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: 18

Title: Source Test Report for Particulate Emissions Twin Impingement Wet Scrubber Number 4 Boiler: Atlantic Sugar Association

November 1990

Ref-5

DSW1-ASA 3

Air Consulting and Engineering, Inc.

SOURCE TEST REPORT
for
PARTICULATE EMISSIONS

IMPINGEMENT WET SCRUBBER
NUMBER 4 BOILER

ATANTIC SUGAR ASSOCIATION
BELLE GLADE, FLORIDA

NOVEMBER 29, 1990

PREPARED FOR:
KLEEMAN ENGINEERING, INC.
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TABLE OF CONTENTS

SECTION		PAGE
1.0	INTRODUCTION	1
2.0	SUMMARY AND DISCUSSION OF RESULTS	2
3.0	PROCESS DESCRIPTION AND OPERATION	4
4.0	SAMPLING POINT LOCATION	5
5.0	FIELD AND ANALYTICAL PROCEDURES	7

APPENDICES

APPENDIX A--COMPLETE EMISSION DATA AND SAMPLE CALCULATIONS

APPENDIX B--FIELD DATA SHEETS

APPENDIX C--LABORATORY ANALYSES

APPENDIX D--QUALITY ASSURANCE AND CHAIN OF CUSTODY

APPENDIX E--PRODUCTION RATE CERTIFICATION

APPENDIX F--PROJECT PARTICIPANTS

LIST OF TABLES

TABLE
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1 SUMMARY OF PARTICULATE MATTER EMISSIONS.....3

LIST OF FIGURES

FIGURE
---

1 SAMPLING POINT LOCATION.....6

2 EPA 5 SAMPLING TRAIN.....8

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

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1.0 INTRODUCTION

Personnel from Air Consulting and Engineering, INC. (ACEI) performed annual source emission compliance testing for the Atlantic Sugar Association on November 29, 1990. Testing was performed at the Number 4 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 Kleeman Engineering, Inc.

Mr. Sherril Culliver of the Florida Department of Environmental Regulation(FDER) witnessed a portion of the testing.

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 44.02 pounds per hour (LB/HR) and 0.198 pounds per million btu(LB/MMBTU) heat input against a "process rate" basis allowable emission of 0.290 LB/MMBTU. Permit conditions limit emissions to 0.10 LB/MMBTU from oil and 0.290 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 4 BOILER
NOVEMBER 29,1990

RUN NUMBER	TIME	ACTUAL EMISSIONS		ALLOWABLE EMISSIONS	
		LB/HR	LB/MMBTU	LB/HR	LB/MMBTU
1	0845-0946	42.21	0.199	61.50	0.290
2	1100-1201	44.18	0.196	65.32	0.290
3	1315-1416	45.67	0.200	66.08	0.290
AVERAGES	---------	44.02	0.198	64.30	0.290

3.0 PROCESS DESCRIPTION AND OPERATION

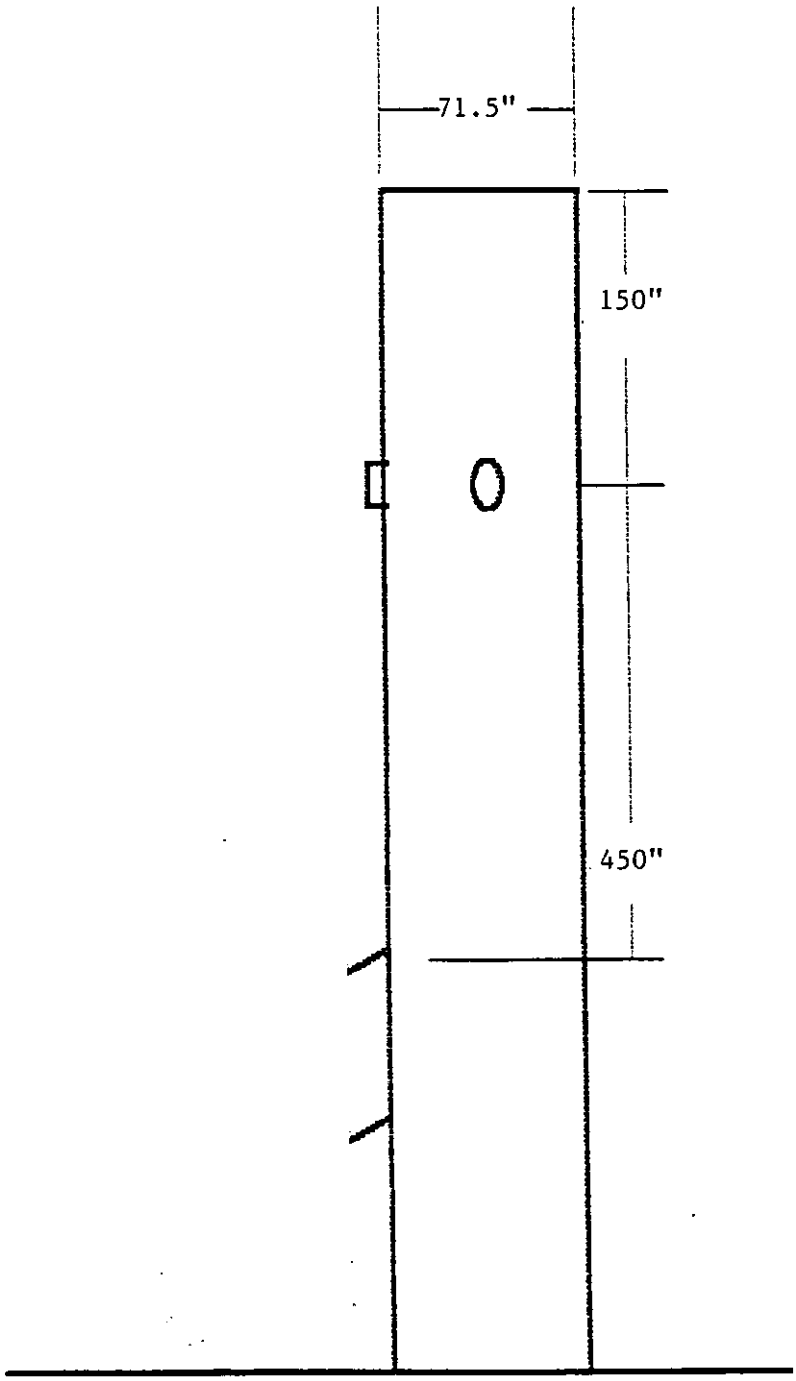
The Number 4 Boiler at the Alantic Sugar Asociation is a spreader stoker design used primarily for residue fuel firing. Supplemental oil firing may also be utilized but was not used during the emission test series. The boiler averaged 113,933 pounds per hour steam production over the three run test period.

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

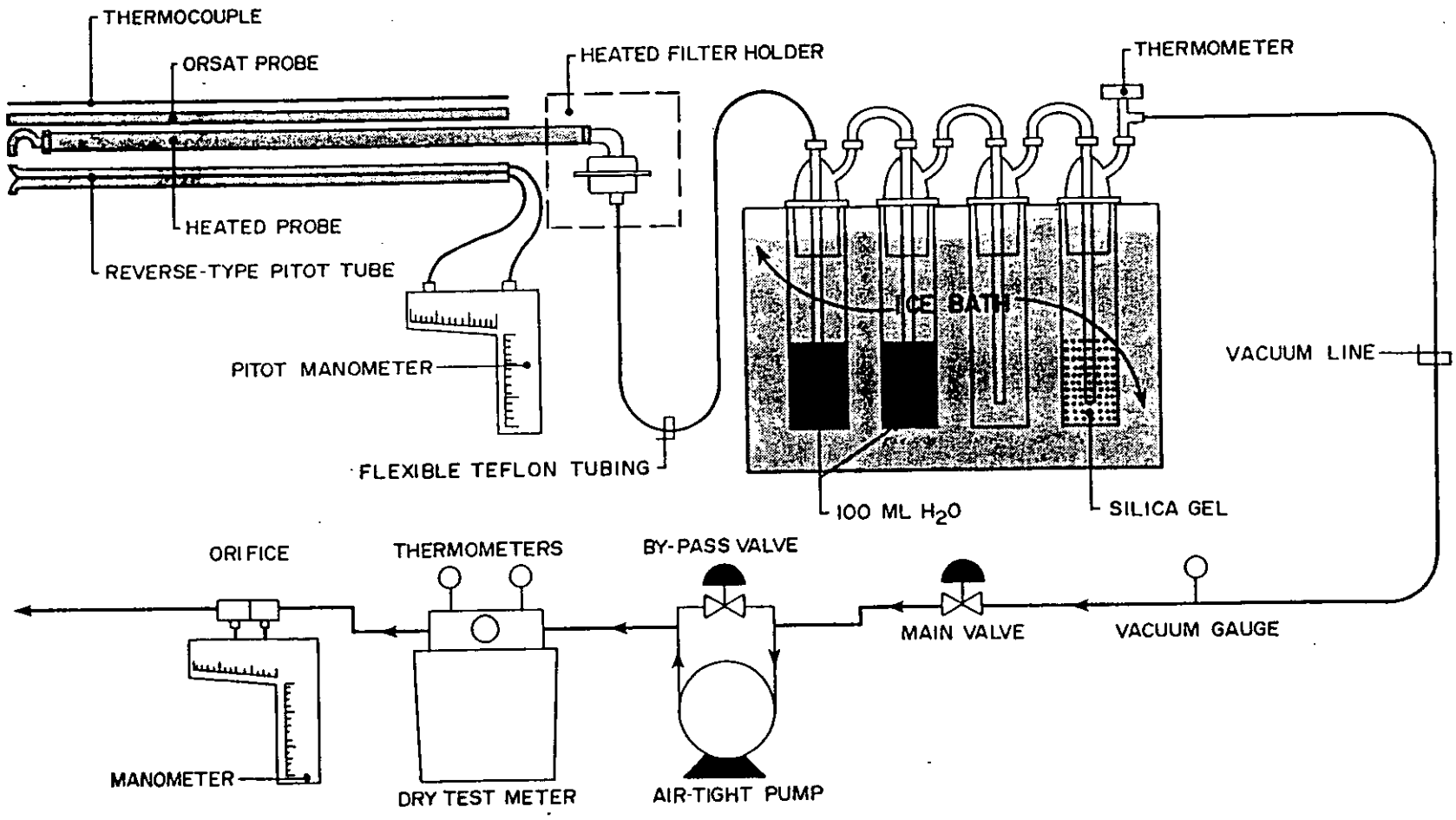


FIGURE 1.
EPA METHOD 5 SAMPLING TRAIN

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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 Data

PLANT:	ATLANTIC SUGAR ASSOCIATION	DATE:	11-29-90
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	1
SOURCE:	NUMBER 4 SCRUBBER OUTLET	TIME:	0845-0945

TIME INTERVAL	60	MINUTES
OIL:		
FINAL OIL	0	
BEGIN OIL	0	
FACTOR	1	
STEAM:		
FINAL STEAM	9548	
BEGIN STEAM	8457	
FACTOR	100	
TEMPERATURE	543	DEGREES F
PRESSURE	234	PSIG
	249	PSIA
FEEDWATER:		
TEMPERATURE	250	DEGREES F
PRESSURE	350	PSIG
	365	PSIA
HEAT INPUT:		
STEAM	1287.5	BTU/LB
FEEDWATER	218.4	BTU/LB
NET STEAM	1069.0	BTU/LB
STEAM RATE	109100	LB/HR
BOILER EFFICIENCY	55.0	%
TOTAL FUEL HEAT INPUT	212.05	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)	212.05	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.29	LB/MMBTU
TOTAL ALLOWABLE EMISSION	61.50	LB/HR
TOTAL ACTUAL EMISSION	42.21	LB/HR
TOTAL ALLOWABLE EMISSION	0.290	LB/MMBTU
TOTAL ACTUAL EMISSION	0.199	LB/MMBTU

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Complete Emission Results

Plant:	ATLANTIC SUGAR ASSOCIATION		
Location:	BELLE GLADE, FLORIDA	Date:	11-29-90
Stack:	NUMBER 4 BOILER	Run 1	From 0845 - 0946

Y Factor	0.994		Nozzle Diameter	0.230	In
Total Time	60.00	Min	Nozzle Area	0.000289	Ft^2
Stack Area	27.883	Ft^2	Barometric Pressure	30.40	In Hg
Stack Temperature	173.6	°F	Meter Temperature	74.9	°F
Stack Pressure	30.40	In Hg	Meter Orifice Diff	1.716	In H2O
Stack Avg √ Vel Head	0.989	In H2O	Meter Volume	39.492	CF
			Condensate Vol	292.80	ml

1.	Volume Water Vapor Sampled	13.782	SCF
2.	Volume Standard Dry Gas Sampled	39.518	SCF
3.	Total Standard Sample Volume	53.300	SCF
4.	Percent Moisture	25.900	
5.	Percent Dry Air	74.100	
6.	Molecular Weight of Dry Flue Gas	29.860	
7.	Molecular Weight of Wet Flue Gas	26.788	
8.	Specific Gravity Flue Gas	0.93	
9.	Percent Oxygen [O2]	10.50	
10.	Percent Carbon Dioxide [CO2]	9.00	
11.	Percent Excess Air	97.656	
12.	Velocity of Flue Gas	62.646	FPS
13.	Actual Volumetric Flow Rate	104805.1	ACFM
14.	Dry Volumetric Flow Rate	77660.6	ACFMD
15.	Standard Volumetric Flow Rate	65755.4	SCFMD
16.	Emission Concentration	0.0749	gr/SCF
17.	Emission Concentration	0.0470	gr/ACF
18.	Emission Rate	42.21	lbs/Hr
19.	Percent Isokinetic	96.8	

Probe/Nozzle Wash	21.4	mg
Filter	170.4	mg
Total	191.8	mg

Plant: ATLANTIC SUGAR ASSOCIATION
Date: 11-29-90
Stack: NUMBER 4 BOILER
Run Number: 1

Average SQR Velocity Head = 0.989
Velocity Head Inputs:

0.7800	0.7400	1.1000	1.1000	1.1000	1.1500	1.1000
1.1500	1.1500	1.0500	0.6100	0.8000	0.8000	0.8300
0.8700	0.9700	1.0000	1.1000	1.1500	1.1500	

Average Orifice Pressure = 1.716
Orifice Pressure Inputs:

1.2500	1.2000	1.7500	1.7500	1.7500	1.9000	1.8500
2.1000	2.1000	1.9000	1.1000	1.4400	1.4400	1.5000
1.5500	1.7500	1.8000	2.0000	2.1000	2.1000	

Average Stack Temperature = 173.6
Stack Temperature Inputs:

169	171	172	175	177	176	176
176	176	173	170	172	171	172
172	172	177	176	174	175	

Average Meter Temperature = 74.9
Meter Temperature Inputs:

68	69	70	70	71	72	73
73	74	75	76	76	76	77
78	79	79	80	80	81	

Plant: ATLANTIC SUGAR ASSOCIATION
Date: 11-29-90
Stack: NUMBER 4 BOILER

Vwv Volume Water Vapor Sampled
Vwv = 0.04707 x 292.8 = 13.782 SCF

VMstd Volume Standard Dry Gas Sampled
VMstd = 17.64 x 39.492 x 0.994 x
[30.40 + (1.716 / 13.6)] / (74.9 + 460) = 39.518 SCF

Vt Total Standard Sample Volume
Vt = 13.782 + 39.518 = 53.300 SCF

W Percent Water = (13.782 / 53.300) x 100 = 25.9 %

FDA Percent Dry Air = (1 - 0.259) x 100 = 74.1 %

Md Molecular Weight of Dry Stack Gas
Md = (0.44 X 9.00 %CO2) + (0.32 X 10.50 %O2) +
[0.28 X (80.50 %N2 + 0.00 %CO)] = 29.860

Ms Molecular Weight of Wet Stack Gas
Ms = (29.860 x 0.741) + (18 x 0.259) = 26.788

SG Specific Gravity Stack Gas
SG = 26.788 / 28.84 = 0.93

Ea Percent Excess Air

$$Ea = \frac{((10.5\ \%O2) - (0\ \%CO / 2)\ X\ 100)}{[(.264 \times (80.5\ \%N2)) - (10.5\ \%O2) - (0\ \%CO / 2)]}$$

Ea = 97.656

Vs Velocity of Stack
Vs = (85.49 x 0.84 x 0.989) x √[(173.6 + 460) / (30.40 x 26.788)]
Vs = 62.646

Qa Actual Volumetric Flow
Qa = (27.883 x 62.646 x 60) = 104805.1 ACFM

Qd Dry Volumetric Flow
Qd = (104805.1 x 0.741) = 77660.6 ACFMD

Qsd Standard Volumetric Flow
Qsd = 104805.1 x 0.741 x [528 / (173.6 + 460)] x
(30.40 / 29.92) = 65755.4 SCFMD

Plant: ATLANTIC SUGAR ASSOCIATION
Date: 11-29-90
Stack: NUMBER 4 BOILER

ESTP Emission Rate
gr/SCF = [0.01543 x (21.4 + 170.4)] / (39.518)
gr/SCF = 0.0749

Lbs/Hr Emission Rate
Lbs/Hr = 0.0749 / 7000 x 65755.4 x 60 = 42.21

I Percent Isokinetic
I = 100 x (173.6 + 460) x [(0.002669 x 292.8) + (39.492 x 0.994 / (74.9 + 460)) x (30.40 + (1.716 / 13.6))] / (60 x 60 x 62.646 x 30.40 x 0.000289)
I = 96.8 %

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Complete Emission Data

PLANT:	ATLANTIC SUGAR ASSOCIATION	DATE:	11-29-90
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	2
SOURCE:	NUMBER 4 SCRUBBER OUTLET	TIME:	1100-1200

TIME INTERVAL	60	MINUTES
OIL:		
FINAL OIL	0	
BEGIN OIL	0	
FACTOR	1	
STEAM:		
FINAL STEAM	2058	
BEGIN STEAM	902	
FACTOR	100	
TEMPERATURE	550	DEGREES F
PRESSURE	252	PSIG
	267	PSIA
FEEDWATER:		
TEMPERATURE	250	DEGREES F
PRESSURE	350	PSIG
	365	PSIA
HEAT INPUT:		
STEAM	1290.1	BTU/LB
FEEDWATER	218.4	BTU/LB
NET STEAM	1071.6	BTU/LB
STEAM RATE	115600	LB/HR
BOILER EFFICIENCY	55.0	%
TOTAL FUEL HEAT INPUT	225.24	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)	225.24	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.29	LB/MMBTU
TOTAL ALLOWABLE EMISSION	65.32	LB/HR
TOTAL ACTUAL EMISSION	44.18	LB/HR
TOTAL ALLOWABLE EMISSION	0.290	LB/MMBTU
TOTAL ACTUAL EMISSION	0.196	LB/MMBTU

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Complete Emission Results

Plant:	ATLANTIC SUGAR ASSOCIATION		
Location:	BELLE GLADE, FLORIDA	Date:	11-29-90
Stack:	NUMBER 4 BOILER	Run 2	From 1100 - 1201

Y Factor	0.994		Nozzle Diameter	0.230	In
Total Time	60.00	Min	Nozzle Area	0.000289	Ft^2
Stack Area	27.883	Ft^2	Barometric Pressure	30.40	In Hg
Stack Temperature	176.3	°F	Meter Temperature	80.5	°F
Stack Pressure	30.39	In Hg	Meter Orifice Diff	1.999	In H2O
Stack Avg √ Vel Head	1.023	In H2O	Meter Volume	42.375	CF
			Condensate Vol	328.40	ml

1.	Volume Water Vapor Sampled	15.458	SCF
2.	Volume Standard Dry Gas Sampled	41.992	SCF
3.	Total Standard Sample Volume	57.450	SCF
4.	Percent Moisture	26.900	
5.	Percent Dry Air	73.100	
6.	Molecular Weight of Dry Flue Gas	29.916	
7.	Molecular Weight of Wet Flue Gas	26.711	
8.	Specific Gravity Flue Gas	0.93	
9.	Percent Oxygen [O2]	9.50	
10.	Percent Carbon Dioxide [CO2]	9.60	
11.	Percent Excess Air	80.117	
12.	Velocity of Flue Gas	65.042	FPS
13.	Actual Volumetric Flow Rate	108813.2	ACFM
14.	Dry Volumetric Flow Rate	79542.4	ACFMD
15.	Standard Volumetric Flow Rate	67046.2	SCFMD
16.	Emission Concentration	0.0769	gr/SCF
17.	Emission Concentration	0.0474	gr/ACF
18.	Emission Rate	44.18	lbs/Hr
19.	Percent Isokinetic	100.9	

Probe/Nozzle Wash	15.7	mg
Filter	193.5	mg
Total	209.2	mg

Plant: ATLANTIC SUGAR ASSOCIATION
Date: 11-29-90
Stack: NUMBER 4 BOILER
Run Number: 2

Average SQR Velocity Head = 1.023
Velocity Head Inputs:

0.9700	0.9500	1.1000	1.1500	1.1500	1.1500	1.1500
1.1500	1.1500	1.1000	0.6800	0.7800	0.8800	0.9800
0.9800	1.1000	1.1500	1.1500	1.1500	1.1500	

Average Orifice Pressure = 1.999
Orifice Pressure Inputs:

1.8000	1.8000	2.0500	2.2000	2.2000	2.2000	2.2000
2.2000	2.2000	2.1000	1.3000	1.5000	1.7000	1.8600
1.8600	2.1000	2.2000	2.2000	2.1000	2.2000	

Average Stack Temperature = 176.3
Stack Temperature Inputs:

170	173	174	176	176	178	177
176	177	178	175	176	177	178
178	179	178	174	177	178	

Average Meter Temperature = 80.5
Meter Temperature Inputs:

75	75	76	77	77	78	79
79	80	80	82	82	82	83
83	84	84	84	85	85	

AIR CONSULTING & ENGINEERING, INC.
Complete Emission Data

PLANT:	ATLANTIC SUGAR ASSOCIATION	DATE:	11-29-90
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	3
SOURCE:	NUMBER 4 SCRUBBER OUTLET	TIME:	1315-1415

TIME INTERVAL	60	MINUTES
OIL:		
FINAL OIL	0	
BEGIN OIL	0	
FACTOR	1	
STEAM:		
FINAL STEAM	4683	
BEGIN STEAM	3512	
FACTOR	100	
TEMPERATURE	547	DEGREES F
PRESSURE	244	PSIG
	259	PSIA
FEEDWATER:		
TEMPERATURE	250	DEGREES F
PRESSURE	350	PSIG
	365	PSIA
HEAT INPUT:		
STEAM	1288.8	BTU/LB
FEEDWATER	218.5	BTU/LB
NET STEAM	1070.3	BTU/LB
STEAM RATE	117100	LB/HR
BOILER EFFICIENCY	55.0	%
TOTAL FUEL HEAT INPUT	227.88	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)	227.88	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.29	LB/MMBTU
TOTAL ALLOWABLE EMISSION	66.08	LB/HR
TOTAL ACTUAL EMISSION	45.67	LB/HR
TOTAL ALLOWABLE EMISSION	0.290	LB/MMBTU
TOTAL ACTUAL EMISSION	0.200	LB/MMBTU

AIR CONSULTING AND ENGINEERING, INC.

Complete Emission Results

Plant:	ATLANTIC SUGAR ASSOCIATION		
Location:	BELLE GLADE, FLORIDA	Date:	11-29-90
Stack:	NUMBER 4 BOILER	Run 3	From 1315 - 1416

Y Factor	0.994		Nozzle Diameter	0.230	In
Total Time	60.00	Min	Nozzle Area	0.000289	Ft^2
Stack Area	27.889	Ft^2	Barometric Pressure	30.40	In Hg
Stack Temperature	178.9	°F	Meter Temperature	83.6	°F
Stack Pressure	30.39	In Hg	Meter Orifice Diff	1.887	In H2O
Stack Avg √ Vel Head	0.997	In H2O	Meter Volume	41.127	CF
			Condensate Vol	316.40	ml

1.	Volume Water Vapor Sampled	14.893	SCF
2.	Volume Standard Dry Gas Sampled	40.512	SCF
3.	Total Standard Sample Volume	55.405	SCF
4.	Percent Moisture	26.900	
5.	Percent Dry Air	73.100	
6.	Molecular Weight of Dry Flue Gas	29.916	
7.	Molecular Weight of Wet Flue Gas	26.711	
8.	Specific Gravity Flue Gas	0.93	
9.	Percent Oxygen [O2]	9.50	
10.	Percent Carbon Dioxide [CO2]	9.60	
11.	Percent Excess Air	80.117	
12.	Velocity of Flue Gas	63.518	FPS
13.	Actual Volumetric Flow Rate	106287.0	ACFM
14.	Dry Volumetric Flow Rate	77695.8	ACFMD
15.	Standard Volumetric Flow Rate	65218.0	SCFMD
16.	Emission Concentration	0.0817	gr/SCF
17.	Emission Concentration	0.0501	gr/ACF
18.	Emission Rate	45.67	lbs/Hr
19.	Percent Isokinetic	100.1	

Probe/Nozzle Wash	17.5	mg
Filter	197.0	mg
Total	214.5	mg

Avg O_2 = 9.8

Temp = 172

Flow = 66,006

Input = 222

Plant: ATLANTIC SUGAR ASSOCIATION
Date: 11-29-90
Stack: NUMBER 4 BOILER
Run Number: 3

Average SQR Velocity Head = 0.997
Velocity Head Inputs:

0.9300	0.9700	1.0000	1.1000	1.1000	1.0000	1.0000
1.0000	1.0000	1.0000	0.6300	0.7400	0.8500	0.9300
0.9500	1.1000	1.1000	1.2000	1.2000	1.2000	

Average Orifice Pressure = 1.887
Orifice Pressure Inputs:

1.7500	1.8500	1.9000	2.1000	2.0000	1.9000	1.9000
1.9000	1.9000	1.9000	1.2000	1.4000	1.6000	1.7500
1.8000	2.0000	2.0000	2.3000	2.3000	2.3000	

Average Stack Temperature = 178.9
Stack Temperature Inputs:

176	178	177	179	180	181	180
179	182	180	177	177	178	177
180	180	181	179	178	179	

Average Meter Temperature = 83.6
Meter Temperature Inputs:

78	78	79	79	80	81	82
82	83	84	85	85	86	86
86	87	87	88	88	88	

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. 4 Boiler
PLANT LOCATION Belle Glade, FL.
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES PM
DATE 11-29-90 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 1.68 PITOT CORR. .84
P_b 30.4 "Hg P_s 30.25 "Hg
WEATHER CLEAR TEMP. _____ °F
METER BOX NO. 1 H 2.05 Y 0.994
NOZZLE CAL. .230 .230 .230 = .230
STACK DIMENSIONS 71.5
STACK AREA 27.883 ft² EFFECTIVE _____ ft²
STACK HEIGHT _____ ft.
STACK DIAMETER: UPSTRM. _____ DNSTRM. _____
PORT SIZE _____ in. NIPPLE LENGTH _____ in.
U CORD LENGTH 125
REMARKS:
109100 lbs 543°F
234 PSI
PW 250°F - 350°

.5780
.4024
170.6
17.1

41.37

MAT'L PROCESSING RATE _____
GAS METER READINGS: FINAL 216.470 ft.³
INITIAL 176.978 ft.³
NET _____ ft.³
FILTER NO. 2876 IMP. VOL. GAIN 285 ml.
SIL GEL NO. 25 WT. GAIN 7.8 ml.
TOTAL CONDENSATE 292.8 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					9.0
% O_2					10.5
% CO					
% N_2					

F_O = _____ F_O RANGE = _____
ORSAT ANALYZER _____

LEAK CHECKS
PRE 0.00 cfm 19 "Hg POST 0.000 cfm 25 "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 Gerardo

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	178.75	.78	1.25	1.25	169	251	50	68	6.0
2		0853	180.45	.74	1.2	1.2	171	252	46	69	6
3		0854	182.42	1.1	1.75	1.75	172	253	44	70	8
4		0859	184.40	1.1	1.75	1.75	175	251	44	70	8.5
5		0900	186.43	1.1	1.75	1.75	177	251	44	71	9
6		0905	188.52	1.15	1.9	1.9	176	248	45	72	10

ACE AIR CONSULTING & ENGINEERING, INC.

1.024

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.	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		0908	190.58	1.1	1.85	1.85	176	243	48	73	10.5
8		0909	192.71	1.15	2.1	2.1	176	243	48	73	10.5
9		0912	194.86	1.15	2.1	2.1	176	240	49	74	12.5
10		0915	196.–	1.05	1.9	1.9	173	243	50	75	13
		+ 1 minute									
2-1		0918	198.7	.61	1.1	1.1	170	245	52	76	10
2		0921	200.40	.80	1.44	1.44	172	245	51	76	10.5
3		0924	202.21	.80	1.44	1.44	171	245	51	76	10.5
4		0927	204.18	.83	1.5	1.5	172	243	51	77	11
5		0930	205.95	.87	1.55	1.55	172	241	51	78	11.5
6		0933	207.94	.97	1.75	1.75	172	246	52	79	13.5
7		0936	209.85	1.00	1.8	1.8	177	249	52	79	14
8		0939	212.07	1.1	2.0	2.0	176	252	53	80	16
9		0942	214.30	1.15	2.1	2.1	174	252	54	80	18
10		0945	216.470	1.15	2.1	2.1	175	254	56	81	18

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. 4 Boiler
PLANT LOCATION Belle Glade, Florida
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES P.M.
DATE 11-29-90 RUN NO. 2
TIME START ~~1030~~ 1100 TIME END 1201
SAMPLE TIME 20.3 (min/pt)= 60 Total min
ASSUMED MOISTURE 26 % FDA .74
NOMOGRAPH C_f 1.85 PITOT CORR. .84
P_b 30.4 "Hg P_s 30.39 "Hg
WEATHER CLEAR TEMP. _____ °F
METER BOX NO. 1 H 2.05 Y .994
NOZZLE CAL. _____ _____ _____ = .230
STACK DIMENSIONS 71.5
STACK AREA 27.883 ft.² EFFECTIVE _____ ft.²
STACK HEIGHT 2 ft.
STACK DIAMETER: UPSTRM. _____ DNSTRM. _____
PORT SIZE _____ in. NIPPLE LENGTH _____ in.
U CORD LENGTH 125
REMARKS: _____

.6050
.1075
197.5
19.8

MAT'L PROCESSING RATE _____
GAS METER READINGS: FINAL 259.130 ft.³
INITIAL 216.755 ft.³
NET _____ ft.³
FILTER NO. 2877 IMP. VOL. GAIN 320 ml.
SIL GEL NO. 14 WT. GAIN 8.4 ml.
TOTAL CONDENSATE 328.4 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					9.6
% O_2					9.5
% CO					
% N_2					

F_O = _____ F_O RANGE = _____
ORSAT ANALYZER _____

LEAK CHECKS
PRE 0.00 cfm 24 "Hg POST 0.000 cfm 24 "Hg
METER BOX/PUMP _____ GAS SAMPLE SYST. _____
ORSAT BAG _____
PITOT TUBE NO. 1601 PRE-TEST O.K.
POST-TEST(+) 4.6 / 15 H_2O/Sec
POST-TEST(−) 3.3 / 15 H_2O/Sec
PYROMETER NO. 1
BOX OPERATOR NECK PROBE HOLDER Gerardo

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		1103	218.85	.97	1.8	1.8	170	240	57	75	7
2		1106	220.88	.95	1.8	1.8	173	234	57	75	7
3		1109	223.03	1.1	2.05	2.05	174	230	56	76	8.5
4		1112	225.22	1.15	2.2	2.2	176	227	56	77	10
5		1115	227.43	1.15	2.2	2.2	176	225	58	77	10
6		1118	229.61	1.15	2.2	2.2	178	230	59	78	10

ACE AIR CONSULTING & ENGINEERING, INC.

.000289

.932 = 65

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.	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		1121	231.84	1.15	2.2	2.2	177	235	58	79	11
8		1124	234.05	1.15	2.2	2.2	176	234	59	79	11
9		1127	236.28	1.15	2.2	2.2	177	234	59	80	12
10		1130	238.47	1.1	2.1	2.1	178	237	60	80	12
2-1		1134	240.26	.68	1.3	1.3	175	239	60	82	9
2		1137	242.10	.78	1.5	1.5	176	241	60	82	10
3		1140	244.04	.88	1.7	1.7	177	241	60	82	11
4		1143	246.08	.98	1.86	1.86	178	238	60	83	12.5
5		1146	248.03	.98	1.86	1.86	178	231	58	83	13
6		1149	250.3	1.1	2.1	2.1	179	240	58	84	14.5
7		1152	252.52	1.15	2.2	2.2	178	245	58	84	16
8		1155	254.75	1.15	2.2	2.2	174	246	58	84	16.5
9		1158	256.94	1.1	2.1	2.1	177	252	59	85	16.5
10		1200	259.13	1.15	2.2	2.2	178	250	59	85	17

$\frac{\sqrt{2.0}}{\sqrt{\Delta H_2}} = \frac{.708}{.75}$

$\frac{\sqrt{1.86}}{\sqrt{\Delta H}} = \frac{.632}{.75}$

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. 4 Boiler
PLANT LOCATION Belle Glade, Florida
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES P.M.
DATE 11-29-90 RUN NO. 3
TIME START 1315 TIME END 1416
SAMPLE TIME 20.3 (min/pt)= 60 Total min
ASSUMED MOISTURE 26 % FDA .74
NOMOGRAPH C_f 1.9 PITOT CORR. .84
P_b 30.4 "Hg P_s 30.39 "Hg
WEATHER Clear TEMP. _____ °F
METER BOX NO. 1 H 2.05 Y ~~2.05~~ .994
NOZZLE CAL. _____ _____ _____ = .230
STACK DIMENSIONS 71.5
STACK AREA 27.889 ft.² EFFECTIVE _____ ft.²
STACK HEIGHT _____ ft.
STACK DIAMETER: UPSTRM. _____ DNSTRM. _____
PORT SIZE _____ in. NIPPLE LENGTH _____ in.
U CORD LENGTH 125
REMARKS: _____

MAT'L PROCESSING RATE _____
GAS METER READINGS: FINAL 301.824 ft.³
260.747 INITIAL ~~[illegible]~~ ft.³
NET _____ ft.³
FILTER NO. 2878 IMP. VOL. GAIN 310 ml.
SIL GEL NO. _____ WT. GAIN 6.4 ml.
TOTAL CONDENSATE 316.4 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					9.6
% O_2					9.5
% CO					
% N_2					

F_O = _____ F_O RANGE = _____
ORSAT ANALYZER _____

LEAK CHECKS
PRE 0.00 cfm 23 "Hg POST 0.000 cfm 26 "Hg
METER BOX/PUMP _____ GAS SAMPLE SYST. _____
ORSAT BAG _____
PITOT TUBE NO. 1601 PRE-TEST O.K
POST-TEST(+) 5.3 / 15 H_2O/Sec
POST-TEST(−) 3.0 / 15 H_2O/Sec
PYROMETER NO. 1
BOX OPERATOR Nortis 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		1318	262.70	.93	1.75	1.75	176	238	57	78	7.0
2		1321	264.64	.97	1.85	1.85	178	237	57	78	7.5
3		1324	266.83	1.00	1.9	1.9	177	234	50	79	8
4		1327	269.0	1.1	2.1	2.1	179	229	57	79	9
5		1330	271.1	1.1	2.0	2.0	180	228	51	80	9
6		1333	273.2	1.0	1.9	1.9	181	234	57	81	9

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.	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		1336	275.23	1.0	1.9	1.9	180	244	52	82	9.5
8		1339	277.26	1.0	1.9	1.9	179	249	52	82	10
9		1342	279.33	1.0	1.9	1.9	182	253	54	83	10.5
10		1345	281.39	1.0	1.9	1.9	180	257	53	84	11
2-1		1349	283.03	.63	1.2	1.2	177	252	55	85	8.5
2		1352	284.78	.74	1.4	1.4	177	253	55	85	9.5
3		1355	286.67	.85	1.6	1.6	178	249	55	86	11
4		1358	288.67	.93	1.75	1.75	177	245	55	86	12
5		1401	290.64	.95	1.8	1.8	180	245	55	86	12.5
6		1404	292.8	1.1	2.0	2.0	180	245	55	87	14
7		1407	295.07	1.1	2.0	2.0	181	245	55	87	15
8		1410	297.3	1.2	2.3	2.3	179	245	54	88	18
9		1413	299.6	1.2	2.3	2.3	178	247	55	88	18
10		1416	301.874	1.2	2.3	2.3	179	250	56	88	19

APPENDIX C

LABORATORY ANALYSES

AIR CONSULTING & ENGINEERING, inc. — PARTICULATE LAB DATA

SOURCE: ASA No. 4 BOILER

PROBE RINSE	RUN 1	RUN 2	RUN 3	BLANK	
CONTAINER NUMBER	S-1	S-6	S-23	S-33	
TOTAL VOLUME (ml)	200	205	200	100	LIQUID LEVEL ✓
1st GROSS WEIGHT (g)	106.6278	103.1510	103.1069	100.7617	DATE & TIME: 12-3-0700
2nd GROSS WEIGHT (g)	106.6278	103.1512	103.1069	100.7615	DATE & TIME: 12-4-1730
AVERAGE GROSS WEIGHT (g)	106.6278	103.1511	103.1069	100.7616	
TARE WEIGHT (g)	106.6063	103.1354	103.0894	100.7604	
SUB NET WEIGHT (g)	.0215	.0157	0175	0012	
ACETONE BLANK (g)					
TOTAL NET WEIGHT (mg)	21.5	15.7	17.5	1.2	

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	2876	2877	2878	2839	
1st GROSS WEIGHT (g)	0.5751	0.6010	0.6024	0.4078	DATE & TIME: / /
2nd GROSS WEIGHT (g)	0.5750	0.6010	0.6021	0.4073	DATE & TIME: / /
AVERAGE GROSS WEIGHT (g)	0.5751	0.6010	0.6023	0.40775	
TARE WEIGHT (g)	0.4047	0.4075	0.4053	0.4081	
SUB NET WEIGHT (g)	0.1704	0.1935	0.1970	-.0006	
TOTAL NET WEIGHT (mg)	170.4	193.5	197.0		

TARE BALANCE CHECK

SEE LAB BOOK

1st GROSS WEIGHT BALANCE CHECK

0 0.0000 10.0g —
0.5g 0.5001 100.0g 100.0000
%RH 46 DATE 12-3
Signature S. T. Nick

2nd GROSS WEIGHT BALANCE CHECK

0 0.0000 10.0g —
0.5g 0.5000 100.0g 100.0000
%RH 46 DATE 12-4
Signature S. T. Nick

AIR CONSULTING AND ENGINEERING, Inc.

SAMPLE RECOVERY AND CHAIN OF CUSTODY

PLANT NAME ASA
TEST DATE 11-29-90
SOURCE NAME No. 4 Boiler
SAMPLE RECOVERED BY SJN
TYPE OF SAMPLE PM
PARTICULATE ANALYSES BY SJN

SAMPLE RECOVERY

RUN NO.	CONTAINER NO.	LIQUID LEVEL MARKED	COLOR	COMMENTS
1 PW	S-1	✓	Blackish	
Fil	2876		Black	
2 PW	S-6	✓	"	
Fil	2877		"	
3 PW	S-23	✓	"	
Fil	2878		"	
ACETONE / WATER BLANK (CIRCLE)	S-33			
FILTER BLANK	2839			

SILICA GEL

RUN NO.	CONTAINER NO.	FINAL WT. (g)	INIT. WT. (g)	NET WT. (g)	COLOR
1	25	207.8	200.0	7.8	OK
2	14	208.4	200.0	8.4	"
3	42	206.4	200.0	6.4	"
			200.0		
			200.0		
			200.0		
			200.0		
			200.0		

APPENDIX D

QUALITY ASSURANCE

AND

CHAIN OF CUSTODY

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	406.860	59.226	75 76	78 82	101	20

CALIBRATED BY: S. L. Reed

	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

air consulting and engineering

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:

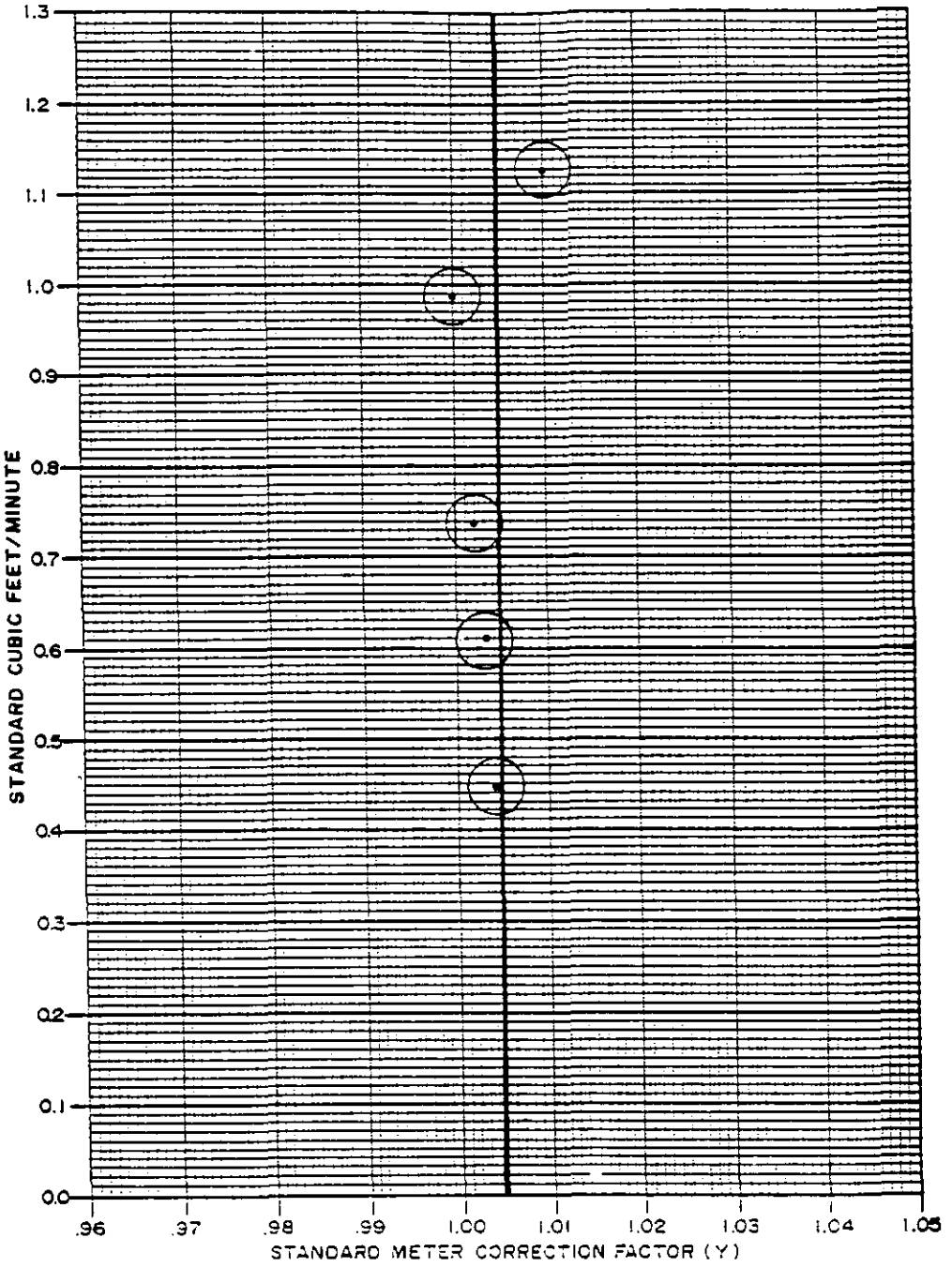
$$Y_a \times Y_s = Y$$

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

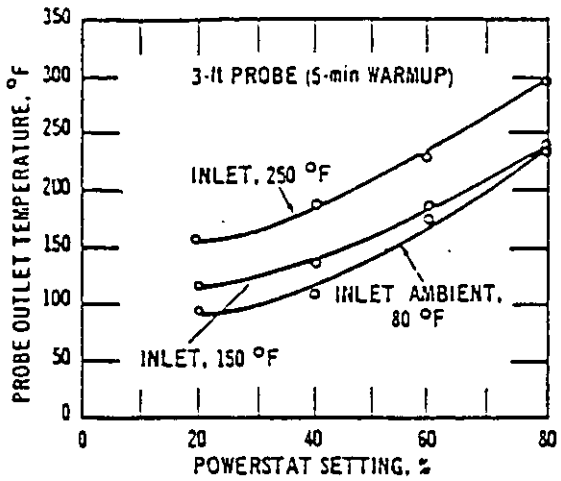
PYROMETER NUMBER METER BOX #1

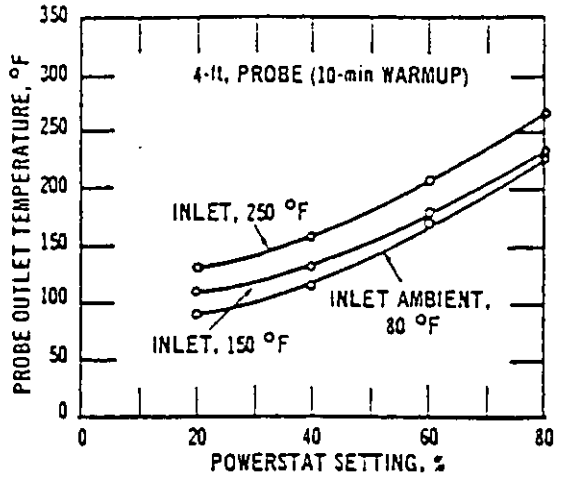
SOURCE (SPECIFY)	GLASS THERMOMETER WITH NBS MERCURY (°F)	PYROMETER (°F)	DEGREE DIFFERENCE	PERCENT DIFFERENCE
ICE BATH	32°	33°	1	.2%
AMBIENT	94°	96°	2	.4%
HOT OVEN	800°	800°	0	0

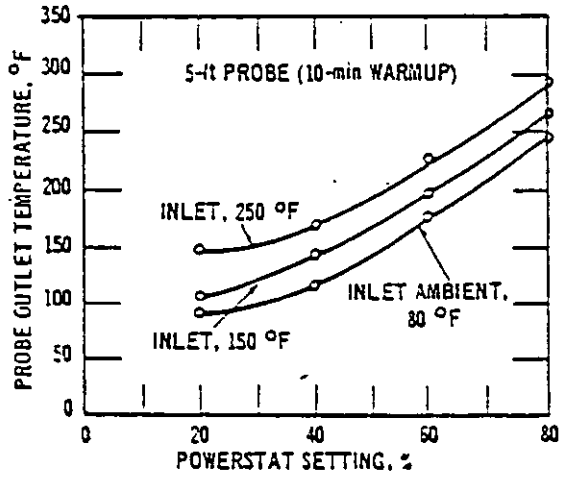
FDER - MAXIMUM 5° DIFFERENCE

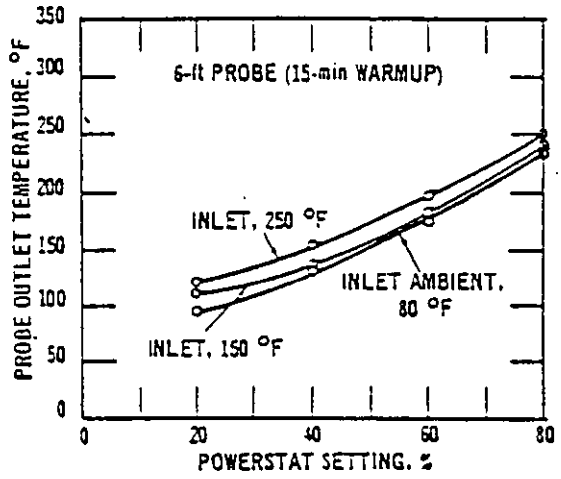
EPA $\left[\frac{(\text{REF. TEMP. °F} + 460°) - (\text{PYROMETER TEMP. °F} + 460°)}{\text{REF. TEMP. °F} + 460°}\right] 100 \leq 1.5\%$

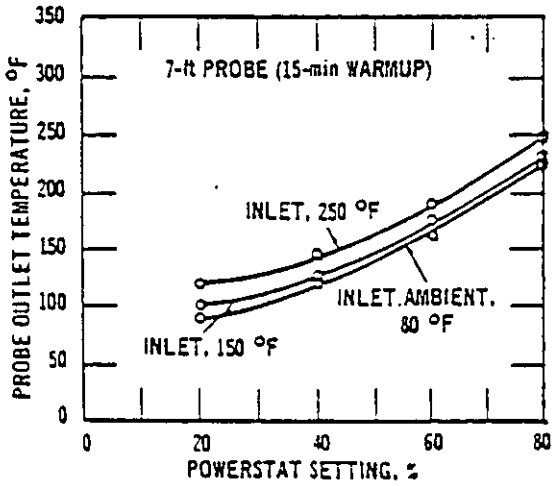
CALIBRATED BY: Larry Watts











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: _____

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

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 No3 & No. 4 Boiler / No. 1 Boiler & ~~No 2 Boiler~~ THERMOCOUPLE NUMBER 1601 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 ~~390.000~~	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

APPENDIX E

PRODUCTION RATE CERTIFICATION

BOILER DATA SHEET

COMPANY ATLANTIC SUGAR ASSN. REPORTED BY Frank Kleman

DATE NOVEMBER 29, 1990

INTEGRATOR FACTOR X 100 BOILER NO. 4

FUEL OIL USED NO OIL

	TIME	INTEGRATOR	LOG SCALE STEAM FLOW X 1400	STEAM PRESSURE	STEAM TEMP.	FEED WATER TEMP.	FEED WATER PRESSURE
RUN 1	845	8457	85	235	555	250	350
	900	8731	85	260	550	250	350
	915	9023	95	225	530	250	350
	930	9279	75	205	530	250	350
	945	9548	75	245	545	250	350
	60 MIN.	1091		234	543	250	350 AVG.
		1091 X 100 = 109,100 LBS/HR					
RUN 2	1100	0902	75	260	550	250	350
	1115	1181	93	235	555	250	350
	1130	1465	90	265	560	250	350
	1145	1767	92	250	535	250	350
	1200	2058	90	250	550	250	350
	60 MIN.	1156		252	550	250	350 AVG.
		1156 X 100 = 115,600 LBS/HR					
RUN 3	~~1250~~ 115	3512	92	250	550	250	350
	130	3810	85	235	545	250	350
	145	4092	91	250	550	250	350
	200	4387	90	240	545	250	350
	215	4683	92	245	545	250	350
	60 MIN.	1171		244	547	250	350 AVG.
		1171 X 100 = 117,100 LBS/HR					

PROCESS DATA INSTALLATION BOILER #4

COMPANY ATLANTIC SUGAR ASSN.

DATE NOVEMBER 29, 1990

TYPE OF INSTALLATION BAGASSE BOILER

TYPE OF MATERIAL PROCESSED STEAM

TYPE OF FUEL USED BAGASSE

TYPE OF POLLUTION CONTROL SYSTEM WET SCRUBBER

	NORMAL	RUN 1	RUN 2	RUN 3
SCRUBBER WATER FLOW (GPM)	350	325	370	345
PRESSURE DROP (INCHES)	4.0	3.2	3.6	3.5

REPORTED BY Frank Kleeman

SUNDAY
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
FISCHER & PORTER CO.
NOV 29 1967

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

FDER

SHERRILL C. CULLIVER

Ref 5

INPUT SHEET - REV:09/13/93 - PAGE 2 OF 2

ENTER THE FOLLOWING:

	RUN1	RUN2	RUN3
1. H2O COLLECTED (ONLY VOL.MEASURED),ML:	.....	.....	.....
2. H2O COLLECTED (WEIGHED PART ONLY),GM:	358.0	268.2	264.0
3. M'N PARTICULATE WEIGHT, GM:	.1790	.1626	.1913
4. V'M VOLUME METERED, CF:	47.336	31.314	32.19
5. Y DRY GAS METER CAL FACTOR:	1.001	1.001	1.001
6. RDP AVG SQR DELTA P (WHEN SAMPLING):	.70	.66	.67
7. DH AVG DELTA H, IN H2O:	3.03	1.23	1.33
8. T'M AVG METER TEMP, DEG F:	86.5	84.4	86.5
9. T'S AVG STACK TEMP, DEG F:	153.5	156.7	156
10. P'S* STACK PRESS, *IN ....(..HG..):	~~30.30~~	~~30.18~~	~~30.19~~
11. P'B BAROMETRIC PRESS, IN HG:	30.09	30.10	30.10
13. D'N ACTUAL NOZZLE DIAMETER, IN.:	.305	.250	.250
14. T ACTUAL SAMPLE TIME, MIN:	60	60	60
15. C'P PITOT TUBE COEFFICIENT:	.84	.84	.84
	251.4	254.7	256.1
OPTION ENTRIES:		254.06	
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):	.....	.....	.....

AP

UNITED STATES SUGAR CORPORATION

Post Office Drawer 1207 Clewiston, Florida 33440
Telephone: (813) 983-8121 Telex: 510-952-7753

February 8, 1991

RECEIVED
FEB 13 1991
Division of Environmental Engineering
PALM BEACH COUNTY
HEALTH DEPARTMENT

Mr. David Knowles
Florida Department of Environmental
Regulation
2269 Bay Street
Fort Myers, Fl. 33901-2896

RE: Palm Beach County AP
USSC Bryant Blr. #1
Annual Compliance Test

Dear Mr. Knowles:

We are enclosing copy of annual Compliance Stack Test report on Boiler No. 1 at our Bryant mill.

This test was performed by Air Consulting & Engineering, Inc. on January 8, 1991.

Also enclosed is a certification of calibration of steam recorders by our Mr. Fernando Llorens, Supervisor of our Process Controls and Instrumentation.

By copy of this letter we are also forwarding one copy of this test to Palm Beach County Health Department.

Sincerely,

UNITED STATES SUGAR CORPORATION

Peter Barquin
Administrative Assistant
to Senior Vice President
Sugar Houses

Francis Capobianco
Boynton Lake W.O.
58 Paxford

Dept.-ESE

UNITED STATES SUGAR CORPORATION
Post Office Drawer 1207 Clewiston, Florida 33440
Telephone: (813) 983-8121 Telex: 510-952-7753

February 8, 1991

TO WHOM IT MAY CONCERN:

This is to certify that the steam flow recorder of Boiler No. 1 at the Bryant Sugar House was recently calibrated under my suprvision and found to be within specifications.

Sincerely,

UNITED STATES SUGAR CORPORATION

Fernando Z. Llorens
Supervisor, Process Controls
and Instrumentation

DATE 03/22/91 FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
PARTICULATE STACK TEST VERIFICATION
DER METHOD 5

FACILITY NAME: ATLANTIC SUGAR APIS #

COMPANY CONDUCTING TEST: ACE TEST DATE 11 29 90

SOURCE DESCRIPTION: BOILER 4

STACK TEST DATA SUMMATION

		RUN1	RUN2	RUN3
1.H2O	(VOL.MEAS.),ML	292.8	328.4	316.4
2.H2O	(MASS MEAS.),GM	0	0	0
3.M'N	PARTICULATE WEIGHT, GM	.1918	.2092	.2145
4.V'M	VOLUME METERED,CF	39.492	42.375	41.127
5.Y	DRY GAS MTR. CALIB.FCTR.	.994	.994	.994
6.RDP	AVG SQR D.P-SAMPLING	.989	1.023	.997
7.DH	AVG DELTA H,IN.H2O	1.716	1.99	1.887
8.T'M	AVG MTR. TEMP,DEG.F	74.9	80.5	83.6
9.T'S	AVG STACK TEMP,DEG.F	173	176.3	178.9
10.P'S	STACK PRESS,''HG(ABS)	30.4	30.4	30.4
11.P'B	BAROMETRIC PRESS,''HG	30.4	30.4	30.4
13.D'N	ACTUAL NOZZLE DIAM,IN	.23	.23	.23
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	39.52	25.86	62.49	3,939,857	96.96	42.15	0.191	0.290
2	41.99	26.91	64.96	4,016,602	101.06	44.11	0.200	0.290
3	40.51	26.88	63.43	3,907,744	100.22	45.61	0.206	0.290
MEAN	40.67	26.55	63.63	3,954,734	99.41	43.96	0.199	0.290

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 = 221 MBTU/HR
ALL REQUIRED LEAK TESTS ACCEPTABLE
ASSUMED M 'D=30.0 (COMBUSTION GASES)

COMMENT.....

RUN 1 :

ACTUAL A 'N = .0002885 SQ FT

COMMENT.....

RUN 2 :

ACTUAL A 'N = .0002885 SQ FT

COMMENT.....

RUN 3 :

ACTUAL A 'N = .0002885 SQ FT

COMMENT.....

Stack area 27.883

ACE 11-29-90

INPUT SHEET - REV:09/10/80 - PAGE 2 OF 2

ENTER THE FOLLOWING:

		RUN1	RUN2	RUN3
1. H2O	COLLECTED (ONLY VOL.MEASURED),ML:	292.80	328.40	316.40
2. H2O	COLLECTED (WEIGHED PART ONLY),GM:	—	—	—
3. M'N	PARTICULATE WEIGHT, GM:	.1918	.2092	.2145
4. V'M	VOLUME METERED, CF:	39.492	42.375	41.127
5. Y	DRY GAS METER CAL FACTOR:	.994	.994	.994
6. RDP	AVG SQR DELTA P (WHEN SAMPLING):	.989	1.023	.997
7. DH	AVG DELTA H, IN H2O:	1.716	1.99	1.887
8. T'M	AVG METER TEMP, DEG F:	74.9	80.5	83.6
9. T'S	AVG STACK TEMP, DEG F:	173	176.3	178.9
10. P'S*	STACK PRESS, *IN ....(.....):	30.40	30.40	30.40
11. P'B	BAROMETRIC PRESS, IN HG:	30.40	30.40	30.40
13. D'N	ACTUAL NOZZLE DIAMETER, IN.:	.230	.230	.230
14. T	ACTUAL SAMPLE TIME, MIN:	60	60	60
15. C'P	PITOT TUBE COEFFICIENT:	.84	.84	.84
	MBTU	212.05	225.24	227.88

OPTION ENTRIES:

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. LAMBDA(CC(20)-VAL(SAMPLE PTS/TOT PTS):			