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: 57

Title: Okeelanta Corporation Compliance Particulate Emissions Test Report Boiler #5

December 1990

Eastmount Engineering

Environmental Consultants — Air Quality Specialists

OKEELANTA CORPORATION

COMPLIANCE PARTICULATE EMISSIONS TEST REPORT

BOILER #5

PREPARED FOR:

Okeelanta Corporation
Okeelanta Sugar Division
South Bay, Florida 33493

CONCERNING:

Particulate Emissions Testing
Okeelanta Corporation
Boiler #5
South Bay Florida Facility
December 12, 1990

PREPARED BY:

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Project Director
Eastmount Engineering, Inc.
420 Main Street
Walpole, MA 02081

Sean MacKay
Project Director

11 FEB 91
Date

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1.0 COMPENDIUM

Eastmount Engineering Inc., conducted a Compliance Particulate Emissions Test Program on Unit #5 at Okeelanta Corporation's South Bay, Florida facility on December 12, 1990. The test program consisted of a series of three EPA Method 5 test runs.

All testing was conducted in strict accordance with the Environmental Protection Agency Reference Methods 1 through 5 as found in the Federal Register (40 CFR 60) as amended and were consistent with the State of Florida Department of Environmental Regulation's guidelines.

The purpose of this test was to determine compliance with the rules of the Department of Environmental Regulation (DER), Chapter 17-2.600 Air Pollution, Section 2.05 Prohibitive Acts, Subsection 6, Stationary Sources, Table II, Emission Limiting Standards.

During testing the boiler was burning bagasse as fuel. Boiler No. 5 is rated at 125,000 pounds of steam per hour. Results of the test program indicate Boiler No. 5 to be in compliance with the Florida DER emission standards. The following table summarizes the emission results, emission standards and boiler operating conditions.

RUN#	DATE	EMISSION RATE #/MMBtu	EMISSION RATE #/HR	ALLOWABLE #MMBtu	ALLOWABLE #/HR	LOAD #/HR	% OF 125 KPH
1	12-12-90	.189	47.69	.300	75.89	122657	98.1%
2	12-12-90	.180	46.36	.300	77.32	124971	100.0%
3	12-12-90	.187	47.95	.300	77.07	124615	99.7%
3 RUN AVG.		.185	47.33	.300	76.76	124081	99.3%

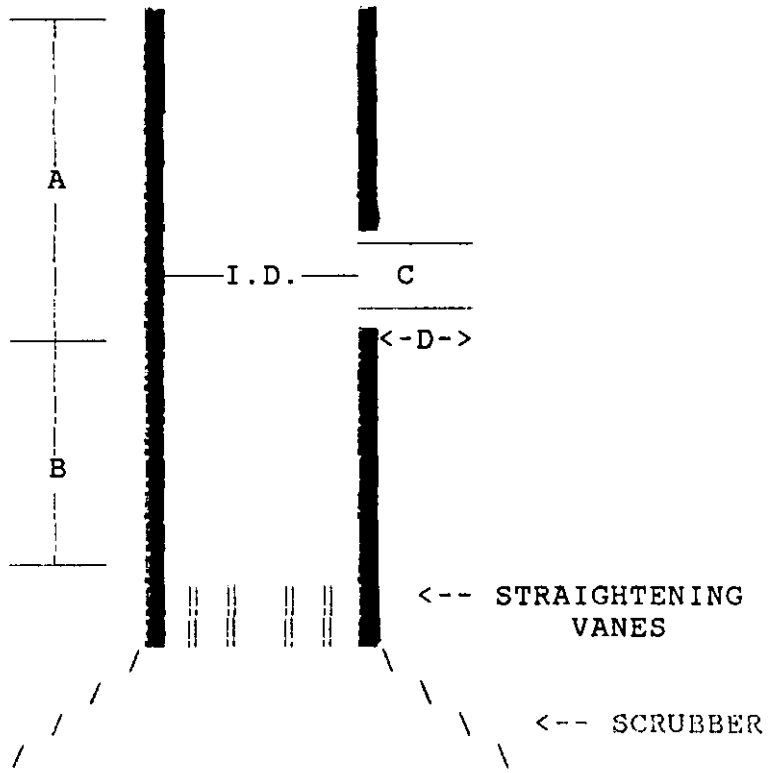
Sean MacKay, Project Director, was in charge of and responsible for all stack testing, conducted all calculations and maintained chain of custody of all samples. Kieran Nolan operated the meter box and performed the field laboratory aspects of the program. Mark Wescott located the probe at the proper traverse point locations and assisted where required. Mr. Kenneth Tucker of the Florida Department of Environmental Regulation observed the stack testing and boiler operations. Mr. A. Padrone was the boiler room superintendent. Mr. George Devane was responsible for boiler operation and acquisition of all pertinent process data.

2.0 STACK SCHEMATIC

OKEELANTA CORPORATION
UNIT # 5
SOUTH BAY, FLORIDA FACILITY

The following is a schematic of the stack which services Boiler #5 at Okeelanta Corporation's South Bay, Florida facility.

Defined are the sampling port locations, interior stack dimensions and distances from the ports to the nearest upstream and downstream interferences.

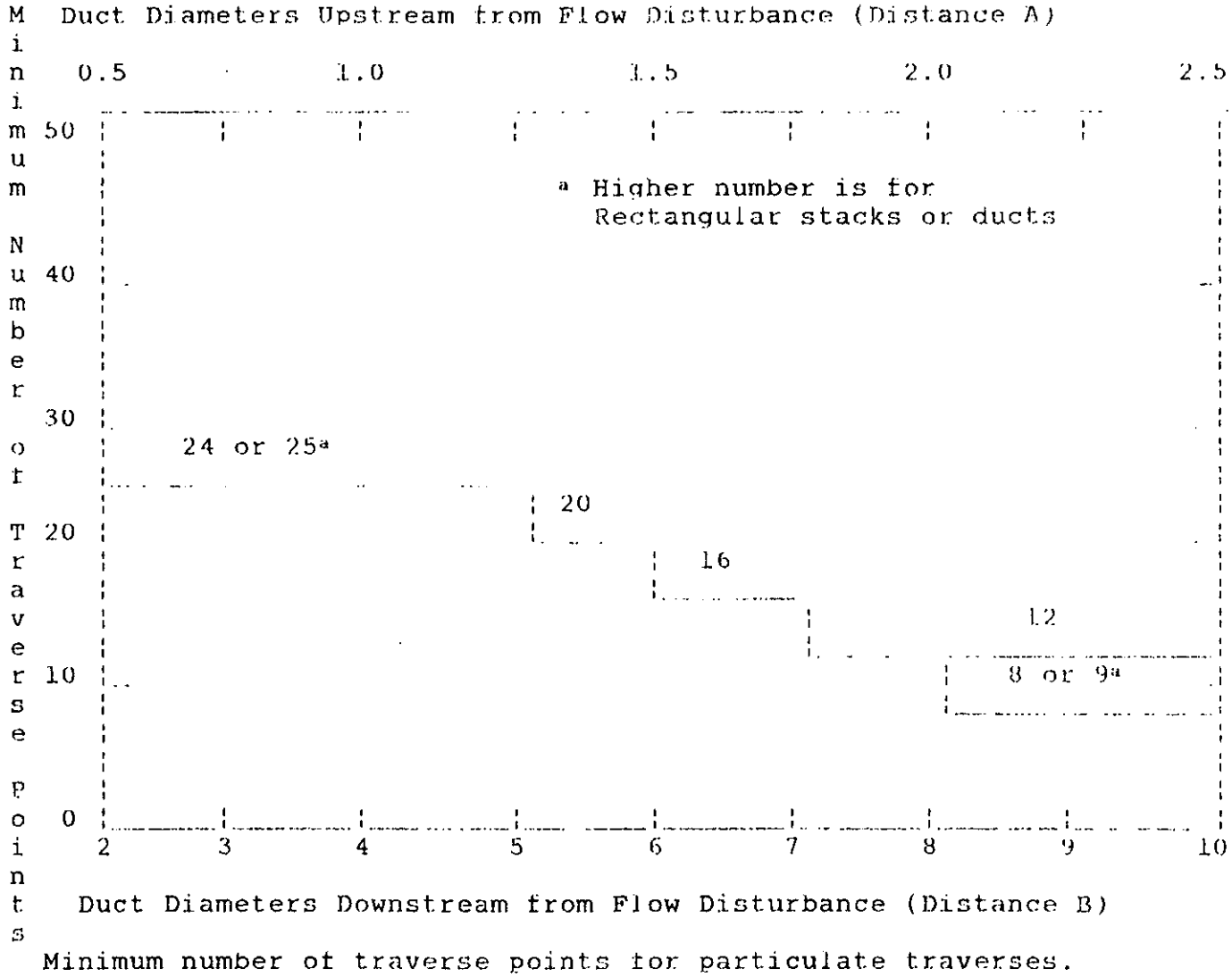


DISTANCE UPSTREAM FROM FLOW DISTURBANCE (A)	4'
DISTANCE DOWNSTREAM FROM FLOW DISTURBANCE (B)	16'
DIAMETER OF PORT SLEEVE (C)	4"
LENGTH OF PORT SLEEVE (D)	3.5"
NUMBER OF PORTS	2
INTERNAL DIAMETER OF STACK AT SAMPLING PORTS	7.5'

Drawing not to scale

3.0 NUMBER OF TRAVERSE POINTS AND SAMPLING TIME PER POINT

OKEELANTA CORPORATION
UNIT # 5
SOUTH BAY, FLORIDA FACILITY



Minimum number of traverse points for particulate traverses.

Distance A = 4' or 0.5 diameters.

Distance B = 16' or 2.1 diameters.

In accordance with Method 1, 24 traverse points are needed.

In order to sample for a minimum of one hour and draw at least 30 cubic feet, each traverse point was sampled for 2.5 minutes.

3.0 NUMBER OF TRAVERSE POINTS AND SAMPLING TIME PER POINT

OKEELANTA CORPORATION
UNIT # 5
SOUTH BAY, FLORIDA FACILITY

DIAMETER OF STACK: 7.5 FEET
PORT SLEEVE LENGTH: 3 INCHES

TRAVERSE POINT	DISTANCE % OF DIAMETER	DISTANCE (INCHES)	PROBE MARK (INCHES)
1	2.1	1.9	5.4
2	6.7	6.0	9.5
3	11.8	10.6	14.1
4	17.7	15.9	19.4
5	25.0	22.5	26.0
6	35.6	32.0	35.5
7	64.4	57.9	61.5
8	75.0	67.5	71.0
9	82.3	74.1	77.6
10	88.2	79.4	82.9
11	93.3	84.0	87.5
12	97.9	88.1	91.6

4.0 SAMPLING TRAIN AND ANALYTICAL TEST PROCEDURES

The following is a description of the sampling train and specifications of particulate collection media used in the tests.

1. EMISSION SAMPLING EQUIPMENT

The specific train used during this test is one manufactured by Research Appliance Company (RAC). The design specifications of this train meets all the requirements of Environmental Protection Agency's Method 5 as found in the Federal Regulations under Section 40 CFR 60 as amended. The following is a description of the individual pieces of equipment used:

Nozzle - The nozzle was of seamless stainless steel tubing construction of the button hook design. A range of sizes suitable for isokinetic sampling was available. All nozzles were calibrated before testing. A nozzle calibration sheet may be found in the calibration section of this report.

Probe - An 10 foot steel probe with a stainless steel liner was used.

Heating System - The filter temperature was maintained by enclosing the filter in a hot box capable of maintaining the temperature at 248 °F +25 °F. This temperature was monitored by use of a thermocouple in the hot box.

Pitot Tube - A type S pitot tube attached to the probe was used to monitor the stack gas velocity. Since the pitot tube meets all the dimensional criteria set forth in Method 2 of 40 CFR 60, a coefficient of 0.84 has been used.

Filter Holder - A borosilicate glass type filter holder with frit support was used.

Condenser - Four impingers connected in series, with ground glass leak-free fittings were used as the condenser. The first, third and fourth impingers were of the Greenburg-Smith design, modified by replacing the tip with a 1/2" glass tube extending to about 1/2" from the bottom of the flask. The second impinger was of the Greenburg-Smith design with the standard tip.

Metering System - A vacuum gauge, micromanometer, inclined manometer, leak-free pump, calibrated thermocouples and a calibrated dry gas meter were the basic components used to meter the dry gas through the system.

4.0 SAMPLING TRAIN AND ANALYTICAL TEST PROCEDURES (cont.)

Gas Density Determination - An ORSAT type combustion analyzer, capable of measuring CO_2, O_2 and CO was used to determine the molecular weight of the flue gas. An integrated proportional sample was taken at each of the traverse points in order to assure that the total test span was covered. The ORSAT analysis was conducted immediately following each test run.

2. SAMPLING AND ANALYTICAL PROCEDURES

All sampling and analytical procedures were conducted in strict accordance with the methods prescribed in Methods 1 through 5 of the Code of Federal Regulations as found in 40 CFR 60 as amended. The following is the sequence of events that occur both prior to and during the actual stack test.

Traverse Points - The traverse points were calculated in accordance with Method 1 and the probe was marked accordingly.

Static Pressure - The static pressure was checked and recorded.

Preliminary Traverse - A preliminary traverse was conducted. Readings included the pressure drops and stack gas temperatures.

Nomograph - Once all of the above information had been obtained, the nomograph was set up for the actual test to correlate the isokinetic relation ships.

Barometric Pressure - Barometric pressure was obtained by use of an aneroid barometer at the test site.

Sampling Train Set-Up
(a) The pre-weighed filter was placed in the filter holder and visually checked.
(b) 100 ml of water was placed in the first two impingers.
(c) Approximately 200 grams of silica gel was placed in the fourth impinger. (Exact weights were logged on the field data sheets).
(d) Crushed ice was placed around the impingers.
(e) Once assembly of the entire train was completed, the probe and heater box were turned on.

Pre-test Leak Check - Once the heater box was at the desired temperature for testing, the system was leak checked at 15 inches of vacuum. A leakage rate of less than 0.02 CFM had to be achieved before testing commenced.

Final Check - Once everything was ready to go, the plant was checked to assure that it was running at desired capacity.

4.0 SAMPLING TRAIN AND ANALYTICAL TEST PROCEDURES (cont.)

Sampling - Isokinetic sampling as described in Method 5 then took place.

Post-test Leak Check - Upon completion of each test run, the system was leak checked at the highest vacuum recorded during that run. All leak checks were less than 0.02 CFM and considered acceptable.

Sample Recovery - Because of the importance of proper sample recovery procedures, details of the sample recovery can be found in the Quality Control Procedures Section of this report.

Isokinetics - Once all sample recovery was completed and the amount of moisture collected had been determined, calculations were conducted to determine the percent isokinetics of the test run.

Operating Data Sheets - All pertinent operating data were logged throughout the testing period by plant personnel.

5.0 QUALITY CONTROL PROCEDURES

The following is a description of the procedures used for maintaining the integrity of samples collected, including the chain of custody and quality control assurance of filters and acetone wash.

Pre-test preparation consisted of the filters being desiccated at 68°+ 10°F at ambient pressure for at least twenty four (24) hours. At intervals of at least six (6) hours, the filters were re-weighed until a constant weight was achieved + 0.5 mg change from the previous weighing. These pre-marked filters were then put into petri dishes and sealed. All filters used during testing were put into a carrying case for transport to the job site. A list of the filters and tare weights was available prior to testing.

After each test run, the filter and any particles which may have adhered to the filter holder gasket were carefully removed from the filter holder and placed into its identified petri dish container. This container was then labeled with the run number and date.

Taking care to see that particulate on the outside of the probe or other exterior surface did not get into the sample, particulate matter from the probe liner, nozzle, probe fittings, and front half of the filter holder were acetone washed into a sample container. This container was then sealed. The run number, date, and a mark indicating the level of the acetone wash in the bottle was recorded on the bottle.

Both the petri dish containing the filter and the bottle containing the acetone wash were transported to Eastmount Engineering's laboratory.

Once at the laboratory, each filter was weighed and then put back into its individual container. The container was then placed in a desiccator for at least twenty four (24) hours and then weighed. At intervals of at least six (6) hours,thefilters were re-weighed until a constant weight was achieved + 0.5 mg change from the previous weighing.

The levels marked on the bottles containing the acetone wash were checked to confirm that no leakage occurred during transport. The contents were then transferred into a pre-tared beaker and evaporated to dryness. Once this had been accomplished, the beaker was placed in a desiccator for at least twenty four (24) hours and then weighed. At intervals of at least six (6) hours, the beaker was re-weighed until a constant weight of + 0.5 mg change from the previous weighing was achieved.

All calculations were conducted in strict accordance with 40 CFR 60 (See Calculation Sheets in report).

APPENDIX I

COMPUTER INPUT SHEETS

INPUT DATA SHEET

PLANT: OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 1
DATE : 12-12-90

Ds (FT)	7.5
Dn (IN)	.251
FILTER#	3728
PIT COEFF	.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	500.0
IMP-1 (FIN)	265
IMP-2 (FIN)	120
IMP-3 (FIN)	1
IMP-4 (FIN)	511.5
% CO2	9.0
% O2	11.2
% CO	0
P BAR	30.09
P STK	.1
NO. PTS	24
TEST LNGTH	60
END METER	918.687
	.219
INT METER	880.115
BEGIN TIME:	08:30
END TIME:	09:40

TRAV PT	VEL HEAD	SQ ROOT	DELTA H	DRYGAS IN	DRYGAS OUT	STACK TEMP
A1	.48	.69	1.44	63	62	138
2	.54	.73	1.62	70	62	138
3	.52	.72	1.56	68	64	136
4	.55	.74	1.65	71	65	138
5	.56	.75	1.68	74	65	138
6	.50	.71	1.50	75	66	140
7	.50	.71	1.50	76	68	143
8	.58	.76	1.74	77	68	140
9	.67	.82	2.01	78	71	140
10	.72	.85	2.16	80	73	139
11	.74	.86	2.22	82	73	140
12	.70	.84	2.10	83	76	140
B1	.46	.68	1.38	83	76	140
2	.50	.71	1.50	84	79	140
3	.53	.73	1.59	86	80	141
4	.56	.75	1.68	88	82	142
5	.56	.75	1.68	88	81	144
6	.48	.69	1.44	89	84	143
7	.46	.68	1.38	88	82	144
8	.53	.73	1.59	87	82	143
9	.52	.72	1.56	88	81	141
10	.57	.75	1.71	88	81	140
11	.57	.75	1.71	87	81	140
12	.57	.75	1.71	88	82	140
AVERAGE	.56	.74	1.67	80.9	74.3	140.3

INPUT DATA SHEET

PLANT: OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 2
DATE : 12-12-90

Ds (FT)	7.5
Dn (IN)	.250
FILTER#	3729
PIT COEFF	.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	500.0
IMP-1 (FIN)	268
IMP-2 (FIN)	117
IMP-3 (FIN)	2
IMP-4 (FIN)	510.2
% CO2	8.5
% O2	11.7
% CO	0
P BAR	30.09
P STK	.1
NO. PTS	24
TEST LNGTH	60
END METER	955.950
	.111
INT METER	918.902
BEGIN TIME:	10:30
END TIME:	11:40

TRAV PT	VEL HEAD	SQ ROOT	DELTA H	DRYGAS IN	DRYGAS OUT	STACK TEMP
A1	.42	.65	1.34	77	76	136
2	.46	.68	1.47	80	77	137
3	.52	.72	1.66	78	77	140
4	.52	.72	1.66	80	77	140
5	.48	.69	1.54	82	78	138
6	.42	.65	1.34	83	79	139
7	.40	.63	1.28	82	78	139
8	.46	.68	1.47	84	77	142
9	.55	.74	1.76	85	78	142
10	.56	.75	1.79	85	79	142
11	.62	.79	1.98	87	80	141
12	.59	.77	1.89	86	82	142
B1	.42	.65	1.34	83	80	142
2	.47	.69	1.50	85	82	141
3	.50	.71	1.60	93	84	144
4	.51	.71	1.63	87	80	143
5	.50	.71	1.60	89	81	145
6	.45	.67	1.44	88	82	146
7	.44	.66	1.41	90	83	143
8	.45	.67	1.44	91	83	143
9	.48	.69	1.54	90	84	140
10	.48	.69	1.54	90	84	141
11	.48	.69	1.54	89	86	142
12	.45	.67	1.44	90	85	142
AVERAGE	.48	.70	1.55	85.6	80.5	141.3

INPUT DATA SHEET

PLANT: OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 3
DATE : 12-12-90

Ds (FT)	7.5
Dn (IN)	.251
FILTER#	3730
PIT COEFF	.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	500.0
IMP-1 (FIN)	292
IMP-2 (FIN)	123
IMP-3 (FIN)	2
IMP-4 (FIN)	512.9
% CO2	9.1
% O2	11.1
% CO	0
P BAR	30.09
P STK	.1
NO. PTS	24
TEST LNGTH	60
END METER	997.447
	.135
INT METER	956.155
BEGIN TIME:	12:45
END TIME:	13:50

TRAV PT	VEL HEAD	SQ ROOT	DELTA H	DRYGAS IN	DRYGAS OUT	STACK TEMP
A1	.52	.72	1.72	81	80	145
2	.56	.75	1.85	84	81	143
3	.58	.76	1.91	85	81	145
4	.62	.79	2.05	87	82	144
5	.56	.75	1.85	88	81	143
6	.54	.73	1.78	89	83	142
7	.50	.71	1.65	89	84	145
8	.58	.76	1.91	90	83	144
9	.66	.81	2.18	90	85	144
10	.68	.82	2.25	91	85	143
11	.75	.87	2.48	92	85	144
12	.76	.87	2.51	93	91	143
B1	.46	.68	1.52	86	84	144
2	.55	.74	1.82	90	86	145
3	.58	.76	1.91	90	84	144
4	.61	.78	2.01	90	84	144
5	.58	.76	1.91	90	84	146
6	.55	.74	1.82	91	85	143
7	.50	.71	1.65	90	85	142
8	.53	.73	1.75	92	85	144
9	.60	.77	1.98	93	88	142
10	.58	.76	1.91	94	86	142
11	.58	.76	1.91	93	85	142
12	.62	.79	2.05	91	87	142
AVERAGE	.59	.76	1.93	89.5	84.3	143.5

APPENDIX II

ISOKINETIC CALCULATION SHEETS

ISOKINETIC CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 1
DATE : 12-12-90

TS (`F)=	140.3	% CO2=	9.0	VM (CF) =	38.353
TS (`R)=	600.3	% O2=	11.2	DELTA H (ABS)=	30.21
TM (`F)=	77.6	% CO=	0	PS (ABS) =	30.10
TM (`R)=	537.6	% N2=	79.8	SQRT DELTA P =	.744734
VI(TOT)=	197.5	CP=	.84	AREA NOZZLE =	.000344
				Y =	1.001

VM STD	=	17.64 (VM)(Y)(DELTA H ABS) / (TM)	= 38.06	DSCF
VW STD	=	.04707 (VI TOT)	= 9.30	CF
BWO	=	VW STD / (VW STD + VM STD)	= .196	
BWO	=	MOISTURE FROM STEAM TABLES	= .197	
VI TOT	=	ADJUSTED TO SATURATION VOLUME	= N/A	ML
1-BWO	=	1 - BWO	= .804	
Md (DRY)	=	.44 (% CO2) +.32 (% O2) +.28 (% CO) +.28 (% N2)	= 29.89	LBS/LB MOLE
Ms (WET)	=	MD (1-BWO) + 18 (BWO)	= 27.55	LBS/LB MOLE
G	=	SQRT (TS / PS / MS)	= .85	
VS	=	85.49(CP)(G)(SQRT DELTA P)	= 45.5	FPS
H	=	0.002669 (VI TOT)	= .53	
J	=	(DELTA H ABS)(VM)(Y) /(TM)	= 2.16	
K	=	(H) + (J)	= 2.68	
% ISO	=	(TS) (K) (1.667) / (TIME) (VS) (PS) (AN)	= 95.2	

ISOKINETIC CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 2
DATE : 12-12-90

TS (`F)=	141.3	% CO2=	8.5	VM (CF) =	36.937
TS (`R)=	601.3	% O2=	11.7	DELTA H (ABS)=	30.20
TM (`F)=	83.0	% CO=	0	PS (ABS) =	30.10
TM (`R)=	543.0	% N2=	79.8	SQRT DELTA P =	.695076
VI(TOT)=	197.2	CP=	.84	AREA NOZZLE =	.000341
				Y =	1.001

VM STD	=	$\frac{(VM)(Y)(DELTA\ H\ ABS)}{(TM)}$	= 36.28	DSCF
VW STD	=	.04707 (VI TOT)	= 9.28	CF
BWO	=	$\frac{VW\ STD}{VW\ STD + VM\ STD}$	= .204	
BWO	=	MOISTURE FROM STEAM TABLES	= .202	
VI TOT	=	ADJUSTED TO SATURATION VOLUME	= 195.5	ML
1-BWO	=	1 - BWO	= .798	
Md (DRY)	=	.44 (% CO2) +.32 (% O2) +.28 (% CO) +.28 (% N2)	= 29.83	LBS/LB MOLE
Ms (WET)	=	MD (1-BWO) + 18 (BWO)	= 27.47	LBS/LB MOLE
G	=	SQRT (TS / PS / MS)	= .85	
VS	=	85.49(CP)(G)(SQRT DELTA P)	= 42.6	FPS
H	=	0.002669 (VI TOT)	= .52	
J	=	(DELTA H ABS)(VM)(Y) /(TM)	= 2.06	
K	=	(H) + (J)	= 2.58	
% ISO	=	$\frac{(TS)\ (K)\ (1.667)}{(TIME)\ (VS)\ (PS)\ (AN)}$	= 98.6	

ISOKINETIC CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 3
DATE : 12-12-90

Avg=142 Avg=11.3

TS (`F)=	143.5	% CO2=	9.1	VM (CF) =	41.157
TS (`R)=	603.5	% O2=	11.1	DELTA H (ABS)=	30.23
TM (`F)=	86.9	% CO=	0	PS (ABS) =	30.10
TM (`R)=	546.9	% N2=	79.8	SQRT DELTA P =	.763793
VI(TOT)=	229.9	CP=	.84	AREA NOZZLE =	.000344
				Y =	1.001

VM STD = $17.64 \dfrac{(VM)(Y)(DELTA\ H\ ABS)}{(TM)}$ = 40.17 DSCF

VW STD = .04707 (VI TOT) = 10.82 CF

BWO = $\dfrac{VW\ STD}{VW\ STD + VM\ STD}$ = .212

BWO = MOISTURE FROM STEAM TABLES = .214

VI TOT = ADJUSTED TO SATURATION VOLUME= N/A ML

1-BWO = 1 - BWO = .788

Md (DRY) = .44 (% CO2)
+.32 (% O2)
+.28 (% CO)
+.28 (% N2)
= 29.90 LBS/LB MOLE

Ms (WET) = MD (1-BWO)
+ 18 (BWO)
= 27.37 LBS/LB MOLE

G = SQRT (TS / PS / MS) = .86

VS = 85.49(CP)(G)(SQRT DELTA P) = 46.9 FPS

H = 0.002669 (VI TOT) = .61

J = (DELTA H ABS)(VM)(Y) /(TM) = 2.28

K = (H) + (J) = 2.89

% ISO = $\dfrac{(TS)\ (K)\ (1.667)}{(TIME)\ (VS)\ (PS)\ (AN)}$ = 99.8

APPENDIX III

ENTHALPY CALCULATION SHEETS

ENTHALPY CALCULATION SHEET

PLANT : OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 1
DATE : 12-12-90

STEAM PRESSURE	STEAM TEMPERATURE	FEED WATER TEMPERATURE
370	700	260
370	700	
380	700	
370	700	
370	700	
360	700	
AVERAGE 370.0 PSIG	700.0	260.0

P ABS = 384.7 PSIA

ENTHALPY @	700	'F AND	380	PSIA =	1363.0
ENTHALPY @	600	'F AND	380	PSIA =	1308.4
ENTHALPY @	700.0	'F AND	380	PSIA =	1363.0

ENTHALPY OF FEED WATER = 228.65

AVERAGE ENTHALPY = 1134.4 BTU/LB OF STEAM

ENTHALPY CALCULATION SHEET

PLANT : OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 2
DATE : 12-12-90

	STEAM PRESSURE	STEAM TEMPERATURE	FEED WATER TEMPERATURE
	350	700	260
	340	700	
	370	700	
	390	700	
	390	700	
	380	700	
AVERAGE	370.0 PSIG	700.0	260.0

P ABS = 384.7 PSIA

ENTHALPY @	700	'F AND	380	PSIA =	1363.0
ENTHALPY @	600	'F AND	380	PSIA =	1308.4
ENTHALPY @	700.0	'F AND	380	PSIA =	1363.0

ENTHALPY OF FEED WATER = 228.65

AVERAGE ENTHALPY = 1134.4 BTU/LB OF STEAM

ENTHALPY CALCULATION SHEET

PLANT : OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 3
DATE : 12-12-90

	STEAM PRESSURE	STEAM TEMPERATURE	FEED WATER TEMPERATURE
	370	700	260
	395	700	
	375	700	
	360	700	
	370	700	
	380	700	
AVERAGE	375.0 PSIG	700.0	260.0

P ABS = 389.7 PSIA

ENTHALPY @	700	'F AND	390	PSIA =	1362.5
ENTHALPY @	600	'F AND	390	PSIA =	1307.7
ENTHALPY @	700.0	'F AND	390	PSIA =	1362.5

ENTHALPY OF FEED WATER = 228.65

AVERAGE ENTHALPY = 1133.9 BTU/LB OF STEAM

APPENDIX IV

HEAT INPUT CALCULATION SHEETS

HEAT INPUT CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 1
DATE : 12-12-90

	STEAM INTEGRATOR READINGS	TIME	INTEGRATOR FACTOR
			1350
END	348929	9: 40	
			LBS/HR STEAM
BEGIN	348823	8: 30	
NET	106	70	

106 X 1350 / 70 MINS = 122657

122657 LBS/HR STEAM / 55% EFF. = 223013 EQUIV.

223013 LBS/HR STEAM X 1134 BTU/LB = 253.0 BTU(e6)/HR

	OIL INTEGRATOR READINGS	TIME	GALS/HR
END	0	9: 40	
BEGIN	0	8: 30	
NET	0 GALLONS	70	MINS = 0 GPH

0 GPH X 150,000 BTU/GAL (EST) = 0 BTU(e6)/HR

ALLOWABLE EMISSIONS

BAGASSE	253.0	-	0	X	.3	=	75.9	LBS/HR
OIL			0	X	.1	=	.0	LBS/HR
TOTAL						=	75.9	LBS/HR

HEAT INPUT CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 2
DATE : 12-12-90

	STEAM INTEGRATOR READINGS	TIME	INTEGRATOR FACTOR
			1350
END	349106	11: 40	
			LBS/HR STEAM
BEGIN	348998	10: 30	
NET	108	70	

108 X 1350 / 70 MINS = 124971

124971 LBS/HR STEAM / 55% EFF. = 227221 EQUIV.

227221 LBS/HR STEAM X 1134 BTU/LB = 257.7 BTU(e6)/HR

	OIL INTEGRATOR READINGS	TIME	GALS/HR
END	0	9: 40	
BEGIN	0	8: 30	
NET	0 GALLONS	70	

0 GALLONS / 70 MINS = 0 GPH

0 GPH X 150,000 BTU/GAL (EST) = 0 BTU(e6)/HR

ALLOWABLE EMISSIONS

BAGASSE	257.7	-	0	X	.3	=	77.3	LBS/HR
OIL			0	X	.1	=	.0	LBS/HR
TOTAL						=	77.3	LBS/HR

HEAT INPUT CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 3
DATE : 12-12-90

	STEAM INTEGRATOR READINGS	TIME	INTEGRATOR FACTOR
			1350
END	349293	13: 50	
			LBS/HR STEAM
BEGIN	349193	12: 45	
NET	100	65	

100 X 1350 / 65 MINS = 124615

124615 LBS/HR STEAM / 55% EFF. = 226573 EQUIV.

226573 LBS/HR STEAM X 1134 BTU/LB = 256.9 BTU(e6)/HR

	OIL INTEGRATOR READINGS	TIME	GALS/HR
END	0	13: 50	
BEGIN	0	12: 45	
NET	0 GALLONS	65 MINS =	0 GPH

0 GPH X 150,000 BTU/GAL (EST) = 0 BTU(e6)/HR

ALLOWABLE EMISSIONS

BAGASSE	256.9	-	0	X	.3	=	77.1	LBS/HR
OIL			0	X	.1	=	.0	LBS/HR
TOTAL						=	77.1	LBS/HR

APPENDIX V

EMISSION CALCULATION SHEETS

EMISSION CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 1
DATE : 12-12-90

	SAMPLES		BLANKS	
	FILTER	BEAKER	FILTER	ACETONE
NO. :	3728	1	3777	12
FINAL:	.7806	71.1515	.6443	73.2295
TARE :	.6306	71.1402	.6442	73.2285
NET :	.1500	.0113	.0001	.0010/200ML

VOLUME OF RINSE 255

WEIGHT = 161.30
RESIDUE = - 1.28

Mn = 160.03 Mg AS = 44.2 SQ FT

Qs = 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS) = 5143657 DSCFH

CS = (2.205 X 10-6) (Mn) / (VM STD) = 9.271e-6 LBS/SCF

CS' = 0.0154 (Mn) / (VM STD) = .06 GRAINS /SCF

PMR = (QS) (CS) = 47.69 LBS/HR

LOAD= MILLIONS OF BTU / HOUR INPUT = 253.0 BTU e10 / HR

CS = LBS / MILLION BTu = .189 LBS/ BTu e6

ALLOWABLE = 75.89 LBS/HR

= .30 LBS/ BTu e6

EMISSION CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 2
DATE : 12-12-90

	SAMPLES		BLANKS	
	FILTER	BEAKER	FILTER	ACETONE
NO. :	3729	2	3777	12
FINAL:	.7764	71.5784	.6443	73.2295
TARE :	.6289	71.5648	.6442	73.2285
NET :	.1475	.0136	.0001	.0010/200ML

VOLUME OF RINSE 240

WEIGHT = 161.10
RESIDUE = - 1.20

Mn = 159.90 Mg AS = 44.2 SQ FT

Qs =	3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)	= 4770436	DSCFH
CS =	(2.205 X 10-6) (Mn) / (VM STD)	= 9.719e-6	LBS/SCF
CS' =	0.0154 (Mn) / (VM STD)	= .07	GRAINS /SCF
PMR =	(QS) (CS)	= 46.36	LBS/HR
LOAD=	MILLIONS OF BTU / HOUR INPUT	= 257.7	BTU e10 / HR
CS =	LBS / MILLION BTu	= .180	LBS/ BTu e6
ALLOWABLE		= 77.32	LBS/HR
		= .30	LBS/ BTu e6

EMISSION CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 5

RUN #: COMP - 3
DATE : 12-12-90

	SAMPLES		BLANKS	
	FILTER	BEAKER	FILTER	ACETONE
NO. :	3730	3	3777	12
FINAL:	.7868	70.8208	.6443	73.2295
TARE :	.6278	70.8094	.6442	73.2285
NET :	.1590	.0114	.0001	.0010/200ML

VOLUME OF RINSE 310

WEIGHT = 170.40
RESIDUE = - 1.55

Mn = 168.85 Mg AS = 44.2 SQ FT

Qs = 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS) = 5174000 DSCFH

Avg = 5,029,364

CS = (2.205 X 10-6) (Mn) / (VM STD) = 9.268e-6 LBS/SCF

CS' = 0.0154 (Mn) / (VM STD) = .06 GRAINS /SCF

PMR = (QS) (CS) = 47.95 LBS/HR

LOAD= MILLIONS OF BTU / HOUR INPUT = 256.9 BTU e10 / HR

Avg = 255.9

CS = LBS / MILLION BTu = .187 LBS/ BTU e6

ALLOWABLE = 77.07 LBS/HR

= .30 LBS/ BTU e6

APPENDIX VI

NOMENCLATURE SHEETS

NOMENCLATURE SHEET

PARTICULATE EMISSION TEST

Ar	Acetone residue - result of Blank evaporation.
AREA NOZZLE	Area of the nozzle in square feet.
AS	Area of the stack in square feet.
BDL	Below detectable limits
BWO	The amount of moisture in the flue gas.
% CO	Percent of carbon monoxide in the flue gas.
% CO2	Percent of carbon dioxide in the flue gas.
Cp	Pitot tube coefficient.
CS	The concentration in the stack in pounds per standard cubic foot.
Cs'	The concentration in the stack in grains per standard cubic foot.
DELTA H	The meter orifice differential.
DELTA H(ABS)	The meter orifice differential, absolute conditions in inches of mercury.
Dn (IN)	Diameter of the nozzle in inches.
DRY GAS IN	Temperature of the dry gas meter inlet degrees Farenheight.
DRY GAS OUT	Temperature of the dry gas meter outlet degrees Farenheight.
Ds (FT)	Diameter of the stack in feet.
E	The emission rate in pounds per million Btu derived by using F-Factor.
E (Heat Input)	The emission rate in pounds per million Btu derived by use of calculated heat input.
END METER	The dry gas meter reading at the end of the test.
F factor	The theoretical amount of air in dry standard cubic feet (DSCF) needed to combust a million Btu's worth of fuel.

NOMENCLATURE (cont'd)

Filter Catch	The amount of particulate captured on the filter during testing.
INT METER	The dry gas meter reading at the beginning of the test.
Md (DRY)	The dry molecular weight of the flue gas in pounds per pound mole.
MN	The amount of particulate collected by washing the nozzle, probe, and front half of the glassware, reported in milligrams.
MN'	The milligrams of particulate collected minus the blank.
Ms (WET)	Wet or actual molecular weight of the flue gas in pounds per pound mole.
% N2	The percent of nitrogen in the flue gas.
NO PTS	Number of traverse points.
% O2	Percent of oxygen in the flue gas.
P BAR	Barometric pressure at test location.
P STK	Static pressure of the stack in inches of water.
PMR	The emission rate in pounds per hour.
PS (ABS)	Absolute pressure conditions in the stack in inches of mercury.
Qs	The volumetric flow rate of the flue gas in dry standard cubic feet per hour.
SQ ROOT	The square root of each velocity head measurement.
SQRT DELTA P	The average of the square roots of the measured pressure drops.
Stack Temp or TS (`F)	The temperature of the stack in degrees Farenheight.
TS (`R)	The temperature of the stack in degrees Rankine.
T (Hot Box)	Temperature around the filter box, degrees Farenheight.
TM (`F)	Average temperature of the dry gas meter in degrees Farenheight.

NOMENCLATURE (cont'd)

TM (°R)	Average temperature of the dry gas meter in degrees Rankine.
VEL HEAD	The pressure drop measured across the pitot tubes.
VI (TOT)	The amount of water collected in the impingers in milliliters.
VM (CF)	The volume sampled through the dry gas meter in cubic feet.
VM STD	Volume sampled through the dry gas meter corrected to standard conditions.
VS	Velocity of the stack gas in feet per second.
VW STD	The amount of moisture collected, converted to standard cubic feet.
Y	Meter box calibration factor.
θ	Sampling time in minutes.

APPENDIX VII

FIELD DATA SHEETS - UNIT OPERATING CONDITIONS

CAPACITY 116,700
INT. FACTOR 1350
RUN # 5-1

BOILER # 5

POLLUTION COMPLIANCE TESTING
DATE: 12-12-90
TESTED BY: Eastmount Eng

TIME	STEAM INTERGRATOR	OIL METER North	OIL METER South	STEAM PRESS.	STEAM TEMP.	CHART READING LBS/HR.	FEED WATER PRESS.	FEED WATER TEMP.
8:30	348823	5378580	Oil Water	370	700	120,000	660	260°
8:45	348845			320	700	120,000	660	"
9:00	348867			380	700	115,000	740	"
9:15	348891			370	700	120,000	700	"
9:30	348914			370	700	120,000	700	"
9:40	348929	5378580		360	700	120,000	660	"

BOILER PRESSURE DROP

OVERFIRE AIR PRESS.					
AIR HEATER AIR OUT	6.0	6.0	6.0	6.0	6.0
UNDERGRATE AIR PRESS.	2.0	2.0	2.0	2.0	2.0
WIND BOX PRESSURE					
FURNACE PRESSURE	.29	.20	.20	.20	.20
BLR. OUTLET PRESSURE		1.2	1.2	1.2	1.2
DUST COLLECTOR OUT.					
SCRUBBER DIFF.	6.0	6.0	6.0	6.0	6.0

BOILER TEMPERATURE

BOILER OUTLET	710	710	710	710	710
AIR HEATER GAS OUT					
AIR HEATER AIR OUT	590	590	590	590	590
I.D. FAN	550	550	550	550	
S.H. STEAM TEMP.	700	700	700	700	700

PANEL SETTINGS

FURNACE PRESSURE					
F.D. FAN PRESSURE					
BAGASSE FEED	50	—	—	—	—
UNDERGRATE AIR					
OVERFIRE AIR					

TEST RESULTS

OIL USED	None	GALS.
TOTAL TEST TIME	70	MINS.
INTERGATOR TIME	106	COUNT
INTERGRATOR STEAM	122,657	P.P.H
CHART READING	715,000	TOTAL
CHART AVERAGE	119,167	P.P.H.
I.D. FAN TURBINE	11,000	RPM
STACK TEMPERATURE	138	°F
GRATE TEMPERATURE	NA	°F
SCRUBBER WATER	500	G.P.M.

COMMENTS:
(1) Mill speed "A" 75 "B" 25 F.P.M.
(2) Using no oil burners.

Allowed = 75.89
Actual = 47.69

PLANT READINGS BY George DeVan

% OF CAPACITY

CAPACITY 116,700
INT. FACTOR 1350
RUN # 5-2

BOILER # 5

POLLUTION COMPLIANCE TESTING
DATE: 12-12-90
TESTED BY: Eastwood Eng

TIME	STEAM INTERGRATOR	OIL METER North	OIL METER South	STEAM PRESS.	STEAM TEMP.	CHART READING LBS/HR.	FEED WATER PRESS.	FEED WATER TEMP.
10:30	348998	5378580	~~eng~~ ~~mem~~	350	700	115,000	660	260°
10:45	349021			340	700	120,000	640	"
11:00	349043			370	700	120,000	700	"
11:15	349067			390	700	125,000	740	"
(68) 11:30	349090			390	700	120000	740	"
11:40	349106	5378580		380	700	120,000	690	"

BOILER PRESSURE DROP					
OVERFIRE AIR PRESS.					
AIR HEATER AIR OUT	4.5	4.5	5.5	5.5	5.5
UNDERGRATE AIR PRESS.	1.4	1.5	1.8	1.8	2.0
WIND BOX PRESSURE					
FURNACE PRESSURE	.25	.25	.20	.20	.20
BLR. OUTLET PRESSURE	1.2	1.2	1.3	1.3	1.2
DUST COLLECTOR OUT.					
SCRUBBER DIFF.	6.0	6.0	6.0	6.0	6.0

BOILER TEMPERATURE					
BOILER OUTLET	700	700	710	710	710
AIR HEATER GAS OUT	550	550	550	550	550
AIR HEATER AIR OUT	600	600	620	620	620
I.D. FAN					
S.H. STEAM TEMP.	700	700	700	700	700

PANEL SETTINGS					
FURNACE PRESSURE					
F.D. FAN PRESSURE					
BAGASSE FEED	45	—	50	40	50
UNDERGRATE AIR					
OVERFIRE AIR					

TEST RESULTS

OIL USED	None	GALS.
TOTAL TEST TIME	70	MINS.
INTERGATOR TIME	108	COUNT
INTERGRATOR STEAM	124,971	P.P.H
CHART READING	720,000	TOTAL
CHART AVERAGE	120,000	P.P.H.
I.D. FAN TURBINE	4000	RPM
STACK TEMPERATURE	138	°F
GRATE TEMPERATURE	NA	°F
SCRUBBER WATER	500	G.P.M.

COMMENTS:

	"A"	"B"
(1) Mill speed	80	80 F.P.M.

(2) using no oil burners
(3) Mill speed increased to 80 F.P.M.

Allowed = 77.32

Actual = 46.36

PLANT READINGS BY Gary Davis

% OF CAPACITY

CAPACITY 116,700
INT. FACTOR 1350
RUN # 5-3

BOILER # 5

POLLUTION COMPLIANCE TESTING
DATE: 12-12-90
TESTED BY: Eastmount Emp.

TIME	STEAM INTERGRATOR	OIL METER North	OIL METER South	STEAM PRESS.	STEAM TEMP.	CHART READING LBS/HR.	FEED WATER PRESS.	FEED WATER TEMP.
PM 12:45	349193	5378580	One Meter	370	700	115,000	700	260°
1:00	349215			395	700	120,000	700	"
1:15	349239			375	700	120,000	600	"
1:30	349262			360	700	120,000	600	"
1:45	349285			370	700	125,000	600	"
1:50	349293	5378580		380	700	115,000		

BOILER PRESSURE DROP					
OVERFIRE AIR PRESS.					
AIR HEATER AIR OUT	5.2	5.2	5.0		
UNDERGRATE AIR PRESS.	1.8	1.8	1.8		
WIND BOX PRESSURE					
FURNACE PRESSURE	.20	.20	.25		
BLR. OUTLET PRESSURE	1.2	1.2	1.2		
DUST COLLECTOR OUT.					
SCRUBBER DIFF.	6.0	6.0	6.0		

BOILER TEMPERATURE					
BOILER OUTLET	710	710	710		
AIR HEATER GAS OUT					
AIR HEATER AIR OUT	620	620	620		
I.D. FAN					
S.H. STEAM TEMP.	700	700	700		

PANEL SETTINGS					
FURNACE PRESSURE					
F.D. FAN PRESSURE					
BAGASSE FEED	45	45	45		
UNDERGRATE AIR					
OVERFIRE AIR					

TEST RESULTS		
OIL USED	None	GALS.
TOTAL TEST TIME	65	MINS.
INTERGATOR TIME	100	COUNT
INTERGRATOR STEAM	124,615	P.P.H.
CHART READING	715,000	TOTAL
CHART AVERAGE	119,167	P.P.H.
I.D. FAN TURBINE	4000	RPM
STACK TEMPERATURE	143	°F
GRATE TEMPERATURE	NA	°F
SCRUBBER WATER	500	G.P.M.

COMMENTS:

	"A"	"B"	
(1) Mill speed	80	80	F.P.M.

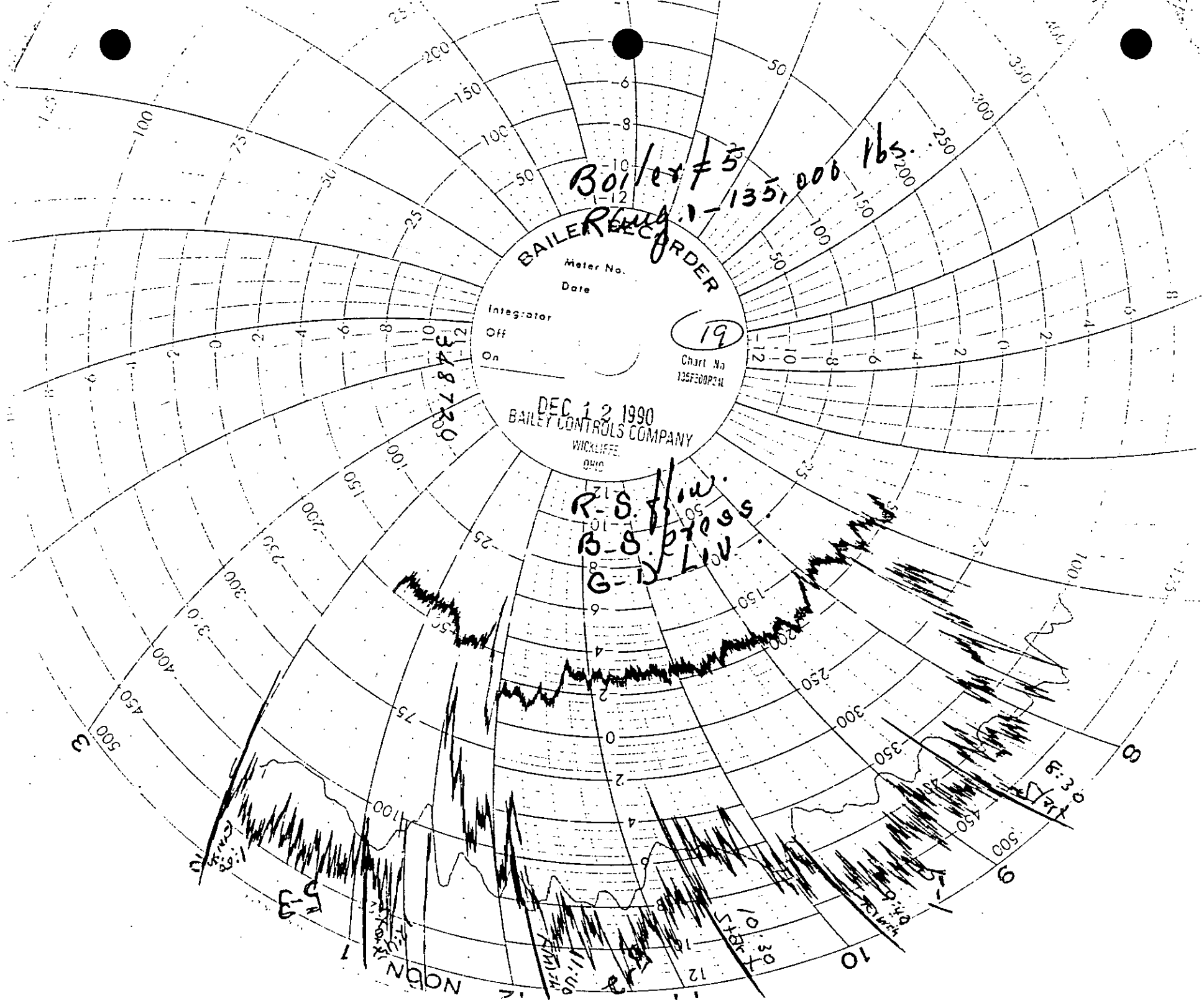
(2) using no oil burners.

Allowed = 77.07

Actual = 47.95

PLANT READINGS BY [signature]

% OF CAPACITY


Boiler #5
Reg. 1-135,000 lbs.
BAILEY RECORDER
Meter No.
Date
Integrator
Off
On
19
Chart No
DEC 12 1990
BAILEY CONTROLS COMPANY
WICKLIFFE
OHIO
R-S. Flow.
B-S. Press.
G-D. Lev.
NOON

APPENDIX VIII

FIELD DATA SHEETS - STACK TESTING

FIELD DATA SHEET

GENERAL INFORMATION

Plant:	OKEELANTA	Run #:	COMP-1
Location:	UNIT 5	Date:	12-12-90
Ds (ft):	7.5 ft	No. Points:	24
Dn (in):	.251	Test Length:	60 min
Filter #:	3728	End Meter Reading:	820.115
Cp:	.84	Int Meter Reading:	918.687
P bar:	30.09	Begin Time:	08:30
P stack:	.1	End Time:	09:40
IMP-1 (INT)	100 ml	IMP-1 (FINAL)	265
IMP-2 (INT)	100 ml	IMP-2 (FINAL)	120
IMP-3 (INT)	0 ml	IMP-3 (FINAL)	1
IMP-4 (INT)	500.0g	IMP-4 (FINAL)	511-5

	TEST 1	TEST 2	TEST 3
% CO2	9.0		
% O2	11.2		
% CO	0		

Project Director:	SEAN MACKAY	Field Laboratory:	MACKAY / NOLAN
Meter Box Operator:	K. NOLAN	Chain of Custody:	MACKAY
Probe Operator:	M. WESOTT	Plant Coordinator:	G. DEVANE
Orsat Analyst:		Agency Rep:	K. TUCKER

Comments:

TRAVERSE DATA SHEET

Page 1 of 2 | Sampling time per point: 2 ½ min

Plant: OKEELANTA | Run #: Comp - 1

Location: UNIT - 5 | Date: 12 - 12 - 90

O_2 %	Trav. No.	Delta P	Delta H	Meter Reading 880.115	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
	A 1	.48	1.44	881.67	63	62	266	54	138	1
	2	.54	1.62	883.40	70	62	260	50	138	1
12.0	3	.52	1.56	884.90	68	64	260	51	136	1
	4	.55	1.65	886.49	71	65	264	52	138	1
	5	.56	1.68	888.20	74	65	266	53	138	1
	6	.50	1.50	889.80	75	66	270	55	140	1
	7	.50	1.50	891.25	76	68	267	55	143	1
13.5	8	.58	1.74	892.86	77	68	261	57	140	1
	9	.67	2.01	894.58	78	71	265	57	140	1
	10	.72	2.16	896.35	80	73	264	58	139	1
	11	.74	2.22	898.19	82	73	264	59	140	2
	12	.70	2.10	899.990	83	76	265	60	140	2

Relationship: 3.0
Box #: 4 Y: 1.001 Delta H@: 2
Start Time: 8:30 End Time: _____
Pre Leak Ck: .000 CFM @ 15 "Hg
Mid Leak Ck: .000 CFM @ 8 "Hg (Vol: _____)
Post Leak CK: .000 CFM @ 4 "Hg
Pitot Leak CK: Good @ 6 "H2O
Box Oper: K. NOLAN Probe Oper: M. WESCOT

TRAVERSE DATA SHEET

Page 2 of 2

Sampling time per point: 2 ½ min

Plant: OKEELANTA

Run #: Comp - 1

Location: UNIT - 5

Date: 12 - 12 - 90

	Trav. No.	Delta P	Delta H	Meter Reading	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
O_2%				900.209						
	B1	.46	1.38	901.61	83	76	246	61	140	1
	2	.50	1.50	903.07	84	79	244	50	140	1
	3	.53	1.59	904.60	86	80	245	51	141	1
12.5	4	.56	1.68	906.30	88	82	248	52	142	1
	5	.56	1.68	907.85	88	81	251	55	144	2
	6	.48	1.44	909.31	89	84	251	51	143	2
	7	.46	1.38	910.80	88	82	252	53	144	2
12.0	8	.53	1.59	912.35	87	82	252	56	143	2
	9	.52	1.56	913.85	88	81	253	55	141	2
	10	.57	1.71	915.45	88	81	252	56	140	3
	11	.57	1.71	917.08	87	81	251	55	140	3
11.5	12	.57	1.71	918.687	88	82	248	60	140	3

Relationship: 3.0
Box #: _____ Y: _____ Delta H@: _____
Start Time: _____ End Time: 9:40
Pre Leak Ck: _____ CFM @ _____ "Hg
Mid Leak Ck: _____ CFM @ _____ "Hg (Vol: _____)
Post Leak CK: .000 CFM @ 4 "Hg
Pitot Leak CK: _____ @ _____ "H2O
Box Oper: _____ Probe Oper: _____

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

Page 2 of 2 | Sampling time per point: 2½ min

Plant: OKEELANTA | Run #: COMP - 2

Location: UNIT - 5 | Date: 12 - 12 - 90

O₂ %	Trav. No.	Delta P	Delta H	Meter Reading	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
				937.703						
	B1	.42	1.34	939.16	83	80	261	59	142	1
	2	.47	1.50	940.67	85	82	253	53	141	1
11.0	3	.50	1.60	942.23	93	84	248	55	144	1
	4	.51	1.63	943.81	87	80	240	53	143	
	5	.50	1.60	945.35	89	81	242	54	145	1
	6	.45	1.44	946.85	88	82	251	55	146	
	7	.44	1.41	948.35	90	83	255	55	143	
12.0	8	.45	~~1.44~~	949.50	91	83	260	56	143	1
	9	.48	1.54	951.45	90	84	250	56	140	1
	10	.48	1.54	952.90	90	84	252	59	141	1
	11	.48	1.54	954.42	89	86	255	59	142	2
11.0	12	.45	1.44	955.950	90	85	256	58	142	2

Comments: DELTA P * 3.2 = DELTA H
BOX # _____ ; Y = _____ , DELTA H @ _____
START TIME : _____
STOP TIME : _____
INITIAL LEAK CHECK _____ AT _____ INCHES HG
FINAL LEAK CHECK 000 AT 3 INCHES HG

TRAVERSE DATA SHEET

Page 1 of 2 | Sampling time per point: 2½ min

Plant: OKELLANTA | Run #: COMP - 2

Location: UNIT - 5 | Date: 12-12-90

O2 %	Trav. No.	Delta P	Delta H	Meter Reading 918.902	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
	A1	.42	1.34	920.43	77	76	270	64	136	1
	2	.46	1.47	921.95	80	77	270	54	137	1
	3	.52	1.66	923.61	78	77	270	51	140	1
	4	.52	1.66	925.05	80	77	251	58	140	1
13.0	5	.48	1.54	926.70	82	78	255	55	138	1
	6	.42	1.34	928.11	83	79	266	56	139	1
	7	.40	1.28	929.54	82	78	270	56	139	1
10.5	8	.46	1.47	931.15	84	77	269	56	142	1
	9	.55	1.76	932.53	85	78	262	57	142	1
	10	.56	1.79	934.25	85	79	259	57	142	1
	11	.62	1.98	935.88	87	80	260	57	141	1
10.0	12	.59	1.89	937.592	86	82	265	59	142	1

Relationship: 3.2
Box #: 4 Y: 1.001 Delta H@: 2.03
Start Time: 10.30 End Time: _____
Pre Leak Ck: .000 CFM @ 15 "Hg
Mid Leak Ck: .000 CFM @ 7 "Hg (Vol: _____)
Post Leak CK: _____ CFM @ _____ "Hg
Pitot Leak CK: Good @ 6 "H2O
Box Oper: K. NOLAN Probe Oper: M. WESCOTT

FIELD DATA SHEET

GENERAL INFORMATION

Plant:	OKEELANTA	Run #:	COMP-3
Location:	UNIT 5	Date:	12 DEC 90
Ds (ft):	7.5 ft	No. Points:	24
Dn (in):	.251	Test Length:	60 min
Filter #:	3730	End Meter Reading:	997.447
Cp:	.84	Int Meter Reading:	956.155
P bar:	30.10	Begin Time:	12:45
P stack:	.10	End Time:	13:50
IMP-1 (INT)	100 ml	IMP-1 (FINAL)	292
IMP-2 (INT)	100 ml	IMP-2 (FINAL)	123
IMP-3 (INT)	0 ml	IMP-3 (FINAL)	2
IMP-4 (INT)	500.0 g	IMP-4 (FINAL)	512.9

	TEST 1	TEST 2	TEST 3
% CO2	9.1		
% O2	11.1		
% CO	0		

Project Director:	S. MacKay	Field Laboratory:	MacKay Nolan
Meter Box Operator:	K. Nolan	Chain of Custody:	MacKay
Probe Operator:	M. Wescott	Plant Coordinator:	G. Devine
Orsat Analyst:		Agency Rep:	

Comments:

TRAVERSE DATA SHEET

Page 1 of 2 | Sampling time per point: 2 ½ min

Plant: OKEELANTA | Run #: Comp - 3

Location: UNIT - 5 | Date: 12-12-90

O_2 %	Trav. No.	Delta P	Delta H	Meter Reading 956.155	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
	A1	.52	1.72	957.19	81	80	268	56	145	1
	2	.56	1.85	959.64	84	81	262	51	143	1
	3	.58	1.91	961.34	85	81	242	51	145	1
12.0	4	.62	2.05	963.21	87	82	240	54	144	1
	5	.56	1.85	964.86	88	81	235	56	143	1
	6	.54	1.78	966.47	89	83	246	57	142	1
	7	.50	1.65	968.16	89	84	255	58	145	2
11.5	8	.58	1.91	969.78	90	83	263	57	144	1
	9	.66	2.18	971.55	90	55	251	56	144	2
	10	.68	2.25	973.35	91	85	245	57	143	3
	11	.75	2.48	975.23	92	85	244	53	144	3
11.0	12	.76	2.51	977.122	93	91	245	54	143	3

Relationship: 3.3
Box #: 4 Y: 1.001 Delta H@: 2.03
Start Time: 1245 End Time: _____
Pre Leak Ck: .000 CFM @ 15 "Hg
Mid Leak Ck: .000 CFM @ 7 "Hg (Vol: _____)
Post Leak CK: _____ CFM @ _____ "Hg
Pitot Leak CK: GOOD @ 5 "H2O
Box Oper: K. NOLAN Probe Oper: M. WESCOTT

TRAVERSE DATA SHEET

Page 2 of 2 | Sampling time per point: 2 ½ min

Plant: OKEELANTA | Run #: Comp - 3

Location: UNIT - 5 | Date: 12-12-90

O_2 %	Trav. No.	Delta P	Delta H	Meter Reading	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
				977.257						
	B1	.46	1.52	978.80	86	84	247	68	144	1
	2	.55	1.82	980.42	90	86	251	57	145	2
10.5	3	.58	1.91	982.14	90	84	249	57	144	3
	4	.61	2.01	983.90	90	84	250	57	144	3
	5	.58	1.91	985.62	90	84	247	58	146	3
	6	.55	1.82	987.35	91	85	241	58	143	3
9.4	7	.50	1.65	988.97	90	85	243	59	142	3
	8	.53	1.75	990.71	92	85	253	60	144	3
	9	.60	1.98	992.29	93	88	265	60	142	3
	10	.58	1.91	994.05	94	86	268	60	142	4
9.8	11	.58	1.91	995.75	93	85	270	63	142	4
	12	.62	2.05	997.447	91	87	268	64	142	5

Relationship: 3.3
Box #: _____ Y: _____ Delta H@: _____
Start Time: _____ End Time: _____
Pre Leak Ck: _____ CFM @ _____ "Hg
Mid Leak Ck: _____ CFM @ _____ "Hg (Vol: _____)
Post Leak CK: .000 CFM @ 5 "Hg
Pitot Leak CK: _____ @ _____ "H2O
Box Oper: KN Probe Oper: MW

APPENDIX IX

EQUIPMENT CALIBRATION SHEETS

METER BOX CALIBRATION SHEET

BOX NUMBER: 4
PRESS BAR : 30.04

DATE: 10 SEPT 1990
DUE: 10 MAR 1991

RUN #	VOLUME WET	VOLUME DRY	DELTA H	DELTA H /13.6	PRES BAR (ABS)	TIME (MINS)
1	5	5.037	.50	.0368	30.08	13.80
2	5	5.043	1.00	.0735	30.11	9.55
3	10	10.190	1.50	.1103	30.15	15.34
4	10	10.273	2.00	.1471	30.19	13.46
5	10	10.330	3.00	.2206	30.26	11.69
6	10	10.400	4.00	.2941	30.33	9.64

RUN #	TEMP WET (°F)	TEMP DRY INLET	TEMP DRY OUT	TEMP DRY (AVG)	Y	DELTA H @
1	69.3	82.3	77.3	79.8	1.011	2.09
2	69.7	83.7	78.3	81.0	1.010	2.00
3	70.0	86.7	80.3	83.5	1.003	1.93
4	70.0	89.3	82.7	86.0	.9979	1.97
5	69.3	91.7	83.3	87.5	.9940	2.21
6	69.0	94.7	85.3	90.0	.9900	1.99
				AVERAGE	1.001	2.03

MAX % DEVIATION 1.10
ALLOWABLE % DEV 2.00

FORMULAS:

Y=

$$\frac{(V\ w)(P\ b)(T\ d)}{(V\ d)(P\ b\ \ ABS)(T\ w)}$$

DELTA H @=

$$\frac{0.0317\ (DELTA\ H)}{(P\ b)(T\ d)} * \left[\frac{(T\ w)(TIME)}{(V\ w)}\right]^2$$

CALIBRATION BY: From Computer Disk BCH 12-Feb-90

SCOTT LAWTON

POST
METER BOX CALIBRATION SHEET

BOX #: 4 DATE: 2-11-91
PRES BAR: 30.02 VACUUM: 10IN HG

RUN #	VOLUME WET	VOLUME DRY	DELTA H	DELTA H /13.6	PRES BAR (ABS)	TIME (MINS)
1	10.00	10.089	1.95	.143	30.16	13.39
2	10.00	10.353	1.95	.143	30.16	13.73
3	10.00	10.333	1.95	.143	30.16	13.73

RUN #	TEMP WET (`F)	TEMP DRY INLET	TEMP DRY OUT	TEMP DRY (AVG)	Y	DELTA H @
1	65.0	85.7	80.0	82.8	1.020	1.87
2	65.0	87.7	81.7	84.7	.9973	1.96
3	65.0	88.7	82.3	85.5	1.001	1.96
					---	---
				AVERAGE	1.006	1.93

PRE CAL Y = 1.0010 % DIFFERENCE = .50 %

ALLOWABLE = 5.00 %

FORMULAS:

Y= DELTA H @=

$$\frac{(V\ w)\ (P\ b)\ (T\ d)}{(V\ d)\ (P\ b\ \ ABS)\ (T\ w)} \qquad \frac{0.0317\ (DELTA\ H)}{(P\ b)\ (T\ d)} * \left[\frac{(T\ w)\ (TIME)}{(V\ w)}\right]^2$$

CALIBRATION BY: S. MacKAY

NOZZLE CALIBRATION SHEET

PROJECT NAME: OKEELANTA PROJECT NUMBER: 90-102

POINT#	NOZZLE# 5/16-3	NOZZLE # 5/16-14	NOZZLE# 1/4-3	NOZZLE # 1/4-1
1	.316	.313	.251	.250
2	.314	.312	.249	.251
3	.315	.311	.250	.251
AVG.	.315	.312	.250	.251

SEAN MACKAY
CALIBRATED BY:

3 DEC 90
DATE:

THERMOCOUPLE CALIBRATION SHEET

SET #: 8'-1 DATE: 10-25-85

REFERENCE MERCURY/GLASS

STANDARD ('F)	THERMOCOUPLE ('F)	ABSOLUTE OF % DEVIATION
74	72	.37
210	205	.75
400	409	1.05
	MAXIMUM DEVIATION	1.05
	ALLOWABLE	1.50

SET #: 8.5'-1 DATE: 11-15-85

STANDARD ('F)	THERMOCOUPLE ('F)	ABSOLUTE OF % DEVIATION
66	63	.57
170	170	0
211.5	215	.52
	MAXIMUM DEVIATION	.57
	ALLOWABLE	1.50

CALIBRATION BY: G. ZWILLING

DATE 4 25 91 ../../..

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

FACILITY NAME: OKEELANTA APIS #

COMPANY CONDUCTING TEST: EASTMOUNT TEST DATE 12 12 90

SOURCE DESCRIPTION: OKEELANTA BOILER 5

STACK TEST DATA SUMMATION

		RUN1	RUN2	RUN3
1.H2O	(VOL.MEAS.),ML	0	0	0
2.H20	(MASS MEAS.),GM	197.5	197.2	229.9
3.M'N	PARTICULATE WEIGHT, GM	.16	.159	.1688
4.V'M	VOLUME METERED,CF	38.353	36.937	41.157
5.Y	DRY GAS MTR. CALIB.FCTR.	1.001	1.001	1.001
6.RDP	AVG SQR D.P-SAMPLING	.74	.7	.76
7.DH	AVG DELTA H,IN.H2O	1.67	1.55	1.93
8.T'M	AVG MTR. TEMP,DEG.F	77.6	83	86.9
9.T'S	AVG STACK TEMP,DEG.F	140.3	141.3	143.5
10.P'SG	STACK PRESS,''HG(GAUGE)	.1	.1	.1
11.P'B	BAROMETRIC PRESS,''HG	30.09	30.09	30.09
13.D'N	ACTUAL NOZZLE DIAM,IN	.251	.25	.251
14.T	ACTUAL SAMPLE TIME,MIN	60	60	60
15.C'P	PITOT TUBE COEFFICIENT	.84	.84	.84
23.S/T	VALUE:SAMPLE PTS/TOT PTS	1	1	1

RUN	VOLUME SAMPLED DSCF	MOISTURE CONTENT PERCENT	STACK VEL FPS	FLOW RATE DSCF/H	PERCENT ISO-KINETIC	ACTUAL EMISS LB/HR	ACTUAL EMISS LB/MBTU	ALLOW EMISS LB/MBTU
1	38.06	19.64	45.07	5,112,577	95.78	47.38	0.185	0.300
2	36.28	20.15	42.72	4,806,856	97.88	46.44	0.182	0.300
3	40.17	21.25	46.57	5,150,005	100.36	47.70	0.186	0.300
MEAN	38.17	20.35	44.79	5,023,146	98.01	47.17	0.184	0.300

SUMMARY

GENERAL:

REVIEWED BY AS
ACTUAL A 'S = 44.2 SQ FT
LAMINAR FLOW ASSUMED (<10 DEG YAW) (OR <20 DER)
ACTUAL EMISS BASED ON HEAT INPUT = 255.8 MBTU/HR
ALL REQUIRED LEAK TESTS ACCEPTABLE
ASSUMED M 'D=30.0 (COMBUSTION GASES)

COMMENT.....

RUN 1 :

ACTUAL A 'N = .0003436 SQ FT
P 'S = 30.19 IN HG
OVERSATURATED CONDITIONS: SATURATION MOISTURE ASSUMED/GIVEN PG.1

COMMENT.....

RUN 2 :

ACTUAL A 'N = .0003409 SQ FT
P 'S = 30.19 IN HG
OVERSATURATED CONDITIONS: SATURATION MOISTURE ASSUMED/GIVEN PG.1

COMMENT.....

RUN 3 :

ACTUAL A 'N = .0003436 SQ FT
P 'S = 30.19 IN HG

COMMENT.....

10/21/91

As 2442

Revisa

Okeelanta corporation
Boilers
12/12/90.

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

ENTER THE FOLLOWING:

		RUN1	RUN2	RUN3
1. H2O	COLLECTED (ONLY VOL.MEASURED),ML:	186	187	217
2. H2O	COLLECTED (WEIGHED PART ONLY),GM:	11.5	10.2	12.9
3. M'N	PARTICULATE WEIGHT, GM:	0.160	0.1598	.16885
4. V'M	VOLUME METERED, CF:	38.853	36.937	41.157
5. Y	DRY GAS METER CAL FACTOR:	1.001	1.001	1.001
6. RDP	AVG SQR DELTA P (WHEN SAMPLING):	.74	.70	.76
7. DH	AVG DELTA H, IN H2O:	1.67	1.55	1.93
8. T'M	AVG METER TEMP, DEG F:	77.6	83	86.9
9. T'S	AVG STACK TEMP, DEG F:	140.3	141.3	143.5
10. P'S*	STACK PRESS, *IN ....(.....):	.1	.1	.1
11. P'B	BAROMETRIC PRESS, IN HG:	30.09	30.09	30.09
13. D'N	ACTUAL NOZZLE DIAMETER, IN.:	.251	.250	.251
14. T	ACTUAL SAMPLE TIME, MIN:	60	60	60
15. C'P	PITOT TUBE COEFFICIENT:	.84	.84	.84

OPTION ENTRIES:

17. ORSAT/FYRITE - %CO2:	.....	.....	.....
18. ORSAT/FYRITE - %O2:	.....	.....	.....
28. ORSAT/FYRITE (FOR C'S @ 50%E.A.)-%CO:	.....	.....	.....
19. SPECIFIC M'D ENTRIES:	.....	.....	.....
20. CYCLONIC (10-20 DEG) - AVG COS(YAW):	.....	.....	.....
26. CYC.(>20) - AVG(SQR D.P X COS(YAW)):	.....	.....	.....
21. PROCESS WT SOURCE - T/HR:	.....	.....	.....
22. LB/TON REGULATED - T/HR:	.....	.....	.....
27. LB/* REGULATED (* AS DEFINED) - */HR:	.....	.....	.....
23. LAM&CYC((20)-VAL(SAMPLE PTS/T PTS):	1	1	1

Allowable 75.9 Hz) 77.3, 77.1

100

N1

100 - 265

100 - 120

0 - 1

N2

100 - 268

100 - 117

0 - 2

N3

100 - 292

100 - 123

100 - 2

510.2 - 500

512.9 - 500

TV 511.5 - 500

192
23
217

165
20
186

168
17
2
187

2
75.9
77.3
77.1
230.3 | 3
73,43
21
10
9
13
2
10

45

STACK TEST REVIEW DATA INPUT FORM

TEST DATE: _____

FACILITY: Sabbagh Okeelanta APIS #: _____

DESCRIPTION: Boiler #5

TESTING FIRM: Eastmount Engineering

PERMIT EMISSION LIMIT: .30 LB/MMBTU OR _____ LB/HR

AVERAGE HEAT INPUT: 255.8 MMBTU/HR

A's (AREA OF STACK): 44.2 FT2

MEASURED PARAMETERS

		Run-1	Run-2	Run-3
1.	H2O impingers (V'i), milliliters	~~.1600~~	~~.1590~~	~~.1684~~
2.	H2O filter, grams	197.5	197.2	229.9
3.	M'n (particulate weight), grams	.1600	.1590	.1684
4.	V'm (gas volume metered), FT3	38.353	36.937	41.157
5.	Y (dry gas calibration factor)	1.001	1.001	1.001
6.	RDP (average square root dP)	.74	.70	.76
7.	dH (average delta H), inches H2O	1.67	1.55	1.93
8.	T'm (average meter temperature), F	77.6	83.0	86.9
9.	T's (average stack temperature), F	140.3	141.3	143.5
10.	P's (stack pressure, abs.) inches Hg	.1	.1	.1
11.	P'b (barometric pressure, abs.) inches Hg	30.09	30.09	30.09
13.	D'n (nozzle dia.), inches	.251	.250	.251
14.	Sample Time, minutes	60	60	60
15.	C'p (pitot tube coefficient)	.84	.84	.84
23.	S/T (sample pts./total pts.)	1	1	1

DATE 10/31/91 FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
PARTICULATE STACK TEST VERIFICATION
EPA METHOD 5

FACILITY NAME: okeelanta APIS # 0005

COMPANY CONDUCTING TEST: eastmount eng TEST DATE 12/12/1990

SOURCE DESCRIPTION: boiler5

STACK TEST DATA SUMMATION

		RUN1	RUN2	RUN3
1.H2O	(VOL.MEAS.),ML	186	187	217
2.H2O	(MASS MEAS.),GM	11.5	10.2	12.9
3.M'N	PARTICULATE WEIGHT, GM	.16	.1599	.1688
4.V'M	VOLUME METERED,CF	38.35	36.93	41.157
5.Y	DRY GAS MTR. CALIB.FCTR.	1.001	1.001	1.001
6.RDP	AVG SQR D.P-SAMPLING	.74	.7	.76
7.DH	AVG DELTA H,IN.H2O	1.67	1.55	1.93
8.T'M	AVG MTR. TEMP,DEG.F	77.6	83	86.9
9.T'S	AVG STACK TEMP,DEG.F	140.3	141.3	143.5
10.P'SG	STACK PRESS,''HG(GAUGE)	.1	.1	.1
11.P'B	BAROMETRIC PRESS,''HG	30.9	30.9	30.9
13.D'N	ACTUAL NOZZLE DIAM,IN	.251	.25	.251
14.T	ACTUAL SAMPLE TIME,MIN	60	60	60
15.C'P	PITOT TUBE COEFFICIENT	.84	.84	.84
23.S/T	VALUE:SAMPLE PTS/TOT PTS	1	1	1

RUN	VOLUME SAMPLED DSCF	MOISTURE CONTENT PERCENT	STACK VEL FPS	FLOW RATE DSCF/H	PERCENT ISO-KINETIC	ACTUAL EMISS LB/HR	ALLOW EMISS LB/HR
1	39.08	19.13	44.43	5,207,996	96.54	47.004	73.430
2	37.25	19.62	42.11	4,897,425	98.62	46.346	73.430
3	41.25	20.76	45.91	5,245,694	101.17	47.318	73.430
MEAN	39.19	19.84	44.15	5,117,038	98.78	46.890	73.430

SUMMARY

GENERAL:
REVIEWED BY raisa
ACTUAL A 'S = 44.2 SQ FT
LAMINAR FLOW ASSUMED (<10 DEG YAW) (OR <20 DER)
ALL REQUIRED LEAK TESTS ACCEPTABLE
ASSUMED M 'D=30.0 (COMBUSTION GASES)

COMMENT.....

RUN 1 :
ACTUAL A 'N = .0003436 SQ FT
P 'S = 31 IN HG
OVERSATURATED CONDITIONS: SATURATION MOISTURE ASSUMED/GIVEN PG.1

COMMENT.....

RUN 2 :
ACTUAL A 'N = .0003409 SQ FT
P 'S = 31 IN HG
OVERSATURATED CONDITIONS: SATURATION MOISTURE ASSUMED/GIVEN PG.1

COMMENT.....

RUN 3 :
ACTUAL A 'N = .0003436 SQ FT
P 'S = 31 IN HG
OVERSATURATED CONDITIONS: SATURATION MOISTURE ASSUMED/GIVEN PG.1

COMMENT.....