Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP-42 Section Number: 1.8

Reference Number: 17

Title: Source Test Report for Particulate Emissions Twin Impingement Wet Scrubber Number 3 Boiler: Atlantic Sugar Association

November 1990

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Air Consulting and Engineering, Inc.

REPORT CERTIFICATION

To the best of my knowledge, all applicable field and analytical procedures comply with Florida Department of Environmental Regulation requirements and all test data and plant operating data are true and correct.

Stephen L. Neck

Stephen L. Neck, P.E.

State of Florida
Registration No. 20020

December 22, 1990

Date

SEAL

2106 N.W. 67th Place, Suite 4 • Gainesville, Florida 32606 • (904) 335-1889

1.0 INTRODUCTION

Personnel from Air Consulting and Engineering, INC. (ACEI) performed annual source emission compliance testing for the Atlantic Sugar Association on November 26, 1990. Testing was performed at the Number 3 Boiler wet scrubber outlet.

Testing was designed to fulfill "specific conditions" of the current Florida Department of Environmental Regulation (FDER) operating permit.

Three United States Environmental Protection Agency (USEPA) Method 5 particulate matter (PM) test runs were conducted while the plant was documented to be operating within 10% of permitted production.

Mr. Frank Kleeman served as test coordinator and certified production rates. ACEI performed this work under subcontract to K Kleeman Engineering.

2.0 SUMMARY and DISCUSSION of RESULTS

Results of the emission testing are provided in Table 1. Complete emission data are located in the report appendices.

The source was found to be operating within full compliance of permit conditions. Stack emissions averaged 43.86 pounds per hour (LB/HR) and 0.183 pounds per million btu(LB/MMBTU) heat input against a "process rate" basis allowable emission of 0.300 LB/MMBTU. Permit conditions limit emissions to 0.10 LB/MMBTU from oil and 0.300 LB/MMBTU from residue firing. No oil was used during compliance testing.

Production rate summaries are provided in Appendix A. These data were taken from control room recordings of steam flow, temperature, and pressure as well as feedwater temperature and pressure(Appendix E). Residue integrator and oil meter readings were recorded at the beginning and end of each particulate test run by Mr. Frank Kleeman.

TABLE 1
EMISSION SUMMARY
ATLANTIC SUGAR ASSOCIATION
NUMBER 3 BOILER
NOVEMBER 27,1990

RUN NUMBER	TIME	ACTUAL EMISSIONS		ALLOWABLE EMISSIONS	
		LB/HR	LB/MMBTU	LB/HR	LB/MMBTU
1	0845-0945 60	47.46	0.198	71.80	0.300
2	1126-1305 39	41.72	0.176	71.12	0.300
3	1336-1516 40	42.39	0.176	72.34	0.300
AVERAGES	--------- 46	43.86	0.183	71.75	0.300

3.0 PROCESS DESCRIPTION AND OPERATION

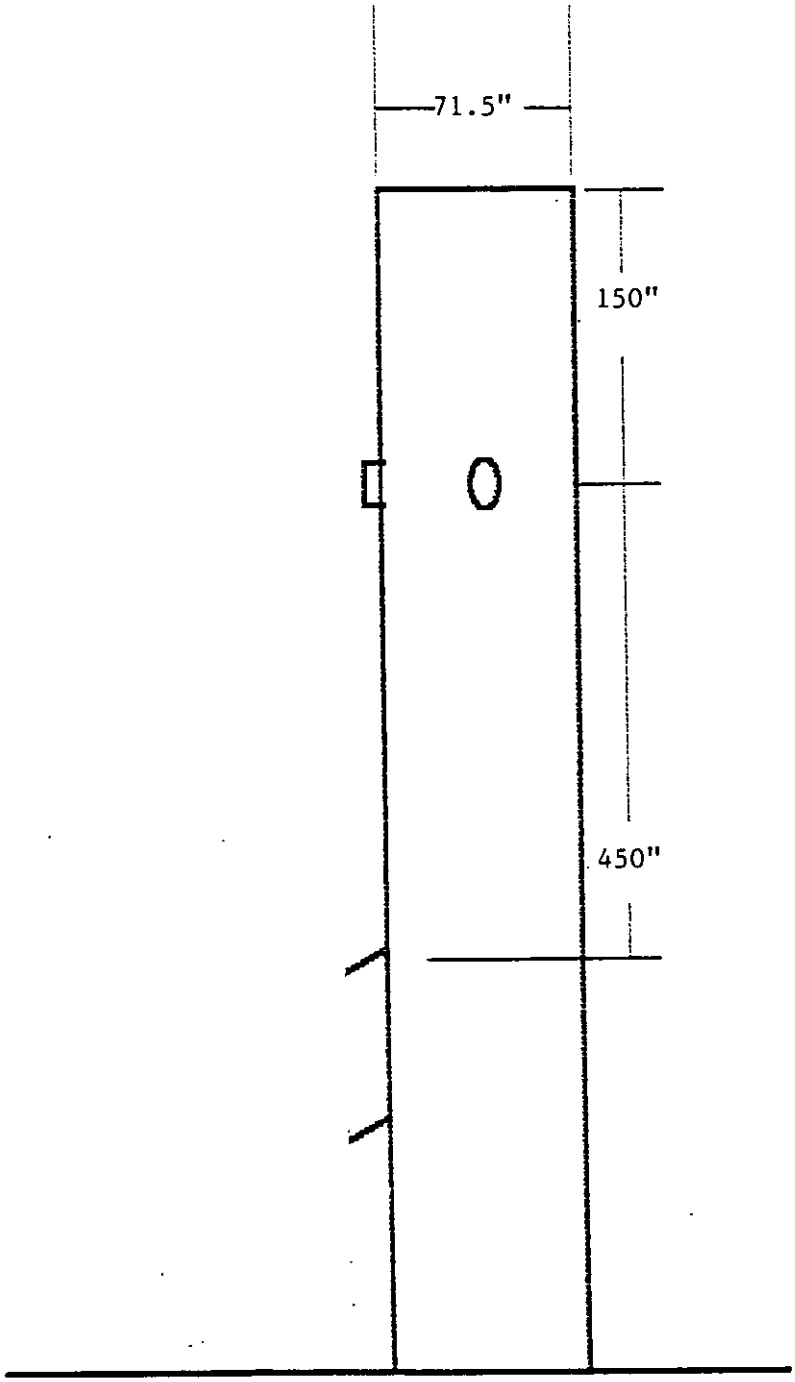
The Number 3 Boiler at the Alantic Sugar Asociation is a spreader stoker design used primarily for residue fuel firing. Supplemental oil firing may also be utilized but was not used during the emission test series. The boiler averaged 120,967 pounds per hour steam production over the three run test period.

Oil meters, steam integrators, and other production monitoring devices were rigorously calibrated prior to the production season.

4.0 SAMPLING POINT LOCATION

The sampling point location consists of a scrubber outlet stack 71.5" in diameter. The stack has two sample ports 90 degrees apart. The ports were located 405" from an upstream disturbance and 150" from the outlet.

Twenty test points were sampled for each test run. The traverse points were located as shown in Figure 1. The stack configuration is such that there is no reason to evaluate the presence of cyclonic flow.



TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL
1	1.8
2	5.8
3	10.5
4	16.2
5	24.4
6	47.1
7	55.3
8	61
9	65.7
10	69.7

FIGURE 1.
SAMPLING POINT LOCATION

5.0 FIELD and ANALYTICAL PROCEDURES- USEPA METHOD 5

Particulate matter samples were collected by the emission measurement method specified by the United States Environmental Protection Agency. A schematic diagram of the sampling train used is provided in Figure 2. All particulate matter captured from the nozzle to and including the filter was included in the calculation of the emission rate of particulate matter.

PREPARATION OF EQUIPMENT

1. FILTERS- Gelman type "A" glass fiber filters were placed in a drying oven for two hours at 105 degrees C, removed and placed in a standard desiccator containing indicating silica gel, allowed to cool for two hours, and weighed to the nearest 0.1 mg. The filters were then re-desiccated for a minimum of six hours and weighed to a constant weight (less than 0.5 mg change from previous weighing). The average of the two constant weights was used as the tare value.

2. NOZZLE, FILTER HOLDER, AND SAMPLING PROBE - The nozzle, filter holder, and sampling probe were washed vigorously with soapy water and brushes, rinsed with distilled water and acetone, and dried pror to the test program. All openings on the equipment were sealed while in transit to the test site.

3. IMPINGERS - The Greenburg-Smith impingers were cleaned, rinsed, and dried as in 2. The impingers were also sealed during transit.

TEST PROCEDURE

Prior to performing the actual particulate matter sample runs,certain stack and stack gas parameters were measured. These preliminary measurements included the average gas temperature, the stack gas velocity head, the stack gas moisture content, and the dimensions at the point where the tests were to be performed. The stack temperature was determined using a bi-metallic thermocouple and calibrated

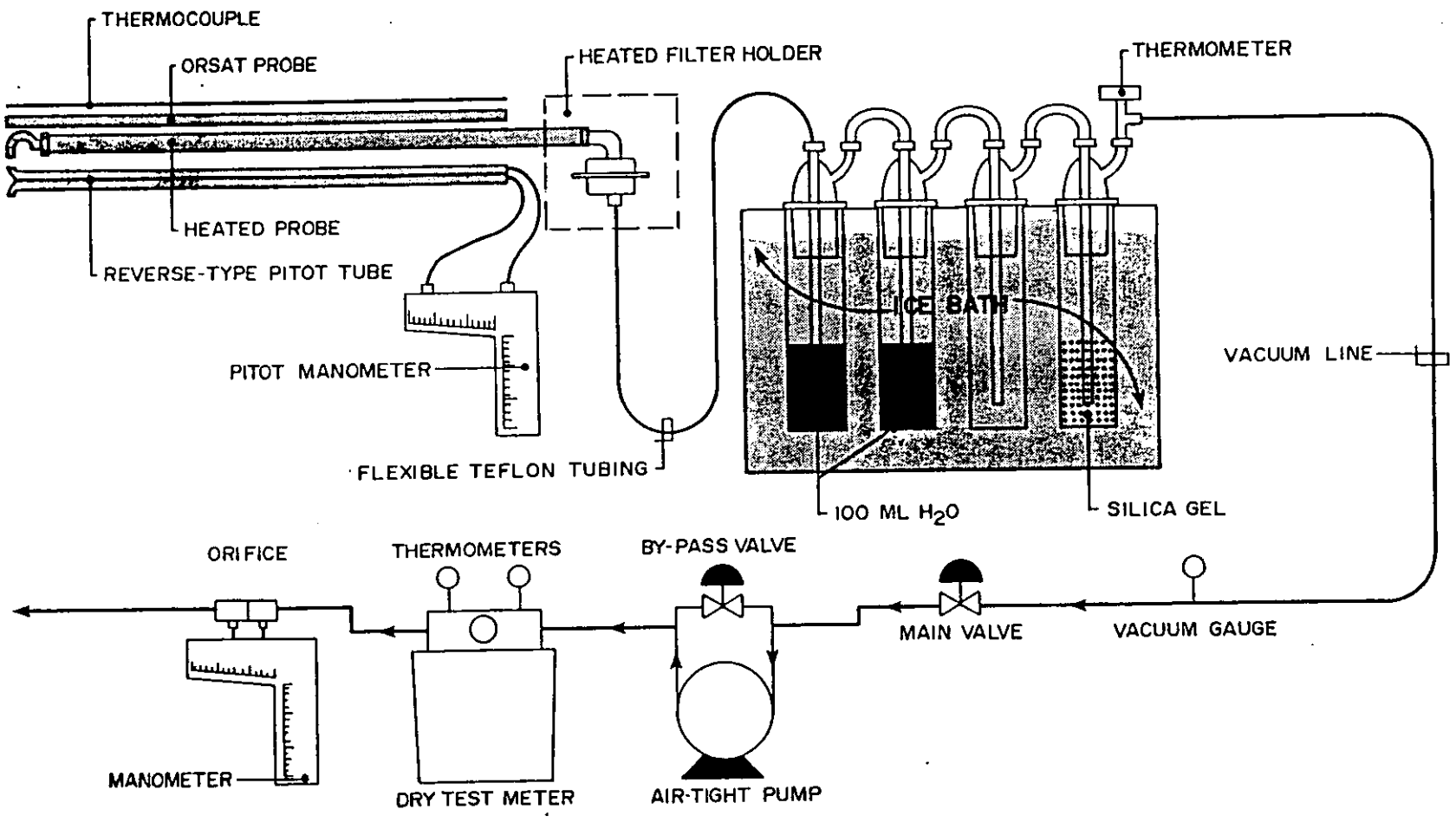


FIGURE 1.
EPA METHOD 5 SAMPLING TRAIN

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and
ENGINEERING

pyrometer. Velocity head measurements were made with a calibrated type "s" pitot tube and an inclined manometer. Velocity head measurements of 0.05 inches H2O or less were measured using a micromonometer.

The sampling traverse points were selected so that a representative sample could be extracted from the gas stream. The traverse points were located in the center of equal areas, the number of which were dependent upon the distance upstream or downstream from flow disturbances. USEPA Methods 1 and 2 were utilized for this task.

Each particulate matter test run consisted of sampling for a specific amount of time at each point. The type "s" pitot tube was connected to the sampling probe so that an instantaneous velocity head measurement could be made at each traverse point while conducting the test run. The stack gas temperature was also measured at each traverse point. Together with assumed moisture and orsat knowledge as well as known nozzle area, calculations of "isokinetic" (equal energy or velocity) were quickly made and effected for each traverse point during the test run.

The gases sampled passed through the following components: a stainless steel nozzle and glass probe; a glass fiber filter; two impingers charged with 100 ml of distilled water each; one dry impinger; one impinger with 200 grams of silica gel desiccant; a flexible length of tubing; a leak free pump; a calibrated dry gas meter: and, finally, a calibrated flow orifice.

Sample recovery was accomplished in the following manner:

1. The pre-tared filter was removed from its holder and placed in Container 1 and sealed. (This is usually performed in the lab).
2. All sample-exposed surfaces prior to the filter were washed with acetone and placed in Container 2. The container was then sealed and the liquid level marked.
3. The volume of water from the first three impingers was measured for the purpose of calculating the moisture content of the stack gases, then discarded.

4. The silica gel from the fourth impinger was transferred to the original tared container and sealed.

LABORATORY ANALYSIS

The three sample containers from each sample run were analyzed according to the following procedures:

1. The filter was either dried for two hours at 105 degrees C or desiccated for 24 hours at ambient temperature. Following desiccation, the filter was weighed to the nearest 0.1 mg. A minimum of two such weighings six hours apart were made with a variance of less than 0.5 mg.

2. The acetone from Container 2 was transferred to a tared beaker, evaporated to dryness, and weighed in the same manner as above.

3. The used silica gel in its tared container was weighed to the nearest 0.1 gram.

The total sample weight included the weight gains from Sample Containers 1 and 2.

DATA

All relevent field and lab data sheets as well as emission calculations are provided in the report appendices.

APPENDIX A

COMPLETE EMISSION DATA

AND

SAMPLE CALCULATIONS

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Complete Emission Results

Plant:	ATLANTIC SUGAR ASSOCIATION		
Location:	BELLE GLADE,FLORIDA	Date:	11-27-90
Stack:	NUMBER 3 BOILER	Run 1	From 0845 - 0946

Y Factor	0.994		Nozzle Diameter	0.225	In
Total Time	60.00	Min	Nozzle Area	0.000276	Ft-
Stack Area	27.883	Ft-	Barometric Pressure	30.38	In Hg
Stack Temperature	170.2	-F	Meter Temperature	79.0	-F
Stack Pressure	30.23	In Hg	Meter Orifice Diff	1.498	In H_2O
Stack Avg - Vel Head	0.937	In H_2O	Meter Volume	37.802	CF
			Condensate Vol	306.30	ml

1.	Volume Water Vapor Sampled	14.418	SCF
2.	Volume Standard Dry Gas Sampled	37.495	SCF
3.	Total Standard Sample Volume	51.912	SCF
4.	Percent Moisture	27.800	
5.	Percent Dry Air	72.200	
6.	Molecular Weight of Dry Flue Gas	30.044	
7.	Molecular Weight of Wet Flue Gas	26.696	
8.	Specific Gravity Flue Gas	0.93	
9.	Percent Oxygen [O_2]	9.50	
10.	Percent Carbon Dioxide [CO_2]	10.40	
11.	Percent Excess Air	81.570	
12.	Velocity of Flue Gas	59.461	FPS
13.	Actual Volumetric Flow Rate	99476.8	ACFM
14.	Dry Volumetric Flow Rate	71822.3	ACFMD
15.	Standard Volumetric Flow Rate	60798.3	SCFMD
16.	Emission Concentration	0.0911	gr/SCF
17.	Emission Concentration	0.0557	gr/ACF
18.	Emission Rate	47.46	lbs/Hr
19.	Percent Isokinetic	103.8	

Probe/Nozzle Wash	16.5	mg
Filter	204.8	mg
Total	221.3	mg

2343

Plant: ATLANTIC SUGAR ASSOCIATION
Date: 11-27-90
Stack: NUMBER 3 BOILER

Vwv Volume Water Vapor Sampled
Vwv = 0.04707 x 306.3 = 14.418 SCF

VMstd Volume Standard Dry Gas Sampled
VMstd = 17.64 x 37.802 x 0.994 x
[30.38 + (1.498 / 13.6)] / (79.0 + 460) = 37.495 SCF

Vt Total Standard Sample Volume
Vt = 14.418 + 37.495 = 51.912 SCF

W Percent Water = (14.418 / 51.912) x 100 = 27.8 %

FDA Percent Dry Air = (1 - 0.278) x 100 = 72.2 %

Md Molecular Weight of Dry Stack Gas
Md = (0.44 X 10.40 %CO_2) + (0.32 X 9.50 %O_2) +
[0.28 X (80.10 %N_2 + 0.00 %CO)] = 30.044

Ms Molecular Weight of Wet Stack Gas
Ms = (30.044 x 0.722) + (18 x 0.278) = 26.696

SG Specific Gravity Stack Gas
SG = 26.696 / 28.84 = 0.93

Ea Percent Excess Air

$$Ea = \frac{((9.5\ \%O_2) - (0\ \%CO / 2) \times 100)}{[(.264 \times (80.1\ \%N_2)) - (9.5\ \%O_2) - (0\ \%CO / 2)]}$$

Ea = 81.570

Vs Velocity of Stack
Vs = (85.49 x 0.84 x 0.937) x -[(170.2 + 460) / (30.23 x 26.696)]
Vs = 59.461

Qa Actual Volumetric Flow
Qa = (27.883 x 59.461 x 60) = 99476.8 ACFM

Qd Dry Volumetric Flow
Qd = (99476.8 x 0.722) = 71822.3 ACFMD

Qsd Standard Volumetric Flow
Qsd = 99476.8 x 0.722 x [528 / (170.2 + 460)] x
(30.23 / 29.92) = 60798.3 SCFMD

Plant: ATLANTIC SUGAR ASSOCIATION
Date: 11-27-90
Stack: NUMBER 3 BOILER

ESTP Emission Rate
gr/SCF = [0.01543 x (16.5 + 204.8)] / (37.495)
gr/SCF = 0.0911

Lbs/Hr Emission Rate
Lbs/Hr = 0.0911 / 7000 x 60798.3 x 60 = 47.46

I Percent Isokinetic
I = 100 x (170.2 + 460) x [(0.002669 x 306.3) + (37.802 x 0.994 / (79.0 + 460)) x (30.38 + (1.498 / 13.6))] / (60 x 60 x 59.461 x 30.23 x 0.000276)
I = 103.8 %

Plant: ATLANTIC SUGAR ASSOCIATION
Date: 11-27-90
Stack: NUMBER 3 BOILER
Run Number: 1

Average SQR Velocity Head = 0.937
Velocity Head Inputs:

0.7000	0.7600	0.8200	0.8200	0.8600	0.9000	0.9300
0.9300	0.9700	0.9700	0.7400	0.9200	1.0000	1.0500
1.0500	0.8400	0.8000	0.8200	0.8600	0.8600	

Average Orifice Pressure = 1.498
Orifice Pressure Inputs:

1.2000	1.3000	1.4000	1.4000	1.4500	1.5000	1.6000
1.6000	1.6500	1.6500	1.2500	1.6000	1.7000	1.8000
1.8000	1.4000	1.3500	1.4000	1.4500	1.4500	

Average Stack Temperature = 170.2
Stack Temperature Inputs:

158	157	156	159	165	174	173
174	175	175	172	171	172	174
175	176	173	176	175	174	

Average Meter Temperature = 79.0
Meter Temperature Inputs:

75	75	75	75	76	77	77
78	79	79	80	80	80	81
81	82	82	82	82	83	

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Complete Emission Data

PLANT:	ATLANTIC SUGAR ASSOCIATION	DATE:	11-27-90
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	2
SOURCE:	NUMBER 3 SCRUBBER OUTLET	TIME:	1030-1130

TIME INTERVAL	60	MINUTES
OIL:		
FINAL OIL	0	
BEGIN OIL	0	
FACTOR	1	
STEAM:		
FINAL STEAM	8380	
BEGIN STEAM	7183	
FACTOR	100	
TEMPERATURE	580	DEGREES F
PRESSURE	234	PSIG
	249	PSIA
FEEDWATER:		
TEMPERATURE	250	DEGREES F
PRESSURE	350	PSIG
	365	PSIA
HEAT INPUT:		
STEAM	1307.7	BTU/LB
FEEDWATER	218.4	BTU/LB
NET STEAM	1089.2	BTU/LB
STEAM RATE	119700	LB/HR
BOILER EFFICIENCY	55.0	%
TOTAL FUEL HEAT INPUT	237.05	MMBTUH
STEAM CALIBRATION FACTOR	1.00	
OIL	0.00	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	0.00	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	237.05	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.30	LB/MMBTU
TOTAL ALLOWABLE EMISSION	71.12	LB/HR
TOTAL ACTUAL EMISSION	41.72	LB/HR
TOTAL ALLOWABLE EMISSION	0.300	LB/MMBTU
TOTAL ACTUAL EMISSION	0.176	LB/MMBTU

AIR CONSULTING AND ENGINEERING, INC.

Complete Emission Results

Plant:	ATLANTIC SUGAR ASSOCIATION		
Location:	BELLE GLADE,FLORIDA	Date:	11-27-90
Stack:	NUMBER 3 BOILER	Run 2	From 1030 - 113

Y Factor	0.994		Nozzle Diameter	0.225	In
Total Time	60.00	Min	Nozzle Area	0.000276	Ft-
Stack Area	27.883	Ft-	Barometric Pressure	30.38	In Hg
Stack Temperature	169.4	-F	Meter Temperature	81.1	-F
Stack Pressure	30.23	In Hg	Meter Orifice Diff	1.350	In H2(
Stack Avg - Vel Head	0.918	In H_2O	Meter Volume	35.802	CF
			Condensate Vol	286.80	ml

1.	Volume Water Vapor Sampled	13.500	SCF
2.	Volume Standard Dry Gas Sampled	35.361	SCF
3.	Total Standard Sample Volume	48.860	SCF
4.	Percent Moisture	27.600	
5.	Percent Dry Air	72.400	
6.	Molecular Weight of Dry Flue Gas	30.044	
7.	Molecular Weight of Wet Flue Gas	26.720	
8.	Specific Gravity Flue Gas	0.93	
9.	Percent Oxygen [O_2]	9.50	
10.	Percent Carbon Dioxide [CO_2]	10.40	
11.	Percent Excess Air	81.570	
12.	Velocity of Flue Gas	58.192	FPS
13.	Actual Volumetric Flow Rate	97354.1	ACFM
14.	Dry Volumetric Flow Rate	70484.3	ACFMD
15.	Standard Volumetric Flow Rate	59746.3	SCFMD
16.	Emission Concentration	0.0815	gr/SCF
17.	Emission Concentration	0.0500	gr/ACF
18.	Emission Rate	41.72	lbs/Hr
19.	Percent Isokinetic	99.7	

Probe/Nozzle Wash	18.2	mg
Filter	168.5	mg
Total	186.7	mg

Plant: ATLANTIC SUGAR ASSOCIATION
Date: 11-27-90
Stack: NUMBER 3 BOILER
Run Number: 2

Average SQR Velocity Head = 0.918
Velocity Head Inputs:

0.6500	0.6800	0.7800	0.8200	0.8200	0.8500	0.9000
0.9000	0.9000	0.9500	0.7000	0.9000	0.9500	0.9500
1.0000	0.8200	0.7800	0.8200	0.8700	0.8700	

Average Orifice Pressure = 1.350
Orifice Pressure Inputs:

1.0500	1.1000	1.2500	1.3000	1.3000	1.3500	1.4500
1.4500	1.4500	1.5000	1.1000	1.4500	1.5000	1.5000
1.6000	1.3000	1.2500	1.3000	1.4000	1.4000	

Average Stack Temperature = 169.4
Stack Temperature Inputs:

154	155	156	157	163	175	177
178	175	175	170	169	171	171
173	174	172	174	174	174	

Average Meter Temperature = 81.1
Meter Temperature Inputs:

78	78	78	78	79	79	79
80	81	81	82	82	82	82
83	83	84	84	84	84	

AIR CONSULTING & ENGINEERING, INC.
Complete Emission Data

PLANT:	ATLANTIC SUGAR ASSOCIATION	DATE:	11-27-90
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	3
SOURCE:	NUMBER 3 SCRUBBER OUTLET	TIME:	1200-1300

TIME INTERVAL	60	MINUTES
OIL:		
FINAL OIL	0	
BEGIN OIL	0	
FACTOR	1	
STEAM:		
FINAL STEAM	80214	
BEGIN STEAM	78994	
FACTOR	100	
TEMPERATURE	577	DEGREES F
PRESSURE	239	PSIG
	254	PSIA
FEEDWATER:		
TEMPERATURE	250	DEGREES F
PRESSURE	350	PSIG
	365	PSIA
HEAT INPUT:		
STEAM	1305.6	BTU/LB
FEEDWATER	218.4	BTU/LB
NET STEAM	1087.1	BTU/LB
STEAM RATE	122000	LB/HR
BOILER EFFICIENCY	55.0	%
TOTAL FUEL HEAT INPUT	241.14	MMBTUH
STEAM CALIBRATION FACTOR	1.00	
OIL	0.00	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	0.00	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	241.14	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.30	LB/MMBTU
TOTAL ALLOWABLE EMISSION	72.34	LB/HR
TOTAL ACTUAL EMISSION	42.39	LB/HR
TOTAL ALLOWABLE EMISSION	0.300	LB/MMBTU
TOTAL ACTUAL EMISSION	0.176	LB/MMBTU

AIR CONSULTING AND ENGINEERING, INC.

Complete Emission Results

Plant:	ATLANTIC SUGAR ASSOCIATION		
Location:	BELLE GLADE,FLORIDA	Date:	11-27
Stack:	NUMBER 3 BOILER	Run 3	From 1200 - 1301

Y Factor	0.994		Nozzle Diameter	0.225	In
Total Time	60.00	Min	Nozzle Area	0.000276	Ft-
Stack Area	27.883	Ft-	Barometric Pressure	30.38	In Hg
Stack Temperature	168.3	-F	Meter Temperature	83.1	-F
Stack Pressure	30.23	In Hg	Meter Orifice Diff	1.350	In H_2O
Stack Avg - Vel Head	0.917	In H_2O	Meter Volume	35.980	CF
			Condensate Vol	282.50	ml

1.	Volume Water Vapor Sampled	13.297	SCF
2.	Volume Standard Dry Gas Sampled	35.406	SCF
3.	Total Standard Sample Volume	48.703	SCF
4.	Percent Moisture	27.300	
5.	Percent Dry Air	72.700	
6.	Molecular Weight of Dry Flue Gas	29.760	
7.	Molecular Weight of Wet Flue Gas	26.550	
8.	Specific Gravity Flue Gas	0.92	
9.	Percent Oxygen [O_2]	0.00	
10.	Percent Carbon Dioxide [CO_2]	11.00	
11.	Percent Excess Air	0.000	
12.	Velocity of Flue Gas	58.263	FPS
13.	Actual Volumetric Flow Rate	97473.6	ACFM
14.	Dry Volumetric Flow Rate	70863.3	ACFMD
15.	Standard Volumetric Flow Rate	60172.7	SCFMD
16.	Emission Concentration	0.0822	gr/SCF
17.	Emission Concentration	0.0507	gr/ACF
18.	Emission Rate	42.39	lbs/Hr
19.	Percent Isokinetic	99.1	

Probe/Nozzle Wash	8.5	mg
Filter	180.1	mg
Total	188.6	mg

Avg O_2 = 6.3

Temp = 169

Flow = 60,239

Input = 239

Plant: ATLANTIC SUGAR ASSOCIATION
Date: 11-27
Stack: NUMBER 3 BOILER
Run Number: 3

Average SQR Velocity Head = 0.917
Velocity Head Inputs:

0.6200	0.7000	0.7000	0.7700	0.8500	0.8500	0.9200
0.9700	0.9700	0.9700	0.7200	0.8800	0.8800	1.0000
1.0000	0.8000	0.8000	0.8000	0.8500	0.8500	

Average Orifice Pressure = 1.350
Orifice Pressure Inputs:

1.0000	1.1000	1.1000	1.2000	1.3500	1.3500	1.5000
1.5500	1.5500	1.5500	1.1500	1.4000	1.4000	1.6000
1.6000	1.3000	1.3000	1.3000	1.3500	1.3500	

Average Stack Temperature = 168.3
Stack Temperature Inputs:

156	157	156	157	158	170	175
177	171	173	168	166	166	173
172	175	173	174	174	174	

Average Meter Temperature = 83.1
Meter Temperature Inputs:

81	81	81	81	81	81	82
82	82	83	84	84	84	85
85	85	85	85	84	86	

APPENDIX B

FIELD DATA SHEETS

STACK SAMPLING FIELD DATA SHEET

ACE AIR CONSULTING & ENGINEERING, INC.
2106 N. W. 67th PLACE · Suites 9 & 10
GAINESVILLE, FLORIDA 32606

TEST ID _____
PAGE ____ OF ____

PLANT: ATLANTIC SUGAR ASSOCIATION
SOURCE: No. 3 BOILER
PLANT LOCATION: BELLEGLADE
TYPE OF SAMPLING TRAIN: EPA-5
TYPE OF SAMPLES: PARTICULATE MATTER
DATE: 11-27-90 RUN NO. 1
TIME START: 0845 TIME END: 0946
SAMPLE TIME: 20 / 3 (min/pt) = 60 Total min
ASSUMED MOISTURE: 28 % FDA: .72
NOMOGRAPH C_f: 1.7 PITOT CORR.: .84
P_b: 30.38 "Hg P_s: 30.23 "Hg
WEATHER: CLEAR TEMP. ____ °F
METER BOX NO.: 1 H: 2.05 Y: 0.994
NOZZLE CAL.: .225 .225 .225 = .1225
STACK DIMENSIONS: 7C-5
STACK AREA: 27.883 ft.² EFFECTIVE ____ ft.²
STACK HEIGHT ____ ft.
STACK DIAMETER: UPSTRM. ____ DNSTRM. ____
PORT SIZE ____ in. NIPPLE LENGTH ____ in.
U CORD LENGTH: 125'
REMARKS:
DUAL IMPINGEMENT SCRUBBER
BIG ELOW BOILERS TYPE F-48

AS3P
RERUN
121200 lb/hr
6265 230 psi
5053 516°F
F.W. 250 & 350 psi
.6195
48.38

MAT'L PROCESSING RATE ____
GAS METER READINGS: FINAL 890.845 ft.³
INITIAL 853.043 ft.³
NET ____ ft.³
FILTER NO. 2830 IMP. VOL. GAIN 300 ml.
SIL GEL NO. 78 WT. GAIN 6.3 ml.
TOTAL CONDENSATE 306.3 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					10.4
% O_2					9.5
% CO					
% N_2					

F_O = ____ F_O RANGE = ____
ORSAT ANALYZER ____

LEAK CHECKS
PRE 0.00 cfm 16 "Hg POST 0.000 cfm 19 "Hg
METER BOX/PUMP ____ GAS SAMPLE SYST. ____
ORSAT BAG ____
PITOT TUBE NO. 1601 PRE-TEST O.K
POST-TEST(+) 3.8 / 15 H_2O/Sec
POST-TEST(−) 4.4 / 15 H_2O/Sec
PYROMETER NO. 1
BOX OPERATOR NICK PROBE HOLDER GERARD

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (FT.³)	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O) CALC.	ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. F	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
1-1		0848	854.77	.70	1.2	1.2	158	273	63	75	5.5
2		0851	856.56	.76	1.3	1.3	157	270	49	75	6
3		0854	858.38	.82	1.4	1.4	156	270	46	75	6.5
4		0857	860.24	.82	1.4	1.4	159	267	46	75	7.0
5		0900	862.11	.86	1.45	1.45	165	267	47	76	7.5
6		0903	864.90	.90	1.5	1.5	174	260	48	77	8

ACE AIR CONSULTING & ENGINEERING, INC.

TEST ID _____

PAGE ____ OF ____

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (ft.^{3})	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O)		STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. (°F)	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
					CALC.	ACTUAL					
1-7		0906	865.92	.93	1.6	1.6	173	255	48	77	8.5
8		0909	867.93	.93	1.6	1.6	174	245	49	78	9.5
9		0912	869.88	.97	1.65	1.65	175	244	50	79	10
10		0915	871.78	.97	1.65	1.65	175	245	50	79	10.0
~~9~~		~~0~~									
~~10~~											
2-1		0919	873.49	.74	1.25	1.25	172	258	50	80	8.5
2		0922	875.38	.92	1.6	1.6	171	274	50	80	10.5
3		0925	877.35	1.00	1.7	1.7	172	268	50	80	11.5
4		0928	879.42	1.05	1.8	1.8	174	254	50	81	12.5
5		0931	881.47	1.05	1.8	1.8	175	262	50	81	13
6		0934	883.35	.84	1.4	1.4	176	265	50	82	11.5
7		0937	885.17	.80	1.35	1.35	173	269	52	82	11.5
8		0940	887.02	.82	1.4	1.4	176	260	52	82	12
9		0943	888.95	.86	1.45	1.45	175	254	52	82	13.5
10		0946	890.845	.86	1.45	1.45	174	260	52	83	13.5

STACK SAMPLING FIELD DATA SHEET

ACE AIR CONSULTING & ENGINEERING, INC.
2106 N. W. 67th PLACE · Suites 9 & 10
GAINESVILLE, FLORIDA · 32606

TEST ID _____
PAGE _____ OF _____

PLANT: ATLANTIC SUGAR ASSOCIATION
SOURCE: NUMBER 3 BOILER
PLANT LOCATION: BELLE GLADE, FL.
TYPE OF SAMPLING TRAIN: EPA-5
TYPE OF SAMPLES: P.M.
DATE: 11-27-90 RUN NO. 3
TIME START: 1200 TIME END: 1301
SAMPLE TIME: 20 / 3 (min/pt) = 60 Total min
ASSUMED MOISTURE: 28 % FDA: .72
NOMOGRAPH C_f: 1.6 PITOT CORR.: .84
P_b: 30.38 "Hg P_s: 30.23 "Hg
WEATHER: CLEAR TEMP. _____ °F
METER BOX NO.: 1 H: 2.05 Y: 0.994
NOZZLE CAL. _____ _____ _____ = .225
STACK DIMENSIONS: 71.5
STACK AREA: 27.883 ft.² EFFECTIVE _____ ft.²
STACK HEIGHT _____ ft.
STACK DIAMETER: UPSTRM. _____ DNSTRM. _____
PORT SIZE _____ in. NIPPLE LENGTH _____ in.
U CORD LENGTH: 125
REMARKS: _____

.5875
.4081
179.4

44.35

MAT'L PROCESSING RATE _____
GAS METER READINGS: FINAL 963.100 ft.³
INITIAL 927.120 ft.³
NET _____ ft.³
FILTER NO.: 2872 IMP. VOL. GAIN: 278 ml.
SIL GEL NO.: 65 WT. GAIN: 7.5 ml.
TOTAL CONDENSATE: 282.5 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					11.0
% O_2					9.0
% CO					
% N_2					

F_O = _____ F_O RANGE = _____
ORSAT ANALYZER _____

LEAK CHECKS
PRE 0.003 cfm 19 "Hg POST _____ cfm _____ "Hg
METER BOX/PUMP _____ GAS SAMPLE SYST. _____
ORSAT BAG _____
PITOT TUBE NO.: 1601 PRE-TEST: O.K.
POST-TEST(+): 5.01 / 15 H_2O/Sec
POST-TEST(−): 6.1 / 15 H_2O/Sec
PYROMETER NO.: 1
BOX OPERATOR: NICK PROBE HOLDER: GERARD

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (FT.³)	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O) CALC.	ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. F	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
1-1		1203	928.78	.62	1.0	1.0	156	253	66	81	5
2		1206	930.38	.70	1.1	1.1	157	255	56	81	5.5
3		1209	932.08	.70	1.1	1.1	156	258	54	81	6
4		1212	933.82	.77	1.2	1.2	157	260	54	81	6.5
5		1215	935.65	.85	1.35	1.35	158	260	54	81	7
6		1218	937.42	.85	1.35	1.35	170	257	55	81	7

ACE AIR CONSULTING & ENGINEERING, INC.

TEST ID _____

PAGE ____ OF ____

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (ft^3)	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O) CALC.	METER ORIFICE PRESS. DIFF. ("H_2O) ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. (°F)	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
1-7		1221	939.22	.92	1.5	1.5	175	260	56	82	8.5
8		1224	941.11	.97	1.55	1.55	177	261	56	82	8.5
9		1227	943.08	.97	1.55	1.55	171	252	57	82	10
10		1230	944.99	.97	1.55	1.55	173	251	58	83	10
2-1		1233	946.63	.72	1.15	1.15	168	273	58	84	8.5
2		1236	948.42	.88	1.4	1.4	166	274	57	84	9.5
3		1239	950.22	.88	1.4	1.4	166	274	57	84	10
4		1242	952.14	1.00	1.6	1.6	173	271	57	84	11.5
5		1245	954.03	1.00	1.6	1.6	172	273	57	85	12
6		1248	955.84	.80	1.3	1.3	175	269	58	85	11.5
7		1252	957.60	.80	1.3	1.3	173	263	58	85	12
8		1255	959.42	.80	1.3	1.3	174	251	57	85	13
9		1258	961.28	.85	1.35	1.35	174	265	58	85	13.5
10		1301	963.10	.85	1.35	1.35	174	261	60	86	13.5

STACK SAMPLING FIELD DATA SHEET

ACE AIR CONSULTING & ENGINEERING, INC.
2106 N. W. 67th PLACE · Suites 9 & 10
GAINESVILLE, FLORIDA · 32606

TEST ID _____
PAGE _____ OF _____

PLANT ATLANTIC SUGAR ASSOCIATION
SOURCE No. 3 BOILER
PLANT LOCATION BELLE GLADE, FL.
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES P.M.
DATE 11-27-90 RUN NO. 2
TIME START 1030 TIME END 1131
SAMPLE TIME 20 / 3 (min/pt) = 60 Total min
ASSUMED MOISTURE 28 % FDA .72
NOMOGRAPH C_f 1.6 PITOT CORR. .84
P_b 30.38 "Hg P_s 30.33 "Hg
WEATHER CLEAR TEMP. _____ °F
METER BOX NO. 1 H 2.05 Y 0.994
NOZZLE CAL. _____ _____ _____ = .225
STACK DIMENSIONS 71.5
STACK AREA 27.883 ft.² EFFECTIVE _____ ft.²
STACK HEIGHT _____ ft.
STACK DIAMETER: UPSTRM. _____ DNSTRM. _____
PORT SIZE _____ in. NIPPLE LENGTH _____ in.
U CORD LENGTH 125
REMARKS: _____

7183
8380
119700
234 psi 580°F
FW. 250°F
350 psi

.5815
.4143

167.2

41.1 lb/HR

68.82

MAT'L PROCESSING RATE _____
GAS METER READINGS: FINAL 926.882 ft.³
INITIAL 891.080 ft.³
NET 2 ft.³
FILTER NO. 2871 IMP. VOL. GAIN 280 ml.
SIL GEL NO. 54 WT. GAIN 6.8 ml.
TOTAL CONDENSATE 286.8 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					10.4
% O_2					9.5
% CO					
% N_2					

F_O = _____ F_O RANGE = _____
ORSAT ANALYZER _____

LEAK CHECKS
PRE 0.00 cfm 19 "Hg POST .000 cfm 18 "Hg
METER BOX/PUMP _____ GAS SAMPLE SYST. _____
ORSAT BAG _____
PITOT TUBE NO. 1601 PRE-TEST O.K.
POST-TEST(+) 4.0 / 15 H_2O/Sec
POST-TEST(−) 4.8 / 15 H_2O/Sec
PYROMETER NO. 1
BOX OPERATOR NICK PROBE HOLDER CLAMP

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (FT.³)	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O) CALC.	ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. F	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
1-1		1033	896.82	.65	1.05	1.05	154	266	62	78	5.0
2		1036	894.45	.68	1.00	1.00	155	265	60	78	5.5
3		1039	896.16	.78	1.25	1.25	156	261	58	78	6.0
4		1042	897.92	.82	1.3	1.3	157	258	57	78	6.5
5		1045	899.66	.82	1.3	1.3	163	257	58	79	7
6		1048	901.45	.85	1.35	1.35	175	251	57	79	7.5

ACE AIR CONSULTING & ENGINEERING, INC.

TEST ID _____

PAGE ____ OF ____

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (ft.^{3})	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O)		STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. (°F)	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
					CALC.	ACTUAL					
1-~~7~~		1051	903.29	.90	1.45	1.45	177	252	58	79	8.5
~~8~~		1054	905.07	.90	1.45	1.45	178	250	57	80	8.5
9~~10~~		1057	906.90	.90	1.45	1.45	175	254	58	81	9
1-10		1100	908.84	.95	1.5	1.5	175	257	57	81	10.5
2-1		1104	910.47	.70	1.1	1.1	170	259	60	82	8
2		1107	912.32	.90	1.45	1.45	169	272	58	82	10
3		1110	914.18	.95	1.5	1.5	171	271	57	82	11
4		1113	916.07	.95	1.5	1.5	171	275	56	82	11.5
5		1116	918.05	1.00	1.6	1.6	173	273	56	83	13
6		1119	919.84	.82	1.3	1.3	174	271	57	83	11.5
7		1122	921.57	.78	1.25	1.25	172	272	57	84	11.5
8		1125	923.31	.82	1.3	1.3	174	264	57	84	12
9		1128	925.11	.87	1.4	1.4	174	257	57	84	13
10		1131	926.882	.87	1.4	1.4	174	252	56	84	13

APPENDIX C

LABORATORY ANALYSES

AIR CONSULTING & ENGINEERING, inc. — PARTICULATE LAB DATA

SOURCE _____

PROBE RINSE	RUN 1	RUN 2	RUN 3	BLANK
CONTAINER NUMBER	5-2	5-5	5-25	5-34
TOTAL VOLUME (ml)	101.0973	101.0927	106.4443	105.4288
1st GROSS WEIGHT (g)	101.0978	101.0929	106.4440	105.4286
2nd GROSS WEIGHT (g)	200	210	205	100
AVERAGE GROSS WEIGHT (g)	101.0976	101.0928	106.4442	105.4287
TARE WEIGHT (g)	101.0811	101.0746	106.4357	105.4272
SUB NET WEIGHT (g)	0.0165	0.0182	0.0085	.0015
ACETONE BLANK (g)				
TOTAL NET WEIGHT (mg)	16.5	18.2	8.5	1.5

LIQUID LEVEL 0.K

DATE & TIME: 11-28 1700

DATE & TIME: 12-1 1700

NOTE: In no case should a blank residue >0.01 mg/g or 0.001% of the weight of acetone used be subtracted from the sample weight.

FILTER	RUN 1	RUN 2	RUN 3	BLANK
FILTER NUMBER	2870	2871	2872	2882
1st GROSS WEIGHT (g)	0.6192	0.5828	0.5881	0.4041
2nd GROSS WEIGHT (g)	0.6192	0.5827	0.5883	0.4039
AVERAGE GROSS WEIGHT (g)	0.6192	0.5828	0.5882	0.4040
TARE WEIGHT (g)	0.4144	0.4143	0.4081	0.4001
SUB NET WEIGHT (g)	0.2048	0.1685	0.1801	3.9
TOTAL NET WEIGHT (mg)	204.8	168.5	180.1	3.9

DATE & TIME: 11-28 1700

DATE & TIME: 12-1 1700

TARE BALANCE CHECK

SEE LAB BOOK

1st GROSS WEIGHT BALANCE CHECK

0 0.0000 10.0g —

0.5 g 0.5000 100.0g 100.0000

%RH 44 DATE 11-28

Signature S. J. [illegible]

2nd GROSS WEIGHT BALANCE CHECK

0 0.0000 10.0g —

0.5g 0.5000 100.0g 100.0000

%RH 45 DATE 12-1

Signature S. J. [illegible]

APPENDIX D

QUALITY ASSURANCE

AND

CHAIN OF CUSTODY

AIR CONSULTING AND ENGINEERING, Inc.

SAMPLE RECOVERY AND CHAIN OF CUSTODY

PLANT NAME ATLANTIC SUGAR ASSOC. TEST DATE 11-27-90
SOURCE NAME No. 3 BOILER SAMPLE RECOVERED BY S. N
TYPE OF SAMPLE PM PARTICULATE ANALYSES BY S. N

SAMPLE RECOVERY

RUN NO.	CONTAINER NO.	LIQUID LEVEL MARKED	COLOR	COMMENTS
1	FIL. 2870		BLK	
	PW	L		
2	FIL 2871		BLK	
	PW	L		
3	FIL 2872		BLK	
BLANK	PW	L		
BLANK	FIL. 2882		WT	
ACETONE / WATER BLANK (CIRCLE)				
FILTER BLANK				

SILICA GEL

RUN NO.	CONTAINER NO.	FINAL WT. (g)	INIT. WT. (g)	NET WT. (g)	COLOR
1			200.0		
2			200.0		
3			200.0		
			200.0		
			200.0		
			200.0		
			200.0		
			200.0		

STANDARD METER CALIBRATION
Meter Number 1040616

Air Consulting and Engineering, Inc. (ACE) uses a dry gas meter for the calibration standard. This meter has been calibrated against a wet test meter in triplicate. This data was used to generate a standard meter calibration curve (see next page). Field meter calibrations are corrected to this curve using the following formula:

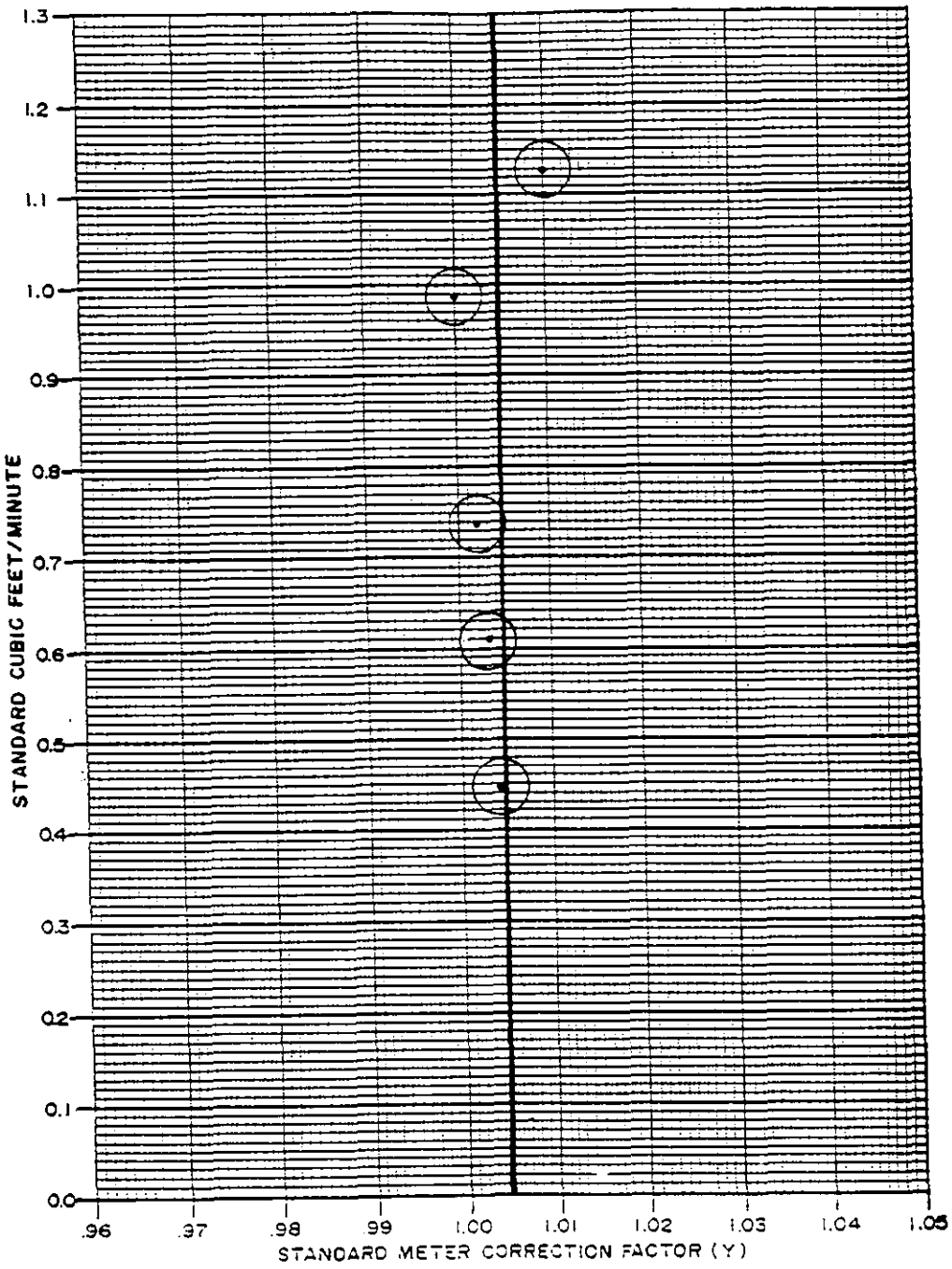
$$Y_a \times Y_s = Y$$

Y_a = actual ratio of field meter to standard meter

Y_s = ratio of standard meter to wet test meter at a given flow rate (from Calibration Curve)

Y = corrected ratio of field meter

The dry standard meter was calibrated on November 23, 1990, and is checked and/or recalibrated at least annually.



STANDARD METER CALIBRATION CURVE
METER SERIAL NO. 1040616 (SOUTH)
NOVEMBER 23, 1990

AIR CONSULTING
and
ENGINEERING

AIR CONSULTING & ENGINEERING — STANDARD METER CALIBRATION

DATE 11-23-90

LEAK CHECK 0.000 CFM at 12 In. Hg.

METER SERIAL NUMBER 1040616 (South)

BAROMETRIC PRESSURE 30.07 In. Hg.

STD GAS METER TEMPERATURE 67 °F / ASTM GLASS THERMOMETER TEMPERATURE 69 °F

WET ΔH	STD ΔH	GAS VOLUME, WET TEST METER			GAS VOLUME, STD GAS METER			TEMP. WET TEST METER (°F)	TEMP. OF STD. METER (°F)	TIME (Minutes)
		INITIAL	FINAL	ACTUAL ft^3	INITIAL	FINAL	ACTUAL ft^3			
-0.1	-1.1	0.000	5.333	5.333	272.003	277.309	5.306	70	67	12
-0.1	-1.1	5.333	10.664	5.331	277.309	282.600	5.291	70	67	12
-0.1	-1.1	10.664	15.982	5.318	282.600	287.877	5.277	70	67	12
-0.3	-1.9	0.000	5.490	5.490	288.149	293.623	5.474	70	67	9
-0.3	-1.9	5.490	12.799	7.309	293.623	300.898	7.275	70	67	12
-0.3	-1.9	12.799	18.278	5.479	300.898	306.359	5.461	70	67	9
-0.4	-2.5	0.000	5.160	5.160	306.712	311.863	5.151	70	67	7
-0.4	-2.5	5.160	10.321	5.161	311.863	317.017	5.154	70	67	7
-0.4	-2.5	10.321	15.488	5.167	317.017	322.173	5.156	70	67	7
-0.5	-3.7	0.000	7.481	7.481	322.562	330.068	7.506	70	67	8
-0.5	-3.7	7.481	14.039	6.558	330.068	336.655	6.587	70	67	7
-0.5	-3.7	14.039	19.649	5.610	336.655	342.278	5.623	70	67	6
-0.7	-5.3	0.000	5.639	5.639	342.648	348.279	5.631	70	67	5
-0.7	-5.3	5.639	11.268	5.629	348.279	353.889	5.610	70	67	5
-0.7	-5.3	11.268	16.889	5.621	353.889	359.498	5.609	70	67	5

CALIBRATED BY: G. F. Gabel

	Y	SCFM	Y	SCFM	Y	SCFM	Y	SCFM	Y	SCFM
Run 1	1.002	0.445	1.002	0.611	1.002	0.738	1.000	0.986	1.009	1.129
Run 2	1.005	0.445	1.004	0.610	1.002	0.738	0.999	0.986	1.011	1.127
Run 3	1.005	0.444	1.002	0.610	1.003	0.739	1.001	0.986	1.010	1.126
Average	1.004	0.444	1.003	0.610	1.002	0.738	1.000	0.986	1.010	1.127

air consulting and engineering

AIR CONSULTING & ENGINEERING, INC. PYROMETER CALIBRATION

DATE 7-10-90

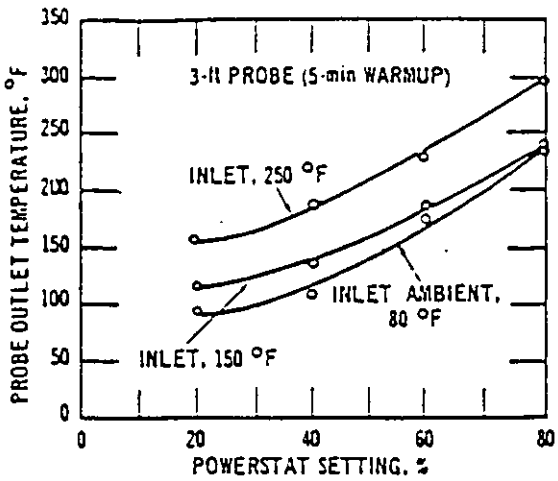
PYROMETER NUMBER METER BOX #1

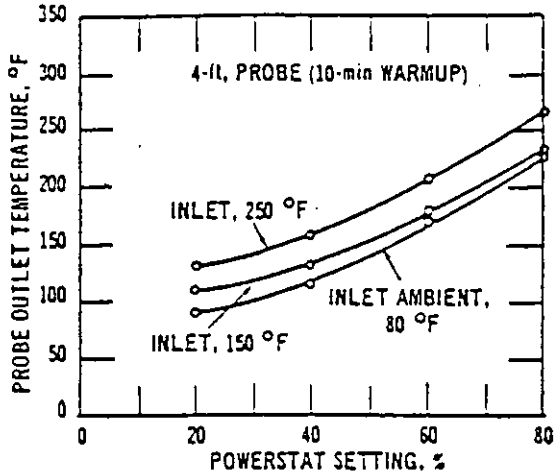
SOURCE (SPECIFY)	GLASS THERMOMETER WITH NBS MERCURY (°F)	PYROMETER (°F)	DEGREE DIFFERENCE	PERCENT DIFFERENCE
ICE BATH	32°	33°	1	.2%
AMBIENT	94°	96°	2	.4%
HOT OVEN	800°	800°	0	0

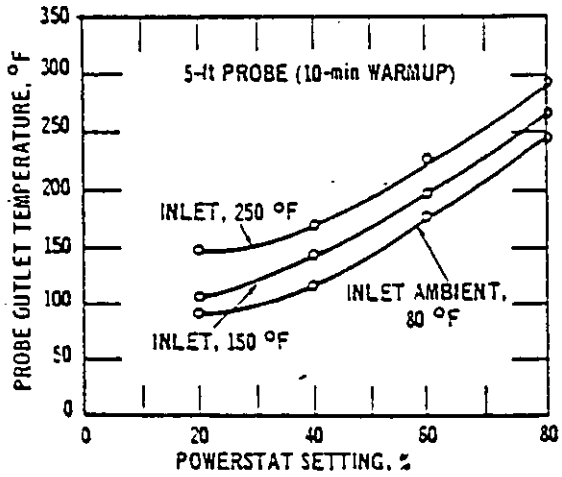
FDER - MAXIMUM 5° DIFFERENCE

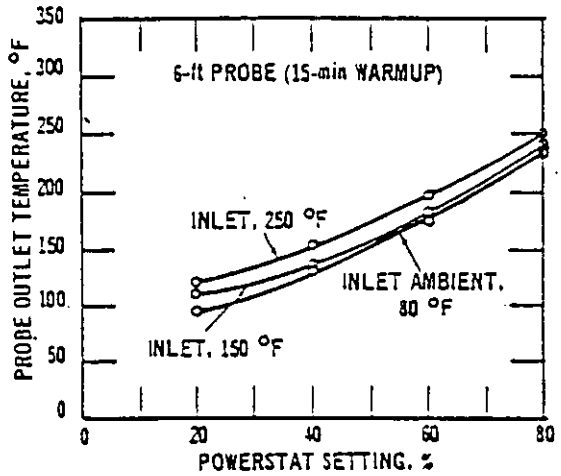
EPA $\left[\frac{(\text{REF. TEMP. °F} + 460°) - (\text{PYROMETER TEMP. °F} + 460°)}{\text{REF. TEMP. °F} + 460°}\right] 100 \leq 1.5\%$

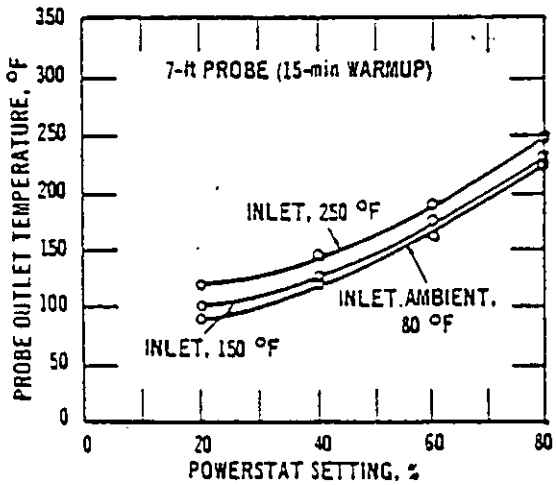
CALIBRATED BY: Larry Watts











NOTE: Flow rate held constant at 0.75; 50% change in flow rate has little effect on probe temperature.

Probe temperatures.

AIR CONSULTING & ENGINEERING, INC. — PITOT TUBE CALIBRATION

DATE CALIBRATED 9-25-90 PITOT TUBE 1601

IS PITOT TUBE ASSEMBLY LEVEL YES ARE PITOT TUBE OPENINGS DAMAGED no

α_1 = 0 °(<10°), α_2 = 1.5 °(<10°), β_1 = 1 °(<5°), β_2 = 2 °(<5°)

γ = 1.5 ° θ = 1 ° A = 1.179 in. = (Pa + Pb)

z = A sin γ = 0.031 in.; <0.32/<1/8 in.

w = A sin θ = 0.021 in.; <0.08/<1/32 in.

P_a 0.5895 in. P_b 0.5895 in. D_t .375

WAS CALIBRATION REQUIRED no

THERMOCOUPLE CALIBRATION

SOURCE (SPECIFY)	ASTM GLASS THERMOMETER WITH MERCURY (°F)	PYROMETER (°F)	DEGREE DIFFERENCE	PERCENT DIFFERENCE
ICE BATH				
AMBIENT				
HOT OVEN				

FDER - MAXIMUM 5° DIFFERENCE

CALIBRATED BY: _____

EPA $\left[\frac{(\text{REF. TEMP. °F} + 460°) - (\text{PYROMETER TEMP. °F} + 460°)}{\text{REF. TEMP. °F} + 460°}\right] 100 \leq 1.5\%$

AIR CONSULTING & ENGINEERING, inc. POST TEST CALIBRATION

DATE 11-27-90 METER BOX NUMBER 1 LEAK CHECK 0.00 CFM at 24 in. Hg.

CLIENT ASA / SCGCOF SOURCE No 3 & No. 4 Boilers / No 1 Boiler & ~~No 2 Boiler~~ THERMOCOUPLE NUMBER 161 PYROMETER NUMBER 1

FLIGHT SERVICE Pb — in. Hg. ACE BAROMETER Pb — in. Hg.

ASTM GLASS THERMOMETER 173 °F / THERMOCOUPLE 173 °F ASTM GLASS THERMOMETER 73 °F / METER TEMP 74 °F

ΔHS	AVERAGE ΔHD	GAS VOLUME, STANDARD METER			GAS VOLUME, DRY GAS METER			TEMP. STANDARD METER	TEMP. OF DRY METER	TIME (Minutes)	MAX. VACUUM In. Hg.
		INITIAL	FINAL	ACTUAL ft^3	INITIAL	FINAL	ACTUAL ft^3				
-.75	1.3	374.714	382.073	7.359	979.100	986.776	7.676	73 73	84 85	13.0	15.0
-.75	1.3	382.073	389.951	7.878	986.776	994.981	8.205	73 73	85 87	14.0	15
-.75	1.3	390.000	397.812 ~~390.00~~	7.812	995.033	1003.188	8.155	73 73	87 87	14.0	15

CALIBRATED BY: Stephen J. Neil

$Y_1 = 0.976$

$Y_2 = 0.980$

$Y_3 = 0.980$

$Y_{AVG} = 0.98$

603
618
634

air consulting and engineering

AIR CONSULTING & ENGINEERING — ANNUAL METER CALIBRATION

DATE 6-7-90

LEAK CHECK 0.000 CFM at 12 In. Hg.

METER BOX NUMBER 1

BAROMETRIC PRESSURE 30.02 In. Hg

DRY GAS METER TEMPERATURE 89 °F/ASTM GLASS THERMOMETER TEMPERATURE 90 °F

ΔHS	AVERAGE ΔHD	GAS VOLUME, STANDARD METER			GAS VOLUME, DRY GAS METER			TEMP. STD. METER	TEMP. OF DRY METER	TIME (Minutes)	TIMER
		INITIAL	FINAL	ACTUAL ft^3	INITIAL	FINAL	ACTUAL ft^3				
-.07	0.5	206.539	214.496	7.957	719.311	727.244	7.933	85	85	21	21
-.15	1.25	215.308	221.239	5.931	728.042	733.952	5.910	85	86	10	
-.22	2.0	221.610	227.578	5.968	734.320	740.265	5.945	85	87	8	
-.32	2.75	228.029	233.291	5.262	740.708	745.940	5.232	86	88	6	
-.40	3.5	233.668	239.592	5.924	746.315	752.205	5.890	87	90	6	
-.50	4.25	240.117	245.527	5.410	752.724	758.112	5.388	87	91	5	

	DELTA H	Ya	SCFM	Ys	Y
	2.004	1.002	0.368	1.004	1.006
	2.041	1.002	0.577	0.998	1.000
	2.061	1.003	0.725	0.993	0.996
	2.054	1.003	0.851	0.989	0.992
	2.063	1.003	0.956	0.985	0.988
	2.082	1.001	1.048	0.983	0.984
MEAN:	2.051	1.002		0.992	0.994

CALIBRATED BY: H. F. Gabel

AIR CONSULTING & ENGINEERING, inc. POST TEST CALIBRATION

DATE 12-22-90 METER BOX NUMBER 1 LEAK CHECK 0.00 CFM at 22 in. Hg.

CLIENT ATLANTIC SUGAR + S.G. Co-op SOURCE VARIOUS THERMOCOUPLE NUMBER 1601 PYROMETER NUMBER 1

FLIGHT SERVICE Pb 30.10 in. Hg. ACE BAROMETER Pb 30.11 in. Hg.

ASTM GLASS THERMOMETER 149 °F / THERMOCOUPLE 150 °F ASTM GLASS THERMOMETER 68 °F / METER TEMP 68 °F

ΔHS	AVERAGE ΔHD	GAS VOLUME, STANDARD METER			GAS VOLUME, DRY GAS METER			TEMP. STANDARD METER	TEMP. OF DRY METER	TIME (Minutes)	MAX. VACUUM In. Hg.
		INITIAL	FINAL	ACTUAL ft^3	INITIAL	FINAL	ACTUAL ft^3				
.26	2.1	452.500	493.960	41.46	290.053	331.598	41.545	71 73	69 76	55	21
.19	1.5	493.960	509.942	15.982	331.598	347.654	16.056	73 75	76 78	25	22
.32	2.7	509.942	569.500	59.558	347.654	406.880	59.226	75 76	78 82	101	20

CALIBRATED BY: S. L. Deck

	DELTA H	Ya	SCFM	Ys	Y
	2.068	0.994	0.753	0.993	0.987
	2.052	0.997	0.636	0.995	0.992
	4.341	1.007	0.585	0.998	1.005
MEAN:	2.820	1.000		0.995	0.995

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APPENDIX E

PRODUCTION RATE CERTIFICATION

Kleeman Engineering, Inc.
4300 N.W. 44th Street • Fort Lauderdale, Florida 33319
CHEMICAL & ENVIRONMENTAL ENGINEERS
305/733-5067

December 3, 1990

Mr. Steve Neck
14642 Flamingo Drive
Loxahatchee, FL 33470

Re: Atlantic Sugar Assn.
Compliance Stack Tests
Boilers #3 and 4

Dear Steve:

Enclosed are the two steam production charts for the two referenced stack tests.

Thank you for your good cooperation in this matter.

Sincerely,

Frank S. Kleeman, P.E.

PROCESS DATA

INSTALLATION BOILER #3

COMPANY ATLANTIC SUGAR ASSN.

DATE NOVEMBER 27, 1990

TYPE OF INSTALLATION BAGASSE BOILER

TYPE OF MATERIAL PROCESSED STEAM

TYPE OF FUEL USED BAGASSE

TYPE OF POLLUTION CONTROL SYSTEM DUAL WET SCRUBBERS

		NORMAL	RUN 1	RUN 2	RUN 3
SCRUBBER WATER FLOW (GPM)	N	175	180	175	170
	S	175	180	175	170
PRESSURE DROP (INCHES)	N	4.0	3.6	3.3	3.3
	S	4.0	3.4	3.3	3.2

REPORTED BY Frank Kleeman

BOILER DATA SHEET

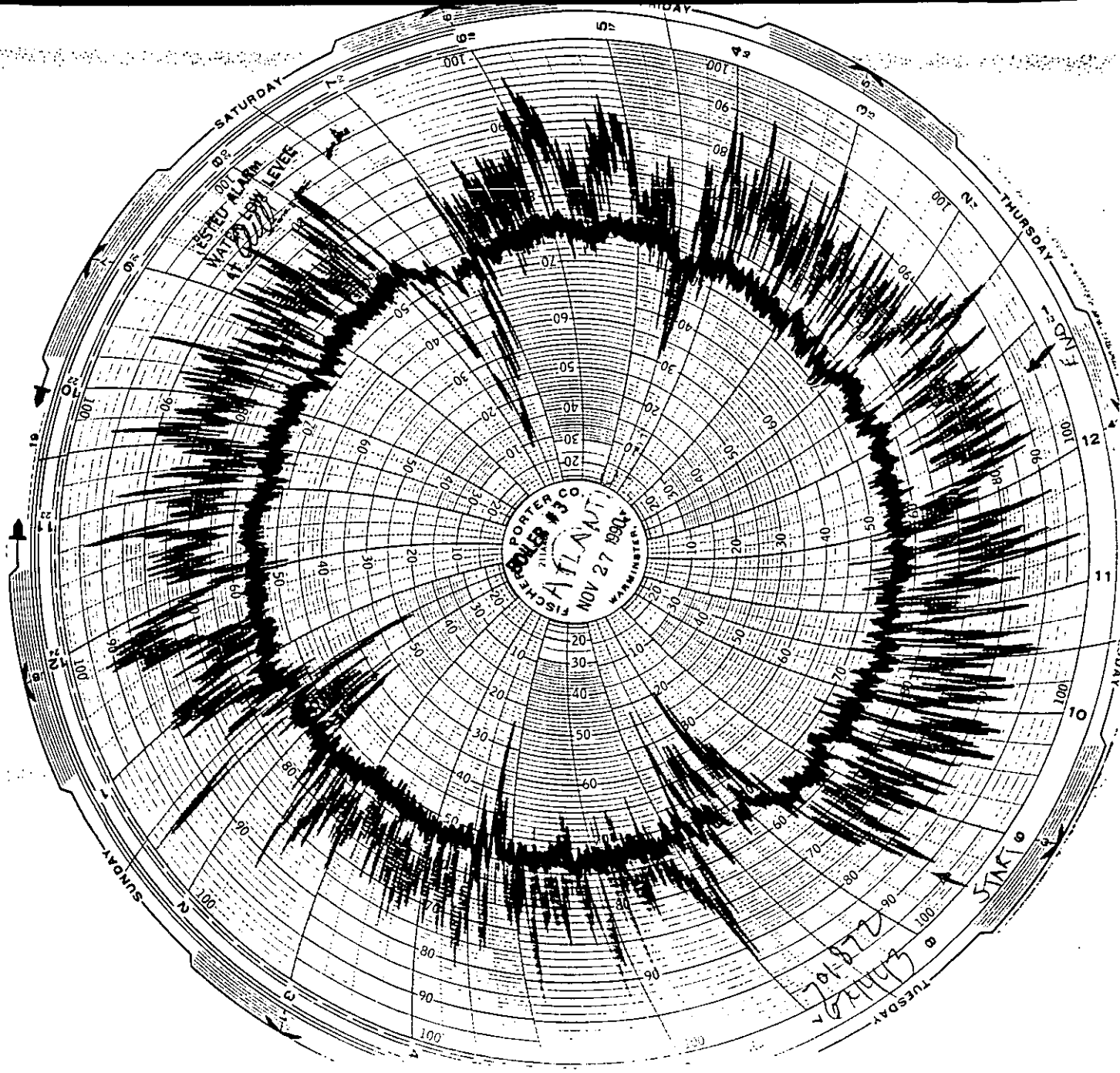
COMPANY ATLANTIC SUGAR ASSN REPORTED BY Frank Kleeman

DATE NOVEMBER 27, 1990

INTEGRATOR FACTOR X 100 BOILER NO. 3

FUEL OIL USED No OIL

	TIME	INTEGRATOR	LOG SCALE STEAM FLOW X 1400	PRESSURE	TEMP.	FEED WATER TEMP.	FEED WATER PRESSURE
RUN 1	845	5053	90	215	560	250	350
	900	5377	82	230	580	250	350
	915	5674	85	240	580	250	350
	930	5977	86	220	575	250	350
	945	6265	84	245	585	250	350
	60 MIN	1212		230	576	250	350 AVG
		1212 X 100 =	121,200	LBS/HR			
RUN 2	1030	7183	88	225	575	250	350
	1045	7487	89	230	575	250	350
	1100	7797	82	240	580	250	350
	1115	8088	82	235	595	250	350
	1130	8380	85	240	575	250	350
	60 MIN.	1197		234	580	250	350 AVG
		1197 X 100 =	119,700	LBS/HR			
RUN 3	1200	78994	85	220	575	250	350
	1215	9290	84	235	575	250	350
	1230	9590	85	240	580	250	350
	1245	9905	90	250	580	250	350
	100	80214	85	250	575	250	350
	60 MIN.	1220		239	577	250	350 AVG
		1220 X 100 =	122,000	LBS/HR			


SATURDAY
THURSDAY
SUNDAY
TUESDAY
ESTED ALARM
WATER LOW LEVEE
PORTER CO.
BOILER #3
FISCHER
WARMINSTER
NOV 27 1990
START
END

APPENDIX F

PROJECT PARTICIPANTS

PROJECT PARTICIPANTS

ACEI:

STEPHEN L. NECK, P.E.	FIELD TESTING REPORT PREPARTION
GERARD GAUTHREAUX	FIELD TESTING

KLEEMAN ENGINEERING, INC

FRANK S. KLEEMAN, P.E.	PROJECT COORDINATOR

Ref 4

DATE 3/29/91

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
PARTICULATE STACK TEST VERIFICATION
DER METHOD 5

FACILITY NAME: ATLANTIC SUGAR APIS #

COMPANY CONDUCTING TEST: ACE TEST DATE NOV 27 90

SOURCE DESCRIPTION: BOILER 3

STACK TEST DATA SUMMATION

		RUN1	RUN2	RUN3
1.H2O	(VOL.MEAS.),ML	306.3	286.8	282.5
2.H20	(MASS MEAS.),GM	0	0	0
3.M'N	PARTICULATE WEIGHT, GM	.2213	.1867	.1886
4.V'M	VOLUME METERED,CF	37.8	35.82	35.98
5.Y	DRY GAS MTR. CALIB.FCTR.	.994	.994	.994
6.RDP	AVG SQR D.P-SAMPLING	.937	.918	.917
7.DH	AVG DELTA H,IN.H2O	1.498	1.35	1.35
8.T'M	AVG MTR. TEMP,DEG.F	79	81.1	83.1
9.T'S	AVG STACK TEMP,DEG.F	170.2	169.4	168.3
10.P'S	STACK PRESS,''HG(ABS)	30.23	30.23	30.23
11.P'B	BAROMETRIC PRESS,''HG	30.38	30.38	30.38
13.D'N	ACTUAL NOZZLE DIAM,IN	.225	.225	.225
14.T	ACTUAL SAMPLE TIME,MIN	60	60	60
15.C'P	PITOT TUBE COEFFICIENT	.84	.84	.84
23.S/T	VALUE:SAMPLE PTS/TOT PTS	1	1	1

RUN	VOLUME SAMPLED DSCF	MOISTURE CONTENT PERCENT	STACK VEL FPS	FLOW RATE DSCF/H	PERCENT ISO-KINETIC	ACTUAL EMISS LB/HR	ACTUAL EMISS LB/MBTU	ALLOW EMISS LB/MBTU
1	37.49	27.77	59.49	3,649,727	103.76	47.49	0.199	0.300
2	35.38	27.62	58.23	3,584,413	99.70	41.70	0.174	0.300
3	35.41	27.30	58.07	3,596,741	99.43	42.23	0.177	0.300
MEAN	36.09	27.57	58.60	3,610,294	100.96	43.80	0.183	0.300

SUMMARY

GENERAL:

REVIEWED BY AS
ACTUAL A 'S = 27.883 SQ FT
LAMINAR FLOW ASSUMED (<10 DEG YAW) (OR <20 DER)
ACTUAL EMISS BASED ON HEAT INPUT = 239.16 MBTU/HR
ALL REQUIRED LEAK TESTS ACCEPTABLE
ASSUMED M 'D=30.0 (COMBUSTION GASES)

COMMENT.....

RUN 1 :

ACTUAL A 'N = .0002761 SQ FT

COMMENT.....

RUN 2 :

ACTUAL A 'N = .0002761 SQ FT

COMMENT.....

RUN 3 :

ACTUAL A 'N = .0002761 SQ FT

COMMENT.....

Y = .994
Stack Area 27.883

Atlantic Sugar Association.
.3 lbs/MBTU Nozzle dia .225

Heat Input

INPUT SHEET - REV:09/13/83 - PAGE 2 OF 2

ENTER THE FOLLOWING:

		RUN1	RUN2	RUN3
1. H2O	COLLECTED (ONLY VOL.MEASURED),ML:	306.30	286.80	282.50
2. H2O	COLLECTED (WEIGHED PART ONLY),GM:			
3. M'N	PARTICULATE WEIGHT, GM:	.2213	.1867	.1886
4. V'M	VOLUME METERED, CF:	37.80	35.802	35.980
5. Y	DRY GAS METER CAL FACTOR:	.994	.994	.994
6. RDP	AVG SQR DELTA P (WHEN SAMPLING):	.937	.918	.917
7. DH	AVG DELTA H, IN H2O:	1.498	1.35	1.35
8. T'M	AVG METER TEMP, DEG F:	79.0	81.1	83.1
9. T'S	AVG STACK TEMP, DEG F:	170.2	169.4	168.3
10. P'S*	STACK PRESS, *IN ....(.....):	30.23	30.23	30.23
11. P'B	BAROMETRIC PRESS, IN HG:	30.38	30.38	30.38
13. D'N	ACTUAL NOZZLE DIAMETER, IN.:	.225	.225	.225
14. T	ACTUAL SAMPLE TIME, MIN:	60	60	60
15. C'P	PITOT TUBE COEFFICIENT:	.84	.84	.84
OPTION ENTRIES:		239.3	237.05	241.14
17. ORSAT/FYRITE - %CO2:				
18. ORSAT/FYRITE - %O2:				
28. ORSAT/FYRITE (FOR C'S @ 50%E.A.)-%CO:				
19. SPECIFIC M'D ENTRIES:				
20. CYCLONIC (10-20 DEG) - AVG COS(YAW):				
26. CYC.(>20) - AVG(SQR D.P X COS(YAW)):				
21. PROCESS WT SOURCE - T/HR:				
22. LB/TON REGULATED - T/HR:				
27. LB/* REGULATED (* AS DEFINED) - */HR:				
23. LAM&CYC(<20)-VAL(SAMPLE PTS/TOT PTS):				

Atlantic

239.16

Run #1 missing

Heat Input