.

With an inlet loading to the scrubber of 2 gr/dry standard CFM (DSCFM), we will guarantee a particulate outlet not to exceed .07 gr/DSCFM. If the condensables are to be included with particulate emission, we will then guarantee an outlet not to exceed .08 gr/DSCFM. These guarantees are based on operating the equipment at a pressure drop across the unit of not less than 5" water column (w.c.) and not more than 9" w.c. In addition, these guarantees are based on sampling with the EPA Train, Method 5, described in the Federal Register, Volume 36, No. 247, Thursday, December 23, 1971, copy enclosed.

The aforementioned guarantees are made on our equipment as originally designed or as modified with our approval. Any unauthorized modifications will abrogate these guarantees.

Very truly yours,

Allen H. Jones
Vice President, Standard Products

AHJ:js

Encl. EPA Train, Method 5.

cc: F. Arroyo - Arroyo Process Equipment
cc: L. Newton - Western Precipitation
cc: R. Fernandez - Western Precipitation

WESTERN PRECIPITATION DIVISION
JOY MANUFACTURING COMPANY
4565 COLORADO BOULEVARD
LOS ANGELES, CALIFORNIA 90039
Phone: (213) 240-2300

February 8, 1974

Florida Sugar Cane League, Inc.
P.O. Box 1148
Clewiston, Florida 33440

Attention: Mr. J. Nelson Fairbanks
Vice President & General Manager

$\left[\frac{1-0.05}{1}\right] = 95\%$

Gentlemen:

Confirming our conversations of January 30, 1974, we wish to present, herewith, the guarantees we are prepared to make to any member of the Sugar Cane League on the performance of our Type D "TURBULAIRE" Scrubber when used in conjunction with bagasse fired boilers.

With an inlet loading to the scrubber of 1 gr/dry standard CFM (DSCFM), we will guarantee a particulate outlet not to exceed .05 gr/DSCFM. If the condensables are to be included with particulate emission, we will then guarantee an outlet not to exceed .06 gr/DSCFM. These guarantees are based on operating the equipment at a pressure drop across the unit of not less than 5" water column (w.c.) and not more than 9" w.c. In addition, these guarantees are based on sampling with the EPA Train, Method 5, described in the Federal Register, Volume 36, No. 247, Thursday, December 23, 1971, copy enclosed.

The aforementioned guarantees are made on our equipment as originally designed or as modified with our approval. Any unauthorized modifications will abrogate these guarantees.

Very truly yours,

Allan H. Jones
Vice President, Standard Products

AHJ:js

Encl. EPA Train, Method 5.

cc: F. Arroyo - Arroyo Process Equipment
cc: L. Newton - Western Precipitation
cc: R. Fernandez - Western Precipitation

STATE OF FLORIDA
DEPARTMENT OF POLLUTION CONTROL
2562 EXECUTIVE CENTER CIRCLE, EAST
MONTGOMERY BUILDING, TALLAHASSEE, FLORIDA 32301

VINCENT D. PATTON
EXECUTIVE DIRECTOR

DAVID H. LEVIN
CHAIRMAN

DIVISION OF OPERATIONS

3319 Maguire Boulevard
Suite 232
Orlando, Florida 32803

May 21, 1973

RECEIVED
MAY 25 1973

Frank S. Kleeman, P. E.
Engineering Consultant
Florida Sugar Cane League, Inc.
Post Office Box 1148
Clewiston, Florida 33440

Dear Mr. Kleeman:

Pursuant to our meeting with the representive of Florida's sugar industry held on April 12, 1973, this office agreed to coordinate the Department's response to all the questions discussed.

Please be advised that the following is the Department's official response to those questions.

Process Weight Determination:

The process weight is defined as all materials entered into the process. This would include "natural" or "adsorbed" moisture found in the bagasse as it comes from the milling operation or from the by-product resulting from the production of furfural. The term "uncombined water" is directed toward water added to the baggasse just before entering the boilers would be considered uncombined water.

Latest Technology

The technical staff of this Department has determined that the scrubbers proposed by the Florida Sugar Cane League in the April 12, 1973 meeting would constitute latest technology. The modifications necessary to accommodate scrubbers to each plant may change, therefore, the performance of these units would be considered on an individual basis.

Source Testing Method:

Some questions have arisen concerning the necessity of changing from our present testing procedures. These were discussed by Mr. Oven with Mr. Henderson during recent conversations. Concern exists over the solubility of particulate matter in the thimble because of a "wet" stack. This may result in particulate emissions greater than that obtained from the stack analysis. Consequently, our present test method must apply. If test data can be submitted which would justify the "dry" stack sampling method as a more accurate indication of particulate matter emitted from baggasse boilers, a change in test methods will definately be considered.

If you have any questions concerning the above, please feel free to contact this office and if necessary another meeting can be held.

Very truly yours,

A. Senkevich, P. E.
Director
Division of Operations

AS/KK/rm

cc: Mr. H. Oven
Mr. P. Baljet
Mr. Nelson Fairbanks, Fla. Sugar Cane League, Inc.
Mr. W. Straham
Mr. J. Cooper, Palm Beach County Health Dept.

United States
Environmental Protection
Agency

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345 Courtland Street NE
Atlanta GA 3030[illegible]

[illegible] Florida,
Mississippi, North Carolina,
South Carolina, Tennessee,
Kentucky

EPA

MAR 22 1979

REF: 4RC

William H. Green, Esquire
Mahoney, Hadlow & Adams
P.O. Box 5617
Tallahassee, Florida 32301

Re: Best Available Control Technology
Determination for Bagasse Boiler

Dear Mr. Green:

This is in response to your February 12, 1979, letter on the above. Specifically, your letter addressed our pending Best Available Control Technology (BACT) determination for a bagasse boiler the United States Sugar Company intends to install at its Bryant, Florida, sugar cane processing operation.

You first asked whether an overly stringent BACT emission limitation could be modified upward after the facility is in operation, if operating results justify a higher limitation. We know of no written EPA policy that provides for such a procedure. As you are aware, EPA regulations also do not provide for such a procedure. However, since this is a policy or program question and not a legal question, we offer no opinion on it.

The remainder of your letter addressed what the appropriate emission limitation reflecting BACT should be in this case. As quoted in your letter, the BACT definition in EPA regulations is:

> "... an emission limitation ... based on the maximum degree of reduction for each pollutant ... which the Administrator, on a case-by-case basis ... determines is achievable for such [major stationary] source ... through application of production processes or available methods, <u>systems, and techniques</u> ...." (emphasis added)

43 Fed.Reg. 26388, 26404 (1978), to be printed as 40 C.F.R. §52.21(b)(10). From this, it is evident that the BACT emission limitation must reflect the maximum emission reduction achievable through use of control systems and techniques. The designation EPA uses to describe techniques that can be used in achieving the BACT emission limitation is "good operating practices". Also, as noted in your letter, the emission limitation must be met on a continuous basis. Clean Air Act §302(k).

In the February 12 letter, you argue that the data from the Clewiston, Florida, bagasse boilers of U.S. Sugar should be weighted more heavily than that from the Bryant boilers. The reasons given are that the Clewiston boilers are 40% larger than the existing Bryant boilers and show consistently higher emission levels. Since the contemplated Bryant boiler will be even larger than the Clewiston boilers, the argument is in effect that the larger the boiler, the higher the emission rate, so that the BACT emission limitation for the contemplated Bryant boiler should at least be as high as the Clewiston test results.

We see at least two weaknesses in this argument. First, the test results at Clewiston when both Boiler No. 1 and Boiler No. 2 were being fired at their highest rate tested (218,000 #/hr. and 215,000 #/hr., respectively) both would meet the BACT emission limit of .15 #/million B.t.u. contemplated for the new Bryant boiler. This and other aspects of the data convince us that there is no clear correlation between size and emissions control efficiency of the bagasse boilers. Second, insufficient information was submitted to eliminate other variables affecting emissions. For example, a significant factor could be differences from site to site or from time to time in adherence to good operating practices. These practices include, for example, maintenance of a sufficient scrubber pressure and sufficient flue gas and water flow rates into the scrubber. This factor of use of good operating practices is, of course, within the control of the permit holder.

There has not been a showing that good operating practices were followed when the Bryant test results showed emissions higher than .15 #/million B.t.u. Also, the .15 #/million B.t.u. level was only rarely exceeded in the Bryant data and thus was not consistently exceeded at a significantly higher level.

These considerations lead us to conclude that .15 #/million B.t.u. can be met continuously if U.S. Sugar uses BACT, including good engineering practices, in designing and operating the contemplated Bryant bagasse boiler.

If we may be of further assistance, please call (telephone 404/881-2335).

Sincerely yours,

Sanford W. Harvey, Jr.
Regional Counsel

cc: Ms Mary F. Clark
Florida Department of Environmental Regulation

OSCEOLA FARMS CO.

Pahokee, Fla.

Prevention of Significant Deterioration (PSD) Report

May 28, 1981

The State of Florida Department of Environmental Regulation (DER) and United States Environmental Protection Agency (EPA) have promulgated regulations concerning the Prevention of Significant Deterioration (PSD). All new major sources of air pollution must undergo a PSD review to determine if significant deterioration will be caused by the proposed new source. The proposed action constitutes a new major source under both state and federal PSD regulations by virtue of an increase over specified emission levels for several air pollutants.

In response to these requirements, OFC contracted ESE to perform a PSD analysis for the proposed action. The analysis was conducted using suggested and approved EPA and Florida DER atmospheric dispersion models and modeling techniques. Results showed that allowable PSD increments and Ambient Air Quality Standards (AAQS) of the State of Florida will not be violated as a result of increased operation capacity of the mill due to the proposed boiler. The analysis was based upon the maximum predicted emissions from the proposed and existing units.

Best Available Control Technology (BACT) for all affected pollutants will be met by the proper utilization of appropriate control techniques and proper operation and maintenance procedures for the proposed boiler.

The operation of the proposed bagasse boiler is not expected to have a significant impact upon visibility, soils or vegetation, or any area which has been designated Class I for PSD purposes. This report provides an evaluation of the PSD analysis and provides a complete description of the methods, data bases, results, and conclusions of the study.

3.0 AIR QUALITY REVIEW REQUIREMENTS

The following discussion pertains to the air quality regulatory requirements that must be met for the major modification proposed. These requirements include demonstrating compliance with AAQS and PSD increment consumption.

3.1 AMBIENT AIR QUALITY STANDARDS (AAQS)

As a result of the requirements of the 1970 Amendments to the Clean Air Act (CAA), EPA enacted Primary and Secondary National AAQS (Federal Register, 1971) for six air pollutants. Primary National AAQS are required to protect the public health, and Secondary National AAQS are required to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air.

Table 3-1 presents the existing applicable National and State of Florida AAQS. The State of Florida in January 1972 promulgated the Secondary National AAQS as the State AAQS. Since states have the discretion of adopting (or maintaining) AAQS more stringent than those established by EPA, the State of Florida has chosen to retain the annual AAQS and 24-hour secondary AAQS for sulfur dioxide (SO_2) that have been eliminated by EPA since 1971. Pollutants for which AAQS have been established are termed "criteria" pollutants.

Areas of the country in violation of any of the AAQS are designated as "nonattainment areas," and new or modified sources to be located in or near these areas may be subject to more stringent air permitting requirements than those in non-attainment areas. Palm Beach County has been designated as a nonattainment area for ozone. However, no areas within 100 km of the OFC site have received a nonattainment designation for any pollutant other than ozone.

Table 3-1. National and State of Florida AAQS Applicable

Pollutant	Averaging Time	National Primary Standard	National Secondary Standard	Florida
Suspended Particulate Matter	Annual Geometric Mean	75 ug/m^3	60 ug/m^3	60 ug/m^3
	24-Hour Maximum*	260 ug/m^3	150 ug/m^3	150 ug/m^3
Sulfur Dioxide	Annual Arithmetic Mean	80 ug/m^3	NA†	60 ug/m^3
	24-Hour Maximum*	365 ug/m^3	NA†	260 ug/m^3
	3-Hour Maximum*	NA†	1,300 ug/m^3	1,300 ug/m^3
Carbon Monoxide	8-Hour Maximum*	10 mg/m^3	10 mg/m^3	10 mg/m^3
	1-Hour Maximum*	40 mg/m^3	40 mg/m^3	40 mg/m^3
Hydrocarbons	3-Hour Maximum* (6 to 9 A.M.)	160 ug/m^3	160 ug/m^3	160 ug/m^3
Nitrogen Dioxide	Annual Arithmetic Mean	100 ug/m^3	100 ug/m^3	100 ug/m^3
Ozone	1-Hour Maximum*	235 ug/m^3	235 ug/m^3	160 ug/m^3
Lead	Calendar Quarter Arithmetic Mean	1.5 ug/m^3	1.5 ug/m^3	NA†

* Maximum concentration not to be exceeded more than once per year.
† No standard exists.

Source: 40CFR Part 50, 1980.

3.2 PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

3.2.1 General Requirements

Under federal PSD review requirements, all major new or modified sources of air pollutants regulated under the CAA must be reviewed and approved by EPA (or in this case, reviewed by Florida DER since technical and administrative review authority before final approval by EPA has been delegated to the state). A "major stationary source" is defined as any one of 28 named source categories which has the potential to emit 100 tons per year or more, or any other stationary source which has the potential to emit 250 tons per year or more, of any pollutant regulated under the Act. "Potential to emit" means the capability at maximum design capacity to emit a pollutant after the application of control equipment (40 CFR 52.21).

"Major modification" means any physical change in the design or operation of a major stationary source, or a series of contemporaneous changes in the design or operation of a major stationary source, that would result in a significant net increase in the source's potential to emit the pollutant for which the source is major (40 CFR 52.21). "Significant" is defined as any increase in emissions in excess of specified levels (Table 3-2).

The PSD review is used to determine whether significant air quality deterioration will result from the new or modified source. This section addresses PSD requirements contained in 40 CFR 52.21, Prevention of Significant Deterioration of Air Quality, and in the State of Florida PSD Regulations, Chapter 17-2, Florida Administrative Code. Major sources are required to undergo the following federal reviews related to PSD:

1. Control technology review,
2. Air quality review,
3. Monitoring,

Table 3-2. Significant Emission Rates and De Minimis Air Quality Impact Levels

Pollutant	De Minimis Emission Rate (tons per year)	De Minimis Air Quality Impact Level
Carbon Monoxide	100	575 ug/m^3, 8-hour average
Nitrogen Dioxide	40	14 ug/m^3, 24-hour
Total Suspended Particulates	25	10 ug/m^3, 24-hour
Sulfur Dioxide	40	13 ug/m^3, 24-hour
Ozone*	40 (volatile organic compounds)	
Lead	0.5	0.1 ug/m^3, 3-month
Mercury	0.1	0.25 ug/m^3, 24-hour
Beryllium	0.0004	0.0005 ug/m^3, 24-hour
Asbestos	1	†
Fluorides	3.0	0.25 ug/m^3, 24-hour
Sulfuric Acid Mist	7	†
Vinyl Chloride	1.0	15 ug/m^3, maximum value
Total Reduced Sulfur Hydrogen sulfide	10	10 ug/m^3, 1-hour
Reduced Sulfur Compounds (including H_2S)	10	10 ug/m^3, 1-hour
Hydrogen sulfide	10	0.023 ug/m^3, 1-hour
Benzene	0	0
Radionuclides	0	0
Inorganic Arsenic	0	0

* A de minimis air quality level is not given for ozone. However, a plant which is subject to PSD review and has a net increase of 100 tons per year of volatile organic compounds would be required to perform an ambient air quality analysis.

† No satisfactory monitoring technique available at this time.

Source: EPA, 1980, 40CFR Part 52, Section 52.21.

4. Source information, and
5. Additional impact analyses.

The control technology review includes determination of BACT for each applicable pollutant. BACT information is contained in the DER construction permit application.

Source impact analysis requires demonstration of compliance with federal and state AAQS and allowable increment limitations (see Table 3-3). Projected ambient impacts upon designated nonattainment areas and federally promulgated Class I PSD areas must also be addressed. The monitoring portion of PSD review requires an analysis of continuous ambient air monitoring data to be performed for the impact area of the proposed source. Source information, including process design parameters and control equipment information, must be submitted to the reviewing agencies. Additional impact analyses of the proposed source's impact upon soils, vegetation, and visibility, especially pertaining to Class I PSD areas, must be performed.

Florida DER has promulgated PSD regulations similar to those of EPA. Table 3-4 presents the applicable PSD regulations of both Florida DER and EPA. Some important differences between the state and federal review requirements do exist. The first is in the definition of "potential to emit," which determines if a new or modified source is "major" and therefore subject to PSD review. EPA defines "potential to emit" as emissions after control and takes into account any decrease in emissions due to the application of control equipment which has been incorporated into the design of the source. Florida DER defines "potential emissions" as those emissions before the application of control equipment, unless such equipment is an inherent part of the process. The second major difference is in the EPA and Florida DER definition of "baseline" air quality. The discussions that follow describe in more detail the PSD requirements for the state and federal regulations, including the difference in baseline analysis.

Table 3-3. Federal and State of Florida PSD Allowable Increments (ug/m^3)

Pollutant/Averaging Time	Class I	Class II	Class III
Particulate Matter			
Annual Geometric Mean	5	19	37
24-Hour Maximum*	10	37	75
Sulfur Dioxide			
Annual Arithmetic Mean	2	20	40
24-Hour Maximum*	5	91	182
3-Hour Maximum*	25	512	700

* Maximum concentration not to be exceeded more than once per year.

Sources: Public Law 95-95, Clean Air Act Amendments of 1977.
<u>Federal Register</u>, Vol. 43, No. 118, June 19, 1978.

Table 3-4. PSD Regulations Applicable

Requirement	Federal Regulation*	State of Florida Regulation†
General Source Applicability	40 CFR 52.21(i)	FAC 17-2.04(1)
Control Technology Review	40 CFR 52.21(j)	
New Source Performance Standards	40 CFR 52.21(j)(1)	FAC 17-2.03(1)(a)
Best Available Control Technology	40 CFR 52.21(j)(2)	FAC 17-2.04(6)(c)
Source Impact Analysis	40 CFR 52.21(k)	
Ambient Air Quality Standards	40 CFR 52.21(k)(1)	FAC 17-2.04(6)(a)
Allowable Increments	40 CFR 52.21(k)(2)	FAC 17-2.04(6)(a)
Air Quality Analysis (Monitoring)	40 CFR 52.21(m)	
Source Information	40 CFR 52.21(n)	FAC 17-2.04(6)(a)
Stack Heights	40 CFR 52.21(h)	
Additional Impact Analyses	40 CFR 52.21(o)	
Public Participation	40 CFR 52.21(q)	FAC 17-2.04(9)
Referenced Requirements		
Best Available Control Technology	40 CFR 52.21(b)(10)	FAC 17-2.03
Ambient Air Quality Standards	40 CFR 50	FAC 17-2.06(1)
Allowable Increments	40 CFR 52.21(c)	FAC 17-2.04(1)

* CFR = Code of Federal Regulations, 1980.
† FAC = Florida Administrative Code, Chapter 17-2, Supplement 101.

Sources: Code of Federal Regulations, 1980.
Florida Administrative Code, Chapter 17-2, Supplement 101.

3.2.2 EPA PSD Review Requirements

3.2.2.1 Applicability--When determining the level of EPA PSD review applicable to OFC's proposed modification, the predicted net emissions increase from the modification is compared with the significant emission rates presented in Table 3-2 (the proposed boiler's emissions, shown in Table 2-2, represent the net change in emissions because no contemporaneous emission reductions are associated with the proposed action). Each pollutant showing a net emissions increase which is predicted equal to or greater than the appropriate significant rate must undergo PSD review. As the comparison shows, emissions of particulate matter, SO_2, hydrocarbons (HC), and nitrogen dioxide (NO_2) are above the appropriate levels. As such, an air quality analysis (AAQS and/or increment consumption) was conducted for these pollutants for EPA review.

3.2.2.2 Ambient Monitoring--Proposed new and modified sources are exempt from the new monitoring requirements associated with the air impact analysis if an otherwise complete PSD application is submitted prior to June 7, 1981 and the applicant complies with the 1978 PSD monitoring requirements. Since OFC is submitting this PSD application prior to June 7, 1981, the use of existing ambient data (see Section 5.0) upon approval of the reviewing agency is permitted under the 1978 regulations; therefore, this exemption applies.

3.2.2.3 Baseline--The term "baseline" evolves from federal and state PSD regulations and denotes a fictitious concentration level corresponding to a specified baseline date and certain additional baseline sources. Baseline should not be confused with "background," which, for this PSD report, refers to concentration levels due to sources not accounted for in the point source emission inventories (i.e., natural and distant manmade sources).

EPA defines baseline concentration as:

> . . . that ambient concentration level which exists in the baseline area at the time of the applicable baseline date. A baseline concentration is determined for each pollutant for which a baseline date is established and shall include:
>
> 1. The allowable emissions of major stationary sources which commenced construction before January 6, 1975, but were not in operation by the applicable baseline date;
>
> 2. The actual emissions representative of sources in existence on the applicable baseline date, except for those listed below, which will affect the maximum allowable increases:
>   a. Actual emissions from any major stationary source on which construction commenced after January 6, 1975; and
>   b. Actual emissions increases and decreases at any stationary source occurring after the baseline date.

When considering actual emission rates, EPA is referring to emissions estimated from source records and any other information reflecting actual source operation over the 2-year time period preceding the baseline date. The baseline date is 1977 and is applicable for both particulate matter and SO_2 for all attainment areas of the state. When applying the baseline emissions concept, EPA does not require the establishment of a formal baseline concentration.

When considering factors such as hours of operation, capacity utilization, and types of materials combusted, processed, and/or stored, the values existing at the baseline date will generally be used; however, the EPA baseline emissions concept can also include future increases in hours of operation or capacity utilization as they occur, if it is demonstrated that a source's operation after the baseline date is more representative of normal operation than its operation preceding the baseline date (Federal Register, 1980).

3.2.2.4 Additional Impact Analysis--In addition to air quality impact analyses, the federal PSD regulations require additional analyses of the impairment to visibility and the impacts upon soils and vegetation that would occur as a result of the source. This analysis is to be conducted primarily for Class I PSD areas. Impacts due to general commercial, residential, industrial, and other growth associated with the source must also be addressed.

3.2.3 Florida DER PSD Review Requirements

3.2.3.1 Applicability--All new or modified major emitting facilities ("major stationary source" under EPA regulations) located in attainment areas are subject to PSD review on the state level. According to Florida DER guidelines, once BACT is determined, the applicant OFC may proceed with a PSD analysis on the proposed facility. A BACT application was submitted to DER.

3.2.3.2 Ambient Monitoring--All preconstruction monitoring to determine the air quality status of an area should be conducted in accordance with the 1978 EPA PSD regulations (i.e., "Ambient Monitoring Guidelines for Prevention of Significant Deterioration," EPA-450/2-78-019). Compliance with these requirements are presented in Section 4.0.

3.2.3.3 Baseline--State of Florida--The State of Florida has defined baseline concentration for PSD purposes to mean:

> For sulfur dioxide and particulate matter, the applicable ambient concentration levels existing during 1974 plus any additional concentrations for the area of impact estimated to result from sources permitted for construction but not operating prior to January 1, 1975 . . . In the case of the 3-hour and 24-hour concentrations, only the second highest concentrations shall be considered [Florida Administrative Code, Chapter 17-2.02(14)].

In October 1978, the Florida DER Bureau of Air Quality Management published "Guidelines on Prevention of Significant Deterioration (PSD)--PSD Review." The document states: "Baseline emissions data consist of the January 1, 1975 allowable emission rates and January 1, 1975 stack configurations for all sources holding either an operating or construction permit during any part of 1974." As a result, Florida DER requires the formal establishment of a baseline concentration level. Because of the adopted definition, only modeling can be utilized to determine the baseline levels.

3.2.4 Modeling

The PSD regulations specifically require the use of atmospheric dispersion models in performing impact analysis, estimating baseline and future air quality levels, and determining compliance with the AAQS and the allowable PSD increments. Guidance for the use and application of dispersion models is presented in the EPA publication, "Guideline on Air Quality Models" (EPA, 1978a). (Note: Recently, EPA has held conferences and distributed revised guidelines in draft form.) The models used in the PSD analysis were the long-term (ISCLT) and short-term (ISCST) Industrial Source Complex models.

Various lengths of record for meteorological data can be utilized for short-term modeling. A 5-year period can be used with corresponding evaluation of highest, second-highest concentrations for comparison to AAQS or PSD increments. The term "highest, second-highest" refers to the highest at all receptors of the second-highest concentrations (i.e., the highest concentration at each receptor is discarded). The second-highest concentration is significant because the short-term AAQS specify that the level should not be exceeded at any location more than once a year. If less than 5 years of meteorological data are used, the highest concentration at any location must be used.

3.2.5 Good Engineering Practice Stack Height

The 1977 Clean Air Act Amendments (CAAA) require that the degree of emission limitation required for control of any pollutant not be affected by a stack height that exceeds good engineering practice (GEP) or any other dispersion technique. On January 12, 1979, EPA promulgated proposed regulations on stack heights. The proposed GEP stack height means the highest of:

a) 30 meters, or

b) a height established by applying the formula:

$$H_g = H + 1.5L \qquad \text{Equation 1}$$

where: H_g = GEP stack height,

H = Height of the structure or nearby structure, and

L = Lesser dimension (height or width of the structure or nearby structure).

"Nearby" is defined for a specific structure or terrain feature as that distance equal to five times the lesser of the height or width dimension of the structure or terrain feature not greater than one-half mile (EPA, 1978d). While the actual stack height employed can exceed this height, modeling for determining compliance with AAQS and PSD increments must incorporate the GEP stack height.

4.0 ATMOSPHERIC DISPERSION MODELING METHODOLOGY

4.1 GENERAL

To evaluate completely the impact of emissions and to determine compliance with AAQS and other regulations, the relationship between atmospheric emissions and air quality must be established. One approach to determine this relationship is to assume that a change in emissions would cause a proportionate change in air quality. This approach, however, does not explicitly include the effects of meteorology, topography, and stack gas parameters. Therefore, this method does not ensure an accurate estimate of the impact of emissions on the overall air quality.

In response to this deficiency, the air quality dispersion model has become an accepted method for estimating the spatial distribution of pollutant concentrations. Currently, the dispersion models are generally restricted to nonreactive or slow-reacting pollutants, such as SO_2, particulate matter, and CO. Current state-of-the-art techniques in dispersion modeling cannot accurately predict concentrations for reactive pollutant species such as NO_2, HC, and photochemical oxidants.

Mathematical dispersion models simulate the effects of stack height, stack flow parameters, source distributions, and atmospheric elements such as air flow and mixing on the transport and dispersion of pollutants emitted into the atmosphere. Dispersion models are useful for calculating the spatial distribution of concentrations that result from various sources, and these models can be utilized to estimate ground-level concentrations for extreme meteorological conditions. Figure 4-1, which illustrates the procedure to follow in applying a mathematical model, shows that by compiling existing emissions, meteorological, and air quality data, a dispersion model can estimate the impact of source emissions on air quality. The model is also useful in predicting the relative change in air quality as a result of varying emission parameters, meteorological conditions, and source distributions.

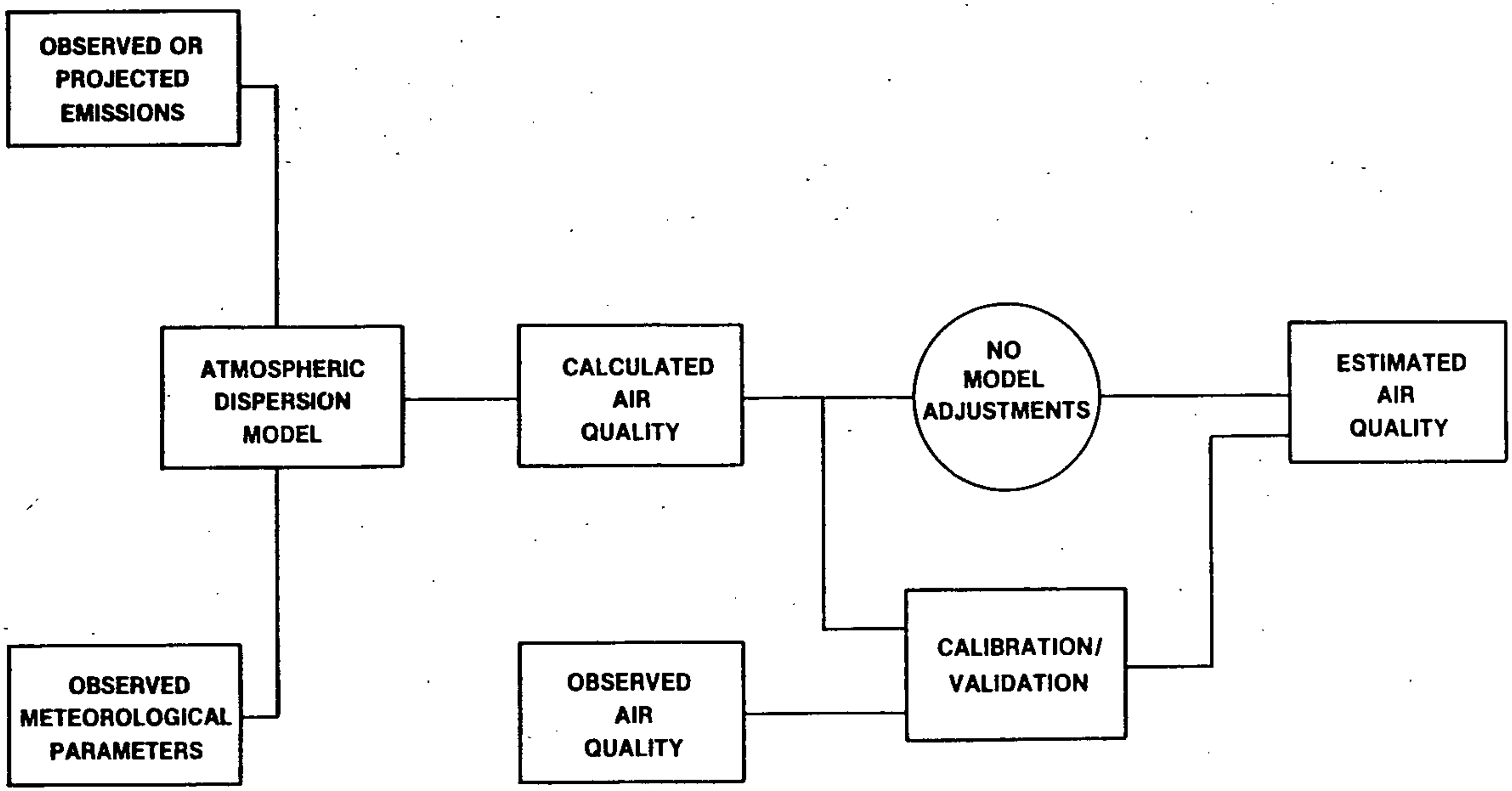


Figure 4-1
FLOW DIAGRAM FOR THE APPLICATION OF ATMOSPHERIC DISPERSION MODELS.

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

EPA has developed several dispersion models which use the Gaussian diffusion equation. The basic formulation of the Gaussian equation assumes that the ground-level concentration is inversely proportional to the mean wind speed. The Gaussian distribution describes the horizontal and vertical pollutant dispersion in a plane normal to the wind direction.

An atmospheric dispersion model can be defined as a mathematical description of the transport, dispersion, and transformation processes that occur in the atmosphere. In the case of SO_2, it is generally assumed that chemical conversion of this substance is small with respect to its average residence time in the atmosphere. In the case of particulate matter, it is assumed that no particles are scavenged from the atmosphere by fallout or washout. These conservative assumptions tend to result in higher predicted concentrations than actual measured concentrations.

Florida DER and EPA Ambient Air Quality Standards are for annual, 24-hour, 8-hour, and 3-hour periods of time; therefore, the dispersion models must predict concentrations for various averaging times. Most dispersion models, however, estimate concentrations for a 1-hour period or for seasonal or annual time periods. If an average concentration for an intermediate period is required, then, two options, both of which are approved by EPA and Florida DER, are available:

1. The short-term model can be used to estimate concentrations hour by hour for the period of interest, and an average of all hours can be taken with consideration given to an appropriate calibration factor.
2. Statistical techniques suggested by Larsen (1971) for log-normally distributed data or empirical techniques as summarized by Strom (1976) for point sources can be utilized to convert a concentration from one averaging time to another.

In this study, Method 1 was utilized to determine point source impacts for the annual, 24-hour, 8-hour, 3-hour, and 1-hour averaging times.

The long-term AAQS for TSP is expressed in terms of an annual geometric mean. The air dispersion models, however, calculate annual arithmetic mean concentrations. Therefore, a method of conversion from arithmetic mean to geometric mean concentration is necessary in order to compare estimates with air quality standards. Larsen (1971) has developed an equation which expresses the relationship for log-normally distributed data:

$$Mg = \frac{M_{aa}}{\exp\,(0.5\ \ln^2 S_g)} \qquad \text{Equation 2}$$

where: M_g = geometric mean

M_{aa} = arithmetic mean

S_g = standard geometric deviation

An analysis of many years of ambient TSP data indicates that the log-normal assumption is a good approximation for suspended particulates in suburban and rural areas. This analysis also shows that S_g values normally range from 1.0 to 2.0 for an annual period, with a typical value of 1.5. Inserting an S_g of 1.5 into Equation 2 results in a M_g/M_{aa} ratio of 0.92. This ratio is used to convert arithmetic mean TSP levels to geometric mean TSP levels, based upon the modeling results.

4.2 COMPUTER MODELS

Two EPA-approved computer models were used to estimate or predict the grond-level pollutant concentrations in this study. The Industrial Source Complex Model Long Term (ISCLT) was used to predict annual impacts, and the Industrial Source Complex Model Short Term (ISCST) was used for impact predictions for shorter averaging times.

In the ISCLT, sources within a 50-km radius were modeled. The impact area receptor grid for the model covered a 25-km area surrounding the OFC site, with receptors placed at a 0.1-km spacing.

In the ISCST, the receptors were spaced at 0.2-km radials beginning at the nearest properly line, 3.9 km from the site. The worst case meteorology was determined from this modeling. The ISCST model allows the user to input spacially distributed sources and was also used for receptor refinement (at a 0.1-km spacing) to resolve the maximum impact predictions. The short-term modeling case runs and meteorological periods are presented in Table 4-1.

4.3 METEOROLOGY

Meteorological data used in the ISC modeling were obtained from the West Palm Beach Airport for the years 1970 through 1974. Approximately 181 days of the meteorological data were used for each year to cover the operation of the sugar mill from October to April. The recorded data included wind direction, wind speed, stability class, mixing depth, and ambient temperature for each hour. The wind directions are randomized within a 10-degree sector by EPA's randomization scheme. In the ISCST, the model processed each hour of the data set to estimate hourly concentrations over the 5-year period. These concentrations were averaged over each applicable averaging period to provide the user with the desired concentrations.

The ISCLT utilized the data record as a joint frequency distribution of wind direction, wind speed, and atmospheric stability class over the 5-year period. This data format is provided by the National Climatic Center's (NCC) "Star" program. In addition, annual averaged values of temperature, pressure, and maximum afternoon mixing heights are utilized. These data are used in the ISCLT to estimate the spacial distribution of annual averaged concentrations of baseline and future ambient concentration levels.

4.4 EMISSIONS INVENTORY

The area within 50 km of the OFC site was inventoried for point sources or particulate and SO_2 emissions. The basis for this inventory was the Air Permit Inventory System (APIS).

Table 4-1. Short-Term Modeling Case Runs and Corresponding Meteorological Periods

OFC Maximum Impacts	Day/Year		
3-hr SO_2	23,2/1973		
24-hr SO_2	325/1973		
24-hr TSP	325/1973		
Maximum Interactions With:	**3-hr SO_2 Day/Year**	**24-hr SO_2 Day/Year**	**24-hr TSP Day/Year**
Atlantic Sugar	61,8/1970	50/1973	50/1973
U.S. Sugar Bryant	277,1/1970	50/1973	50/1973
Florida Refinery	15,8/1970	14/1971	14/1971
Gulf & Western	363,1/1973	62/1973	62/1973
Tallisman	331,7/1971	356/1971	363/1970
SCGC	87,2/1972	280/1972	280/1972

Source: ESE, 1981.

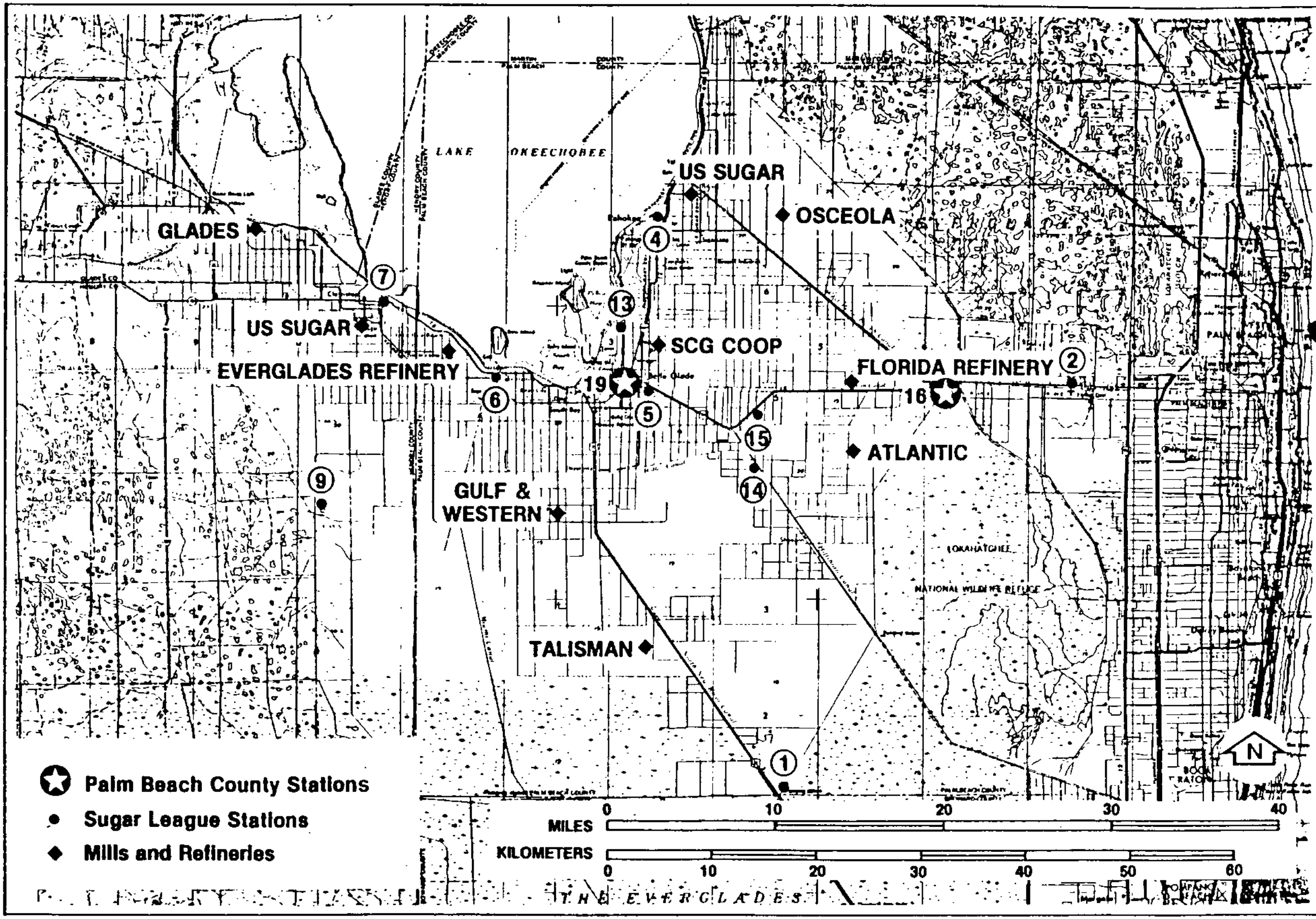
5.0 MONITORING DATA

The Clean Air Act Amendments of August 1977 require that the owner of any proposed major air pollution source conduct ambient air monitoring for applicable pollutants for a period of 1 year prior to submission of a construction permit application. The use of existing representative data may be permitted in lieu of monitoring, provided the data meet EPA PSD monitoring criteria. Assuming this application is complete before June 8, 1981, the monitoring provisions of the 1978 PSD regulations will apply. Under these regulations, monitoring was required only for criteria pollutants for which the source was major or a major modification. A major modification was defined as an increase in potential uncontrolled emissions from a new facility within the source of either 100 tons per year (28 listed source categories) or 250 tons per year. The plant is one of the 28 named categories on the basis of a combined boiler heat input rate of greater than 250 MMBtu/hr. As such, the proposed modification, under the 1978 PSD regulations would be subject to ambient monitoring data submission for SO_2, particulate matter, and NO_x.

5.1 TOTAL SUSPENDED PARTICULATE (TSP)

The Florida Sugar Cane League (FSCL) and Palm Beach County (PBC) maintain a network of hi-vol monitors in the sugar producing area of the state. The monitoring is conducted on a 6-day monitoring cycle using the EPA reference method (40 CFR Part 50 App. B). Figure 5-1 shows the location of these monitors, and four additional monitors considered appropriate for determination of a background concentration value. Table 5-1 summarizes the most recently available data from the monitors. No violations of the 150-ug/m^3 24-hour or 60-ug/m^3 annual geometric mean standards have been observed during 1980.

For each station, the concentration one (1) standard deviation above the geometric mean was calculated. For lognormally distributed data, 84 percent of the observed values are below this value. Correlation coefficients for a lognormal fit of the FSCL data are all above 0.990,



SOURCES: FLORIDA SUGAR CANE LEAGUE.
ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1981.

Figure 5-1 REGIONAL HI-VOL MONITORS

Table 5-1. Summary of 1980 Ambient TSP Monitoring Data (24-Hour Average, ug/m^3)

Station*	Number of Observations	Maximum	Second Maximum	Arithmetic Mean	Geometric Mean	Geometric Standard Deviation	Correlation Coefficient	84th Percentile†
SL-1	54	103	79	46	42	1.50	0.979	64
SL-2	57	78	68	30	27	1.55	0.989	42**
SL-4	60	110	89	54	50	1.42	0.983	72
SL-5	58	107	107	64	60	1.40	0.978	85
SL-6	60	115	100	43	39	1.56	0.995	61
SL-7	53	102	83	45	42	1.44	0.968	61
SL-9	56	49	44	24	23	1.45	0.992	32**
SL-13	57	106	92	36	32	1.66	0.969	53
SL-14	60	102	100	40	35	1.65	0.993	58
SL-15	51	105	90	47	43	1.51	0.990	65
PB-16	60	68	67	34	32	1.44	--††	46**
PB-19	61	110	96	59	57	1.34	--††	76

* SL = Sugar League Data
PB = Palm Beach County Data.

† $C_{.84} = M\ Sg^{(1-0.5 \text{ in } Sg)}$
$C_{.84}$ = 84th percentile concentration
M = arithmetic mean
Sg = geometric standard deviation (Larson, 1971).

** Background station.

†† Not available from annual report.

Source: ESE, 1981.

indicating a very close approximation of the lognormal distribution (correlations not available for PBC stations). Stations 1, 2, 9 and PB16 are greater than 10 km from any point source and yet affected by the same meteorology as the proposed source. As such, they are considered regional monitors, and a statistical analysis of their data was performed to establish a background concentration.

Construction on Highway U.S. 27 near Station 1 began in January 1980 and clearly influenced results at that station during that year. The average 84th-percentile value among the remaining three stations was 40 ug/m^3, which was taken to be an appropriate short-term background concentration. The probability of the 84th-percentile or higher concentration occurring in combination with meteorological conditions causing highest, second-highest 24-hour point source impacts is less than once in 15 years. The highest geometric mean of the three background stations is 32 ug/m^3 and was used as the annual background TSP level in the computer modeling study.

5.2 SULFUR DIOXIDE (SO_2)

The only continuous SO_2 monitoring data available were obtained with a Beckman 906A analyzer n combination with selective scrubbers. During 1976 and the first three quarters of 1977, the monitor was located in downtown Belle Glade. The highest 1-hour reading during this period was 257 ug/m^3.

In November 1977, the monitor was moved to the IFAS Agricultural Research and Education center outside Belle Glade. The data recorded at that location are summarized in Table 5-2. The highest values recorded were 210 ug/m^3 (3-hour), 115 ug/m^3 (24-hour), and 18 ug/m^3 (annual). Monitoring for SO_2 was discontinued in June 1979 because of consistently low readings during the previous 4 years.

The Palm Beach County Health Department operated a continuous SO_2 monitor at the Belle Glade Water Treatment Plant until May 1978. The highest 3-hour and 24-hour averages recorded in 1977 were 76 ug/m^3

Table 5-2. Summary of Sulfur Dioxide Monitoring Data, 1978 to 1979, Florida Sugar Cane League

Year	Quarter	Number of Observations	Highest 3-Hour (ug/m^3)	Highest 24-Hour (ug/m^3)	Arithmetic Average (ug/m^3)
1978	1	--	210	115	34
	2	--	47	24	8
	3	1,788	123	55	26
	4	1,762	52	31	13
	Annual	--	--	--	18
1979	1	1,900	52	26	9
	2	1,893	66	45	5
	Year to date	--	--	--	8

Note: Monitor is located at the IFAS Agricultural Research and Educational Center outside the city of Belle Glade.

Source: Florida Sugar Cane League, 1981.

and 42 ug/m^3, respectively. The highest 3-hour and 24-hour averages recorded in 1978 before the monitor was discontinued were 113 ug/m^3 and 50 ug/m^3, respectively.

A background concentration of 20 ug/m^3 was assumed for modeling purposes (EPA, 1978a).

5.3 NITROGEN OXIDES (NO_x)

NO_x monitoring data is not available for the OFC area. On the basis that the OFC plant is a remote source and does not pose a threat to the NO_2 AAQS (see Section 6.1.3), a background level of 20 ug/m^3 was assumed (EPA 79).

Table 6-1. Maximum Predicted Ground-Level Concentrations (ug/m³)

Pollutant	Averaging Time	Highest, Second-Highest Concentration (ug/m³) Without Background	Background Concentration**	With Background	State of Florida Standard
Sulfur Dioxide	3-Hour	337.4	20	357.4	1,300*
	24-Hour	110.6 90	20	130.6	260*
	184-Day	~~53~~ 33	20	~~73~~ 53	
Particulate Matter	24-Hour	39.4	40	79.4	150*
	184-Day	15		47	75
Nitrogen Dioxide	184-Day	9	20	29	100

* Can be exceeded once per year.
† Calculated from the 181-day arithmetic mean and geometric standard deviation obtained from ambient monitoring.
** Based upon highest recorded concentrations from ambient monitoring.

Source: ESE, 1981.

6.2 PSD INCREMENTS

Because of the difference in baseline dates as well as the basis of emissions (see Section 3) the PSD increment consumption analysis was different for Florida DER review than for EPA review. As such, increment consumption for EPA will be discussed independent of Florida DER.

6.2.1 EPA Increment Consumption

The EPA baseline date is August 7, 1977, and considers actual emissions over the 2-year period prior to that date for baseline modeling. The predicted maximum short-term increment consumption of the proposed action for OFC is based upon the greatest difference, on a receptor-by-receptor basis, between the baseline ISCST modeling results and the ISCST modeling results representing the proposed condition. The maximum predicted increment consumptions are presented in Table 6-3 as well as the maximum allowable increment consumption for comparison. This comparison shows that predicted ground-level concentrations from the action proposed will not exceed the allowable increments.

The worst case impacts on Air Quality of OFC far exceeded the concentrations for interaction executions in the vicinity. Therefore, increment consumption from interaction with U.S. Sugar and Atlantic was not considered.

6.2.2 Florida DER Increment Consumption

The Florida DER baseline date, which considers maximum allowable emissions, is 1974. The predicted maximum short-term increment consumption of the proposed action is based upon the maximum difference between the baseline modeling results and the projected conditions, again on a receptor-by-receptor basis. The maximum predicted short-term increment consumptions are presented in Table 6-3, along with the maximum allowable increments for comparison. As with the EPA analysis, this comparison shows that there is no danger of exceeding the allowable increments.

6.3 NONATTAINMENT AND CLASS I AREAS

The action proposed by OFC should not significantly impact any Class I or nonattainment areas. The nearest Class I area is located approximately 103 km from the OFC site (Everglades National Park), and the nearest nonattainment area (excluding ozone) is over 100 km away (Hillsborough County).

6.4 DOWNWASH

Modifications to the dispersion coefficients in the Gaussian plume dispersion model can account for the enhanced dispersion in the lee of nearby buildings. The Gaussian equation and a definition of the variables follow.

Equation 3:

$$X(x,y,z,H) = \frac{Q}{2\pi\sigma_y\sigma_z u} \exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right]\left\{\exp\left[-\frac{1}{2}\left(\frac{z+H}{\sigma_z}\right)^2\right] + \exp\left[-\frac{1}{2}\left(\frac{z-H}{\sigma_z}\right)^2\right]\right\}$$

Table 6-3. Summary of PSD Increment Consumption Results

Pollutant	Maximum Increment Consumption (ug/m³)					
	EPA			DER		
	3-hr	24-hr	Annual*	3-hr	24-hr	Annual*
Sulfur Dioxide						
OFC, Maximum Increment Consumption	86	34	13	161	54	17
Allowable Increment	512	91	20	512	91	20
Particulate						
OFC, Maximum Increment Consumption	—	10	3	—	<0	<0
Allowable Increment	—	37	19	—	37	19

* Actually 181-day average

Source: ESE, 1981.

where: x = Concentration in grams/meters^3 (g/m^3)

Q = Source strength in g/s

u = Average wind speed in m/s

σ_y, σ_z = Diffusion coefficients in y and z direction in meters

H = Effective height of source emission in meters

Huber (1979) presented modifications to the dispersion coefficients for downwind distances greater than 10 times the height of the influencing building. These coefficients are:

$$\sigma_y' = \sigma_y (x + Sy) \quad \text{and} \quad \sigma_z' = \sigma_z (x + Sz)$$

where: x is the downwind distance,

Sy is the virtual source distance such that σ_y' (10 Hw) = 0.7 Hw/2 + 0.5 Hb,

Sz is the virtual source distance such that σ_z' (10 Hb) = 1.2 Hb,

Hw is the building height, and

Hb is the building width normal to wind.

Under EPA's definition of ambient air, the impact from the proposed boiler is required to be evaluated at the nearest area of reasonable public access. The closest such area is approximately 3.9 km from the stack.

This downwind distance to the OFC property line and a "D" stability class were used in conjunction with Figures 4-4 and 4-5 of the EPA guidance document (EPA, 1977) to obtain σ_y and σ_z values. The "width" of the influential building, as previously discussed, is 97 feet, 9 inches (29.8 m) and the height of that building is 93 feet 10 inches (28.6 m). The virtual source distances were then calculated to be 44 m and 0, respectively. This gives modified dispersion coefficients of 250 m and 77 m for σ_y and σ_z, respectively.

Both the wind speed and effective stack height parameters must also be estimated. The 5-year West Palm Beach meteorological data was consulted, and two wind speeds were selected. The higher speed of 18.4 mph was selected as approximately the 85th percentile speed. A speed of 5.7 mph was selected as representing the lower speed producing downwash conditions. Effective stack heights were calculated using the procedures of EPA (1977).

The Gaussian equation calculates concentrations based on a 1-hour averaging time. The EPA recommends multiplication factors of 0.9($\pm$0.1), 0.7($\pm$0.2), and 0.4($\pm$0.2) for 3-hour, 8-hour, and 24-hour averaging times, respectively (EPA, 1977). To represent worst-case conditions, the upper limits of the factors were used.

The variables discussed above and the maximum allowable emission rates listed in Table 2-2 were used as input into the modified Gaussian equation. Maximum ground-level concentrations due to worst-case aerodynamic effects of the nearby structure were calculated. The resulting values were then adjusted by the appropriate multiplication factors, and a 3-hour maximum SO_2 concentration of 132.2 ug/m^3 was calculated for the plant. The maximum 24-hour SO_2 concentration was calculated as 79.32 ug/m^3. These concentrations represent emissions from all 5 boilers and the lower wind speed and are below the applicable AAQS. As such, the proposed stack height should be sufficient to ensure that emissions from the proposed facility do not result in excessive ground-level concentrations as a result of aerodynamic effects of nearby structures.

7.0 ADDITIONAL IMPACTS ANALYSIS

7.1 IMPACTS ON SOILS AND VEGETATION

Impacts on soils and vegetation due to operation of the proposed sources are expected to be minor. The projected highest, second-highest 3-hour SO_2 concentration of 336 ug/m^3 and crop season average concentration of 25 ug/m^3 (see Table 2-5) are below levels generally reported as damaging to most plant species. As an example of such damage levels, European studies have found one-half-hour levels of 3,406 ug/m^3 and long-term means of 393 ug/m^3 to approximate threshold levels for several species (Heck and Brandt, 1977). Alfalfa, which is commonly thought to be one of the most SO_2-sensitive species, has a 2-hour threshold level of at least 2,620 ug/m^3 and an 8-hour threshold of 655 ug/m^3 (Heck and Brandt, 1977). No data are available on the sensitivity of sugar cane to SO_2 concentrations. No evidence of damage to the cane surrounding the ASA mill has been observed to date. The proposed modification will result in reduced concentration impacts on surrounding vegetation. No discernible impacts are predicted from this source.

Particulate matter is generally considered to have a relatively unimportant effect on vegetation (Jacobson and Hill, 1970). The particulate matter generated by this source is largely ash from the burning of the same vegetation which would be impacted. Emitted particulate will be mostly suspended and will deposit on vegetation primarily through plume impaction.

Plant species classified as "sensitive" to NO_2, such as pinto bean, cucumber, lettuce, and tomato, displayed injury when exposed to NO_2 levels of 3,760 to 4,960 ug/m^3 for a 2-hour period. Extremely resistant species, such as heath, were unaffected by an exposure of 1,900,000 ug/m^3 for 1 hour. Blue grass, orange tree plants, and rye are all classified as "intermediate" in resistance to NO_2 injury. According to Jacobson, et al., (1970), NO_x concentration is more important to plant injury than the duration of exposure. Because of the low levels of NO_2 predicted to result from the proposed modification (less than 10 ug/m^3, estimated annual average), no effect on plants or soils is expected.

Effects of SO_2, NO_2, and particulate matter emissions on soils are are expected to be negligible. According to the Florida Sulfur Oxides Study, Inc., (1978) acid rain effects in the area are generally unknown, due to a lack of data for the region. The potential for long-range pollutant transport or significant acid rain effects from the proposed source is considered to be very low.

7.2 VISIBILITY IMPACTS

A Level I visibility screening analysis (EPA, 1980) was conducted which confirmed that no visibility impairment should occur in the Class I area. The absolute values of the three Level I contrast parameters (C1--plume contrast against the sky; C2--plume contrast against terrain; and C3--change in the sky/terrain contrast caused by primary and secondary aerosol) are well below 0.10. Thus, it is highly unlikely that the emissions source would cause adverse visibility impairment in Class I areas.

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DISTRAL S. A.

BOGOTA - COLOMBIA

Nuestra Referencia
ET-80-104

Issued : Sept. 25, 1980

PROPOSAL - CONTRACT

TO : OSCEOLA FARMS CO.

(Hereinafter Called the Purchaser)

FLORIDA. U.S.A.

DISTRAL, S.A. proposes to furnish to the Purchaser the equipment listed below, upon the terms and conditions and in accordance with the sepcifications hereinafter set forth.

General arrangement, principal dimensions and design of the steam generator will be as shown on the proposal drawing identified on the Summary Performance Sheet herein. The principal features of the equipment are stated in general terms throughout the proposal and the specific details not fully described will conform to the Combustion Engineering and DISTRAL'S standards.

One (1) unit(s), two (2) drum(s) Top supported steam generating unit(s) type, designed and built under Combustion Engineering (U.S.A.) technical assistance and with the following main characteristics. (Description and characteristics are given for each unit).

Superheated Steam Generation	150000	lb/hr
Saturated Steam Generation		lb/hr
Superheated Steam Pressure	250	psig
Superheated Steam Temperature	500	°F
Feedwater Temperature	210	°F

Rev. 4 Nov. 21, 1980

DISTRAL, S.A.

ET-80-104

Designed for outdoor service balance draft and fired by bagasse as main fuel and fuel oil No. 6 as alternative fuel.

Auxiliary equipment and instruments shall be for indoor service, except where noted.

Heating surfaces and main furnace dimensions are shown on page 4 of this proposal.

ANNEX : List of Approved Manufacturers.

Rev. 1. Oct. 24. 1980 Rev. 4 Nov. 21, 1980

Rev. 2. Nov. 7. 1980 Rev. 5 Dic. 3, 1980

Rev. 6 Jan. 9 1981

STEAM GENERATING UNIT PERFORMANCE GUARANTEE

GUARANTEES

Subject to the conditions herein specified under Steam Generating Unit Performance Conditions and the Summary Performance Sheet, DISTRAL, S.A. makes the following guarantees :

PEAK LOAD CAPACITY

At a capacity not exceeding 165000 lb.steam per hour, when firing bagasse and with Feedwater entering unit at 210 °F, the unit can be operated for one (1) hour within any twenty four (24) hours period.

PERFORMANCE AT NORMAL CAPACITY

At a capacity of 150000 lb. steam per hour when firing Bagasse as specified in the Summary Performance Sheet : No. 2 and with Feedwater entering unit at 210 °F

1) The overall efficiency of the unit will not be less than 61.05 % on H.H.V. basis.

2) The average temperature of the steam leaving the superheater will be 500 °F plus or minus 10 °F, at 150000 lb. steam per hour.

3) The average steam pressure loss between the steam drum and S.H. header will not exceed 40 Psi.

~~The [illegible] forced draft fan outlet [illegible] inlet will [illegible] 2 [illegible]~~

4) The average total solids in the steam leaving the boiler steam drum will not exceed 1 ppm

Rev. 1 Oct. 24, 1980
Rev. 3 Nov. 13, 1980
Rev. 4 Nov. 21, 1980

1. DESIGN STANDARS.

The design materials and workmanship of all pressure parts shall be made following the latest edition of the ASME Code, ICONTEC norms and Distral's Standards. Inspection if required will be performed by The Hartford Steam Boiler Inspection and Insurance Co. Under Whose Inspection the pressure parts shall be constructed.

WORKING PRESSURE.

The steam generating unit hereinafter described shall be constructed for a maximun drum design pressure of 325 Lbs. per square inch.

2. FIELD HYDROSTATIC

Before being enclosed in the setting, all pressure parts shall be field tested and made tight under a water pressure 50% greater than the above named working pressure. The Purchaser shall make such provisions as are necessary to deliver the water into the boiler and drain it from blow off openings after test is completed: The Purchaser shall further notify his insurance company's inspector of the readiness for the field hydrostatic test, and shall request the inspector to witness this test. DISTRAL'S responsability in connection with the field hydrostatic test is limited to the demostration of the tightness of the equipment furnished under the above mentioned test pressure, provided DISTRAL erects the equipment. If DISTRAL does not erect the equipment DISTRAL shall have no responsibility in connection with the field hidrostatic test, except in so far as the materials furnished by DISTRAL is concerned.

3. MANUFACTURERS DATA REPORTS AND CERTIFICATE OF INSPECTION.

DISTRAL, shall furnish two copies of the standard Manufacturers Data Report covering the fabrication of all pressure parts in the DISTRAL shop. Following inspection during fabrication in the DISTRAL shop of all pressure parts by an Inspector of The Hartford Steam Boiler Inspection and Insurance Co. DISTRAL shall furnish two copies of the Certificate of Inspection. The Manufacturers Data Report and Certificate of Shop Inspection will certify that all pressure parts of the unit have been constructed in strict accordance with the latest rules of the A.S.M.E. Steam Boiler Construction Code, and that the inspections made by the representative of the Hartford Steam Boiler Inspection and Insurance Co. disclose the material and workmanship of all pressure parts are in accordance with the approved practices of boiler fabrication and in accordance with A.S.M.E., Code requirements.

4. All heating surfaces listed herein are approximate and subject to change following a detailed design check after contract award.

HEATING SURFACE

Each unit will include the following nominal heating surfaces :

Convection boiler surface		17243	sq ft
Water walls in furnace	(Projected)	2702	sq ft
Superheater		525	sq ft
Economizer		-	sq ft
Air heater		24870	sq ft
Total furnace volume		11604	cu ft
Total furnace surface	(E.R.H.S.)	2848	sq ft
Furnace depth	(6099 mm)	20.01'	
Furnace width	(4900 mm)	16.08'	

Boiler and water wall heating surface consists of all on the heat-transfer apparatus in contact internally with the water or wet steam being heated and externally with gas or refractory being cooled, in which the fluid being heated forms part of the circulating system. This surface is measured on the side receiving heat.

Water wall heating surface in the furnace, is measured as projected area.

All other boiler surfaces, including screen tubes, are measured on that portion of the circumferential and the extended metallic surface receiving heat. Surface is not included in more than one category.

Superheater surface consists of all of the heat-transfer apparatus in contact internally with steam being heated and externally with gas or refractory being cooled. This surface is measured on the side receiving heat.

Net heat release factor is the heat fired per sq ft of heat absorbing surface in the furnace.

Furnace surface is the projected area of tubes and extended metallic surfaces on the furnace side including walls, floor, roof, partition walls, and platen and the area of the plane of the furnace exit which is defined as the entranc to the convection tube bank.

1. BOILER

DISTRAL, S.A. shall furnish for the unit one (1) Boiler of 16397 sq. ft. heating surface, as shown on the proposal drawing.

2. BOILER DRUMS

Boiler drums shall be fusion welded to meet the requirements and under the inspection of The Hartford Steam Boiler Inspec-

tion and Insurance Co. strictly in accordance with the A.S.M.E. Code, Class I Specification for fired pressure vessels, including stress relieving and X-Raying of welded seams. Drums shall be manufactured of 70,000 lb. tensible strength steel. Drums shall be equipped with One (1) 12" x 16" manhole with hinged cover (in each head).

3. DRUM SIZES

Drum diameters, thicknesses and lengths shall be approximately as stated below :

	Inside Diameter in	Wall Thickness in	Approximate Overall Length
Steam Drum	60"	1-1/8"	20'-0"
Mud Drum	42	7/8"	20'-0"

4. Nozzles

Description	Location	No. & Size Opening		Type
Steam Outlet	(XXXXXXXXXXX) (Superheater)	One (1)	12"	FLG
Safety Valve	Steam Drum	Two (2)	4"	FLG
Feed Inlet	Steam Drum	One (1)	4"	FLG
Blow-off	Mud Drum	Two (2)	1-1/2"	FLG
Water Column	Steam Drum	Four (4)	1-1/2"	S.W.
Soot Blower	Steam Drum	One (1)	2"	S.W.
Feed Water Regulator	Steam Drum	Two (2)	1"	S.W.
Cont. Blow Down	Steam Drum	One (1)	1"	S.W.
Boiler Vent	Steam Drum	One (1)	1"	S.W.
Chemical Feed	Steam Drum	One (1)	1"	S.W.
Steam Sampling	Steam Drum	One (1)	3/8"	S.W.
Atomizing Steam	Steam Drum	One (1)	1-1/2"	S.W.
Remote Level Indicator	Steam Drum	Two (2)	1"	S.W.
Steam Gauge	Steam Drum	One (1)	1/2"	S.W.
Superheater Steam Gage	S.O.H.	One (1)	1/2"	S.W.
Superheater Safety Valve	S.O.H.	One (1)	3"	FLG
Superheater vent	S.O.H.	One (1)	1"	S.W.
Superheater drain		One (1)	1-1/2"	S.W.

TUBES

1. Boiler Bank Tubes shall be electric resistance welded. 2" O.D. tubes shall be spaced on 4.53"x3.94" centers. Material SA-178 Gr a. Wall thickness = 0.105"

2. Tubes in the rear water wall shall be arranged to form a slag-screen with tubes spaced on 7.874" centers.

3. Tube ends shall enter the drums radially, with full parallel bearing thru the drum plate.

4. Tube holes shall be grooved and counterbored in accordance with DISTRAL'S Standard practice.

DRUM HANGERS OR SADDLES

5. The Company shall furnish Hangers as required to support boiler from supporting steel. Method of support shall be designed to permit free expansion of the unit under service without placing undue stresses on any part of the unit or structural steel.

INTERNAL PIPING

6. The Company shall furnish internal feed, chemical feed distributing and blow off piping.

Rev. 3. Nov. 13, 1980
Rev. 4. Nov. 21, 1980

STEAM PURIFYING APPARATUS

The Company shall furnish and install in the steam release drum of the boiler a Steam Purifying System.

STEAM PURITY GUARANTEE

The Company guarantees the purity of steam leaving the steam purifying system to be such that the total entrained solids shall not exceed 1 ppm based on water conditions stated below.

BOILER WATER AND FEED WATER CONDITIONS

The following conditions shall be established during testing for acceptance of guaranteed steam purity :

a) Boiler water concentrations shall not exceed the values stated below for the corresponding drum operating pressures :

Maximum Boiler Water Concentration ppm	Total Alkalinity ppm	Suspended Solids ppm	Boiler Drum Operating Pressure Psig
3500	700	300	0 - 300
3000	600	250	301 - 450
2500	500	150	451 - 600
2000	400	100	601 - 750
1500	300	60	751 - 900
1250	250	40	901 -1000

b) The total quantity of oil or grease or substances which are extractable either by sulphuric ether or by chloroform shall not exceed 7 ppm in the boiler water when the sample being tested is acidified to 1% hydrochloric acid, or 7 ppm in the feed water when the sample being tested is first concentrated at low temperature and pressure to the same ppm total solids as the boiler water. The Company shall not be responsible for carryover resulting from the presence of oil, grease or other foam inducing materials.

c) Boiler water samples for testing shall be taken from the continuous blowdown and shall be cooled to prevent flashing. Sampling and determination of boiler water conditions shall be under methods contained in ASTM Special Technical Publication No. 148.

d) Water conditions specified above are not intended to be the Company's recommendations for correct boiler water conditions to be maintained. The boiler contractor is not sufficiently familiar with the nature of water available for boiler feed and water treatment is beyond the control of the Company. Therefore the Company shall not be held responsible for damages caused by intercrystalline cracking (caustic embrittlement), corrosion, scale or other deposits on the internal surfaces of the steam generating equipment.

TEST PROCEDURE FOR TOTAL SOLIDS IN STEAM

The total solids in the steam may be determined by gravimetric or conductivity procedures. If the conductivity method is used the sample shall be treated to separate the readily removable non-condensible gases, and the total solids as indicated by this test shall be corrected to compensate for any ammonia and other non-condensible gases which remain in the de-gassed sample. Should the total solids in the condensed steam be determined by the gravimetric procedure, the method employed shall be that which is specified in the latest edition of Standard Methods of Water Analysis, published jointly by the American Water Works Association and The American Public Health Association, or other approved method. For the purpose of measuring performance, total solids in the steam shall be determined by testing no less than ten samples of condensed steam and taking the average of all results.

FURNACE

The furnace shall be of the welded wall construction. XXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Tubes will be secured to headers by welding and riser tubes to drums by rolling . Tubes shall be electric resistance welded

DISTRAL, S.A. shall furnish all required material properly designed for ample circulation.

Thickness of tubes, headers, risers, feeders and downcomers shall be as required by the ASME Boiler Code

DESIGN DATA

Wall	Tube O.D.	Tube Spacing	Material
Lateral	3 x 0.150"	3.937" (100 mm)	SA-178 Gr A
Front, Rear roof	3 x 0.150"	3.937" (100 mm)	SA-178 Gr A

Headers

Each header shall be supplied with required hand holes to be closed with hand hole covers and Flexitallic or similar gaskets. XXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.

SUPERHEATER SPECIFICATIONS

CONSTRUCTION — Superheater elements, headers, connections and spacers will be of suitable material and thickness for the pressure and temperature encountered and in accordance with the ASME Boiler Code. Elements shall be welded to headers.

DISTRAL, S.A. shall furnish superheater elements and headers, complete with required steam connections to drum, element spacers, immediately adjacent supports or hangers, and thermometer or thermocouple well at superheater outlet, thermowells before and after attemperator if supplied, and differential gage.

Superheater outlet connection outside of setting.

Superheater heating surface is stated on Heating Surface Sheet herein.,

DESIGN DATA

No. of Sections Wide	30			
No. of Rows Deep	4			
Tubes : Number	30			
Diameter	1-3/4"×0.150"			
Material	SA-192			
Tube Spacing :				
Transverse :	5.91"			
Front to Back :	6.00			
Inlet Headers				
Number :				
Diameter				
Material				
Number				
Diameter				
Material				
Location				
Outlet Headers :				
Number	One (1)			
Diameter	12-3/4"			
Material	SA-106 Gr B			
Outlet Connections :				
Number	One (1)			
Diameter	12-3/4"			
Material	SA-181			
Location	S.H.O.H.			

AIR HEATER

The Company shall furnish for the steam generating unit one (1) Tubular Air Heater of 24870 effective heating surface. Air heater shall have 1 gass passes and 2 air passes.

AIR HEATER TUBES

Air heater tubes shall be welded, 2-1/2" O.D. x 0.095" thick.

A 513 MT 1010

Combustion gases shall pass thru the inside of the tubes and air to be heated shall be in contact with the outside of the tubes. Gas and air shall be in counterflow. Air shall enter at cold end of air heater thru a plenum chamber to obtain immediate and uniform distribution of air over air heater surface.

TUBE SHEETS

Air heater tubes shall be straight and expanded into upper and lower tube sheets not less than 1 thick.

CASING

Air heater shall be completely encased in an air-tight steel casing, constructed of flanged No. 10 gauge steel panels. Panel joints shall be made air tight by seal welding to insure air and gas tightness under operating conditions. Air heater casing shall be heavily reinforced to prevent pulsation and distortion under the pressure differences occurring.

AIR AND GAS INLET AND OUTLET

Air and gas inlet and outlet openings shall be equipped with flanges for connecti of air and gas ducts.

The entire air heater structure shall be so designed as to permit free expansion of the air heater elements under service without placing strains on any part of the unit.

VALVES AND FITTINGS

DISTRAL , S.A. shall furnish for each unit the following set of valves and fittings brands and diameters can be changed after final design.

SAFETY VALVES.

QTY	SIZE IN.	MAKE	TYPE	SET PRESS. PSIG.	LOCATION
One (1)	4"	Consolidated	1811 PA	325	Steam Drum
One (1)	4"	Consolidated	1811 NA	335	Steam Drum
One (1)	3"	Consolidated	1811 MA	275	Superheater

FEEDWATER VALVES

QTY	SERVICE	MAKE		ENDS	SIZE	PRESS. RATING PSIG
One (1)	Feed Stop	Edward	318	FLG	4"	300
One (1)	Feed Check ~~Feed Stop Check~~	Powell	3061 A	FLG	4"	300
Two (2)	F.W. Gate By-Pass	Powell	3003 FE	FLG	4"	300
One (1)	F.W. Globe By-Pass	Edward	318	FLG	4"	300

BLOW OFF AND DRAIN VALVES

QTY	LOCATION	MAKE		ENDS	SIZE	PRESS RATING P
Two (2)	Sets Mud Drum	Edward	1441-1443	FLG	1-1/2"	300
Four (4)	Sets W. W. Headers	Edward	1441-1443	FLG	1-1/2"	300
One (1)	Superheater	Edward	848 Y	S.W.	1-1/2"	600
One (1)	Soot Blowers Line	Edward	848 Y	S.W.	3/4"	600
Four (4)	Water Colums	Edward	848 Y	S.W.	3/4"	600
Four (4)	Water Gauges	Edward	848 Y	S.W.	3/8"	600

Water wall blow-off valves are distributed as follows.
Lower Front Water Wall Header. Qty. One (1)
Lower Rear Water Wall Header. Qty. One (1)
Side Water Wall Header. Qty. One (1) on each

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OTHER VALVES AND FITTINGS

QTY	SERVICE	MAKE		SIZE	ENDS	PRESSURE RATING PSIG
One (1)	Non Return	Edward	302	12"	FLG.	300
One (1)	Chem. Feed Stop	Edward	3624	1/2"	S.W.	1500
One (1)	Chem. Feed Check	Edward	3674	1/2"	S.W.	1500
One (1)	Drum Vent	Edward	848 Y	1"	S.W.	600
One (1)	Cont. Blow. Down	Hancock	5525 W	1"	S.W.	600
One (1)	S.B. Shut-off	Edward	849 Y	2"	S.W.	600
One (1)	S.B. at Drum	Edward	849 Y	2"	S.W.	600
One (1)	Steam Sampl.	Edward	848 Y	3/8"	S.W.	600
One (1)	S.H. Vent	Edward	848 Y	1"	S.W.	600
One (1)	Drum gage S.O.	Edward	848 Y	1/2"	S.W.	600
One (1)	S.H. gage S.O.	Edward	848 Y	1/2"	S.W.	600
One (1)	Atomizing S.O.	Edward	848 Y	1-1/2"	S.W.	600
Two (2)	F.W. reg. S.O.	Edward	848 Y	1"	S.W.	600
Two (2)	Remote level S.O.	Edward	848 Y	1"	S.W.	600

One (1) Steam Gage Ashcroft 8-1/2" Ø Dial (0-500 psi) S.D.
One (1) Steam Gage Ashcroft 8-1/2" Ø Dial (0-500 psi) S.H.
~~Steam Gage~~

WATER COLUMN AND ACCESSORIES

DISTRAL shall furnish two (2) water columns each composed of:

One	(1)	Water Column Reliance W-350
One	(1)	Sets 3/4" water gage valves Reliance 404 RS
Three	(3)	Gage cocks Reliance 451
30 Ft Chain for cocks		
One	(1)	Simpliport ported Bi-Color P-3005

REMOTE LEVEL AND ALARMS

One (1) Remote level Reliance EYE-HYE E-351
One (1) EA-17 levalarm located in one water column

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SOOT BLOWERS

DISTRAL, S.A. shall furnish for each unit the Soot Blowing equipment as described below :

1. Equipment as fabricated by any manufacturer named in "List of Approved Manufacturers".
2. Steam for Soot Blowing shall be taken from the steam drum at 290 Psig.and 419 °F approximately
3. Soot Blower Descriptive data :

No.	TYPE	MODEL	LENGTH OR LENGTH OF TRAVE	LOCATION
One (1)	Retractable	Electric	16'-0"	Superheater
Three (3)	Rotary	Manual	16'-0"	Main Bank
One (1)	Retractable	Electric	16'-0"	Air heater

Long Retractable soot blowers shall be complete with electric motor

Rotaries soot blowers shall be complete with chain for manual operation.

Air heater cleaners shall be complete with electric motor.

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FUEL FIRING EQUIPMENT

GRATES

A. TRAVELING GRATE

DISTRAL, S.A. traveling grates are designed and built to efficiently burn a wide variety of coals as well as other low heating value fuels like sub-bituminous coals, lignite, bagasse, wood and cellulose type refuse fuels.

Each grate is provided complete with grate surface elements, drive, drive shaft and idler shaft with adjustable bearing, necessary chains and sprockets independent undergrate zoning with dampers and support steel frame.

The grate driver is of the Hydraulic type with oil and dust tight housing and equipped with flow control valve for grate speed regulation.

Grate Arrangement Rear discharge [X] Front discharge [ ]
Single unit [X] Twin unit [ ]
Total grate width 15'-0"
Length between shafts 24
Effective grate area 337.5 sq.ft.

B. DUMPING GRATE VOID

DISTRAL, S.A. Dumping grates are provided complete with grate surface elements, supports, dumping mechanisms and in sections across the furnace width.

Operating media : Steam [ ] Air [ ]
Number of sections wide ______
Dumping mechanisms per section ______
Grate width ______
Grate length ______
Effective grate area ______

C. WATER COOLED GRATE F [ ] VOID NF [ ]

DISTRAL, S.A. Water cooled grates are supplied complete with grate surface elements and support elements to furnace floor tubes if required.

Grate width ______
Grate length ______
Effective grate area ______

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D. OTHER GRATES N.A.

GENERAL NOTE :

The Stoker or grate supplied by DISTRAL, S.A. is to rest on foundations or steel structure provided by the purchaser at stoker or grate base line elevation.

FUEL FIRING EQUIPMENT
FEEDERS

A.- FOR REFUSE FUEL (BAGASSE, WOOD, ETC)

1.- FEEDERS

Four (4) feeders including housing, observation doors, drive and idle shafts, conveying chain and sprocket wheel.

2.- FEEDER DRIVE

Each feeder is driven by one (1) Reliance Electric Co. Reeves Varispeed Pulleys or equivalent motor including starter.

3.- CONNECTING CHUTE(S)

Four (4) Chutes of hot rolled carbon steel plate, 3/16" thickness, Chutes connect each refuse fuel feeder with the corresponding pneumatic distribuitor.

4.- PNEUMATIC DISTRIBUITOR

Four (4) Pneumatic distribuitors including adjustable distribuitor tong observation door, housing and air connection.

5.- PNEUMATIC DISTRIBUITOR

The air for the pneumatic distribuitor is taken from the following fan(s). Characteristics are given for each fan. Fan by any named in List of Approv Manufacturers.

Quantity	One (1)			
Fan Capacity	10314/420 LB/Hr/°F		Design	2300 PA SISW
Total Static Pressure	27.14	in Wg.	Size	2600
Elevation	100	FT	Arrangement	8
SISW [X] DIDW [ ]			WK^2	39 LB.FT^2

6.- PNEUMATIC DISTRIBUITOR FAN DRIVE

Fan drive is single [X] Dual [ ]

a.- ELECTRIC MOTOR DRIVE

Each fan is driven by a electric ~~or equivalent~~ squirrel cage inductic motor 40 HP, 3600 RPM, 460 V, 3 PH, Std. protection, 1.15 service fa The starter is supplied by others.

b.- TURBINE DRIVE N.A.

Each fan is driven by a Terry or equivalent steam turbine with steam at PSIG, °F and exhaust pressure of PSIG. Turbine is direct coupled [ ] reduction gear coupled [ ]

7.- PNEUMATIC DISTRIBUITOR AIR DUCTS

This duct system is for interconnecting the pneumatic distribuitor fan(s) to the pneumatic distrubuitor assemblies at boiler furnace. Aire shall be taken from Air Heater Air exit duct.

8.- FLOATING CONTROL FEED ATTACHMENT

For attachment of automatic feed control to a single point a disconnect device is provided for each feeder.

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B.- FOR COAL VOID

1.- FEEDER

Spreader stoker feeders with adjustable distribuitor blades, adjustable gates, dust tight gear case and lubricating mechanism and water cooled housing and bearing.

2.- FEEDER DRIVE VOID

Feeder drive is single [ ] Dual [ ]

a.- ELECTRIC DRIVE VOID

Each fan is driven by a Reliance Electric Co. Reeves Varispeed Pulleys or equivalent motor including starter

b.- TURBINE DRIVE VOID

Each feeder is driven by a Terry or equivalent steam turbine with steam at PSIG, °F and exhaust pressure of PSIG.

FUEL FIRING EQUIPMENT AUXILIARIES

A.- FRONT PLATE

Width and height as required by the design.

B.- OVERFIRE AIR SYSTEM

This system includes all necessary ducts and boiler furnace nozzles to take the overfire air into the furnace. Air shall be taken from the air heater air exit ducts.

C.- CINDER RETURN SYSTEM DO NOT APPLY

The cinder return system is complete with pick-up and reinjection nozzles air ducts and air-cinder conveying piping. The cinder is reinjected from the following points :

Boiler bank hoppers ☐

________________ ☐

E.- COAL BUNKERS : VOID

F.- GENERAL NOTES :

1.- Unless otherwise stated the pneumatic distribuitor system, the overfire air system including basic assemblies, air ducts and fans and cinder return air ducts and fans are designed for a maximum air temperature of 100 °F and an air velocity of 2500 f.p.m. Air ducts are of hot rolled carbon steel plate 3/16" thickness.

None of the Air ducts of fans supplied are insulated and they are only shop primed.

If hot air is required for any of these systems the design will be changed accordingly and for air temperatures over 150 °F the fans and air ducts will be insulated with mineral wool and covered with flat aluminum 22 ga. sheet.

System air design temperature if higher than 100 °F

Pneumatic distribuitor	420	°F
Overfire	420	°F
Cinder Return	VOID	°F

2.- Voltage for feeders drive motors is 440 V, 3 PH. 60 Cy,

3.- Coal size 3/4" x 0 with no more than 50% through 1/4" round mesh.

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FUEL FIRING EQUIPMENT. BURNERS

Burner equipment and burner windbox will be as described below :

Burner windbox will be of welded steel plate construction. All parts will be properly supported, stiffened and made commercially tight. Provision will be made for support of the burners.

Burners will be ;

As manufactured by any of the named in the List of Approved Manufacturers.

Type	M-28
Number	Two (2)
Suitable for	Fuel oil No. 6
Required gas pressure at burner	
Required oil pressure at burner	130 Psig
Required oil viscosity at burner	250 SSU
Required steam pressure at burner	150 Psig

Burner equipment will include the following :

One (1) Forced draft register complete steam atomizing oil unit, flexible metallic oil and steam hose, manual oil and shut oft and check valves with burner fittings suitable for negative furnace firing and gas electric ignitor with transformer.

NOTE : Fuel Oil operation shall be made in manual mode.

FORCED DRAFT FAN

DISTRAL, S.A. shall furnish for each unit the following Forced Draft Fan (s) :

One (1) Chicago Blower or equivalent Fan (s), Design

Arrangement 3 Size 49 XXXXX DIDW, including :

Inlet boxes	[ ]	Inlet Damper	[X]	I.V.C.
Independent Pedestal	[X]	Outlet Damper	[X]	
Sole Plates	[ ]	Inlet screen	[X]	
Split housing	[X]	Housing Drain	[X]	
Access Door	[X]	WK^2 = 1571 $Lb\text{-}Ft^2$		

Test block conditions are based on the following margins applied to the calculated requirement at a steam capacity of 150000 PPH when firing Bagasse at an elevation of 100 ft above sea level.

Air or Gas Weight	20	%
Static Pressure	44	%
Air Temperature +	20	°F

Performance Point	LB/HR	S.P. In Wg.	AIR OR Gas Temp °F	R.P.M.	B.H.P.
Fan Test Block	294287	11.45	100	1200	154

Fan Drive : Each fan shall be driven by an * or equivalent electric motor 200 HP, 60 Cy, 3 PH, 440 Volts, and 1200 RPM.
Type : Squirrel cage induction
Protection : Standard
Enclosure : T.E.F.C.
Service Factor : 1.15
Starter : By others

* For any of the named in the "List of Approved Manufacturers".

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INDUCED DRAFT FAN (BY OTHERS)

The following are the design conditions for the induced draft fan which shall be supplied by others, and based on the following margins applied to the calculated requirements at a steam capacity of 150000 LB/HR when firing bagasse at an elevation of 100 Ft above sea level.

Gas Weight		20%
Static Pressure		44%
Gas Temp.	+	50 °F

Performance Point.	LB/HR.	SP In Wg	Gas Temp °F	RPM	BHP
Fan Test Block	382613		491		

The design SP shall be determined by adding the dust collector equipment pressure drop to 5.25 in Wg. times 1.44.

Inlet and outlet dampers, and drive equipment shall be by others.

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D U C T S

DISTRAL, S.A. shall furnish for the unit gas and air ducts as described below :

Gas and Air Ducts shall be 1/4" and 3/16" steel except where noted to contrary, of air tight welded constructions with flanged field connections, continuous seal welded to insure air and gas tightness. All air and gas ducts shall be properly reinforced and stiffened for the operating air and gas pressure and temperatures which shall be encountered under all conditions of operation guaranteed. Expansion joints shall be provided where required.

All hot air and gas ducts to be insulated shall be provided with necessary ribs or attachments for proper fastening or wiring in place of insulation.
Supports for all air and gas ducts for hanging same from the supporting steel shall be furnished by the Company.

Air and gas ducts are designed for actual velocities up to 3000 and 2500 f.p.m. respectively.

AIR DUCTS

	Furnish
Forced Draft Fan to Air Heater	[x]
Forced Draft Fan to Steam Air Preheater	[ ]
Air Heater exit to distributor system	[x]
Air Heater to Grate Plenum and Burners Windbox	[x]
Air Heater exit to overfire system	x

GAS DUCTS

	Furnish
Boiler to Economizer	[ ]
Economizer to Air Heater	[ ]
Economizer to Dust Collector	[ ]
Economizer to Steel Stack	[ ]
Economizer to Induced Draft Fan	[ ]
Boiler to Air Heater	[x]
Air Heater to Dust Collector	[ ]
Air Heater to Induced Draft Fan	[ ]
Air Heater to Steel Stack	[ ]
Dust Collector to Induced Draft Fan	[ ]
Dust Collector to Steel Stack	[ ]
Boiler to Induced Draft Fan	[ ]
Boiler to Steel Stack	[ ]
Induced Draft Fan to Steel Stack	[ ]

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[illegible]

[illegible]
[illegible]
[illegible]
[illegible]

SOOT HOPPERS

DISTRAL, S.A. shall furnish soot hoppers, of 3/16" steel for the rear pass of unit to serve boiler approximately as shown on proposal drawing.

Soot hopper surfaces shall be provided with proper fastening for wiring insulation in position.

SETTING, INSULATION, CASING

Setting, insulation and casing is supplied for welded wall arrangement in furnaces.

1- The enclosure for the furnace and convection pass shall consist escentially of continuously welded fins between adjacent tubes of all peripheral walls, backed by insulation. ~~[illegible] insulation~~

~~[illegible] casing~~

2- Roof tubes shall be arranged in a similar way as described in point 1

3- Where transition will occur between the integral fin type tube wall and plate type seals, the transition will be made by scalloped bars.

All castable refractories and special shapes, as required by the design, will be furnished.

4 DISTRAL, S.A. shall furnish for the unit insulation materials for the following surfaces described below ;

Drum (s) ~~[illegible]~~
Exposed superheater header (s) ends
Exposed portions of water walls feeder tubes
Exposed Water wall header (s) areas.
Hot gas flues end hot air ducts
Soot hoppers
~~[illegible]~~
~~[illegible]~~
Air heater Casing
Soot Blowers ~~[illegible] piping [illegible]~~
~~[illegible]~~
Burners Windbox

5- Insulation shall consist of mineral wool, block insulation or a combination of both, as required by DISTRAL, S.A. standard practice. Total thickness of insulation shall be not less than the following.

Temperature range °C			Insulation thickness. mm.
UP	to	204	51
205	to	259	64
260	to	315	76
316	to	370	89
371	to	481	102
482	to	592	114
593	to	704	127

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6. ~~Refractory tiles shall be opposite boiler bank side wall to be installed between the outer row of tubes and the insulation.~~

7. Outer finish shall be supplied as follows.

Furnace walls and lateral walls of boiler bank shall be covered with aluminum lagging 0.04 Thk.

Roof shall be covered with carbon steel plate # 10 Ga.

Air heater external casing shall consist of aluminum sheet No. 22 Ga.

Ducts shall covered with aluminum sheet No. 22 Ga.

8. Access doors and observation doors shall be supplied as follows : (16" dia. doors are hinged; 14" x 18" doors are bolted.)

Type	Quantity	Size	Location
Access	Two (2)	ø 16"	Superheater
Access	One (1)	14" x 18"	Air heater gas duc
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
Access	As req'd.	14" x 18"	Dust Hoopers
Observation	Twelve (12)	4" x 8"	Furnace Lat. Walls
Access	Two (2)	14" x 18"	Ungergrate Plenum

STRUCTURAL STEEL

DISTRAL, S.A. shall furnish the structural steel frame required to support the equipment supplied by DISTRAL.
Such steel members as are indicated to be existing or marked (M) on proposal drawing shall not be furnished by DISTRAL.

The structural steel frame work shall be designed in accordance with A.I.S.C. formulae, rules and regulations. Field connections shall be designed for bolting, or field welding. at the DISTRAL'S, option.

Unless specified and described in detail hereunder the steel frame work furnished by DISTRAL S.A. shall not be designed or constructed to carry the Purchaser's building loads, bunker loads nor any other loads of equipment not furnished under this contract. The structural steel frame work shall be designed for a seismic shock of 0.1 g and a wind load of * LBS per sq. ft. No wind load will be considered if the unit is for indoor installation.

Existing Steel

This proposal does not include the cost of possible alterations to the Purchaser's existing steel work nor the cost of drilling for connections to steel work furnished by others if necessary to accommodate the equipment proposed herein. If alterations or drilling of existing steel work or steel work not furnished by the Company are required this work shall be done by others at no expense to the DISTRAL, S.A. or if desired by the Purchaser, DISTRAL, S.A. perform this work at an extra charge.

The Purchaser will furnish all foundations. If the unit is bottom supported, the foundations shall include concrete or masonry piers up to steam generator wall support members, or headers, if required by the design.

DISTRAL, S.A. will furnish foundations loading diagrams.

* Wind load shall be determined for a wind velocity of 100 K.P.H.

PLATFORMS, WALKWAYS AND STAIRS

DISTRAL S.A. , will furnish materials for platforms, walkways, and stairs as required for normal access and inspection of the steam generator. The quantities furnished do not include provisions for special requirements of access, inspection location, interference of other equipment, or any other unusual requirements.

Structural steel to support the platforms, walkways and stairs where they cannot be supported by the boiler steel, will be furnished by DISTRAL S.A.

Cut outs and fitting of the grating for piping and structural steel interference shall be done in the field by the Erector.

Stair rails, with the exception of corner pieces, shall be shop assembled in standard panels. Stair rail corner pieces and miscellaneous pieces of railing shall be fabricated and welded in the field by the erection contractor.

Platforms, walkways and stairs will be designed for a live load of 100 psf and a dead load of 35 psf.

The following quantities are to be furnished :

Checkered Plate :	1000 SQ FT
Stair treads :	70
Railings :	667 Ft

Material, construction and nominal dimensions shall be as follows :

Checkered Plate : Nominal thk 3/16". Carbon Steel.

Platforms and Walkways : Checkered plate material. Nominal width 2'-6".

Stair treads : Checkered plate material noising size 30" x 9"

Hand rails : Black Tube 1-1/2" Ø

Hand railing and platforms grating or plates shall be furnished in modules of standard size.
Erector shall cut these modules to fit specific needs such as piping, corners,etc.

I P S

INTERNATIONAL PLANNING SERVICES, INC.
CONSULTING ENGINEERS

SPECIFICATION 309/06-03-01

ONE (1) BAGASSE FIRED STEAM GENERATING UNIT AND ACCESSORIES

For

OSCEOLA FARMS CO.
PAHOKEE FLORIDA

I. INTENT

The intent of this Specification is to cover pertinent features of the steam generating unit with accessories in sufficient detail to permit the manufacturer to bid on a unit suitable for outdoor sugar factory operation under Florida semi-tropical conditions. Design standards to be provided by the manufacturer are listed. The omission of certain details is not to be construed by the manufacturer as a basis for omitting components of engineering and manufacture that will affect the unit in the quality of performance or will increase maintenance cost or reduce the life of the unit. Bidders will comply with the Instruction to Bidders.

II. GENERAL CONDITIONS

II. 1 Boiler Type: A two (2) or three (3) drums water tube boiler, with bent tubes and waterwalls.

II. 2 Furnace Type: Spreader stoker with traveling grate.

II. 3 The unit shall have a continous rated capacity of 150,000 lbs/hr of steam at 250 Psig, 500°FTT, at the superheater outlet, with feedwater at 210°F. It shall have an efficiency of 55-60% when using bagasse of 56% moisture as fuel.

Boiler shall be designed for 400 Psig, to meet all A.S.M.E. design requirements. No. 6 Fuel-oil will be used as an auxiliary fuel. The boiler shall be capable of producing 90,000-100,000 pounds steam per hour when burning fuel-oil.

I P S

II. 4 The capacity herein stated shall apply to all items herein specified, these being designed to perform their assigned functions effectively during standard commercial operation and throughout the life of the unit.

III. FURNISHED BY PURCHASER

III. 1 Adequate storage space convenient to the site of installation for protection of equipment pending installation.

III. 2 All piping including installation from the steam non-return valve of the steam generator and beyond the boiler blow-off and feed valves and all piping and electrical wiring incidental to the installation of firing equipment, controls, and fans.

III. 3 Electrical power at 110-220-440 volts, 3 phase, 60 cycle for operating hoist, tools, and so forth.

III. 4 Water piped to the boiler for hydrostatic tests.

III. 5 Motor starters.

III. 6 Building improvements and shed over firing isle.

III. 7 Fuel for starting and testing of boiler unit.

III. 8 Operators to assist in starting and testing the Unit.

III. 9 Lubrication as required for parts of boiler unit.

III.10 Chemicals, labor, and fuel for boiling and drying out.

III.11 Complete reinforced concrete foundation.

IV. FURNISHED BY BIDDER

Steam generating unit furnished under these specifications shall consist of at least the following items of equipment and services, but not neccessarily limited to such if other items are neccessary for proper performance with economical operation:

IPS

Boiler.
Superheaters.
Furnace and setting materials.
Spreader stoker with traveling grate.
Water walls.
Baffles and baffle supports.
Oil burners.
Windboxes.
Air preheater.
Air ducts.
Flue gas ducts.
Soot hoppers.
Instrumentation and controls.
Valves and fittings.
Soot blowers.
Walkways and ladders.
Stacks (To be quoted separately).
Bagasse feeders.
Access and observation doors.
Neccesary structural steel.
Water column.
Casing-metal.
Wet scrubbers (Supplied by others).
Induced draft fans and steam turbine drives (To be quoted separately).
Forced draft fan and steam turbine drive.
Grates.
Support steel.
Complete erection of all equipment listed above.

V. DESIGN STANDARDS

V. 1 Boiler

Fusion welded design; 400 Psig design pressure; designed to meet A.S.M.E. standards; 250 Psig initial operating pressure at superheater outlet; including steam purifiers in steam drum; design shall be such that with boiler water having a concentration of as high as 3,000 ppm of solids, the carryover at rated steam output shall not exceed 1 ppm at the boiler outlet.

The tubes shall be of material and thickness as recommended by the A.S.M.E. Code for Power Boilers and suitable for the 400 Psig design conditions.

Bidders shall indicate tubes diameter and tube wall thickness being offered.

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V. 2 Access Doors

An adequate number of boiler access doors, tube removal doors and furnace observation doors shall be furnished.

V. 3 Trimmings

The manufacturer shall furnish the following boiler accessories including all piping and supports between the accessories and the boiler unit:

One (1) 12" non-return valve.
One (1) 12" steam pressure gauge, complete with two valves, syphon and test gauge connection with shutoff valve.
Water column.
Two (2) sets of blow-off valves.
Required number of safety valves.
One (1) globe feed valve.
One (1) swing check valve.
One (1) chemical feed valve.
Required number of vent valves.
Steam sampling valve.
Continous blowdown valve.

V. 4 Boiler Supporting Steel

All required boiler supporting steel shall be furnished, including columns, supporting members, horizontal and vertical ties, drum saddles, etc.

All structural steel furnished by the manufacturer shall be designed in accordance with the latest standards of the American Institute of Steel Construction, and materials utilized shall meet the minimum requirements set by ASTM designation A36 and A325.

V. 5 Soot Blowers

An adecuate soot blowing system as recommended by the boiler manufacturer to meet his specified needs shall be provided. The soot blowers shall use steam as a blowing medium. A retractable soot blower shall be provided in the superheater section if it is felt neccesary by the Manufacturer. The soot blower system shall be as manufactured by the Diamond Power Specialty Corporation, Copes-Vulcan Division, or equivalent.

V. 6 Superheater

The superheater unit shall be capable of delivering rated boiler capacity with 250 Psig, 500°FTT at superheater outlet. The superheater shall be constructed in accordance with requirements of the latest A.S.M.E. Code for Power Boilers. All necessary accessories and auxiliares shall be included.

V. 7 Air Preheater

A tubular air preheater shall be furnished for heating ambient air from an average temperature of 80°F to a hot air temperature of 500°F maximum.

The air preheater shall be of the vertical tube counterflow, multi-pass type. The flue gas shall enter at the top and flow inside the tubes. The air shall flow outside the tube and it shall enter one side of the preheater at the bottom and exit the opposite side at the top.

The casing shall be of 7 gauge welded steel suitably braced and supported in a structural steel frame. Air gas inlets and outlets shall be flanged for bolting.

The bidder shall indicate total heating surface, estimate gas outlet temperature and estimated air outlet temperature. These values should be within the ranges specified above.

Tubesheets shall be of 1" minimum thickness.

V. 8 Forced Draft Fan

The fan shall have inlet dampers, independent pedestals sole plates, full blade liners, housing drain, inlet screen, housing to be supplied for convenient wheel removal and access doors. Performance data shall be given for test block load.

Basic quotations shall consist of an independent fan, driven at a maximum speed of 1200 RPM by a steam turbine-gear of adequate capacity. The drive shall meet the following design characteristics:

a. Single stage, horizontally split case with separate constant speed and emergency governors and valves.

b. Double seated governor valve having valve and seats renewable.

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c. Corrosion resistant steam strainer surrouding valve and having an area at least 1-1/2 times the valve area.

d. Carbon ring glands.

e. Water cooled, double ring oil lubricated bearings.

f. Sentinel relief valve.

g. Chrome-plated turbine shaft under glands.

h. Speed changer with 20% speed range.

i. Materials of construction in accordance with NEMA Class I for Mechanical Drive Turbines.

j. Gear unit shall be double helical single reduction from turbine speed down to fan shaft speed, as specified above.

k. Turbo-geared unit shall be completely assembled on a common base.

l. Gear unit shall have an AGMA service factor of 1.5.

m. Horsepower rating on the turbo-gear unit shall be exclusive of gear losses. The unit shall have a water rate not to exceed 40 lb/BHP-hr, including gear losses when supplied with steam at 250 Psig, 500°FTT, and exhausting to 20 Psig. The turbine shall be able to generate its rated power at a minimum pressure of 200 Psig.

V. 9 INDUCED DRAFT FANS

The gases leaving the air preheater will flow in parallel thru two wet scrubbers, each having its individual induced draft fan and stack. The wet scrubbers will be supplied by others. The pressure drop across the wet scrubbers can be assumed at (8") eight inches of water. Both induced draft fans and drives shall be identical, and shall meet the following characteristics. The fan shall be:

a. Suitable for operation at temperatures up to 700°F.

b. Horizontally split housing with minimum of 3/16" plate on inlet boxes and 1/4" plate on scroll and check liners. Material 316 L stainless steel.

c. Fan wheel of radial blade type with 3/16" blades, 5/8" center plate and 1/4" blade wear pads. Material 316 L stainless steel.
d. Independent pedestals.
e. Water cooled babbitted sleeve bearing or roller bearings.
f. Access doors in scroll and inlet boxes.
g. Maximum fan speed 800 RPM.
h. Stack to be ground mounted.

The induced draft fans shall be driven by steam turbine-gears of adequate capacity. The drives shall meet the following design characteristics:

a. Single stage, horizontally split case with separate constant speed and emergency governors and valves.
b. Double seated governor valve having valve and seats renewable.
c. Corrosion resistant steam strainer surrounding valve and having area at least 1-1/2 times the valve area.
d. Carbon ring glands.
e. Water cooled, double ring oil lubricated bearings.
f. Sentinel relief valve.
g. Chrome-plated turbine shaft under glands.
h. Speed changer with 20% speed range.
i. Materials of construction in accordance with NEMA Class I for Mechanical Drive Turbines.
j. Gear unit shall be double helical single reduction from turbine speed down to fan shaft speed, as specified above.
k. Turbo-geared unit shall be completely assembled on a common base.
l. Gear unit shall have an AGMA service factor of 1.5.
m. Horsepower rating on the turbo-gear unit shall be exclusive of gear losses. The unit shall have a water rate not to exceed 40 lb/BHP-Hr, including gear losses when supplied with steam at 250 Psig, 500°FTT, and exhausting to 20 Psig. The turbine shall be able to generate its rated power at a minimum pressure of 200 Psig.

V.10 Furnace and Setting Materials

The manufacturer shall furnish all nacessary refactory materials, tiles, castings, supporting steel for the

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complete furnace as well as the necessary insulation for all boiler walls and top section, plus all cleaning and observation doors required including all nacessary high temperature cement and bagasse cast iron feed chutes for the complete boiler installation. Casing of number 7 gauge steel for outdoor service.

V.11 Water Walls

The water walls shall be provided with steel headers into which the water wall tubes shall be expanded. The headers shall be equipped with necessary hand holes to provide access for inspection and cleaning.

These hand holes must be easily accessible from the outside of the unit. Lower headers, which are not designed to be served by the lower drum blowdown valves, shall be provided with tandem blowoff valves. The lower boiler drum and headers shall be designed to insure proper circulation.

All parts of the water walls shall be constructed in accordance with the latest A.S.M.E. Code for Power Boilers. The water walls shall be suitably supported so as not to place undue strain on the other parts of the unit.

V.12 Spreader stoker with traveling grate.

The manufacturer may furnish a continous discharge spreader stoker system that will be capable of injecting the bagasse fuel into the furnace and insuring proper distribution on the grate surface. The distributors for the bagasse fuel shall be of rugged construction, requiring a minimum of operational maintenance and care. They shall be of the unit construction employing individual hydraulic drives for each distributor. Variations shall be possible in distributor speed to compensate for radical changes in fuel sizing or moisture content. Adjustable deflection plates shall be provided to assist in the throw of the fuel to insure proper distribution. The continous discharge grates shall serve not only as a bed for the fuel to burn upon, but also provide the means of disposing of the ash from the grate surface. Continous ash removal with complete burnout for efficient operation is essential. The speed of the grates shall be apadtable to manual control to further assist in distribution and removal of ash. Individual feeders shall be required for each distributor. It is to be noted that this unit will be operating with oil as a standby or supplementary fuel.

The manufacturer of the steam generating equipment shall

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have complete and whole responsability for the stoker equipment that he furnishes as part of his bid. Where the stoker and grate are manufactured by someone other than the steam generator manufacturer, this shall in no way relieve the bidder of absolute responsability, not only for the purchase and installation of same, but for the engineering, co-ordination, erection and performance.

Air for the purpose of overfire and spreading shall be preheated, using the preheated air already described.

V.13 Oil Burners

Burners shall be of the steam atomizing type suitable for mounting into the side wall of the combustion chamber. The ignition system shall be of gas electric type, in which the ignition for the burner is established by using an electric spark to ignite a small jet of gas. The burners shall have manually operated louvers to control the amount of preheated air supplied to the burners. The burners shall have the necessary controls and safeguards for safe and efficient operation. No.6 Fuel-oil will be used as an auxiliary fuel.

V.14 Ductwork and Windboxes

The arrangement of the breeching and ducts shall be such as to provide the best overall layout for the equipment offered. Care shall be exercised in arranging the equipment and ducts so that the replacement of boiler, superheater and air heater tubes may be effected without undue difficulty. Drawings showing the proposed arrangement shall accompany the bid.

Breeching and ducts shall be of welded construction and shall be properly stiffened and reinforced to prevent sagging or deformation of sections. The breeching shall be constructed of steel plate not less than 1/4 inch in thickness and the air ducts shall be constructed of steel not less than No. 7 gauge. Breeching and ducts shall be designed so that the maximum velocity of air or gases will not exceed 3,000 ft. per minute.

Flanges shall be bolted together and all joints properly sealed. Expansion joints and clean-out doors shall be provided in all ducts and breeching runs as required by the arrangement offered.

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Windboxes shall be design to insure proper distribution of air to burners and combustion chamber without undue draft loss.

V.15 Walkways and Ladders

The manufacturer shall provide and install adequate walkways and ladders to insure access to all doors and auxiliary parts of the complete steam generating unit. Walkways and ladders shall be supported off of the structural steel provided with the boiler when possible. If the structural steel of the boiler is used, the walkways and ladders shall in no way interfere with expansion of the unit, nor shall it contribute to any undue stress or strain.

V.16 Stacks

Two (2) stacks shall be furnished by the manufacturer. The stacks shall be of the self-supporting type. The top of the stacks shall be 60 feet from the ground level and a minimum diameter of 6'-0".

V.17 Instruments and Controls

The manufacturer shall supplied Feedwater Control and Combustion Control Systems.

The Feedwater Control System will be of the two (2) element type, and shall include:

a. Feedwater Control Valve.

b. Water flow HAND-AUTO selector station.

c. One (1) remote level indicator complete with a high-low water alarm as the one manufactured by EYE-HYE or similar.

d. One (1) steam flow recorder and integrator, with an additional pen to record steam pressure. The recorder shall be of the circular, 24 hours type.

e. One (1) circular, 24 hours type recorder, to register drum water level and steam temperature.

f. The Feedwater Control System shall include all necessary and recomended elements such as transmitters. air filter, air pressure regulators, actuators, orifice plates and flanges, square root extractor and control elements for both manual and automatic operation.

The Combustion Control System shall include:

a. Bagasse Feeder control drive.

b. Forced Draft Fan drive control.

c. Induced Draft Fans drive controls.

d. Multi-pointer indicators to monitor draft or pressure in the induced draft system. Indicators calibrated in inches of water, with suitable scales to monitor the draft or pressure at:

   1. Furnace
   2. Flue gases leaving boiler.
   3. Induced draft fan inlet.
   4. Induced draft fan outlet.
   5. For future use.

e. Multi-pointer indicators to monitor pressure in the forced draft system. Indicators calibrated in inches of water, with suitable scales to monitor pressure at:

   1. Forced draft fan outlet.
   2. Air preheater outlet.
   3. Windbox.
   4. Secondary air system.
   5. For future use.

f. Temperature indicators to monitor temperatures at:

   1. Air leaving air-preheater.
   2. Flue gases entering air-preheater.
   3. Flue gases leaving air-preheater.

g. Bagasse feeder control, Forced draft drive control and Induced Fan drive control shall include all necessary or recommended elements such as pressure transmitter, temperature transmitters and control elements for both manual and automatic operation.

The instruments and controls mentioned shall be installed in one control panel bench type, complete with all accessories, instrument tubing and wiring for pneumatic and electric controls.

V.18 Water Column

The boiler shall be furnished with a suitable water column, all required piping, supports, and fittings.

BARRON INDUSTRIES, Inc.
ENGINEERS & MANUFACTURERS
P.O. Box 66285 • Birmingham, Alabama 35210
205/956-3441

I. P. S. ENGINEERS, INC.
RECEIVED 12-8-80
ROUTE TO:
☐ JHF
☒ FJF
☒ FILE NO.
☐ DESTROY AFTER ROUTING

December 5, 1980

Mr. C. Alonso
Osceola Farms Company
P.O. Box 679
Pahokee, Florida 33476

Reference: Boiler Induced Draft Fan
I.P.S. Engineers, Inc. No. 309/06-04-01
Barron Proposal #NF-64-1157

Gentlemen:

We are pleased to submit our proposal for a size 790, Series T30A-92 fan to meet the above referenced specification.

We chose the T30A fan with its radial tip blade design because it better fit the medium pressure-to-volume ratio indicated in your specification. The radial tip blade design provides reliable service and efficient operation under these circumstances.

You requested 316L stainless steel construction in this fan, but the 700° F. continuous design criteria precludes its use. What we are offering is 316L stainless steel construction in a fan designed for 200° F, but allowing for upset conditions causing 400° F. operation for a period of up to two (2) hours.

As an alternate we have proposed that the fan be constructed of ARMCO NITRONIC 40 stainless steel. This is a nitrogen strengthtened stainless steel which performs between 304L & 316L stainless steel, but has a minimum yield strength of 65 KSI at room temperature. NITRONIC 40 is less expensive than 316L and welds with similar procedures. By using the NITRONIC 40 stainless steel, we can meet the 700° F. continuous design criteria. This fan would be supplied with NITRONIC 40 blade and housing liners.

As a second alternate we have proposed a NITRONIC 40 impeller in a 316L stainless steel housing. This allows the fan housing, which is more difficult to repair or replace, to be built of the material you originally specified. This alternate will also meet the 700° F. continuous design temperature.

Alternate 3 is an ARMCO NITRONIC 40 impeller in a corten housing with 1/4" 316L stainless steel scroll and cheek liners, 316L stainless steel inlet cones, and the interior overlaid with 16 GA 316L stainless steel sheet.

The performance data you requested is as follows:

LOAD (%)	VOLUME (ACFM)	SPEED (RPM)	STATIC PRESSURE (IN. W.G.)	HORSEPOWER (BHP)
100	111,000	900	16	354
75	83,250	900	16	300
50	55,500	900	16	240

As you can see, this data is based on a constant perssure drop across the scrubber. If this is not a Fixed-pressure system, additional horsepower may be saved through the use of speed and/or inlet damper control.

We feel that the ARMCO NITRONIC 40 material (at least for the fan impeller) is a very viable alternative and we enclose a copy of ARMCO's literature on the subject. We have used the material in the past in severe duty applications with excellent results.

We thank you for the opportunity to bid on this fan, and look forward to working with you on this and future projects, if we can be of service, please call on us.

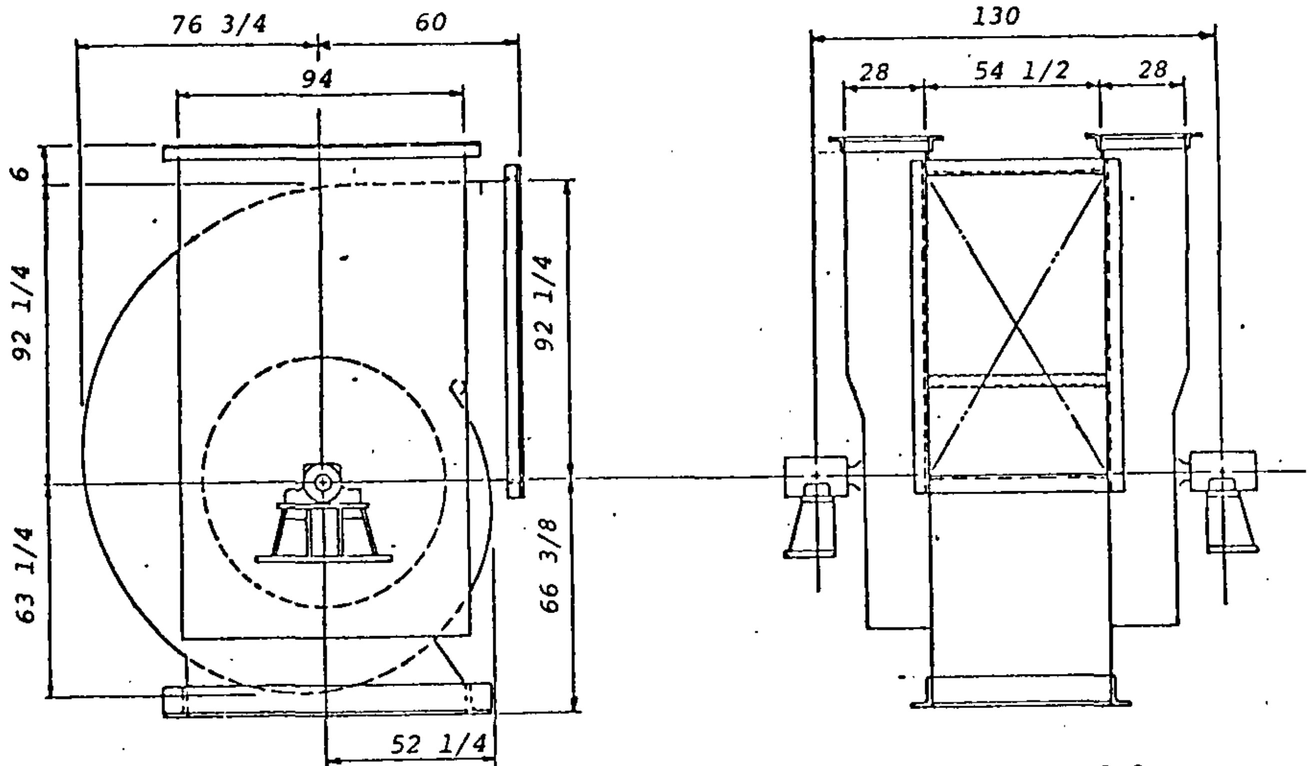
Very truly yours,

Steven N. Nelson
APPLICATION ENGINEER, NEW FANS

SNN:ns

cc: Mr. A. Latour-OSCEOLA FARMS COMPANY
Mr. J.H. Farinas-INTERNATIONAL PLANNING SERVICES, INC.
2226 S. CONGRESS AVENUE WEST PALM BEACH, FLORIDA 33406
Mr. D.R. Faust-BARRON INDUSTRIES
Mr. J.E. Merk, Jr.-BARRON INDUSTRIES

FAN SPECIFICATIONS



FAN SIZE 790 TYPE T30A-92 ARRANGEMENT 3D2

DESIGN RPM 1000 DESIGN TEMPERATURE 200° F. *

* 400° F. For (2) Hours

WEIGHTS:

Total Fan Weight 19,180 Total Rotating Assembly WR^2 11028

Impeller Wt. Less Shaft 2550 Shaft Wt. 2650

PERFORMANCE:

CONDITION	VOLUME	STATIC PRESS	DENSITY	RPM	BHP
DESIGN	111,000	16	.056	900	354

IMPELLER:

	THICKNESS	MATERIAL	TYPE
Blades	1/4	316L SS	RADIAL TIP
Shrouds	1/4	316L SS	CONICAL
Backplate			
Spider ( )	5/8	316L SS	SCALLOPED

SHAFT:

Dia. at Hub: 9 1/2

Approx. Center to Center 130

HUB:

Type: CAST

Material: STEEL

BEARINGS:

Size: 3 15/16

Type: XC SLEEVOIL

MFG. DODGE

HOUSING:

	THICKNESS	MATERIAL
Scroll	1/4	316L SS
Cheek	1/4	316L SS
Inlet Box	1/4	316L SS

OPTIONAL EQUIPMENT INCLUDED IN PRICING:

1. FLANGED INLET & OUTLET
2. HOUSING DRAINS
3. ACCESS DOORS
4. FALK 1020G10 COUPLING
5. HOUSING SPLIT FOR IMPELLER REMOVAL
6. 316L SS SHAFT & HUB COVERS
7. 1/4" 316L SS BLADE & HOUSING LINERS
8.

BY SNN	CUSTOMER: I.P.S. ENGINEERS, INC.	INQUIRY: 309/06-04-01	PAGE: 1 OF
DATE 12/5/80	FOR: OSCEOLA FARMS COMPANY - PAHOKEE FLORIDA		
APPROVED	BARRON PROPOSAL # #NF-64-1157	REVISION:	
DATE	NOTE: The above specifications are preliminary. Barron Industries reserves the right to make modifications upon final determination of application, orientation and arrangement.		RT

BARRON INDUSTRIES

BARRON INDUSTRIES
ENGINEERS & MANUFACTURERS

FAN SIZE 790
FAN SERIES T30A
FAN TYPE DI (92.00%) DW

COND. 1
DEN. (LB/CU. FT.) .0563
RPM 900.

REF: IPS ENGINEERS, INC. OSCEOLA FARMS CO. DATE: 12-3-80