AP-42 Section Number: 1.8

Reference Number: 20

Title: Source Test Report Number 4 Boiler Impingement Wet Scrubber Particulate Emissions: Sugar Cane Growers Cooperative of Florida

December 1990

Ref 7 A.J.

GLADES SUGAR HOUSE

Sugar Cane Growers Cooperative of Florida

POST OFFICE BOX 666 BELLE GLADE, FLORIDA

January 22, 1991

RECEIVED
JAN 24 1991
Division of Environmental Engineering
PALM BEACH COUNTY
HEALTH DEPARTMENT

Department of Environmental Regulation
South Florida District
2269 Bay Street
Fort Myers, FL 33901

Attention: Mr. David Knowles Re: Compliance Testing on Boiler No. 4 - A050-115039

Gentlemen:

Pursuant to fulfilling the provisions of the operating permit referred to above, we are enclosing two compliance test reports on Boiler No. 4.

Also enclosed is a certificate of calibration of the flowmeter installed in this boiler.

Sincerely,

E. R. Arias
Executive Vice President

ERA:jm

Enclosure

cc: Mr. Ajaya K. Satyal, HRS/Palm Beach County Public Health Unit (with copy of report)

Zip Code 33430-0666
Telephone (407) 996-5556

Fax No. (407) 996-4747
TWX (510) 951-7392

GLADES SUGAR HOUSE

Sugar Cane Growers Cooperative of Florida

POST OFFICE BOX 666 BELLE GLADE, FLORIDA

January 22, 1991

TO WHOM IT MAY CONCERN:

I hereby certify that the steam flowmeter of Boiler No. 4 was calibrated, on August 27, 1990, using manufacturer's recommended procedures.

Romilio Alvarez
Chief
Instrumentation Department

Zip Code 33430-0666
Telephone (407) 996-5556

Fax No. (407) 996-4747
TWX (510) 951-7392

SOURCE TEST REPORT
NUMBER 4 BOILER
IMPINGEMENT WET SCRUBBER
PARTICULATE EMISSIONS
SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
BELLE GLADE,FLORIDA

DECEMBER 11, 1990

PREPARED FOR:
SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
BELLE GLADE, FLORIDA

PREPARED BY:
AIR CONSULTING and ENGINEERING, INC.
2106 N.W. 67th PLACE
SUITE 4
GAINESVILLE, FLORIDA
32607
14642 FLAMINGO DRIVE
WEST PALM BEACH, FLORIDA
33470

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

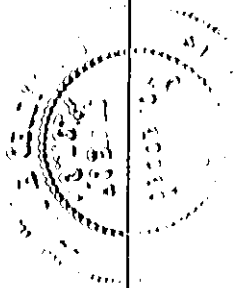
Stephen L. Neck, P.E.

State of Florida
Registration No. 20020

January 6, 1991

Date

SEAL



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

TABLE OF CONTENTS

LIST OF TABLES

TABLE

LIST OF FIGURES

FIGURE

1.0 INTRODUCTION

Personnel from Air Consulting and Engineering,INC.(ACEI) performed annual source emission compliance testing for the Sugar Cane Growers Cooperative of Florida(SCGCOF) on December 11, 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. Blas Marin of SCGCOF served as test coordinator and certified production rates.

Mr. Ken Tucker of the Florida Department of Environmental Regulation witnessed most 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 63.44 pounds per hour (LB/HR) and 0.158 pounds per million btu(LB/MMBTU) heat input against a "process rate" basis allowable emission of 0.190 LB/MMBTU. Permit conditions limit emissions to 0.10 LB/MMBTU from oil and 0.20 LB/MMBTU from residue firing.

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 ACEI personnel.

TABLE 1
EMISSION SUMMARY
SUGAR GROWERS COOPERATIVE OF FLORIDA
NUMBER 4 BOILER
DECEMBER 11, 1990

RUN NUMBER	TIME	ACTUAL EMISSIONS		ALLOWABLE EMISSIONS	
		LB/HR	LB/MMBTU	LB/HR	LB/MMBTU
1	0915-1019 64	61.02	0.152	76.57	0.190
2	1105-1208 63	64.03	0.159	76.50	0.190
3	1244-1348 64	65.27	0.164	75.65	0.190
AVERAGES	---------	63.44	0.158	76.24	0.190

3.0 PROCESS DESCRIPTION AND OPERATION

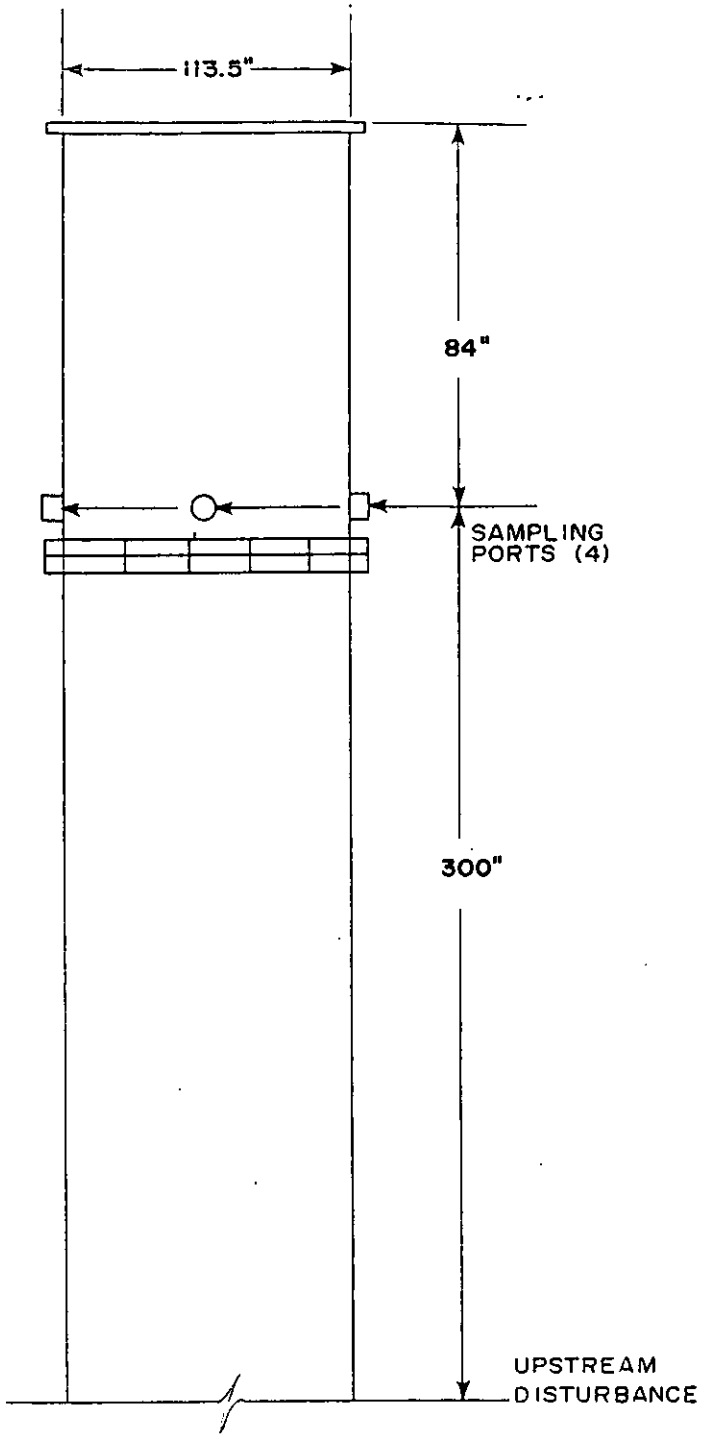
The Number 4 Boiler at Sugar Cane Growers Cooperative is a spreader stoker design used primarily for residue fuel firing. Supplemental oil firing was also utilized for the emission test. The boiler averaged 235,511 pounds per hour steam production over the three run test period.

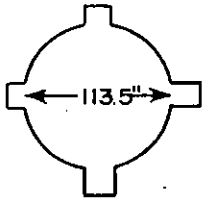
Oil meters, steam integrators, and other production monitoring devices were rigorously calibrated prior to the production season.

4.0 SAMPLING POINT LOCATION

The sampling point location is a single scrubber outlet stack, 113.5" in diameter. The stack has four sample ports 90 degrees apart. The ports are located 300" from an upstream disturbance and 84" from the outlet.

Twenty-four test points were sampled for each test run. The traverse 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	INCHES INSIDE STACK WALL
1	2.4
2	7.6
3	13.4
4	20.1
5	28.4
6	40.4

NOTE: NOT TO SCALE

FIGURE 1.
SAMPLING POINT LOCATION
BOILER NO. 4
SUGARCANE GROWERS COOP. OF FLORIDA

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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

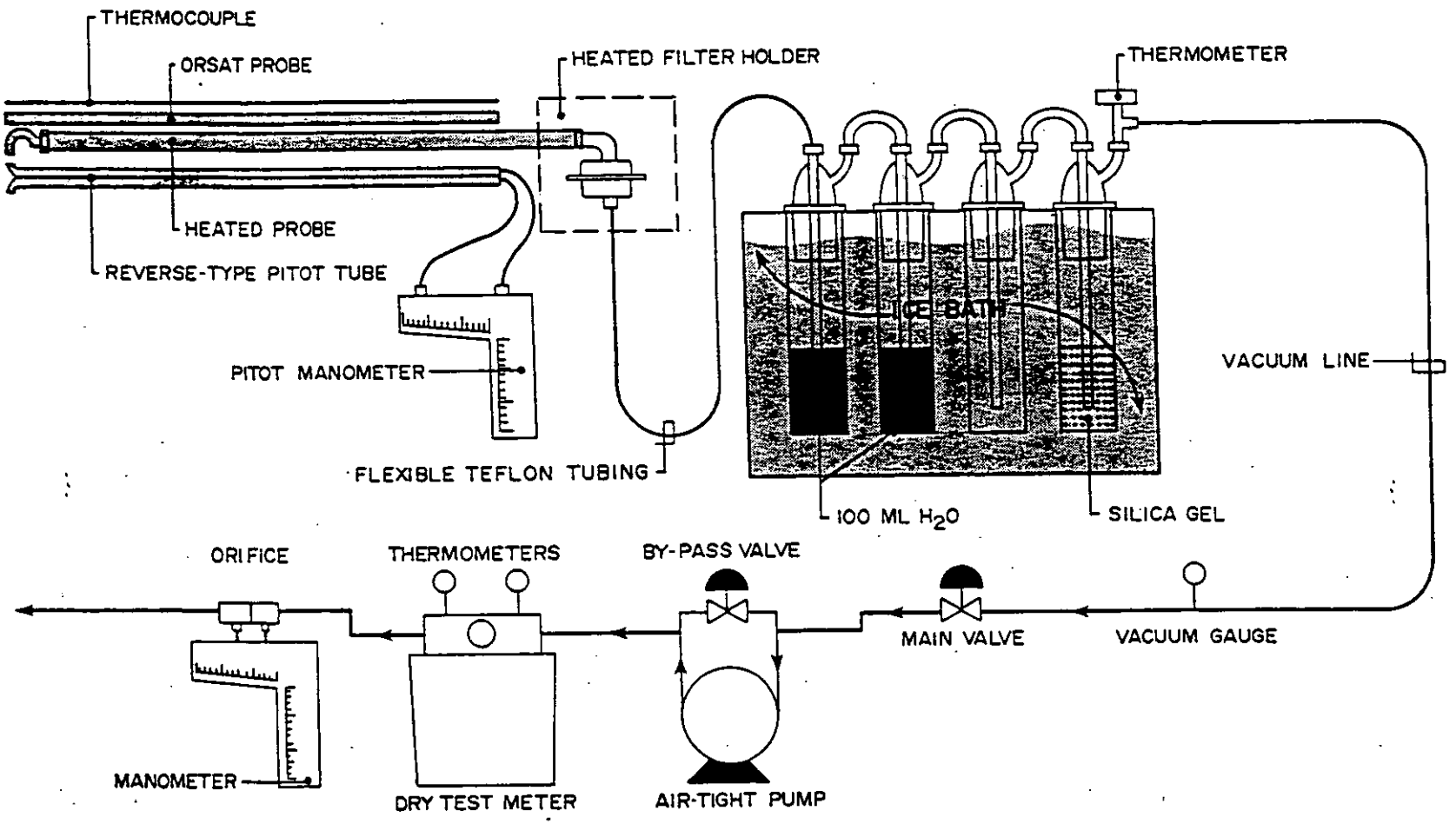

FIGURE 2
EPA METHOD 5 SAMPLING TRAIN

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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

APPENDIX A

COMPLETE EMISSION DATA

AND

SAMPLE CALCULATIONS

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Complete Emission Data

PLANT:	SUGAR GROWERS COOPERATIVE OF FL.	DATE:	12-11-90
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	1
SOURCE:	NUMBER 4 SCRUBBER OUTLET	TIME:	0912-1023

TIME INTERVAL	71	MINUTES
OIL:		
FINAL OIL	24210	
BEGIN OIL	23900	
FACTOR	1	
STEAM:		
FINAL STEAM	6761	
BEGIN STEAM	6681	
FACTOR	3500	
TEMPERATURE	580	DEGREES F
PRESSURE	425	PSIG
	440	PSIA
FEEDWATER:		
TEMPERATURE	260	DEGREES F
PRESSURE	600	PSIG
	615	PSIA
HEAT INPUT:		
STEAM	1291.7	BTU/LB
FEEDWATER	228.6	BTU/LB
NET STEAM	1063.1	BTU/LB
STEAM RATE	236620	LB/HR
BOILER EFFICIENCY	62.5	%
TOTAL FUEL HEAT INPUT	402.48	MMBTUH
STEAM INTEGRATOR FACTOR	1.00	
OIL	261.97	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	39.30	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	363.18	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.20	LB/MMBTU
TOTAL ALLOWABLE EMISSION	76.57	LB/HR
TOTAL ACTUAL EMISSION	61.02	LB/HR
TOTAL ALLOWABLE EMISSION	0.190	LB/MMBTU
TOTAL ACTUAL EMISSION	0.152	LB/MMBTU

AIR CONSULTING & ENGINEERING,INC.
Complete Emission Data

PLANT:	SUGAR GROWERS COOPERATIVE OF FL.	DATE:	12-11-90
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	2
SOURCE:	NUMBER 4 SCRUBBER OUTLET	TIME:	1100-1212

TIME INTERVAL	72	MINUTES
OIL:		
FINAL OIL	24680	
BEGIN OIL	24370	
FACTOR	1	
STEAM:		
FINAL STEAM	6882	
BEGIN STEAM	6801	
FACTOR	3500	
TEMPERATURE	580	DEGREES F
PRESSURE	425	PSIG
	440	PSIA
FEEDWATER:		
TEMPERATURE	260	DEGREES F
PRESSURE	600	PSIG
	615	PSIA
HEAT INPUT:		
STEAM	1291.7	BTU/LB
FEEDWATER	228.6	BTU/LB
NET STEAM	1063.1	BTU/LB
STEAM RATE	236250	LB/HR
BOILER EFFICIENCY	62.5	%
TOTAL FUEL HEAT INPUT	401.85	MMBTUH
STEAM INTEGRATOR FACTOR	1.00	
OIL	258.33	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	38.75	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	363.10	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.20	LB/MMBTU
TOTAL ALLOWABLE EMISSION	76.50	LB/HR
TOTAL ACTUAL EMISSION	64.03	LB/HR
TOTAL ALLOWABLE EMISSION	0.190	LB/MMBTU
TOTAL ACTUAL EMISSION	0.159	LB/MMBTU

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Complete Emission Data

PLANT:	SUGAR GROWERS COOPERATIVE OF FL.	DATE:	12-11-90
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	3
SOURCE:	NUMBER 4 SCRUBBER OUTLET	TIME:	1240-1351

TIME INTERVAL	71	MINUTES
OIL:		
FINAL OIL	25100	
BEGIN OIL	24800	
FACTOR	1	
STEAM:		
FINAL STEAM	6992	
BEGIN STEAM	6913	
FACTOR	3500	
TEMPERATURE	580	DEGREES F
PRESSURE	430	PSIG
	445	PSIA
FEEDWATER:		
TEMPERATURE	260	DEGREES F
PRESSURE	600	PSIG
	615	PSIA
HEAT INPUT:		
STEAM	1291.2	BTU/LB
FEEDWATER	228.6	BTU/LB
NET STEAM	1062.6	BTU/LB
STEAM RATE	233662	LB/HR
BOILER EFFICIENCY	62.5	%
TOTAL FUEL HEAT INPUT	397.26	MMBTUH
STEAM INTEGRATOR FACTOR	1.00	
OIL	253.52	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	38.03	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	359.23	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.20	LB/MMBTU
TOTAL ALLOWABLE EMISSION	75.65	LB/HR
TOTAL ACTUAL EMISSION	65.27	LB/HR
TOTAL ALLOWABLE EMISSION	0.190	LB/MMBTU
TOTAL ACTUAL EMISSION	0.164	LB/MMBTU

AIR CONSULTING AND ENGINEERING, INC.

Complete Emission Results

Plant:	SUGAR CANE GROWEERS CO-OP FL.		
Location:	BELLE GLADE, FLORIDA	Date:	12-11-90
Stack:	NUMBER 4 BOILER	Run 1 From	0915 - 1019

Y Factor	0.994	Nozzle Diameter	0.300 In
Total Time	60.00 Min	Nozzle Area	0.000491 Ft-
Stack Area	70.260 Ft-	Barometric Pressure	30.20 In Hg
Stack Temperature	144.5 -F	Meter Temperature	67.8 -F
Stack Pressure	30.20 In Hg	Meter Orifice Diff	1.981 In H_2O
Stack Avg - Vel Head	0.591 In H_2O	Meter Volume	41.783 CF
		Condensate Vol	241.30 ml

1.	Volume Water Vapor Sampled	11.358	SCF
2.	Volume Standard Dry Gas Sampled	42.122	SCF
3.	Total Standard Sample Volume	53.480	SCF
4.	Percent Moisture	21.200	
5.	Percent Dry Air	78.800	
6.	Molecular Weight of Dry Flue Gas	30.030	
7.	Molecular Weight of Wet Flue Gas	27.480	
8.	Specific Gravity Flue Gas	0.95	
9.	Percent Oxygen [O_2]	9.75	
10.	Percent Carbon Dioxide [CO_2]	10.25	
11.	Percent Excess Air	85.752	
12.	Velocity of Flue Gas	36.222	FPS
13.	Actual Volumetric Flow Rate	152696.0	ACFM
14.	Dry Volumetric Flow Rate	120324.5	ACFMD
15.	Standard Volumetric Flow Rate	106073.5	SCFMD
16.	Emission Concentration	0.0671	gr/SCF
17.	Emission Concentration	0.0466	gr/ACF
18.	Emission Rate	61.02	lbs/Hr
19.	Percent Isokinetic	94.8	

Probe/Nozzle Wash	17.0	mg
Filter	166.2	mg
Total	183.2	mg

AIR CONSULTING AND ENGINEERING, INC.

Complete Emission Results

Plant:	SUGAR CANE GROWEERS CO-OP FL.		
Location:	BELLE GLADE, FLORIDA	Date:	12-11-90
Stack:	NUMBER 4 BOILER	Run 2 From	1105 - 1208

Y Factor	0.994	Nozzle Diameter	0.300 In
Total Time	60.00 Min	Nozzle Area	0.000491 Ft-
Stack Area	70.260 Ft-	Barometric Pressure	30.20 In Hg
Stack Temperature	144.8 -F	Meter Temperature	79.3 -F
Stack Pressure	30.20 In Hg	Meter Orifice Diff	2.213 In H2O
Stack Avg - Vel Head	0.591 In H_2O	Meter Volume	44.061 CF
		Condensate Vol	258.40 ml

1.	Volume Water Vapor Sampled	12.163	SCF
2.	Volume Standard Dry Gas Sampled	43.496	SCF
3.	Total Standard Sample Volume	55.659	SCF
4.	Percent Moisture	21.900	
5.	Percent Dry Air	78.100	
6.	Molecular Weight of Dry Flue Gas	30.060	
7.	Molecular Weight of Wet Flue Gas	27.419	
8.	Specific Gravity Flue Gas	0.95	
9.	Percent Oxygen [O_2]	9.50	
10.	Percent Carbon Dioxide [CO_2]	10.50	
11.	Percent Excess Air	81.756	
12.	Velocity of Flue Gas	36.271	FPS
13.	Actual Volumetric Flow Rate	152903.7	ACFM
14.	Dry Volumetric Flow Rate	119417.8	ACFMD
15.	Standard Volumetric Flow Rate	105238.0	SCFMD
16.	Emission Concentration	0.0710	gr/SCF
17.	Emission Concentration	0.0489	gr/ACF
18.	Emission Rate	64.03	lbs/Hr
19.	Percent Isokinetic	98.6	

Probe/Nozzle Wash	16.9	mg
Filter	183.2	mg
Total	200.1	mg

AIR CONSULTING AND ENGINEERING, INC.

Complete Emission Results

Plant:	SUGAR CANE GROWEERS CO-OP FL.		
Location:	BELLE GLADE, FLORIDA	Date:	12-11-90
Stack:	NUMBER 4 BOILER	Run 3 From	1244 - 1348

Y Factor	0.994	Nozzle Diameter	0.300 In
Total Time	60.00 Min	Nozzle Area	0.000491 Ft-
Stack Area	70.260 Ft-	Barometric Pressure	30.20 In Hg
Stack Temperature	144.8 -F	Meter Temperature	85.9 -F
Stack Pressure	30.20 In Hg	Meter Orifice Diff	2.123 In H2O
Stack Avg - Vel Head	0.579 In H_2O	Meter Volume	44.032 CF
		Condensate Vol	245.60 ml

1.	Volume Water Vapor Sampled	11.560	SCF
2.	Volume Standard Dry Gas Sampled	42.933	SCF
3.	Total Standard Sample Volume	54.493	SCF
4.	Percent Moisture	21.200	
5.	Percent Dry Air	78.800	
6.	Molecular Weight of Dry Flue Gas	30.060	
7.	Molecular Weight of Wet Flue Gas	27.503	
8.	Specific Gravity Flue Gas	0.95	
9.	Percent Oxygen [O_2]	9.50	
10.	Percent Carbon Dioxide [CO_2]	10.50	
11.	Percent Excess Air	81.756	
12.	Velocity of Flue Gas	35.480	FPS
13.	Actual Volumetric Flow Rate	149570.1	ACFM
14.	Dry Volumetric Flow Rate	117861.3	ACFMD
15.	Standard Volumetric Flow Rate	103866.3	SCFMD
16.	Emission Concentration	0.0733	gr/SCF
17.	Emission Concentration	0.0509	gr/ACF
18.	Emission Rate	65.27	lbs/Hr
19.	Percent Isokinetic	98.7	

Probe/Nozzle Wash	16.9	mg
Filter	187.1	mg
Total	204.0	mg

Avg O_2 = 9.6

Temp = 145

Flow = 105,059

Oil input = 38.7 mmBtu/hr 258 gal/hr

non-oil = 362 mmBtu/hr

Plant: SUGAR CANE GROWEERS CO-OP FL.
Date: 12-11-90
Stack: NUMBER 4 BOILER
Run Number: 1

Average SQR Velocity Head = 0.591

Velocity Head Inputs:

0.3400	0.3600	0.3600	0.4100	0.3700	0.3100	0.2900
0.3200	0.3700	0.4000	0.4000	0.3500	0.2700	0.3500
0.4000	0.4000	0.3600	0.3200	0.2600	0.3100	0.3700
0.3700	0.3700	0.3500				

Average Orifice Pressure = 1.981

Orifice Pressure Inputs:

1.9000	2.0000	2.0000	2.3500	2.0000	1.8000	1.6500
1.8000	2.1000	2.3000	2.3000	2.0000	1.5000	2.0000
2.3000	2.3000	2.0000	1.8000	1.4000	1.7500	2.1000
2.1000	2.1000	2.0000				

Average Stack Temperature = 144.5

Stack Temperature Inputs:

145	143	144	144	146	145	147
143	144	145	146	144	144	144
141	146	144	144	145	145	145
144	146	145				

Average Meter Temperature = 67.8

Meter Temperature Inputs:

60	60	61	62	62	63	64
65	65	66	67	68	69	69
70	70	71	72	73	73	73
74	75	75				

Plant: SUGAR CANE GROWEERS CO-OP FL.
Date: 12-11-90
Stack: NUMBER 4 BOILER

Vwv Volume Water Vapor Sampled
Vwv = 0.04707 x 241.3 = 11.358 SCF

VMstd Volume Standard Dry Gas Sampled
VMstd = 17.64 x 41.783 x 0.994 x
[30.20 + (1.981 / 13.6)] / (67.8 + 460) = 42.122 SCF

Vt Total Standard Sample Volume
Vt = 11.358 + 42.122 = 53.480 SCF

W Percent Water = (11.358 / 53.480) x 100 = 21.2 %

FDA Percent Dry Air = (1 - 0.212) x 100 = 78.8 %

Md Molecular Weight of Dry Stack Gas
Md = (0.44 X 10.25 $\%CO_2$) + (0.32 X 9.75 $\%O_2$) +
[0.28 X (80.00 $\%N_2$ + 0.00 %CO)] = 30.030

Ms Molecular Weight of Wet Stack Gas
Ms = (30.030 x 0.788) + (18 x 0.212) = 27.480

SG Specific Gravity Stack Gas
SG = 27.480 / 28.84 = 0.95

Ea Percent Excess Air

$$Ea = \frac{((9.75\ \%O_2) - (0\ \%CO / 2) \times 100)}{[(.264 \times (80\ \%N_2)) - (9.75\ \%O_2) - (0\ \%CO / 2)]}$$

Ea = 85.752

Vs Velocity of Stack
Vs = (85.49 x 0.84 x 0.591) x -[(144.5 + 460) / (30.20 x 27.480)]
Vs = 36.222

Qa Actual Volumetric Flow
Qa = (70.260 x 36.222 x 60) = 152696.0 ACFM

Qd Dry Volumetric Flow
Qd = (152696.0 x 0.788) = 120324.5 ACFMD

Qsd Standard Volumetric Flow
Qsd = 152696.0 x 0.788 x [528 / (144.5 + 460)] x
(30.20 / 29.92) = 106073.5 SCFMD

Plant: SUGAR CANE GROWEERS CO-OP FL.
Date: 12-11-90
Stack: NUMBER 4 BOILER

ESTP Emission Rate
gr/SCF = [0.01543 x (17.0 + 166.2)] / (42.122)
gr/SCF = 0.0671

Lbs/Hr Emission Rate
Lbs/Hr = 0.0671 / 7000 x 106073.5 x 60 = 61.02

I Percent Isokinetic
I = 100 x (144.5 + 460) x [(0.002669 x 241.3) + (41.783 x 0.994 / (67.8 + 460)) x (30.20 + (1.981 / 13.6))] / (60 x 60 x 36.222 x 30.20 x 0.000491)
I = 94.8 %

Plant: SUGAR CANE GROWEERS CO-OP FL.
Date: 12-11-90
Stack: NUMBER 4 BOILER
Run Number: 2

Average SQR Velocity Head = 0.591
Velocity Head Inputs:

0.3200	0.3700	0.4200	0.4200	0.3800	0.3400	0.2500
0.2800	0.3600	0.4100	0.4300	0.3600	0.3000	0.3000
0.3800	0.3800	0.3500	0.3100	0.2700	0.3100	0.3600
0.3700	0.4000	0.3500				

Average Orifice Pressure = 2.213
Orifice Pressure Inputs:

2.0000	2.3000	2.6500	2.6500	2.4000	2.1500	1.6000
1.7500	2.3000	2.6000	2.7000	2.3000	1.9000	1.9000
2.4000	2.4000	2.2000	1.9500	1.7000	1.9500	2.3000
2.3000	2.5000	2.2000				

Average Stack Temperature = 144.8
Stack Temperature Inputs:

144	143	145	143	146	145	145
142	146	145	145	145	144	143
146	146	145	146	146	145	145
145	144	145				

Average Meter Temperature = 79.3
Meter Temperature Inputs:

75	75	75	75	76	76	77
77	78	78	79	79	80	80
80	81	82	82	82	83	83
83	84	84				

Plant: SUGAR CANE GROWEERS CO-OP FL.
Date: 12-11-90
Stack: NUMBER 4 BOILER
Run Number: 3

Average SQR Velocity Head = 0.579
Velocity Head Inputs:

0.2700	0.2700	0.4100	0.4100	0.3600	0.3000	0.2500
0.3000	0.3400	0.4000	0.4200	0.3600	0.2800	0.3000
0.4000	0.3600	0.3300	0.3100	0.2600	0.3000	0.3500
0.3800	0.3800	0.3600				

Average Orifice Pressure = 2.123
Orifice Pressure Inputs:

1.7000	1.7000	2.6000	2.6000	2.3000	1.9000	1.6000
1.9000	2.1000	2.5000	2.6500	2.3000	1.7000	1.9000
2.5000	2.3000	1.9000	2.0000	1.6000	1.9000	2.2000
2.4000	2.4000	2.3000				

Average Stack Temperature = 144.8
Stack Temperature Inputs:

142	143	142	144	142	145	143
145	144	146	145	145	145	145
145	146	146	145	146	145	146
146	147	146				

Average Meter Temperature = 85.9
Meter Temperature Inputs:

82	82	82	82	83	83	84
84	85	85	85	86	87	87
87	87	88	88	89	89	89
89	89	90				

AIR CONSULTING & ENGINEERING, INC.
COMPLETE EMISSION DATA

PLANT: SUGAR GROWERS COOPERTIVE OF FLA. DATE 12-11-90
LOCATION: BELLE GLADE, FLORIDA RUN NUMBER 1
SOURCE: NUMBER 4 BOILER SCRUBBER OUTLET TIME 0912-1031

TIME INTERVAL	71	min.
FINAL OIL	24210	
BEGIN OIL	23900	
FACTOR	1	
FINAL STM	956761	
BEGIN STM	956681	
FACTOR	3500	
TEMP.	580	
PRESSURE	425	
FEEDWATER:		
TEMP.	260	
PRESS.	600	
STEAM BTU/LB	1293.0	
FEEDWATER BTU/#	228.6	
NET BTU/LB STM	1064.4	
LB/HR STEAM	236620	
BOILER EFFICIEN	62.50	
TOTAL BTU INPUT	402.97	MMBTUH
OIL GPH	261.97	
OIL BTU/GAL.	150000	
OIL BTU INPUT	39.30	MMBTUH
NON OIL BTU IN	363.68	MMBTUH
ALLOWED NON OIL	.20	LB/MMBTU
ALLOWED OIL	.10	LB/MMBTU
TOTAL ALLOWED EMISS.	76.66	LB/HR
TOTAL ALLOWED EMISS.	0.190	LB/MMBTU
TOTAL ACTUAL EMISS.	60.85	LB/HR
TOTAL ACTUAL EMISS.	0.151	LB/MMBTU

AIR CONSULTING & ENGINEERING, INC.
COMPLETE EMISSION DATA

PLANT: SUGAR GROWERS COOPERTIVE OF FLA. DATE 12-7-90
LOCATION: BELLE GLADE, FLORIDA RUN NUMBER 2
SOURCE: NUMBER 4 BOILER SCRUBBER OUTLET TIME 1100-1212

TIME INTERVAL	72	min.
FINAL OIL	24680	
BEGIN OIL	24370	
FACTOR	1	
FINAL STM	956882	
BEGIN STM	956801	
FACTOR	3500	
TEMP.	580	
PRESSURE	425	
FEEDWATER:		
TEMP.	260	
PRESS.	600	
STEAM BTU/LB	1293.0	
FEEDWATER BTU/#	228.6	
NET BTU/LB STM	1064.4	
LB/HR STEAM	236250	
BOILER EFFICIEN	62.50	
TOTAL BTU INPUT	402.34	MMBTUH
OIL GPH	258.33	
OIL BTU/GAL.	150000	
OIL BTU INPUT	38.75	MMBTUH
NON OIL BTU IN	363.59	MMBTUH
ALLOWED NON OIL	.20	LB/MMBTU
ALLOWED OIL	.10	LB/MMBTU
TOTAL ALLOWED EMISS.	76.59	LB/HR
TOTAL ALLOWED EMISS.	0.190	LB/MMBTU
TOTAL ACTUAL EMISS.	64.89	LB/HR
TOTAL ACTUAL EMISS.	0.161	LB/MMBTU

AIR CONSULTING & ENGINEERING, INC.
COMPLETE EMISSION DATA

PLANT: SUGAR GROWERS COOPERATIVE OF FL. DATE 12-11-90
LOCATION: BELLE GLADE, FLORIDA RUN NUMBER 3
SOURCE: NUMBER 4 BOILER SCRUBBER OUTLET TIME 1240-1351

TIME INTERVAL	71	min.
FINAL OIL	25100	
BEGIN OIL	24800	
FACTOR	1	
FINAL STM	956992	
BEGIN STM	956913	
FACTOR	3500	
TEMP.	580	
PRESSURE	425	
FEEDWATER:		
TEMP.	260	
PRESS.	600	
STEAM BTU/LB	1293.0	
FEEDWATER BTU/#	228.6	
NET BTU/LB STM	1064.4	
LB/HR STEAM	233662	
BOILER EFFICIEN	62.50	
TOTAL BTU INPUT	397.94	MMBTUH
OIL GPH	253.52	
OIL BTU/GAL.	150000	
OIL BTU INPUT	38.03	MMBTUH
NON OIL BTU IN	359.91	MMBTUH
ALLOWED NON OIL	.20	LB/MMBTU
ALLOWED OIL	.10	LB/MMBTU
TOTAL ALLOWED EMISS.	75.78	LB/HR
TOTAL ALLOWED EMISS.	0.190	LB/MMBTU
TOTAL ACTUAL EMISS.	65.95	LB/HR
TOTAL ACTUAL EMISS.	0.166	LB/MMBTU

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 SCCC of FLORIDA
SOURCE Number 4 Boiler
PLANT LOCATION Belle Glade, Fl.
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES P.M
DATE 12-11-90 RUN NO. 1
TIME START 0915 TIME END 1019
SAMPLE TIME 24, 2.5 (min/pt)= 60 Total min
ASSUMED MOISTURE 25 % FDA _____
NOMOGRAPH C_f 5.7 PITOT CORR. .84
P_b 30.20 "Hg P_s 30.20 "Hg
WEATHER CLEAR TEMP. _____ °F
METER BOX NO. 1 H 2.05 Y 0.994
NOZZLE CAL. .300 .299 .300 = .300
STACK DIMENSIONS 113.5
STACK AREA 70.26 ft² EFFECTIVE _____ ft²
STACK HEIGHT _____ ft.
STACK DIAMETER: UPSTRM. _____ DNSTRM. _____
PORT SIZE _____ in. NIPPLE LENGTH _____ in.
U CORD LENGTH _____
REMARKS: _____

2421 1023
2390 0912
956761
956681

60.85

.5711
.4050
1661
16.6
82.7

MAT'L PROCESSING RATE _____
GAS METER READINGS: FINAL 317.203 ft³
INITIAL 307.420 ft³
NET _____ ft³
FILTER NO. 2901 IMP. VOL. GAIN 235 ml.
SIL GEL NO. 2 WT. GAIN 6.3 ml.
TOTAL CONDENSATE 241.3 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					10.25
% O_2					9.75
% CO					
% N_2					

F_O = _____ F_O RANGE = _____
ORSAT ANALYZER _____

LEAK CHECKS
PRE 0.00 cfm 28 "Hg POST 0.00 cfm 23 "Hg
METER BOX/PUMP _____ GAS SAMPLE SYST. _____
ORSAT BAG _____
PITOT TUBE NO. 53 PRE-TEST 0.1<
POST-TEST(+) 4.3 / .15 H_2O/Sec
POST-TEST(−) 2.9 / .15 H_2O/Sec
PYROMETER NO. 1
BOX OPERATOR Nick PROBE HOLDER Gerry

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)
1-1			309.18	.34	1.9	1.9	145	225	42	60	9.5
2		0920	310.90	.36	2.	2.	143	230	42	60	10
3			312.63	.36	2	2	144	227	41	61	10
4		0925	314.5	.41	2.35	2.35	144	225	43	62	12
5			316.28	.37	2	2	146	231	40	62	11
6		0930	317.95	.31	1.8	1.8	145	231	40	63	10

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					
2-1		~~093~~	319.57	.29	1.65	1.65	147	249	43	64	9.5
2		0936	321.21	.32	1.8	1.8	143	265	41	65	10.5
3			323.00	.36	2.1	2.1	144	268	38	65	12
4		0941	324.9	.40	2.3	2.3	145	266	42	66	14
5			326.78	.40	2.3	2.3	146	265	42	67	14.5
6		0946	328.54	.35	2	2	144	266	46	68	13.5
3-1			330.15	.27	1.5	1.5	144	252	49	69	10.5
2		0953	331.8	.35	2.0	2.0	144	253	49	69	13
3			333 7	.40	2.3	2.3	141	237	48	70	15.5
4		0958	335.53	.40	2.3	2.3	146	248	46	70	16
5			337.32	.36	2	2	144	243	46	71	15
6		1003	339.0	.32	1.8	1.8	144	247	46	72	13.5
4-1			340.43	.26	1.4	1.4	145	251	49	73	10.5
2		1009	342.05	.31	1.75	1.75	145	260	49	73	13.5
3			343.85	.37	2.1	2.1	145	253	48	73	16.5
4		1014	345.60	.37	2.1	2.1	144	266	48	74	16.5
5			347.43	.37	2.1	2.1	146	266	44	75	17
6		1019	349.203	.35	2	2	145	270	48	75	17

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 SCGC of FLORIDA
SOURCE Number 4 Boiler
PLANT LOCATION _____
TYPE OF SAMPLING TRAIN _____
TYPE OF SAMPLES _____
DATE 12-11-90 RUN NO. 2
TIME START 1105 TIME END 1208
SAMPLE TIME 24 , 2.5 (min/pt)= 60 Total min
ASSUMED MOISTURE ____ % FDA _____
NOMOGRAPH C_f 6.3 PITOT CORR. .84
P_b 30.2 "Hg P_s 30.2 "Hg
WEATHER CLEAR TEMP. ____ °F
METER BOX NO. 1 H 2.05 Y 0.994
NOZZLE CAL. ____ ____ ____ = .300
STACK DIMENSIONS _____
STACK AREA 70.26 ft² EFFECTIVE ____ ft²
STACK HEIGHT ____ ft.
STACK DIAMETER: UPSTRM. ____ DNSTRM. ____
PORT SIZE ____ in. NIPPLE LENGTH ____ in.
U CORD LENGTH 125 + 75
REMARKS: _____

956882
950801 1100
24680
24370 1212

.5913
.4069
.1844

MAT'L PROCESSING RATE _____
GAS METER READINGS: FINAL 393.602 ft³
INITIAL 349.541 ft³
NET _____ ft³
FILTER NO. 2902 IMP. VOL. GAIN 250 ml.
SIL GEL NO. 25 WT. GAIN 8.4 ml.
TOTAL CONDENSATE ____ ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					10.5
% O_2					9.5
% CO					
% N_2					

F_O = _____ F_O RANGE = _____
ORSAT ANALYZER _____

LEAK CHECKS
PRE 0.005 cfm 23 "Hg POST 0.000 cfm 26 "Hg
METER BOX/PUMP _____ GAS SAMPLE SYST. _____
ORSAT BAG _____
PITOT TUBE NO. 53 PRE-TEST O.K
POST-TEST(+) 3.4 / 15 H_2O/Sec
POST-TEST(−) 3.4 / 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.	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)
1-1			351.32	.32	~~+.820~~	~~+.12.0~~	144	221	45	75	10
2		1110	353.18	.37	2.3	2.3	143	254	47	75	11
3			355.20	.42	2.65	2.65	145	257	43	75	13
4		1115	357.18	.42	2.65	2.65	143	254	46	75	13.5
5			359.15	.38	2.4	2.4	146	257	48	76	13.5
6		1120	361.00	.34	2.15	2.15	145	261	49	76	12.5

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					
2-1			362.56	.25	1.6	1.6	145	262	49	77	9.5
2		1126	364.24	.28	1.75	1.75	142	263	50	77	10.5
3			366.06	.36	2.3	2.3	146	265	50	78	13.5
4		1131	368.05	.41	2.6	2.6	145	271	50	78	15.5
5			370.1	.43	2.7	2.7	145	269	49	79	17
6		1136	372.0	.36	2.3	2.3	145	272	51	79	15
3-1			373.68	.30	1.9	1.9	144	267	50	80	12
2		1142	375.3	.30	1.9	1.9	143	269	50	80	12
3			377.03	.38	2.4	2.4	146	255	49	80	16
4		1147	378.94	.38	2.4	2.4	146	259	49	81	16
5			380.85	.35	2.2	2.2	145	258	50	82	16
6		1152	382.60	.31	1.95	1.95	146	258	50	82	16
4-1		~~1157~~	384.23	.27	1.7	1.7	146	263	50	82	13
2		1157	385.95	.31	1.95	1.95	145	265	49	83	14.5
3			387.85	.36	2.3	2.3	145	269	49	83	17.5
4		1203	389.75	.37	2.3	2.3	145	272	48	83	18
5			391.70	.40	2.5	2.5	144	271	48	84	20.5
6		1208	393.602	.35	2.2	2.2	145	271	49	84	19

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 SCCA of Florida
SOURCE No. 4 Boiler
PLANT LOCATION Belle Glade, Fl
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES PM
DATE 12-11-90 RUN NO. 3
TIME START 1244 TIME END 1348
SAMPLE TIME 24 / 2.5 (min/pt) = 60 Total min
ASSUMED MOISTURE 20 % FDA .8
NOMOGRAPH C_f 6.3 PITOT CORR. .84
P_b 30.2 "Hg P_s 30.2 "Hg
WEATHER CLEAR TEMP. ____ °F
METER BOX NO. 1 H 2.05 Y .994
NOZZLE CAL. ____ ____ ____ = .300
STACK DIMENSIONS 113.5
STACK AREA 70.26 ft² EFFECTIVE ____ ft²
STACK HEIGHT ____ ft.
STACK DIAMETER: UPSTRM. ____ DNSTRM. ____
PORT SIZE ____ in. NIPPLE LENGTH ____ in.
U CORD LENGTH ____
REMARKS: ____

25100 1351
24800 1240
956992
956913

.5930
.4056
.1874
18.7

MAT'L PROCESSING RATE ____
GAS METER READINGS: FINAL 438.032 ft³
INITIAL 394.00 ft³
NET ____ ft³
FILTER NO. 2903 IMP. VOL. GAIN 240 ml.
SIL GEL NO. 14 WT. GAIN 516 ml.
TOTAL CONDENSATE 245.6 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					10.5
% O_2					9.5
% CO					
% N_2					

F_O = ____ F_O RANGE = ____
ORSAT ANALYZER ____

LEAK CHECKS
PRE 0.005 cfm 23 "Hg POST 0.000 cfm 27 "Hg
METER BOX/PUMP ____ GAS SAMPLE SYST. ____
ORSAT BAG ____
PITOT TUBE NO. 53 PRE-TEST OK
POST-TEST(+) 3.5 / 65 H_2O/Sec
POST-TEST(−) 3 / 65 H_2O/Sec
PYROMETER NO. ____
BOX OPERATOR ____ PROBE HOLDER ____

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (FT³)	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)
1-1			394	.27	1.7	1.7	142	247	54	82	8.5
2		1249	397.4	.27	1.7	1.7	143	249	42	82	9.0
3			399.3	.41	2.6	2.6	142	258	43	82	13
4		1254	401.8	.41	2.6	2.6	144	257	44	82	13
5			403.22	.36	2.3	2.3	142	264	44	83	12.5
6		1259	405.04	.3	1.9	1.9	145	262	45	83	11.5

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					
2-1			406.63	.25	1.6	1.6	143	265	46	84	10
2		1305	408.35	.30	1.9	1.9	145	267	46	84	11
3			410.12	.34	2.1	2.1	144	266	46	85	11.5
4		1310	412.10	.40	2.5	2.5	146	267	46	85	15
5			414.10	.42	2.65	2.65	145	262	47	85	16.5
6		1315	416.05	.36	2.3	2.3	145	260	47	86	15
3-1			417.72	.28	1.7	1.7	145	256	48	87	14.5
2		1321	419.43	.30	1.9	1.9	145	254	47	87	12
3			421.4	.40	2.5	2.5	145	246	46	87	16
4		1326	423.3	.36	2.3	2.3	146	240	47	87	15.5
5			425.1	.33	1.9	1.9	146	239	47	88	14.5
6		1331	426.95	.31	2	2	145	243	47	88	14.5
4-1			428.54	.26	1.6	1.6	146	252	47	89	11.5
2		1338	430.28	.30	1.9	1.9	145	268	46	89	13.5
3			432.13	.35	2.2	2.2	146	268	46	89	15.5
4		1343	434.07	.38	2.4	2.4	147	282	46	89	18.5
5			436.00	.38	2.4	2.4	146	268	46	89	19.5
6		1348	438.032	.36	2.3	2.3	146	262	46	90	19.5

APPENDIX C

LABORATORY ANALYSES

AIR CONSULTING & ENGINEERING, inc. — PARTICULATE LAB DATA

SOURCE Sugar Cane Growers – No. 4 Boiler

PROBE RINSE	RUN 1	RUN 2	RUN 3	BLANK
CONTAINER NUMBER	S-1	S-13	S-22	S-23
TOTAL VOLUME (ml)				
1st GROSS WEIGHT (g)	106.6193	103.5724	103.6482	103.0980
2nd GROSS WEIGHT (g)	106.6197	103.5720	103.6482	103.0935
AVERAGE GROSS WEIGHT (g)	106.6195	103.5722	103.6482	103.0933
TARE WEIGHT (g)	106.6022	103.5604	103.6313	103.0892
SUB NET WEIGHT (g)	0.0173	0.0118	0.0169	0.0041
ACETONE BLANK (g)	—	—	—	—
TOTAL NET WEIGHT (mg)	17.3	11.8	16.9	4.1

LIQUID LEVEL OK

DATE & TIME: 12-14/0938

DATE & TIME: 12-19/1455

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 —	RUN —	BLANK
FILTER NUMBER	2901	2902	2903	2899
1st GROSS WEIGHT (g)	0.5714	0.5903	0.5929	0.3993
2nd GROSS WEIGHT (g)	0.5710	0.5898	0.5925	0.3993
AVERAGE GROSS WEIGHT (g)	0.5712	0.5901	0.5927	0.3993
TARE WEIGHT (g)	0.4050	0.4069	0.4056	0.3993
SUB NET WEIGHT (g)	0.1662	0.1832	0.1871	0.0000
TOTAL NET WEIGHT (mg)	166.2	183.2	187.1	0

DATE & TIME: 12-14/0938

DATE & TIME: 12-19/1455

TARE BALANCE CHECK

SEE LAB BOOK

1st GROSS WEIGHT BALANCE CHECK

0 0.0000 ~~10.0g~~ 100.0000

0.5 g 0.5000 100.0 g 100.0000

%RH 47 DATE 12-14-90

Signature S. L. Nuck

2nd GROSS WEIGHT BALANCE CHECK

0 0.0000 10.0 g —

0.5 g 0.5000 100.0 g 100.0000

%RH 50 DATE 12-19-90

Signature S. L. Nuck

APPENDIX D

QUALITY ASSURANCE

AND

CHAIN OF CUSTODY

AIR CONSULTING AND ENGINEERING, Inc.

SAMPLE RECOVERY AND CHAIN OF CUSTODY

PLANT NAME Sugar Growers Coop TEST DATE 12-11-90
SOURCE NAME Number 4 Boiler SAMPLE RECOVERED BY SAA
TYPE OF SAMPLE P.M. PARTICULATE ANALYSES BY SAA

SAMPLE RECOVERY

RUN NO.	CONTAINER NO.	LIQUID LEVEL MARKED	COLOR	COMMENTS
1	Filter 2901			
1	S-1			
2	Fil. 2902			
2	S-13			
3	Fil. 2903			
3	S-22			
ACETONE / WATER BLANK (CIRCLE)	S-23			
FILTER BLANK	2899			

SILICA GEL

RUN NO.	CONTAINER NO.	FINAL WT. (g)	INIT. WT. (g)	NET WT. (g)	COLOR
1	2	206.3	200.0	6.3	OK
2	25	208.4	200.0	8.4	"
3	14	205.6	200.0	5.6	"
			200.0		
			200.0		
			200.0		
			200.0		
			200.0		

STANDARD METER CALIBRATION

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 April 26, 1990, and is checked and/or recalibrated at least annually.

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.

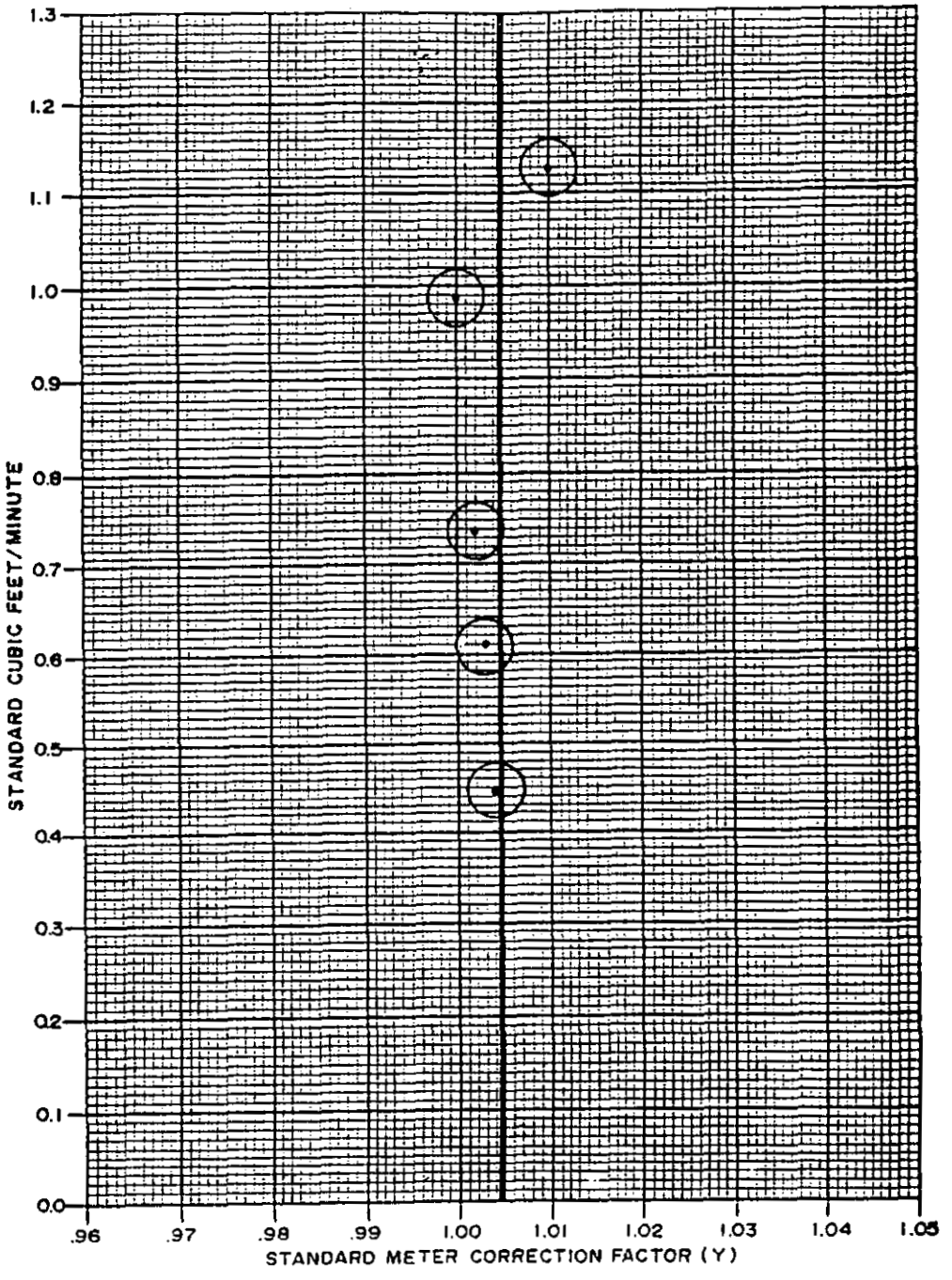
STD GAS METER TEMPERATURE 67 °F / ASTM GLASS THERMOMETER TEMPERATURE 69 °F

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. Habel

air consulting and engineering

	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



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

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. Huber

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. Peck

	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

ace air consulting and engineering

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				

CALIBRATED BY: _____

FDER - MAXIMUM 5° DIFFERENCE

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

AIR CONSULTING & ENGINEERING, INC. — PYROMETER CALIBRATION

DATE 7-10-90

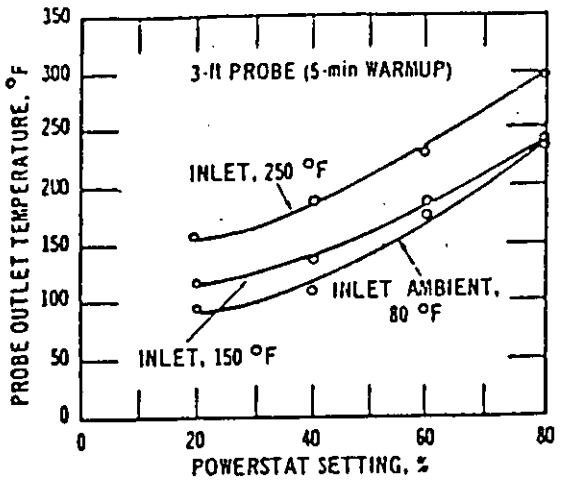
PYROMETER NUMBER METER BOX # 1

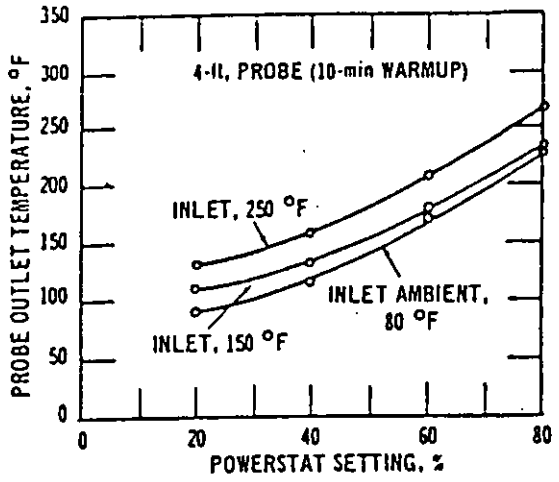
SOURCE (SPECIFY)	GLASS THERMOMETER WITH NBS MERCURY (°F)	PYROMETER (°F)	DEGREE DIFFERENCE	PERCENT DIFFERENCE
ICE BATH	32°	33°	1	.2%
AMBIENT	94°	96°	2	.4%
HOT OVEN	800°	800°	0	0

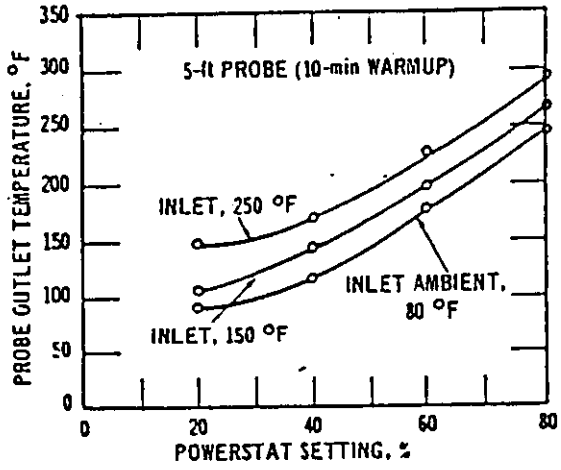
FDER - MAXIMUM 5° DIFFERENCE

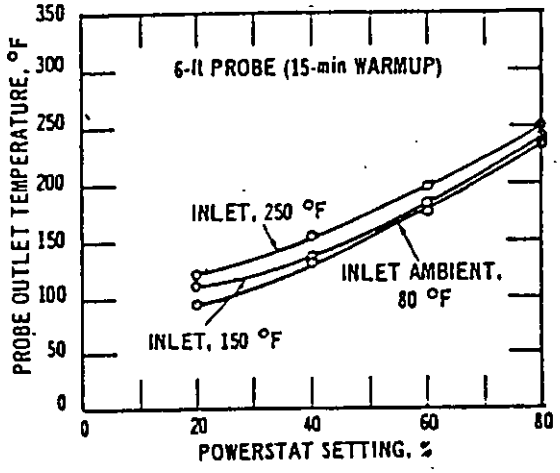
$$\text{EPA}\left[\frac{(\text{REF. TEMP. °F} + 460°) - (\text{PYROMETER TEMP. °F} + 460°)}{\text{REF. TEMP. °F} + 460°}\right] 100 \leq 1.5\%$$

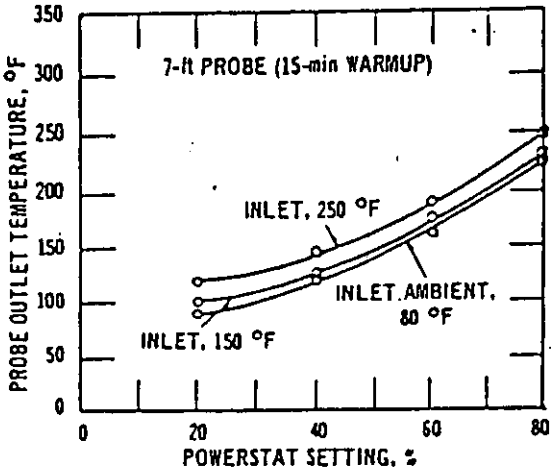
CALIBRATED BY: Larry J. Wentz











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

Probe temperatures.

APPENDIX E

PRODUCTION RATE CERTIFICATION

BOILER OPERATION PARAMETERS

SC N 75 75

PLANT Sugar Cane Growers Coop

BOILER NUMBER 4

DATE 12-11-90

RUN NUMBER 1

OIL METER FACTOR 1

STEAM INTEGRATOR FACTOR 3500

SCRUBBER(S) PRESS.DROP ____, ____

SCRUBBER(S) GPM _____, _____

OPERATOR SIGNATURE N.G.

SCRUBBER(S)H2O LEVEL _____, ____

Ph(if applicable) _____, _____

INITIAL INTEGRATOR 956681

FINAL INTEGRATOR 956766

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS. FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
0912	2390	245000	580	430	260	600
9:22		240000	580	430	260	600
9:32		245000	580	430	260	600
9:42		230000	580	420	260	600
9:52		230000	580	420	260	600
10:02		235000	580	430	260	600
10:12		245000	580	430	260	600
1023	2421	240000	580	430	260	600

BOILER OPERATION PARAMETERS

PLANT Sugar Cane Growers

BOILER NUMBER 4

DATE 12-11-90 RUN NUMBER 2

OIL METER FACTOR 1

STEAM INTEGRATOR FACTOR 3500

SCRUBBER(S) PRESS.DROP____,___
SCRUBBER(S) GPM_____,_____
SCRUBBER(S)H2O LEVEL_____,____
Ph(if applicable)_____,_____

OPERATOR SIGNATURE_____

INITIAL INTEGRATOR 956801

FINAL INTEGRATOR_____

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
1100	24370	240000	580	430	260	600
11:10		245000	580	430	260	600
1120		240000	580	430	260	600
1130		240000	580	430	260	600
11:40		240000	580	430	260	600
11:50		240000	580	430	260	600
12:00		240000	580	420	260	600
12:12	24680	240000	580	430	260	600

BOILER OPERATION PARAMETERS

PLANT SUGAR CANE GROWERS

BOILER NUMBER 4

DATE 12-11-90 RUN NUMBER 3

OIL METER FACTOR 1

STEAM INTEGRATOR FACTOR _____

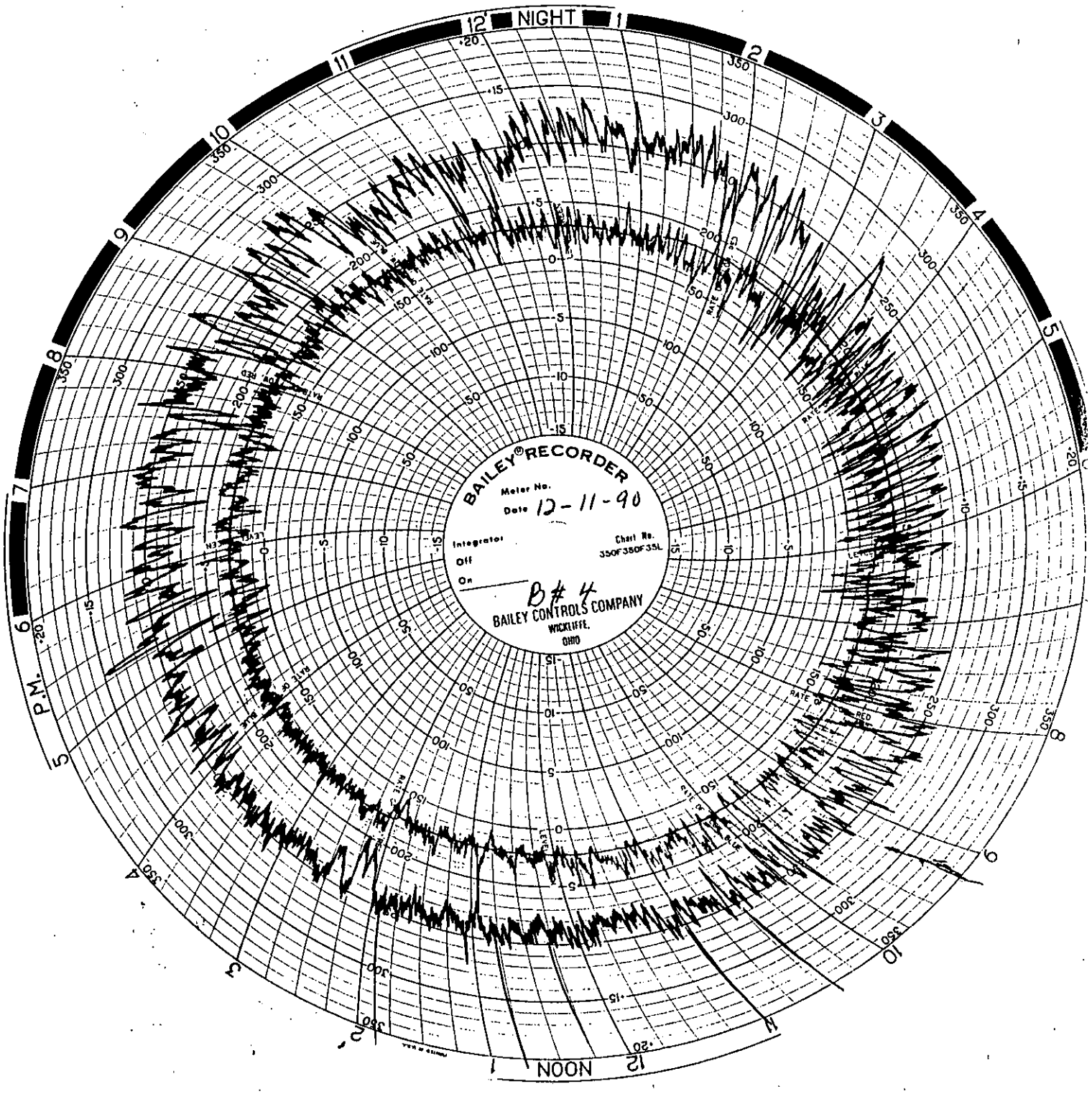
OPERATOR SIGNATURE _____

SCRUBBER(S) PRESS.DROP ____, ____
SCRUBBER(S) GPM _____, _____
SCRUBBER(S)H2O LEVEL _____, _____
Ph(if applicable) _____, _____

INITIAL INTEGRATOR 956913

FINAL INTEGRATOR 956992

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
1240	24800	240000	580	430	260	600
1250		240000	580	420	260	600
1:00		240000	580	430	260	600
1:10		240000	580	430	260	600
1:20		245000	580	430	260	600
1:30		240000	580	430	260	600
1:40	25100	245000	580	430	260	600
1:51						


NIGHT
NOON
P.M.
BAILEY® RECORDER
Meter No.
Date 12-11-90
Integrator
Off
On
Chart No.
350F 350F 35L
B # 4
BAILEY CONTROLS COMPANY
WICKLIFFE,
OHIO

APPENDIX F

PROJECT PARTICIPANTS

PROJECT PARTICIPANTS

ACEI:	
STEPHEN L. NECK,P.E.	FIELD TESTING REPORT PREPARTION
GERARD GAUTHREAUX	FIELD TESTING
SCGCOF:	
JOSE ALVEREZ	PROJECT COORDINATOR
BLAS MARIN	TEST COORDINATOR
FL. DEPT. OF ENVIRONMENTAL REGULATION	
KEN TUCKER	TEST OBSERVER