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: 28

Title: Source Test Report for Particulate Emissions Impingement Wet Scrubber Number 2 Boiler: US Sugar Corporation

January 1991

Ref 15

OSWI- USSC 7

5

air
consulting
and
engineering, Inc.

SOURCE TEST REPORT
for
PARTICULATE EMISSIONS

IMPINGEMENT WET SCRUBBER
NUMBER 2 BOILER

U. S. SUGAR CORPORATION
BRYANT, FLORIDA

JANUARY 23, 1991

PREPARED FOR:
U. S. SUGAR CORPORATION
CLEWISTON, 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

SUMMARY

GENERAL:

REVIEWED BY AS
ACTUAL A 'S = 22.78 SQ FT
LAMINAR FLOW ASSUMED (<10 DEG YAW) (OR <20 DER)
ACTUAL EMISS BASED ON HEAT INPUT = 293.71 MBTU/HR
ALL REQUIRED LEAK TESTS ACCEPTABLE
ASSUMED M 'D=30.0 (COMBUSTION GASES)

COMMENT.....

RUN 1 :
ACTUAL A 'N = .0001521 SQ FT

COMMENT.....

RUN 2 :
ACTUAL A 'N = .0001521 SQ FT

COMMENT.....

RUN 3 :
ACTUAL A 'N = .0001521 SQ FT

COMMENT.....

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

FACILITY NAME: US SUGAR APIS #

COMPANY CONDUCTING TEST: ACE TEST DATE JAN 23 91

SOURCE DESCRIPTION: BOILER 2

STACK TEST DATA SUMMATION

		RUN1	RUN2	RUN3
1.H2O	(VOL.MEAS.),ML	275	270	260
2.H2O	(MASS MEAS.),GM	6	6.5	6.5
3.M'N	PARTICULATE WEIGHT, GM	.054	.043	.083
4.V'M	VOLUME METERED,CF	38.845	38.574	40.32
5.Y	DRY GAS MTR. CALIB.FCTR.	.994	.994	.994
6.RDP	AVG SQR D.P-SAMPLING	1.7	1.68	1.75
7.DH	AVG DELTA H,IN.H2O	1.71	1.68	1.78
8.T'M	AVG MTR. TEMP,DEG.F	62	76	83
9.T'S	AVG STACK TEMP,DEG.F	157	156	156
10.P'S	STACK PRESS,''HG(ABS)	30.18	30.18	30.18
11.P'B	BAROMETRIC PRESS,''HG	30.15	30.15	30.15
13.D'N	ACTUAL NOZZLE DIAM,IN	.167	.167	.167
14.T	ACTUAL SAMPLE TIME,MIN	64	64	64
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	39.50	25.08	106.25	5,632,345	98.50	16.97	0.058	0.300
2	38.20	25.41	104.99	5,550,231	96.66	13.77	0.047	0.300
3	39.43	24.14	109.06	5,863,638	94.42	27.21	0.093	0.300
MEAN	39.04	24.88	106.77	5,682,072	96.53	19.32	0.066	0.300

SOURCE TEST REPORT
for
PARTICULATE EMISSIONS

IMPINGEMENT WET SCRUBBER
NUMBER 2 BOILER

U. S. SUGAR CORPORATION
BRYANT, FLORIDA

JANUARY 23, 1991

PREPARED FOR:
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APPENDIX D--QUALITY ASSURANCE AND CHAIN OF CUSTODY

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air consulting and engineering, Inc.

REPORT CERTIFICATION

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

Stephen L. Neck, P.E.

State of Florida
Registration No. 20020

March 4, 1991
Date

SEAL

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

1.0 INTRODUCTION

Personnel from Air Consulting and Engineering,INC.(ACEI) performed annual source emission compliance testing for the U. S. SUGAR CORPORATION (USSC) on January 23, 1991. Testing was performed at the Bryant Sugar Mill Number 2 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. Augusto Blanchard of USSC served as test coordinator and certified production rates.

Mr. Ken Tucker of the Florida Department of Environmental Regulation and Mr. Jeff Koerner of the Palm Beach County Health Department witnessed most of the testing period.

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 19.470 pounds per hour (LB/HR) and 0.066 pounds per million btu(LB/MMBTU) heat input against a "process rate" basis allowable emission of 0.300 LB/MMBTU. Permit conditions limit emissions to 0.10 LB/MMBTU from oil and 0.300 LB/MMBTU from bagasse 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). Steam integrator readings were recorded at the beginning and end of each particulate test run by Mr. Stephen L. Neck of ACEI.

TABLE 1
EMISSION SUMMARY
U. S. SUGAR CORPORATION
NUMBER 2 BOILER-BRYANT, FLORIDA
JANUARY 23, 1991

RUN NUMBER	TIME	ACTUAL EMISSIONS		ALLOWABLE EMISSIONS	
		LB/HR	LB/MMBTU	LB/HR	LB/MMBTU
1	0831-0938 67	17.029	0.058	88.79	0.300
2	1018-1128 70	14.067	0.048	87.75	0.300
3	1212-1321 69	27.315	0.093	87.80	0.300
AVERAGES	--------- 69	19.470	0.066	88.11	0.300

3.0 PROCESS DESCRIPTION AND OPERATION

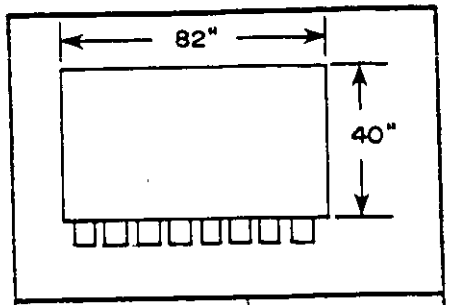
The Number 2 Boiler at the U. S. Sugar Corporation's Bryant plant is a traveling grate stoker design used primarily for bagasse fuel firing. Supplemental oil firing was not used during the emission test series. The boiler averaged 149466 pounds per hour steam production over the three run test period.

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

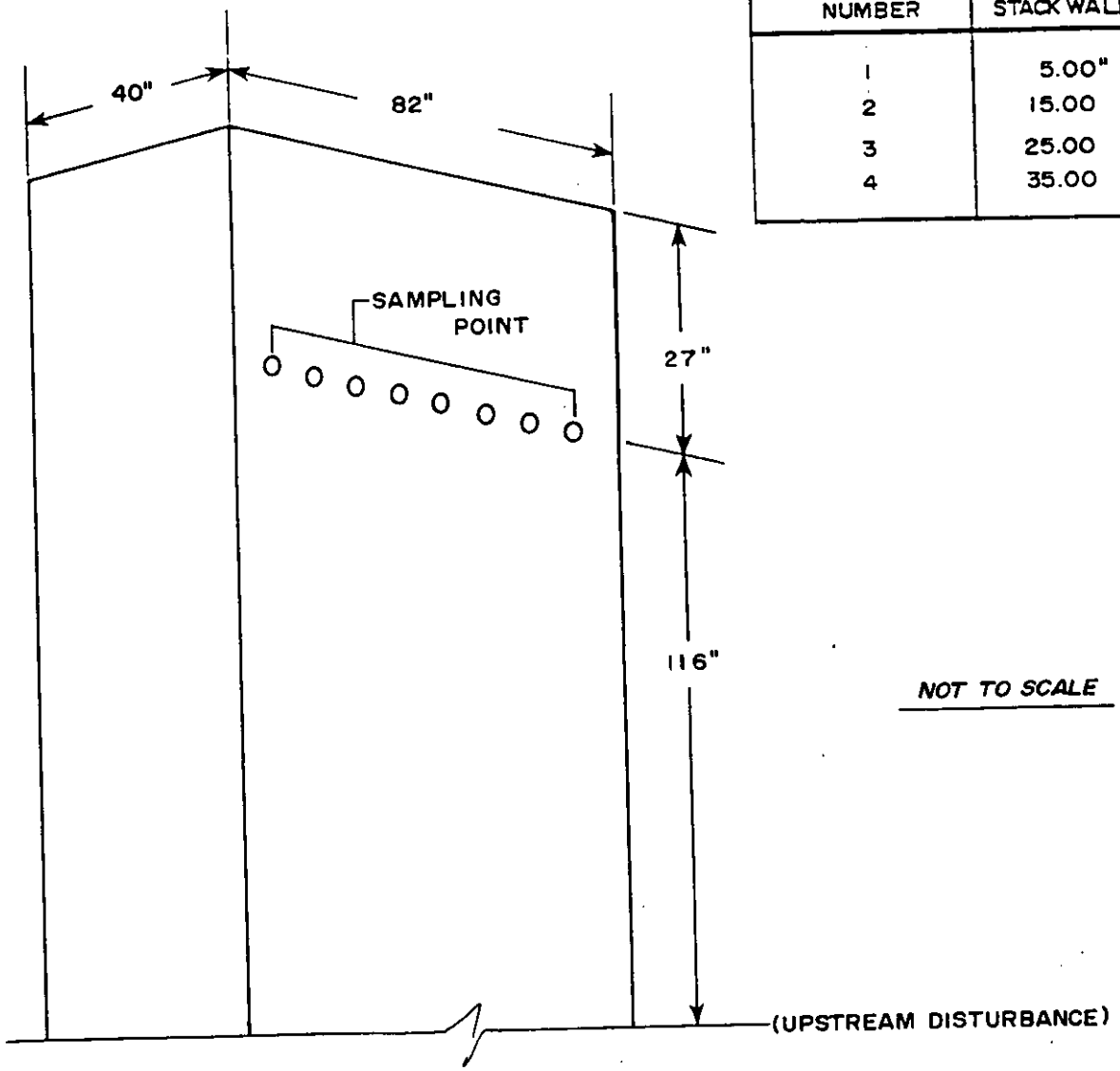
4.0 SAMPLING POINT LOCATION

The sampling point location is a single scrubber outlet stack, 82" wide and 40" deep. The stack has eight equally spaced sample points. The ports are located 116" from an upstream disturbance and 27" from the outlet.

Thirty-two 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	5.00"
2	15.00
3	25.00
4	35.00



NOT TO SCALE

FIGURE 1.
SAMPLING POINT LOCATION
BRYANT-BOILER NO. 2
U.S. SUGAR CORPORATION
PAHOKEE, FLORIDA

AIR CONSULTING and ENGINEERING

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

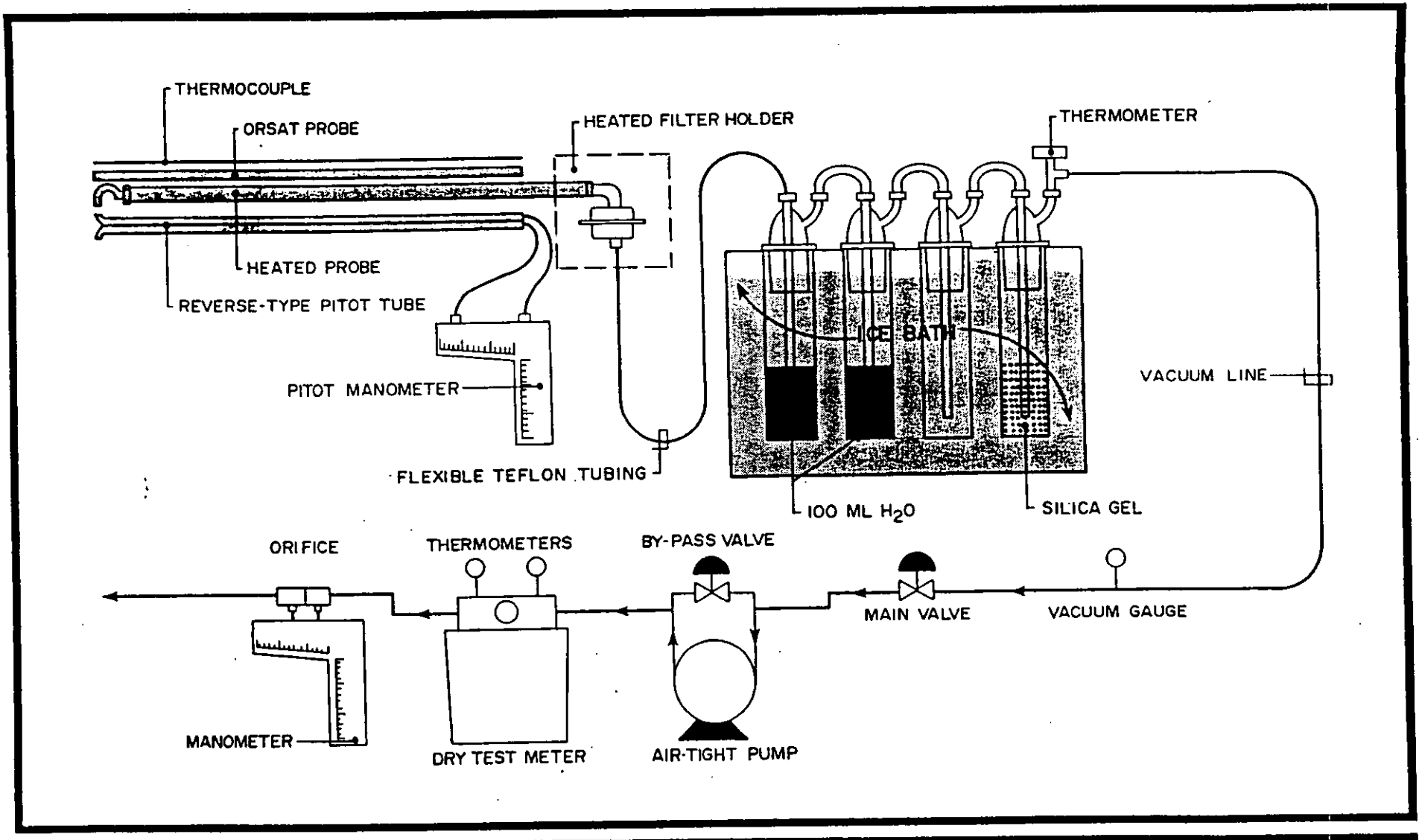


FIGURE 2
EPA METHOD 5 SAMPLING TRAIN

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and
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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

AIR CONSULTING & ENGINEERING,INC.
Complete Emission Data

PLANT:	U. S. SUGAR CORPORATION	DATE:	1-23-91
LOCATION:	BRYANT, FLORIDA	RUN NUMBER	1
SOURCE:	NUMBER 2 BOILER, SCRUBBER OUTLET	TIME:	0823-0942

TIME INTERVAL	79	MINUTES
OIL:		
FINAL OIL	0	
BEGIN OIL	0	
FACTOR	1	
STEAM:		
FINAL STEAM	314550	
BEGIN STEAM	314352	
FACTOR	1000	
TEMPERATURE	618	DEGREES F
PRESSURE	400	PSIG
	415	PSIA
FEEDWATER:		
TEMPERATURE	265	DEGREES F
PRESSURE	634	PSIG
	649	PSIA
HEAT INPUT:		
STEAM	1316.1	BTU/LB
FEEDWATER	233.6	BTU/LB
NET STEAM	1082.5	BTU/LB
STEAM RATE	150380	LB/HR
BOILER EFFICIENCY	55.0	%
TOTAL FUEL HEAT INPUT	295.97	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)	295.97	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.30	LB/MMBTU
TOTAL ALLOWABLE EMISSION	88.79	LB/HR
TOTAL ACTUAL EMISSION	17.02	LB/HR
TOTAL ALLOWABLE EMISSION	0.300	LB/MMBTU
TOTAL ACTUAL EMISSION	0.058	LB/MMBTU

AIR CONSULTING and ENGINEERING
COMPLETE EMISSION DATA

PLANT: U. S. SUGAR CORPORATION-BRYANT
SOURCE: NUMBER 2 BOILER
DATE: 1-23-91

RUN NO.:	1	IMPINGER ml	275
BEGIN TIME:	0831	SILICA GEL gms.	6.0
END TIME:	0938	PERCENT O2	11.2
TOTAL RUN TIME:	64.00 min.	PERCENT CO2	8.9
BAROMETRIC PRESSURE:	30.15 "Hg		
STACK PRESSURE:	30.18 "Hg.		
NOZZLE DIAMETER:	.167 inches	PARTICULATE	
METER CORR. FACTOR:	.994		
FINAL METER:	914.240 cubic ft.	FILTER mg.	42.6
INITIAL METER:	875.395 cubic ft.	WASH mg.	11.6
STACK AREA:	22.780 sq. ft.		

PORT-POINT	VELOCITY HEAD	SQUARE RT. VEL. HEAD	ORIF. DIFF.	STACK TEMP.	METER TEMP.
1-1	9.000	3.000	4.400	149	53
1-2	9.000	3.000	4.400	151	53
1-3	8.300	2.881	4.200	152	53
1-4	6.000	2.449	3.000	151	53
2-1	7.500	2.739	3.750	155	53
2-2	5.500	2.345	2.750	156	55
2-3	4.500	2.121	2.250	157	55
2-4	3.600	1.897	1.800	153	56
3-1	6.400	2.530	3.200	153	57
3-2	4.500	2.121	2.250	157	58
3-3	3.200	1.789	1.600	157	59
3-4	2.000	1.414	1.000	155	60
4-1	6.000	2.449	3.000	152	60
4-2	4.500	2.121	2.750	152	61
4-3	3.000	1.732	1.500	157	62
4-4	1.400	1.183	.700	157	63
5-1	3.800	1.949	1.900	155	63
5-2	3.500	1.871	1.750	157	65
5-3	2.400	1.549	1.200	160	65
5-4	1.200	1.095	.600	161	65
6-1	2.600	1.612	1.300	158	66
6-2	2.600	1.612	1.300	159	67
6-3	2.000	1.414	1.000	160	68
6-4	1.000	1.000	.500	162	68
7-1	1.100	1.049	.550	161	68
7-2	1.200	1.095	.600	163	68
7-3	1.100	1.049	.55	163	69
7-4	.68	0.825	.34	161	70
8-1	.30	0.548	.15	159	70
8-2	.50	0.707	.25	161	70
8-3	.50	0.707	.25	160	70
8-4	.30	0.548	.50	160	70
AVERAGES	3.412	1.700	1.73	157	62

EMISSION RESULTS
RUN 1

NOZZLE AREA (FT2) :0.0001521				
AVG. VELOCITY HEAD :--------	2.89	"H2O	VOL. FLOW ACFM :	145543
AVG. STACK TEMP.: ---------	157	F	VOL. FLOW SCFMD :	93825
AVG. METER TEMP.: ---------	62	F		
AVG. ORIFICE DIFFERENTIAL:---	1.73	"H2O	PARTICULATE DATA :	
METER STANDARD CUBIC FEET:---	39.501		---	
% H2O VAPOR: :--------	25.2		POUNDS PER HOUR:	17.029
GAS MOL. WT. DRY: ---------	29.87		POUNDS PER SCF :	0.0000030
GAS MOL. WT. WET: ---------	26.88		GRAINS/SCF:	0.021
% EXCESS AIR: ---------	113.20		GRAINS/SCF @ 8% O2	0.028
AVG. STACK VEL.(FPS)---------	106.48		GRAINS/SCF @50% EA	0.030
MMBTU INPUT: ---------	295.97		POUNDS PER MMBTU:	0.058
PERCENT ISOKINETIC :---------	98.51			

SAMPLE CALCULATIONS - RUN 1

NOZZLE AREA (FT.2)	(Dn/12)!2x3.1416/4	0.000152
AVG.VELOCITY HEAD:	(AVG.SQ.RT.)!2	106.47
METER STND. FT3:	(Mf-Mi)xMCFx(AVG.ORF.DIFF./13.6))/29.92)x(528/(Tm+460))	39.522
PERCENT H2O:	((IMP+SG)x(((IMP+SG)x.0474)+SCF)x100	
Mw DRY:	((O2%x.32)+CO2%x.44)+(100-(O2%+CO2)x.28	29.87
Mw WET:	(Mw DRYx(1-%H2O/100))+%H2Ox.18	26.88
% EXCESS AIR:	%O2/(((100-(%O2+%CO2))x.264)-%O2)*100	113.20
STACK VEL.(FPS):	85.49x.84x(AVG.SQ.RT.VEL.HD.)x((Ts+460)/(PsxMwWET))!.5	106.47
% ISOKINETIC:	((Ts+460)xSCFx2992)/(528xFPSxTIMEx An xPs x 60x(1-%O2/100)	98.47
VOL. FLOW (ACFM):	FPS x 60 x As	145528
STND. FLOW(SCFMD):	ACFMx528/(Ts+460)x(1-%H2O/100)x(Ps/29.92)	93921
PARTICULATE LB/HR:	PROBE+FILTER mg./453600 x (SCFMD/SCF) x 60	17.037
PARTICULATE LB/SCF):	PROBE+FILTER mg./453600 /SCF	0.0000030
GRAINS/SCF:	LB/SCF x 7000	0.0212
GR/SCF @ 8% O2:	(12.9/(20.9-%O2))x GR/SCF	0.0281
GR/SCF @ 50% E.A.:	GR/SCF x ((100+ %E.A.)/150)	0.0301
LB/MMBTU:	(LB/HR)/(LB/MMBTUH)	0.058
LB/MMBTU "F" FACTOR:	LB/SCF x "F" FACTOR x (20.9/20.9-%O2)	0.000

AIR CONSULTING & ENGINEERING,INC.
Complete Emission Data

PLANT:	U. S. SUGAR CORPORATION	DATE:	1-23-91
LOCATION:	BRYANT, FLORIDA	RUN NUMBER	2
SOURCE:	NUMBER 2 BOLIER, SCRUBBER OUTLET	TIME:	1016-1133

TIME INTERVAL	77	MINUTES
OIL:		
FINAL OIL	0	
BEGIN OIL	0	
FACTOR	1	
STEAM:		
FINAL STEAM	314822	
BEGIN STEAM	314631	
FACTOR	1000	
TEMPERATURE	610	DEGREES F
PRESSURE	399	PSIG
	414	PSIA
FEEDWATER:		
TEMPERATURE	262	DEGREES F
PRESSURE	641	PSIG
	656	PSIA
HEAT INPUT:		
STEAM	1311.6	BTU/LB
FEEDWATER	230.6	BTU/LB
NET STEAM	1081.0	BTU/LB
STEAM RATE	148831	LB/HR
BOILER EFFICIENCY	55.0	%
TOTAL FUEL HEAT INPUT	292.51	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)	292.51	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.30	LB/MMBTU
TOTAL ALLOWABLE EMISSION	87.75	LB/HR
TOTAL ACTUAL EMISSION	14.06	LB/HR
TOTAL ALLOWABLE EMISSION	0.300	LB/MMBTU
TOTAL ACTUAL EMISSION	0.048	LB/MMBTU

AIR CONSULTING and ENGINEERING
COMPLETE EMISSION DATA

PLANT: U. S. SUGAR CORPORATION-BRYANT
SOURCE: NUMBER 2 BOILER
DATE: 1-23-91

RUN NO.:	2	IMPINGER ml	270
BEGIN TIME:	1018	SILICA GEL gms.	6.5
END TIME:	1128	PERCENT O2	11.0
TOTAL RUN TIME:	64.00 min.	PERCENT CO2	9.1
BAROMETRIC PRESSURE:	30.15 "Hg		
STACK PRESSURE:	30.18 "Hg.		
NOZZLE DIAMETER:	.167 inches	PARTICULATE	
METER CORR. FACTOR:	.994		
FINAL METER:	952.988 cubic ft.	FILTER mg.	35.9
INITIAL METER:	914.414 cubic ft.	WASH mg.	7.9
STACK AREA:	22.780 sq. ft.		

PORT-POINT	VELOCITY HEAD	SQUARE RT. VEL. HEAD	ORIF. DIFF.	STACK TEMP.	METER TEMP.
1-1	8.000	2.828	4.000	146	69
1-2	8.400	2.898	4.200	150	69
1-3	7.400	2.720	3.700	150	69
1-4	5.800	2.408	2.900	147	70
2-1	8.600	2.933	4.300	150	70
2-2	5.500	2.345	2.750	153	70
2-3	4.800	2.191	2.400	150	71
2-4	4.000	2.000	2.000	149	72
3-1	6.500	2.550	3.250	152	72
3-2	5.000	2.236	2.500	153	73
3-3	3.100	1.761	1.550	154	74
3-4	2.000	1.414	1.000	154	74
4-1	5.600	2.366	2.800	152	75
4-2	4.400	2.098	2.200	154	75
4-3	2.600	1.612	1.300	157	76
4-4	1.500	1.225	.750	156	76
5-1	3.800	1.949	1.900	155	77
5-2	3.500	1.871	1.750	155	77
5-3	2.500	1.581	1.250	160	77
5-4	1.200	1.095	.600	163	78
6-1	2.500	1.581	1.250	158	78
6-2	2.500	1.581	1.250	161	79
6-3	1.800	1.342	.900	163	79
6-4	.900	0.949	.450	161	79
7-1	.850	0.922	.400	160	80
7-2	1.100	1.049	.550	160	80
7-3	1.100	1.049	.55	159	80
7-4	.70	0.837	.35	160	80
8-1	.40	0.632	.20	159	81
8-2	.38	0.616	.19	161	81
8-3	.50	0.707	.25	160	81
8-4	.40	0.632	.20	160	81
AVERAGES	3.354	1.687	1.68	156	76

EMISSION RESULTS
RUN 2

NOZZLE AREA (FT2) :0.0001521				
AVG. VELOCITY HEAD :--------	2.85	"H2O	VOL. FLOW ACFM :	144305
AVG. STACK TEMP.: ---------	156	F	VOL. FLOW SCFMD :	92836
AVG. METER TEMP.: ---------	76	F		
AVG. ORIFICE DIFFERENTIAL:---	1.68	"H2O	PARTICULATE DATA :	
METER STANDARD CUBIC FEET:---	38.236		---	
% H2O VAPOR: :--------	25.6		POUNDS PER HOUR:	14.067
GAS MOL. WT. DRY: ---------	29.90		POUNDS PER SCF :	0.0000025
GAS MOL. WT. WET: ---------	26.86		GRAINS/SCF:	0.018
% EXCESS AIR: ---------	108.98		GRAINS/SCF @ 8% O2	0.023
AVG. STACK VEL.(FPS)---------	105.58		GRAINS/SCF @50% EA	0.025
MMBTU INPUT: ---------	292.51		POUNDS PER MMBTU:	0.048
PERCENT ISOKINETIC :---------	96.38			

AIR CONSULTING & ENGINEERING, INC.
Complete Emission Data

PLANT:	U. S. SUGAR CORPORATION	DATE:	1-23-91
LOCATION:	BRYANT, FLORIDA	RUN NUMBER	3
SOURCE:	NUMBER 2 BOLIER, SCRUBBER OUTLET	TIME:	1210-1324

TIME INTERVAL	74	MINUTES
OIL:		
FINAL OIL	0	
BEGIN OIL	0	
FACTOR	1	
STEAM:		
FINAL STEAM	315097	
BEGIN STEAM	314913	
FACTOR	1000	
TEMPERATURE	610	DEGREES F
PRESSURE	400	PSIG
	415	PSIA
FEEDWATER:		
TEMPERATURE	264	DEGREES F
PRESSURE	650	PSIG
	665	PSIA
HEAT INPUT:		
STEAM	1311.5	BTU/LB
FEEDWATER	232.6	BTU/LB
NET STEAM	1078.9	BTU/LB
STEAM RATE	149189	LB/HR
BOILER EFFICIENCY	55.0	%
TOTAL FUEL HEAT INPUT	292.65	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)	292.65	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.30	LB/MMBTU
TOTAL ALLOWABLE EMISSION	87.80	LB/HR
TOTAL ACTUAL EMISSION	27.31	LB/HR
TOTAL ALLOWABLE EMISSION	0.300	LB/MMBTU
TOTAL ACTUAL EMISSION	0.093	LB/MMBTU

AIR CONSULTING and ENGINEERING
COMPLETE EMISSION DATA

PLANT: U. S. SUGAR CORPORATION-BRYANT
SOURCE: NUMBER 2 BOILER
DATE: 1-23-91

RUN NO.:	3	IMPINGER ml	260
BEGIN TIME:	1212	SILICA GEL gms.	6.5
END TIME:	1321	PERCENT O2	11.0
TOTAL RUN TIME:	64.00 min.	PERCENT CO2	9.1
BAROMETRIC PRESSURE:	30.15 "Hg		
STACK PRESSURE:	30.18 "Hg.		
NOZZLE DIAMETER:	.167 inches	PARTICULATE	
METER CORR. FACTOR:	.994		
FINAL METER:	993.692 cubic ft.	FILTER mg.	60.2
INITIAL METER:	953.372 cubic ft.	WASH mg.	22.9
STACK AREA:	22.780 sq. ft.		

PORT-POINT	VELOCITY HEAD	SQUARE RT. VEL. HEAD	ORIF. DIFF.	STACK TEMP.	METER TEMP.
1-1	10.000	3.162	4.300	153	77
1-2	8.600	2.933	4.200	153	77
1-3	7.500	2.739	3.800	153	77
1-4	6.000	2.449	3.000	154	77
2-1	7.800	2.793	3.900	154	78
2-2	6.600	2.569	3.300	155	78
2-3	5.400	2.324	2.700	155	78
2-4	4.200	2.049	2.100	155	79
3-1	6.800	2.608	3.400	154	80
3-2	5.200	2.280	2.600	156	80
3-3	3.600	1.897	1.800	155	80
3-4	2.600	1.612	1.300	154	81
4-1	6.000	2.449	3.000	155	82
4-2	4.800	2.191	2.400	155	82
4-3	3.600	1.897	1.800	156	82
4-4	1.800	1.342	.900	155	83
5-1	3.000	1.732	1.500	154	84
5-2	3.800	1.949	1.900	155	84
5-3	2.500	1.581	1.250	157	85
5-4	1.400	1.183	.700	156	85
6-1	2.200	1.483	1.100	156	85
6-2	2.200	1.483	1.100	156	86
6-3	1.500	1.225	.750	157	86
6-4	.900	0.949	.450	156	86
7-1	.950	0.975	.480	157	86
7-2	1.800	1.342	.900	156	87
7-3	1.500	1.225	.75	157	87
7-4	.80	0.894	.40	157	87
8-1	.38	0.616	.19	158	88
8-2	.65	0.806	.38	158	88
8-3	.65	0.806	.38	157	88
8-4	.42	0.648	.16	157	88
AVERAGES	3.598	1.756	1.78	156	83

EMISSION RESULTS
RUN 3

NOZZLE AREA (FT2) :0.0001521				
AVG. VELOCITY HEAD :--------	3.08	"H2O	VOL. FLOW ACFM :	149777
AVG. STACK TEMP.: ---------	156	F	VOL. FLOW SCFMD :	98039
AVG. METER TEMP.: ---------	83	F		
AVG. ORIFICE DIFFERENTIAL:---	1.78	"H2O	PARTICULATE DATA :	
METER STANDARD CUBIC FEET:---	39.452			
% H2O VAPOR: :--------	24.3		POUNDS PER HOUR:	27.315
GAS MOL. WT. DRY: ---------	29.90		POUNDS PER SCF :	0.0000046
GAS MOL. WT. WET: ---------	27.01		GRAINS/SCF:	0.033
% EXCESS AIR: ---------	108.98		GRAINS/SCF @ 8% O2	0.042
AVG. STACK VEL.(FPS)---------	109.58		GRAINS/SCF @50% EA	0.045
MMBTU INPUT: ---------	292.65		POUNDS PER MMBTU:	0.093
PERCENT ISOKINETIC :---------	94.16			

Avg = O_2 = 111.1
Temp = 156
flow = 94,900
MMBtu/hr = 193.7

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 1 OF 2

PLANT U.S SUGAR - BRYANT
SOURCE NO. 2 BOILER
PLANT LOCATION BRYANT, FLORIDA
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES PARTICULATE (PM)
DATE 1-23-91 RUN NO. 1
TIME START 0831 TIME END 0938
SAMPLE TIME 32 / 2 (min/pt) = 64 Total min
ASSUMED MOISTURE 25 % FDA .175
NOMOGRAPH C_f .50 PITOT CORR. .84
P_b 30.15 "Hg P_s 30.18 "Hg
WEATHER CLEAR TEMP. _____ °F
METER BOX NO. 1 H 2.05 Y .994
NOZZLE CAL. .168 .167 .167 = .167
STACK DIMENSIONS 82 + 40
STACK AREA 22.78 ft² EFFECTIVE _____ ft²
STACK HEIGHT _____ ft.
STACK DIAMETER: UPSTRM. _____ DNSTRM. _____
PORT SIZE _____ in. NIPPLE LENGTH _____ in.
U CORD LENGTH 175 + 125'
REMARKS:

BRYZ-1
BRYZB-1

39.486 SCF
25% H_2O
.474
314352 0823
314550 0942
6383.8 FPM
$1.70 = \sqrt{\Delta P}$
2.89
42.3
8.0
50.
145408 ACFM
93168 SCFMD
lb/hr = 31.21 PER 100 mg
8.0 15.6 lb/hr

MAT'L PROCESSING RATE _____
GAS METER READINGS: FINAL 914.240 ft³
INITIAL 875.395 ft³
NET _____ ft³
FILTER NO. 3078 IMP. VOL. GAIN 275 ml.
SIL GEL NO. 24 WT. GAIN 6.0 ml.
TOTAL CONDENSATE _____ ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					8.9
% O_2					11.2
% CO					
% N_2					

F_O = _____ F_O RANGE = _____
ORSAT ANALYZER _____

LEAK CHECKS
PRE .000 cfm 28 "Hg POST 0.00 cfm 20 "Hg
METER BOX/PUMP ✓ GAS SAMPLE SYST. O.K
ORSAT BAG _____
PITOT TUBE NO. 59 PRE-TEST O.K.
POST-TEST(+) 3.0 / 15 H_2O/Sec
POST-TEST(−) 3.5 / 15 H_2O/Sec
PYROMETER NO. 1
BOX OPERATOR NECK PROBE HOLDER GERARD

.12 lb/mm BTU

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.	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		0833	—	9.0	4.5	4.4	260	149	43	53	20
2		0835	879.45	9.0	4.5	4.4	255	151	40	53	20
3		0837	881.50	8.3	4.15	4.2	255	152	40	53	20
4		0839	883.285	6.0	3.0	3.0	254	151	42	53	20
2-1		0842	885.15	7.5	3.75	3.75	251	155	44	53	17.5

AIR CONSULTING & ENGINEERING, INC.

TEST ID 1

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. ("H₂O) CALC.	METER ORIFICE PRESS. DIFF. ("H₂O) ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. (°F)	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
2-2		0844	886.9	5.5	2.75	2.75	156	247	44	55	13
3		0846	888.42	4.5	2.25	2.25	157	249	44	55	11
4		0848	889.78	3.6	1.8	1.8	153	245	46	56	9
3-1		0850	891.5	6.4	3.2	3.2	153	246	46	57	16
2		0852	—	4.5	2.25	2.25	157	243	46	58	13
3		0854	894.65	3.2	1.6	1.6	157	240	47	59	9
4		0856	89 —	2.0	1.0	1.0	155	237	48	60	6.5
4-1		0859	897.33	6.0	3.0	3.0	152	238	48	60	16.5
2		0901	899.0	4.5	2.75	2.75	152	237	46	61	14.5
3		0903	900.27	3.0	1.5	1.5	157	234	46	62	9.5
4		0905	901.2	1.4	0.7	0.7	157	234	48	63	5.5
5-1		0907	902.50	3.8	1.9	1.9	155	235	48	63	11.0
2		0909	903.82	3.5	1.75	1.75	157	236	47	65	10.5
3		0911	904.92	2.4	1.2	1.2	160	235	47	65	8
4		0913	905.69	1.2	.6	.6	161	234	47	65	6
6-1		0916	906.8	2.6	1.3	1.3	158	234	48	66	8.5
2		0918	907.95	2.6	1.3	1.3	159	234	47	67	9
3		0920	908.94	2.0	1.0	1.0	160	231	47	68	7.5
4		0922	909.63	1.0	.5	.5	162	230	47	68	5.5
7-1		0924	910.18	1.1	.55	.55	161	228	49	68	5.5
2		0926	911.0	1.2	.6	.6	163	228	47	68	5.5
3		0928	911.74	1.1	.55	.55	163	229	47	69	6.0
4		0930	912.3	.68	.34	.34	161	227	48	70	5.0
8-1		0932	912.69	.30	.15	.15	159	231	48	70	3.5
2		0934	913.14	.5	.25	.25	161	234	50	70	5.0
3		0936	913.7	.5	.25	.25	160	235	50	70	5.0
4		0938	914.24	.3	.15	.15	160	235	50	70	4.0

STACK SAMPLING FIELD DATA SHEET

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

TEST ID 2
PAGE 1 OF 2

PLANT U.S. SUGAR
SOURCE UNIT 2
PLANT LOCATION BRYANT, FLORIDA
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES P.M.
DATE 1-23-90 RUN NO. 2
TIME START 1018 TIME END 1128
SAMPLE TIME 32 / 2 (min/pt) = 64 Total min
ASSUMED MOISTURE 28 % FDA .75
NOMOGRAPH C_p _____ PITOT CORR. .84
P_b 30.15 "Hg P_s 30.18 "Hg
WEATHER CLEAR TEMP. _____ °F
METER BOX NO. 1 H 2.05 Y .994
NOZZLE CAL. _____ _____ _____ = .167
STACK DIMENSIONS 82 x 40
STACK AREA 22.78 ft.² EFFECTIVE _____ ft.²
STACK HEIGHT _____ ft.
STACK DIAMETER: UPSTRM. _____ DNSTRM. _____
PORT SIZE _____ in. NIPPLE LENGTH _____ in.
U CORD LENGTH 175 + 125
REMARKS:
BRY 2-2
BRY 213-2

1133 31482.2
1016 31463.1

3826 SCF
6291 PPM
143308 ACFM
93078 SCFMD

.4465
.4092
.0373

1.69 = √ΔP

32.18 lb/hr for 100 %

24.21 14.067

MAT'L PROCESSING RATE _____
GAS METER READINGS: FINAL 952.988 ft.³
INITIAL 914.414 ft.³
NET _____ ft.³
FILTER NO. 3079 IMP. VOL. GAIN 270 ml.
SIL GEL NO. 2 WT. GAIN 6.5 ml.
TOTAL CONDENSATE 276.5 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2				9.1	~~10.0~~
% O_2				11.0	~~12.4~~
% CO					
% N_2					

F_O = _____ F_O RANGE = _____
ORSAT ANALYZER _____

LEAK CHECKS
PRE 1.000 cfm 15 "Hg POST 0.000 cfm 19 "Hg
METER BOX/PUMP _____ GAS SAMPLE SYST. _____
ORSAT BAG _____
PITOT TUBE NO. _____ PRE-TEST 0.1
POST-TEST(+) 4.4 / 15 H_2O/Sec
POST-TEST(−) 4 / 15 H_2O/Sec
PYROMETER NO. 1
BOX OPERATOR NECK 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		1020	916.32	8.0	4.0	4.0	146	250	61	69	17.0
2		1022	918.4	8.4	4.2	4.2	150	253	49	69	19.0
3		1024	920.3	7.4	3.7	3.7	150	256	47	69	16.5
4		1026	922.08	5.8	2.9	2.9	147	250	48	70	12.5
2-1		1029	923.95	8.6	4.3	4.3	150.	242	50	70	19

AIR CONSULTING & ENGINEERING, INC.

TEST ID 2

PAGE 2 OF 2

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. ("H₂O) CALC.	METER ORIFICE PRESS. DIFF. ("H₂O) ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. (°F)	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
2-2		1031	925.75	5.5	2.75	2.75	153	253	49	70	13
3		1033	927.4	4.8	2.4	2.4	150	250	50	71	
4		1035	928.84	4.0	2.0	2.0	149	255	51	72	
3-1		1038	930.63	6.5	3.25	3.25	152	260	52	72	15
3-2		1040	—	5.0	2.5	2.5	153	260	52	73	13
3		1042	933.55	3.1	1.55	1.55	154	267	51	74	9
4		1044	934.71	2.0	1.0	1.0	154	267	52	74	7
4-1		1047	936.23	5.6	2.8	2.8	152	266	52	75	14.5
2		1049	937.73	4.4	2.2	2.2	154	259	51	75	12.5
3		1051	—	2.6	1.3	1.3	157	259	51	76	8
4		1053	939.88	1.5	.75	.75	156	255	52	76	6
5-1		1056	941.20	3.8	1.9	1.9	155	256	52	77	10.5
2		1058	942.55	3.5	1.75	1.75	155	256	51	77	10.0
3		1100	943.75	2.5	1.25	1.25	160	254	51	77	8.0
4		1102	945.55	1.2	.60	.60	163	253	52	78	6.0
6-1		1105	945.68	2.5	1.25	1.25	158	248	52	78	8.0
2		1107	946.80	2.5	1.25	1.25	161	243	52	79	8.0
3		1109	947.75	1.8	.9	.9	163	243	52	79	7.0
4		1111	948.46	.90	.45	.45	161	242	52	79	5.0
7-1		1113	949.10	.85	.4	.4	160	249	54	80	5.0
2		1115	949.80	1.1	.55	.55	160	248	54	80	5.5
3		1117	950.53	1.1	.55	.55	159	245	53	80	5.5
4		1119	951.13	.70	.35	.35	160	242	53	80	5
8-1		1122	951.50	.40	.20	.20	159	255	55	81	4
2		1124	952.01	.38	.19	.19	161	256	57	81	4
3		1126	952.50	.5	.25	.25	160	256	56	81	4.5
4		1128	952.988	.4	.2	.2	160	257	56	81	4.5

STACK SAMPLING FIELD DATA SHEET

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

TEST ID 3
PAGE 1 OF 2

PLANT U.S. SUGAR -
SOURCE BRYANT, FL.
PLANT LOCATION No. 2 BOILER
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES D.M.
DATE 1-23-91 RUN NO. 3
TIME START 1212 TIME END 1321
SAMPLE TIME 32.2 (min/pt)= 64 Total min
ASSUMED MOISTURE 25 % FDA .75
NOMOGRAPH C_f 0.5 PITOT CORR. .84
P_b 30.15 "Hg P_s 30.18 "Hg
WEATHER CLEAR TEMP. °F
METER BOX NO. 1 H 2.05 Y .994
NOZZLE CAL. = .167
STACK DIMENSIONS 82 x 40
STACK AREA 22.78 ft² EFFECTIVE ft²
STACK HEIGHT ft.
STACK DIAMETER: UPSTRM. DNSTRM.
PORT SIZE in. NIPPLE LENGTH in.
U CORD LENGTH
REMARKS:
BRYZ-3
BRYZD-3

1210 314913
1324 315097
1.756 = ΔP
(3.08)
.4704
.4106
.0598
59.8
8
67.8
792.65
.093
77.31

MAT'L PROCESSING RATE
GAS METER READINGS: FINAL 993.692 ft.³
INITIAL 953.372 ft.³
NET ft.³
FILTER NO. 3080 IMP. VOL. GAIN 260 ml.
SIL GEL NO. 22 WT. GAIN 6.5 ml.
TOTAL CONDENSATE 266.5 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					9.1
% O_2					11.0
% CO					
% N_2					

F_O = F_O RANGE =
ORSAT ANALYZER

LEAK CHECKS
PRE cfm O.K "Hg POST 0.00 cfm 20 "Hg
METER BOX/PUMP GAS SAMPLE SYST.
ORSAT BAG
PITOT TUBE NO. 59 PRE-TEST O.K
POST-TEST(+) 4.11 15 H_2O/Sec
POST-TEST(−) 4.21 15 H_2O/Sec
PYROMETER NO. 1
BOX OPERATOR NECK PROBE HOLDER GERALD

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		1214	955.43	10.0	5.0	~~5.0~~ 4.3	153	273	46	~~78~~ 77	20
2		1216	—	8.6	4.3	4.2	153	271	43	77	20
3		1218	959.5	7.5	3.8	3.8	153	273	39	77	19.5
4		1220	961.28	6.0	3.0	3.0	154	271	40	77	15.0
2-1		1223	963.2	7.8	3.9	3.9	154	269	41	78	20

AIR CONSULTING & ENGINEERING, INC.

TEST ID 3

PAGE 2 OF 2

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)
~~1225~~	2-2	1225	965.2	6.6	3.3	3.3	155	271	44	78	15.5
~~1227~~	2-3	1227	966.90	5.4	2.7	2.7	155	271	43	78	14.5
2-4		1229	968.41	4.2	2.1	2.1	155	268	43	79	15.0
3-1		1232	970.20	6.8	3.4	3.4	154	268	43	80	18.5
3-2		1234	971.86	5.2	2.6	2.6	156	268	42	80	15
3		1236	973.28	3.6	1.8	1.8	155	268	42	80	11.5
4		1238	974.46	2.6	1.3	1.3	154	268	43	81	9
4-1		1240	976.10	6.0	3.0	3.0	155	264	44	82	17
-2		1242	977.70	4.8	2.4	2.4	155	270	43	82	14.5
3		1244	979.05	3.6	1.8	1.8	156	267	43	82	11.5
4		1246	980.13	1.8	.9	.9	155	266	43	83	8
5-1		1249	981.33	3.0	1.5	1.5	154	274	44	84	10
2		1251	982.61	3.8	1.9	1.9	155	271	43	84	11
3		1253	983.78	2.5	1.25	1.25	157	271	43	85	10
4		1255	984.68	1.4	.7	.70	156	267	43	85	7
6-1		1258	985.68	2.2	1.1	1.1	156	265	45	85	8.5
2		1300	986.71	2.2	1.1	1.1	156	260	43	86	8.5
3		1302	987.61	1.5	.75	.75	157	258	43	86	7.0
4		1304	988.35	.90	.45	.45	156	256	43	86	6.0
7-1		1306	989.00	.95	.48	.48	157	256	43	86	6.0
2		1308	989.95	1.8	.90	.90	156	258	44	87	7.5
3		1310	990.81	1.5	.75	.75	157	254	50	87	8
4		1312	991.46	.80	.40	.40	157	257	44	87	6
8-1		1315	991.92	.38	.19	.19	158	258	58	88	5
2		1317	992.55	.65	.38	.38	158	258	44	88	6
3		1319	993.2	.65	.38	.38	157	255	43	88	6
4		1321	993.69	.42	.16	.16	157	260	44	88	5.0

APPENDIX C

LABORATORY ANALYSES

AIR CONSULTING & ENGINEERING, inc. — PARTICULATE LAB DATA

SOURCE U.S. SUGAR - BRYANT No. 2

PROBE RINSE	RUN 1	RUN 2	RUN 3	BLANK
CONTAINER NUMBER	15	31	28	36
TOTAL VOLUME (ml)	160	160	230	150
1st GROSS WEIGHT (g)	102.3133	103.6940	103.6250	105.4488
2nd GROSS WEIGHT (g)	102.3132	103.6937	103.6245	105.4484
AVERAGE GROSS WEIGHT (g)	102.3133	103.6939	103.6248	105.4486
TARE WEIGHT (g)	102.3017	103.6860	103.6019	105.4483
SUB NET WEIGHT (g)	0.0116	0.0079	0.0229	0.0003
ACETONE BLANK (g)	-	-	-	
TOTAL NET WEIGHT (mg)	11.6	7.9	22.9	0.3

LIQUID LEVEL ✓

DATE & TIME: 1-30-91/1800

DATE & TIME: 3/91/1800

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	3078	3079	3080	3082
1st GROSS WEIGHT (g)	0.4546	0.4453	0.4710	0.4115
2nd GROSS WEIGHT (g)	0.4541	0.4448	0.4705	0.4113
AVERAGE GROSS WEIGHT (g)	0.4544	0.4451	0.4708	[illegible]
TARE WEIGHT (g)	0.4118	0.4092	0.4106	0.4113
SUB NET WEIGHT (g)	0.0426	0.0359	0.0602	
TOTAL NET WEIGHT (mg)	42.6	35.9	60.2	0.1

DATE & TIME: 1-30-91/1800

DATE & TIME: 2/3/91 - 1800

TARE BALANCE CHECK

SEE LAB BOOK

1st GROSS WEIGHT BALANCE CHECK

0 0.0000 10.0g ✓

0.5g 0.5001 100.0g 100.0005

%RH 38 DATE ✓

Signature S. L. [illegible]

2nd GROSS WEIGHT BALANCE CHECK

0 ✓ 10.0g ✓

0.5g ✓ 100.0g ✓

%RH 41 DATE 2/1/91 1800

Signature [illegible]

APPENDIX D

QUALITY ASSURANCE

AND

CHAIN OF CUSTODY

AIR CONSULTING AND ENGINEERING, Inc.

SAMPLE RECOVERY AND CHAIN OF CUSTODY

PLANT NAME U.S. SUGAR - BRIANT TEST DATE 1-23-91
SOURCE NAME NUMBER 2 BOILER SAMPLE RECOVERED BY SLN
TYPE OF SAMPLE P.M. PARTICULATE ANALYSES BY SLN

SAMPLE RECOVERY

RUN NO.	CONTAINER NO.	LIQUID LEVEL MARKED	COLOR	COMMENTS
1	15	✓	LT.	
3	28	✓	"	
2	31	✓	"	
1	3078	–	BLK.	
2	3079	–	"	
3	3080	–	"	
ACETONE / WATER BLANK (CIRCLE)	33			
FILTER BLANK	3082			

SILICA GEL

RUN NO.	CONTAINER NO.	FINAL WT. (g)	INIT. WT. (g)	NET WT. (g)	COLOR
1	22	206.5	200.0	6.5	PINK
2	2	206.5	200.0	6.5	"
3	24	206.0	200.0	6.0	"
			200.0		
			200.0		
			200.0		
			200.0		
			200.0		

AIR CONSULTING & ENGINEERING, inc. POST TEST CALIBRATION

DATE 2-11-91 METER BOX NUMBER 1 LEAK CHECK 0.000 CFM at 29 in. Hg.

CLIENT U.S. SUGAR / TALISMAN SOURCE VARIOUS THERMOCOUPLE NUMBER 36 / 160 PYROMETER NUMBER ~~64~~ 1

FLIGHT SERVICE Pb 30.11 in. Hg. ACE BAROMETER Pb 30.1 in. Hg.

ASTM GLASS THERMOMETER 160 / 160 °F / THERMOCOUPLE 160 / 160 °F ASTM GLASS THERMOMETER 64 °F / METER TEMP 64 °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				
-.5	2.1	513.835	508.00	5.835	193.300	199.452	6.152	~~64~~ 59 ~~66~~ 59	64 66	8	21
-.5	2.1	513.835	522.560	8.725	199.817	209.013	9.196	59 59	66 68	12	21
-.5	2.1	522.560	513.835	7.993	209.013	217.471	8.458	59 59	68 70	11	21

CALIBRATED BY: S Clepton & Neil

RUN NUMBER	SCFM	STANDARD M.C.F.	DELTA Ha	M.C.F.
1	0.75	1.005	2.135	0.959
2	0.74	1.005	2.140	0.963
3	0.74	1.005	2.135	0.963
AVERAGES	0.74	1.005	2.137	0.962

air consulting and engineering

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 4-26-90

LEAK CHECK 0.0 CFM at 0.0 In. Hg.

METER BOX NUMBER STD #691751

BAROMETRIC PRESSURE 30.30 In. Hg.

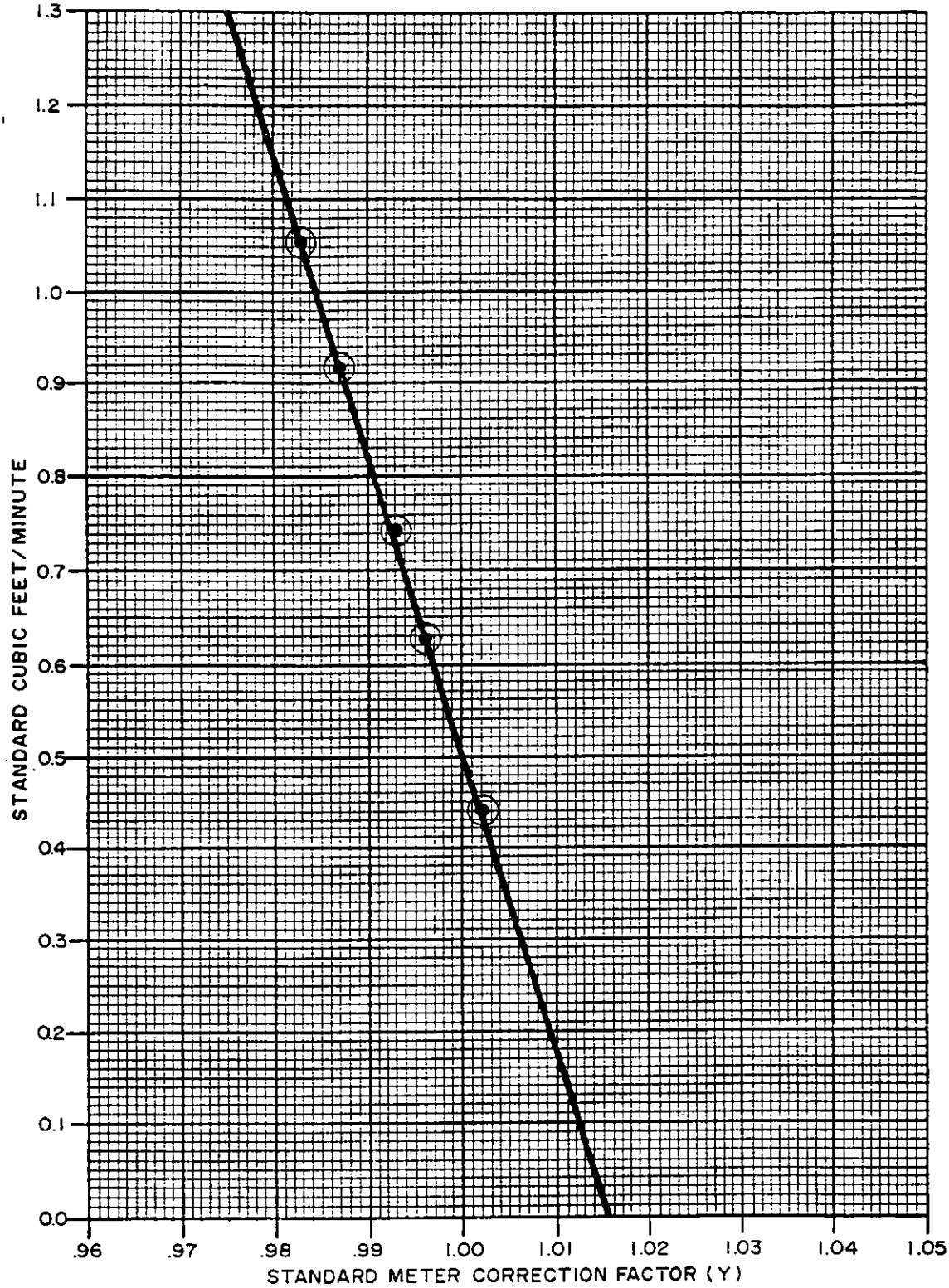
STD GAS METER TEMPERATURE 70 °F/ ASTM GLASS THERMOMETER TEMPERATURE 70 °F

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			
-0.2	-1.1	4.020	9.842	5.822	243.643	249.457	5.814	70	70	13
-0.2	-1.1	9.842	15.577	5.735	249.457	255.194	5.737	70.5	71	13
-0.2	-1.1	5.577	11.240	5.663	255.194	260.872	5.678	70.5	71	13
-0.4	-1.8	2.026	7.602	5.576	261.665	267.296	5.631	70.5	72	9
-0.4	-1.8	7.602	13.171	5.569	267.296	272.923	5.627	70.5	72	9
-0.4	-1.8	3.171	8.734	5.563	272.923	278.539	5.616	70.5	72	9
-0.5	-2.2	9.112	14.275	5.163	278.914	284.153	5.239	70.5	72	7
-0.5	-2.2	4.275	9.434	5.159	284.153	289.386	5.233	70.5	72	7
-0.5	-2.2	9.434	14.600	5.166	289.386	294.632	5.246	70.5	72	7
-0.6	-3.1	5.182	10.663	5.481	295.233	300.834	5.601	70.5	72	6
-0.6	-3.1	0.663	6.124	5.461	300.834	306.424	5.590	70.5	72	6
-0.6	-3.1	6.124	11.579	5.455	306.424	311.997	5.573	70.5	72	6
-0.7	-3.7	2.185	7.422	5.237	312.617	317.993	5.376	70.5	71	5
-0.7	-3.7	7.422	12.658	5.236	317.993	323.366	5.373	70.5	71	5
-0.7	-3.7	2.658	7.888	5.230	323.366	328.737	5.371	70.5	71	5

CALIBRATED BY: George F. Gabel

	Y	SCFM	Y	SCFM	Y	SCFM	Y	SCFM	Y	SCFM
Run 1	1.004	0.452	0.996	0.624	0.993	0.743	0.987	0.920	0.983	1.055
Run 2	1.002	0.444	0.995	0.623	0.993	0.742	0.986	0.917	0.983	1.055
Run 3	1.000	0.439	0.996	0.622	0.992	0.743	0.988	0.916	0.983	1.053
Average	1.002	0.445	0.996	0.623	0.993	0.743	0.987	0.918	0.983	1.054

air consulting and engineering



STANDARD METER CALIBRATION CURVE

APRIL 26, 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. Gabel

AIR CONSULTING & ENGINEERING, INC. — PITOT TUBE CALIBRATION

DATE CALIBRATED 11-9-90 PITOT TUBE 5-9

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

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

γ = 1 ° θ = 1 ° A = 1.165 in. = (Pa + Pb)

z = A sin γ = 0.017 in.; <0.32/<1/8 in.

w = A sin θ = 0.017 in.; <0.08/<1/32 in.

P_a 0.583 in. P_b 0.582 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	34	34	0	0
AMBIENT	77	77	0	0
HOT OVEN	318	320	2	0.3

FDER - MAXIMUM 5° DIFFERENCE

CALIBRATED BY: Sid Carter

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

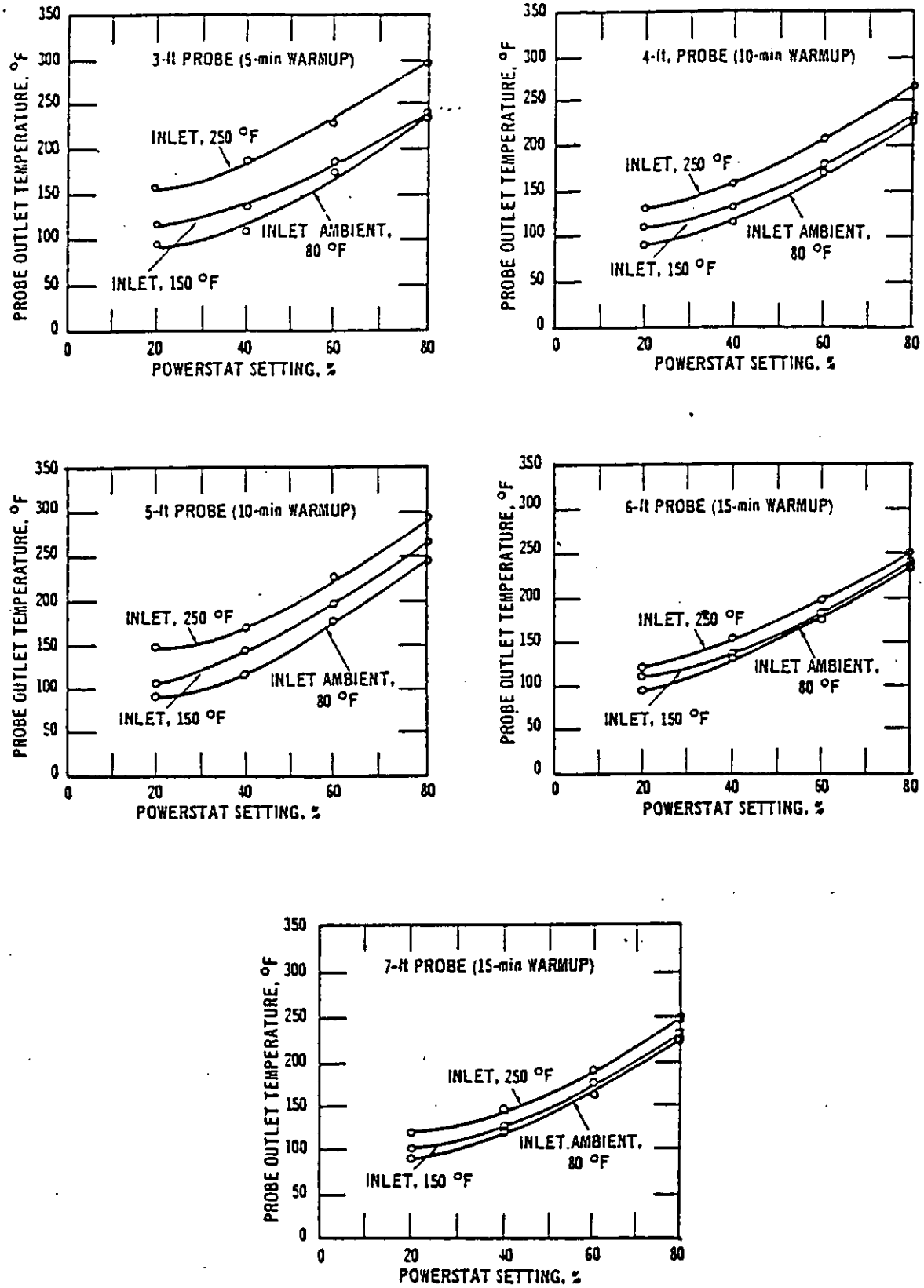
PYROMETER NUMBER METER BOX #1

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

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.

APPENDIX E

PRODUCTION RATE CERTIFICATION

BOILER OPERATION PARAMETERS

PLANT USS BRYANT

BOILER NUMBER 2

DATE 1-23-91 RUN NUMBER 1

OIL METER FACTOR

STEAM INTEGRATOR FACTOR 1000

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

OPERATOR SIGNATURE

INITIAL INTEGRATOR 314352

FINAL INTEGRATOR 314550

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
0823		150000	618	400	265	620
0838		153000	618	400	265	630
0853		150000	618	400	265	630
0908		150000	618	400	265	640
0923		150000	618	400	265	640
0938		150000	618	400	265	640
0942		150000	618	400	265	640

BOILER OPERATION PARAMETERS

PLANT U.S. SUGAR BRYANT

BOILER NUMBER 2

DATE 1-23-91 RUN NUMBER 2

OIL METER FACTOR —

STEAM INTEGRATOR FACTOR 1000

SCRUBBER(S) PRESS. DROP 5.5-6.0

SCRUBBER(S) GPM ____

OPERATOR SIGNATURE [signature]

SCRUBBER(S) H2O LEVEL 6-6.5'

Ph(if applicable) ____

INITIAL INTEGRATOR 314631

FINAL INTEGRATOR 314822

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS. FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
1016		150,000	610	395	261	670
1031		152000	610	400	262	630
1046		152,000	610	400	262	650
1101		145,000	600	400	265	640
1116		145000	610	400	262	640
1131		145000	610	400	262	650
1133		145000	610	400	262	640

BOILER OPERATION PARAMETERS

PLANT U.S. SUGAR - BRYANT

BOILER NUMBER 2

DATE 1-23-91 RUN NUMBER 3

OIL METER FACTOR ——

STEAM INTEGRATOR FACTOR 1000

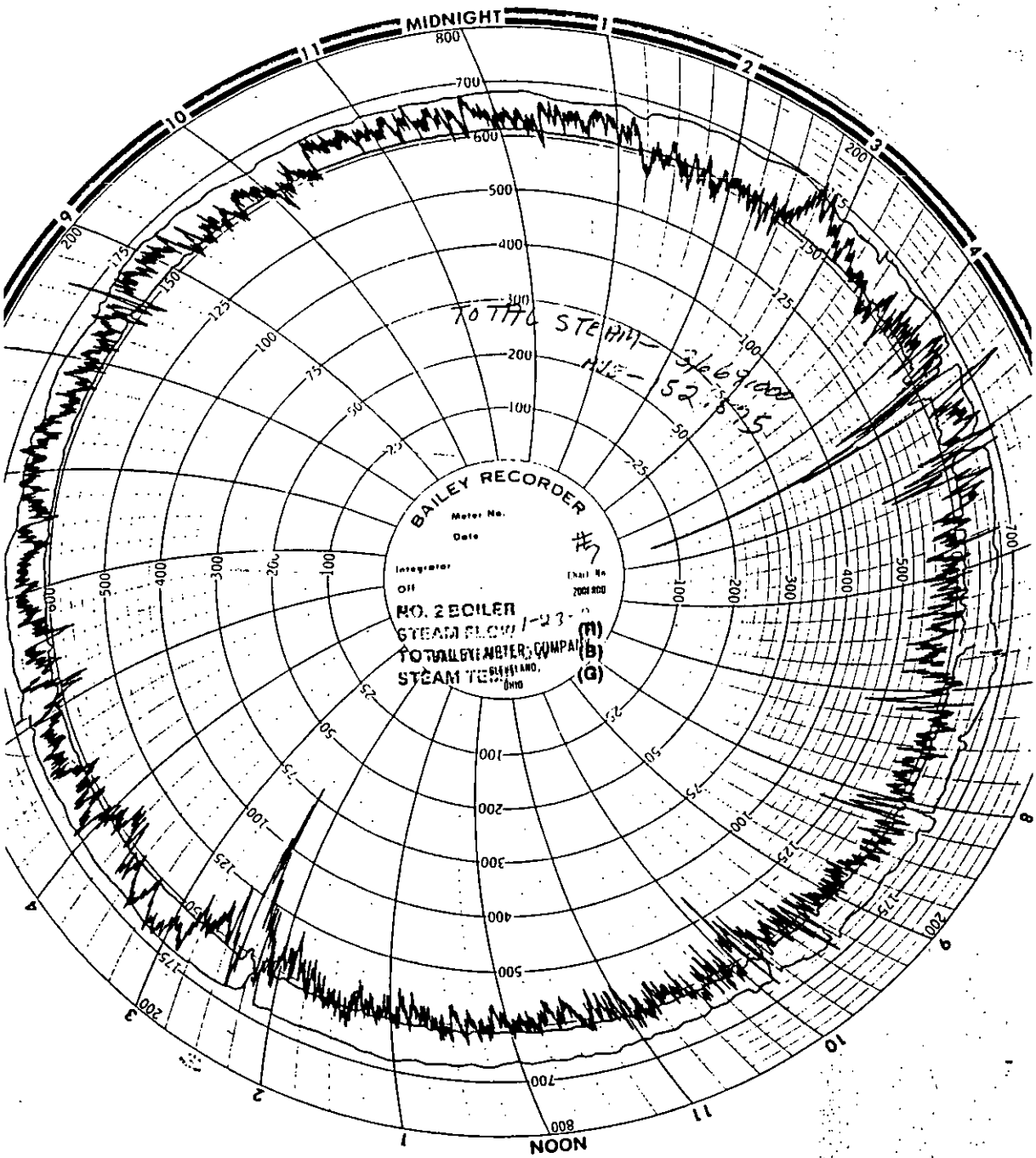
SCRUBBER(S) PRESS.DROP ____,____
SCRUBBER(S) GPM _____,_____
SCRUBBER(S)H2O LEVEL _____,____
Ph(if applicable) _____,_____

OPERATOR SIGNATURE [signature]

INITIAL INTEGRATOR 314913 ~~3491~~

FINAL INTEGRATOR 315097

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
1210		145000	610	400	262	650
1225		155000	610	400	265	650
1240		150000	610	400	265	650
1255		155000	610	400	263	650
1:10		150000	610	400	265	650
1:24		155000	610	400	265	650


MIDNIGHT
NOON
BAILEY RECORDER
Meter No.
Date
Integrator
Off
NO. 2 BOILER
STEAM FLOW (R)
TOTAL FLOW (B)
STEAM TEMP (G)
TOTAL STEAM

APPENDIX F

PROJECT PARTICIPANTS

PROJECT PARTICIPANTS

ACEI:	
STEPHEN L. NECK, P.E.	FIELD TESTING REPORT PREPARTION
GERARD GAUTHREAUX	FIELD TESTING
USSC:	
AUGUSTO BLANCHARD	TEST COORDINATOR
FL. DEPT. OF ENVIRONMENTAL REGULATION	
KEN TUCKER	TEST OBSERVER
PALM BEACH COUNTY HEALTH DEPT.	
JEFF KOERNER	TEST OBSERVER