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: 60

Title: Okeelanta Corporation Particulate Emissions Test Report Boiler #4

December 1990

Eastmount Engineering
Environmental Consultants — Air Quality Specialists

OKEELANTA CORPORATION

COMPLIANCE PARTICULATE EMISSIONS TEST REPORT

BOILER #4

PREPARED FOR:

Okeelanta Corporation
Okeelanta Sugar Division
South Bay, Florida 33493

CONCERNING:

Particulate Emissions Testing
Okeelanta Corporation
Boiler #4
South Bay Florida Facility
December 10 & 11, 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 # 4 at Okeelanta Corporation's South Bay, Florida facility on December 10 and 11, 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. 4 is rated at 94,000 pounds of steam per hour. Results of the test program indicate Boiler No. 4 to be in compliance with the Florida DER emission standard. 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 94 KPH
1	12-10-90	.178	33.80	.300	57.00	92,571	98.5%
2	12-10-90	.150	30.39	.300	60.60	98,357	104.6%
3	12-11-90	.144	29.89	.300	62.45	100,938	107.4%
3 RUN AVG.		.157	31.36	.300	60.02	97,289	103.5%

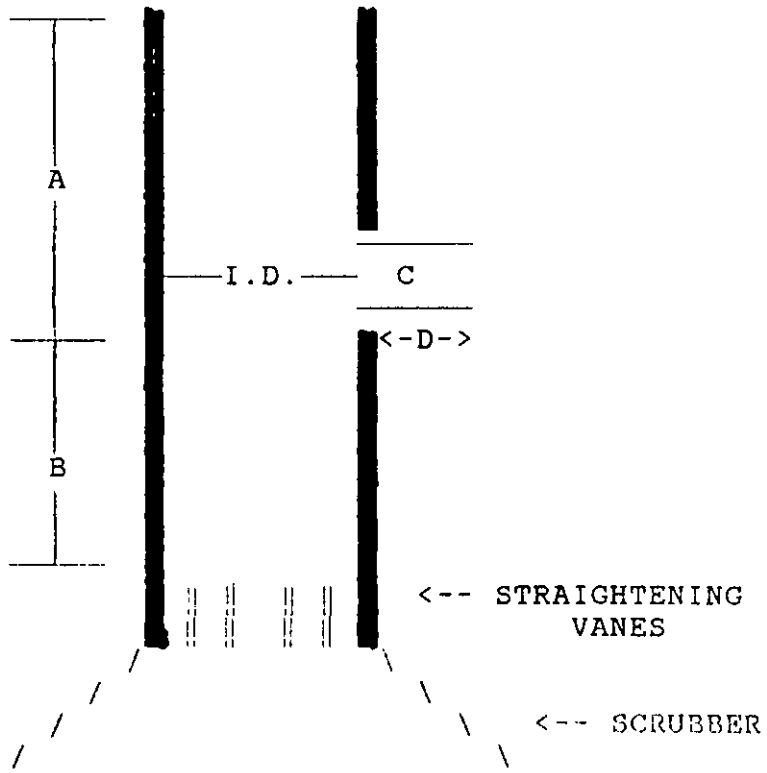
Sean MacKay, Project Director, was in charge of and responsible for all stack testing, conducted all calculations and maintained chain of custody of all samples. Kieran Nolan operated the meter box and performed the field laboratory aspects of the program. Mark Wescott located the probe at the proper 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. Alberto 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 # 4
SOUTH BAY, FLORIDA FACILITY

The following is a schematic of the stack which services Boiler #4 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.

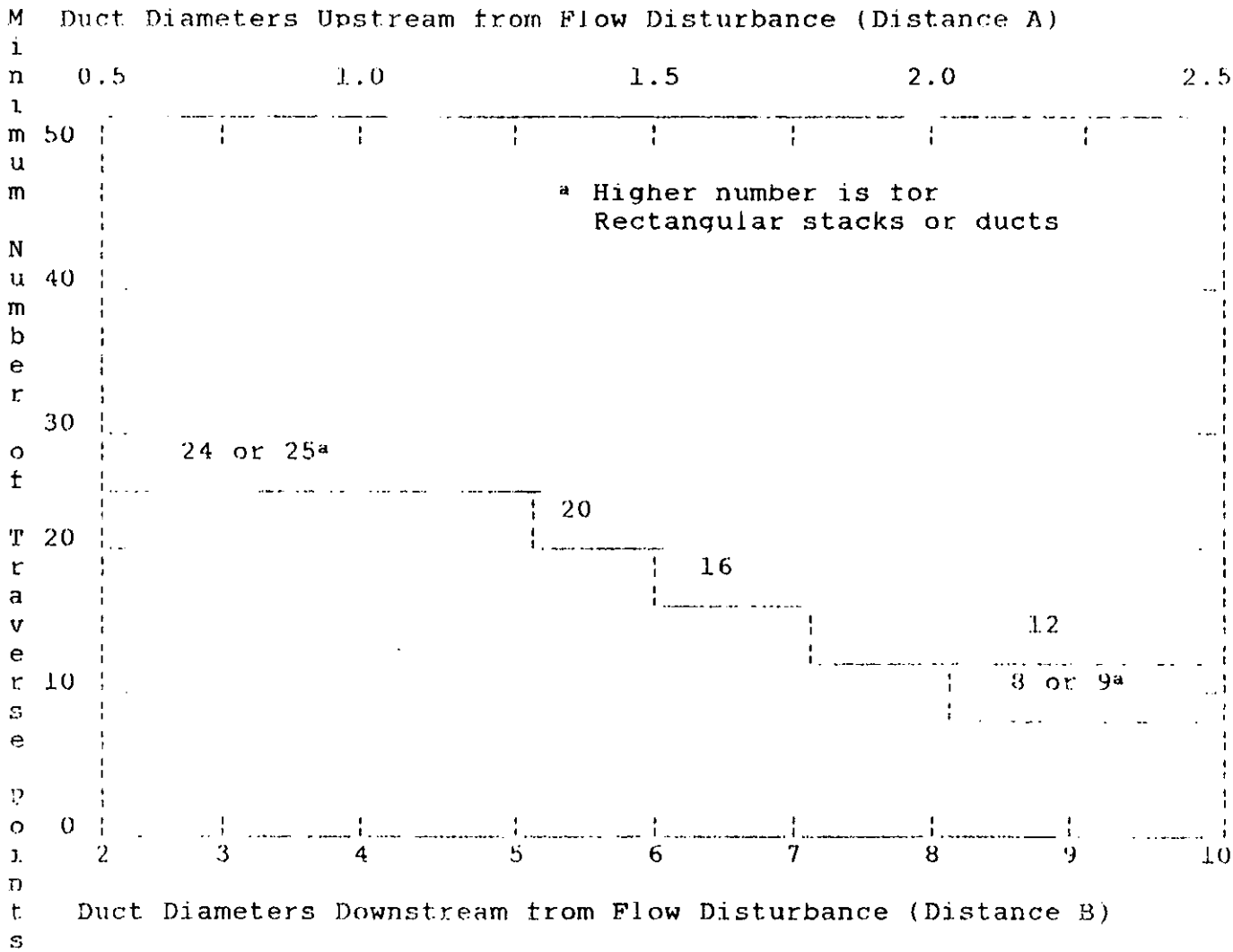


DISTANCE UPSTREAM FROM FLOW DISTURBANCE (A)	4'
DISTANCE DOWNSTREAM FROM FLOW DISTURBANCE (B)	16'
DIAMETER OF PORT SLEEVE (C)	4"
LENGTH OF PORT SLEEVE (D)	3.5"
NUMBER OF PORTS	2
INTERNAL DIAMETER OF STACK AT SAMPLING PORTS	7.5'

Drawing not to scale

3.0 NUMBER OF TRAVERSE POINTS AND SAMPLING TIME PER POINT

OKEELANTA CORPORATION
UNIT # 4
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 # 4
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, the filters 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 4

RUN #: COMP - 1
DATE : 12-10-90

Ds (FT)	7.5
Dn (IN)	.305
FILTER#	3787
PIT COEFF	.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	500.0
IMP-1 (FIN)	274
IMP-2 (FIN)	118
IMP-3 (FIN)	3
IMP-4 (FIN)	516.5
% CO2	8.5
% O2	11.7
% CO	0
P BAR	30.10
P STK	.1
NO. PTS	24
TEST LNGTH	60
END METER	780.448
	.152
INT METER	741.835
BEGIN TIME:	11:50
END TIME:	13:00

TRAV PT	VEL HEAD	SQ ROOT	DELTA H	DRYGAS IN	DRYGAS OUT	STACK TEMP
A1	.18	.42	1.89	76	76	140
2	.21	.46	1.39	77	77	140
3	.23	.48	1.52	80	77	142
4	.23	.48	1.51	82	77	143
5	.24	.49	1.58	82	77	145
6	.25	.50	1.65	83	78	144
7	.23	.48	1.52	84	78	145
8	.25	.50	1.65	84	78	145
9	.25	.50	1.65	86	79	141
10	.25	.50	1.65	87	80	142
11	.26	.51	1.72	87	81	145
12	.25	.50	1.65	88	80	144
B1	.20	.45	1.32	82	81	142
2	.25	.50	1.65	84	81	141
3	.26	.51	1.72	86	81	140
4	.27	.52	1.78	87	82	142
5	.27	.52	1.78	88	82	141
6	.26	.51	1.72	89	82	140
7	.23	.48	1.52	89	83	143
8	.26	.51	1.72	90	83	145
9	.26	.51	1.72	90	84	145
10	.28	.53	1.85	90	84	143
11	.28	.53	1.85	91	84	144
12	.28	.53	1.85	91	85	145
AVERAGE	.25	.50	1.66	85.5	80.4	142.8

INPUT DATA SHEET

PLANT: OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 2
DATE : 12-10-90

Ds (FT)	7.5
Dn (IN)	.305
FILTER#	3788
PIT COEFF	.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	500.0
IMP-1 (FIN)	295
IMP-2 (FIN)	118
IMP-3 (FIN)	3
IMP-4 (FIN)	511.1
% CO2	8.6
% O2	11.6
% CO	0
P BAR	30.14
P STK	.1
NO. PTS	24
TEST LNGTH	60
END METER	820.025
	.202
INT METER	780.700
BEGIN TIME:	14:15
END TIME:	15:20

TRAV PT	VEL HEAD	SQ ROOT	DELTA H	DRYGAS IN	DRYGAS OUT	STACK TEMP
A1	.19	.44	1.27	78	77	134
2	.23	.48	1.54	78	77	143
3	.25	.50	1.68	80	77	143
4	.27	.52	1.81	80	77	142
5	.28	.53	1.87	83	79	144
6	.26	.51	1.74	84	78	145
7	.26	.51	1.74	84	78	145
8	.26	.51	1.74	86	78	145
9	.27	.52	1.81	86	80	145
10	.26	.51	1.74	87	81	145
11	.26	.51	1.74	88	81	144
12	.25	.50	1.68	88	81	143
B1	.18	.42	1.21	84	81	145
2	.22	.47	1.47	85	82	144
3	.25	.50	1.68	87	82	144
4	.26	.51	1.74	87	83	145
5	.26	.51	1.74	89	83	145
6	.25	.50	1.68	89	83	143
7	.25	.50	1.68	90	83	145
8	.26	.51	1.74	90	83	147
9	.26	.51	1.74	90	84	146
10	.27	.52	1.81	90	84	148
11	.27	.52	1.81	91	84	147
12	.27	.52	1.81	91	85	147
AVERAGE	.25	.50	1.69	86.0	80.9	144.3

INPUT DATA SHEET

PLANT: OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 3
DATE : 12-11-90

Ds (FT)	7.5
Dn (IN)	.305
FILTER#	3789
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)	118
IMP-3 (FIN)	0
IMP-4 (FIN)	512.5
% CO2	8.9
% O2	11.3
% CO	0
P BAR	30.10
P STK	.1
NO. PTS	24
TEST LNGTH	60
END METER	860.055
	.260
INT METER	820.920
BEGIN TIME:	09:30
END TIME:	10:35

TRAV PT	VEL HEAD	SQ ROOT	DELTA H	DRYGAS IN	DRYGAS OUT	STACK TEMP
A1	.21	.46	1.41	69	66	141
2	.23	.48	1.54	72	67	143
3	.24	.49	1.61	74	68	143
4	.25	.50	1.68	77	69	143
5	.27	.52	1.81	79	70	141
6	.25	.50	1.68	80	71	141
7	.25	.50	1.74	82	73	141
8	.25	.50	1.68	83	74	145
9	.26	.51	1.74	83	75	140
10	.25	.50	1.68	85	76	142
11	.25	.50	1.68	88	77	141
12	.24	.49	1.61	86	77	143
B1	.21	.46	1.41	82	78	142
2	.23	.48	1.54	84	79	143
3	.24	.49	1.61	86	80	143
4	.25	.50	1.68	86	80	140
5	.27	.52	1.81	86	80	140
6	.25	.50	1.68	87	81	142
7	.25	.50	1.68	87	81	142
8	.25	.50	1.68	87	81	141
9	.26	.51	1.74	87	81	141
10	.25	.50	1.68	87	81	143
11	.25	.50	1.68	87	81	142
12	.24	.49	1.61	88	82	142
AVERAGE	.25	.50	1.65	83.0	76.2	141.9

APPENDIX II

ISOKINETIC CALCULATION SHEETS

ISOKINETIC CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 1
DATE : 12-10-90

TS (`F)=	142.8	% CO2=	8.5	VM (CF) =	38.461
TS (`R)=	602.8	% O2=	11.7	DELTA H (ABS)=	30.22
TM (`F)=	83.0	% CO=	0	PS (ABS) =	30.11
TM (`R)=	543.0	% N2=	79.8	SQRT DELTA P =	.496423
VI(TOT)=	211.5	CP=	.84	AREA NOZZLE =	.000507
				Y =	1.001

VM STD	=	17.64 $\frac{(VM)(Y)(DELTA\ H\ ABS)}{(TM)}$	= 37.80	DSCF
VW STD	=	.04707 (VI TOT)	= 9.96	CF
BWO	=	$\frac{VW\ STD}{VW\ STD + VM\ STD}$	= .208	
BWO	=	MOISTURE FROM STEAM TABLES	= .210	
VI TOT	=	ADJUSTED TO SATURATION VOLUME	= N/A	ML
1-BWO	=	1 - BWO	= .792	
Md (DRY)	=	.44 (% CO2) +.32 (% O2) +.28 (% CO) +.28 (% N2)	= 29.83	LBS/LB MOLE
Ms (WET)	=	MD (1-BWO) + 18 (BWO)	= 27.36	LBS/LB MOLE
G	=	SQRT (TS / PS / MS)	= .86	
VS	=	85.49(CP)(G)(SQRT DELTA P)	= 30.5	FPS
H	=	0.002669 (VI TOT)	= .56	
J	=	(DELTA H ABS)(VM)(Y) /(TM)	= 2.14	
K	=	(H) + (J)	= 2.71	
% ISO	=	$\frac{(TS)\ (K)\ (1.667)}{(TIME)\ (VS)\ (PS)\ (AN)}$	= 97.3	

ISOKINETIC CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 2
DATE : 12-10-90

TS (`F)=	144.3	% CO2=	8.6	VM (CF) =	39.123
TS (`R)=	604.3	% O2=	11.6	DELTA H (ABS)=	30.26
TM (`F)=	83.5	% CO=	0	PS (ABS) =	30.15
TM (`R)=	543.5	% N2=	79.8	SQRT DELTA P =	.501047
VI(TOT)=	227.1	CP=	.84	AREA NOZZLE =	.000507
				Y =	1.001

VM STD = $\frac{(VM)(Y)(DELTA\ H\ ABS)}{(TM)}$ = 38.47 DSCF

VW STD = .04707 (VI TOT) = 10.69 CF

BWO = $\frac{VW\ STD}{VW\ STD + VM\ STD}$ = .217

BWO = MOISTURE FROM STEAM TABLES = .218

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

1-BWO = 1 - BWO = .783

Md (DRY) = .44 (% CO2) +.32 (% O2) +.28 (% CO) +.28 (% N2) = 29.84 LBS/LB MOLE

Ms (WET) = MD (1-BWO) + 18 (BWO) = 27.27 LBS/LB MOLE

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

VS = 85.49(CP)(G)(SQRT DELTA P) = 30.9 FPS

H = 0.002669 (VI TOT) = .61

J = (DELTA H ABS)(VM)(Y) /(TM) = 2.18

K = (H) + (J) = 2.79

% ISO = $\frac{(TS)\ (K)\ (1.667)}{(TIME)\ (VS)\ (PS)\ (AN)}$ = 99.2

ISOKINETIC CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 3
DATE : 12-11-90

Avg = 143 Avg = 11.5

TS (`F)=	141.9	% CO2=	8.9	VM (CF) =	38.875
TS (`R)=	601.9	% O2=	11.3	DELTA H (ABS)=	30.22
TM (`F)=	79.6	% CO=	0	PS (ABS) =	30.11
TM (`R)=	539.6	% N2=	79.8	SQRT DELTA P =	.495596
VI(TOT)=	198.5	CP=	.84	AREA NOZZLE =	.000507
				Y =	1.001

VM STD = $\frac{17.64 \; (VM)(Y)(DELTA\ H\ ABS)}{(TM)}$ = 38.45 DSCF

VW STD = .04707 (VI TOT) = 9.34 CF

BWO = $\frac{VW\ STD}{VW\ STD + VM\ STD}$ = .196

BWO = MOISTURE FROM STEAM TABLES = .185

VI TOT = ADJUSTED TO SATURATION VOLUME= 188.3 ML

1-BWO = 1 - BWO = .815

Md (DRY) = .44 (% CO2)
+.32 (% O2)
+.28 (% CO)
+.28 (% N2)
= 29.88 LBS/LB MOLE

Ms (WET) = MD (1-BWO)
+ 18 (BWO)
= 27.85 LBS/LB MOLE

G = SQRT (TS / PS / MS) = .85

VS = 85.49(CP)(G)(SQRT DELTA P) = 30.2 FPS

H = 0.002669 (VI TOT) = .50

J = (DELTA H ABS)(VM)(Y) /(TM) = 2.18

K = (H) + (J) = 2.68

% ISO = $\frac{(TS)\ (K)\ (1.667)}{(TIME)\ (VS)\ (PS)\ (AN)}$ = 97.4

APPENDIX III

ENTHALPY CALCULATION SHEETS

ENTHALPY CALCULATION SHEET

PLANT : OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 1
DATE : 12-10-90

STEAM PRESSURE	STEAM TEMPERATURE	FEED WATER TEMPERATURE
350	690	260
340	690	
390	700	
370	690	
360	690	
370	690	
AVERAGE 363.3 PSIG	691.7	260.0

P ABS = 378.0 PSIA

ENTHALPY @ 700 'F AND 380 PSIA = 1363.0

ENTHALPY @ 600 'F AND 380 PSIA = 1308.4

ENTHALPY @ 691.7 'F AND 380 PSIA = 1358.5

ENTHALPY OF FEED WATER = 228.65

AVERAGE ENTHALPY = 1129.8 BTU/LB OF STEAM

ENTHALPY CALCULATION SHEET

PLANT : OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 2
DATE : 12-10-90

STEAM PRESSURE	STEAM TEMPERATURE	FEED WATER TEMPERATURE
360	690	260
355	690	
370	690	
350	690	
340	690	
350	690	
AVERAGE 354.2 PSIG	690.0	260.0

P ABS = 368.9 PSIA

ENTHALPY @	700	'F AND	370	PSIA =	1363.6
ENTHALPY @	600	'F AND	370	PSIA =	1309.1
ENTHALPY @	690.0	'F AND	370	PSIA =	1358.2

ENTHALPY OF FEED WATER = 228.65

AVERAGE ENTHALPY = 1129.5 BTU/LB OF STEAM

ENTHALPY CALCULATION SHEET

PLANT : OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 3
DATE : 12-11-90

	STEAM PRESSURE	STEAM TEMPERATURE	FEED WATER TEMPERATURE
	370	700	260
	380	700	
	360	700	
	365	700	
	350	700	
AVERAGE	365.0 PSIG	700.0	260.0

P ABS = 379.7 PSIA

ENTHALPY @	800	'F AND	380	PSIA =	1416.4
ENTHALPY @	700	'F AND	380	PSIA =	1363.0
ENTHALPY @	700.0	'F AND	380	PSIA =	1363.0

ENTHALPY OF FEED WATER = 228.65

AVERAGE ENTHALPY = 1134.4 BTU/LB OF STEAM

APPENDIX IV

HEAT INPUT CALCULATION SHEETS

HEAT INPUT CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 1
DATE : 12-10-90

	STEAM INTEGRATOR READINGS	TIME	INTEGRATOR FACTOR
			1350
END	532979	13: 0	
			LBS/HR STEAM
BEGIN	532899	11: 50	
NET	80	70	

80 X 1350 / 70 MINS = 92571

92571 LBS/HR STEAM / 55% EFF. = 168312 EQUIV.

168312 LBS/HR STEAM X 1130 BTU/LB = 190.2 BTU(e6)/HR

	OIL INTEGRATOR READINGS	TIME	GALS/HR
END	0	13: 0	
BEGIN	0	11: 50	
NET	0 GALLONS	70 MINS =	0 GPH

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

ALLOWABLE EMISSIONS

BAGASSE	190.2	-	0	X	.3	=	57.0	LBS/HR
OIL			0	X	.1	=	.0	LBS/HR
TOTAL						=	57.0	LBS/HR

HEAT INPUT CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 2
DATE : 12-10-90

	STEAM INTEGRATOR READINGS	TIME	INTEGRATOR FACTOR
			1350
END	533141	15: 20	
			LBS/HR STEAM
BEGIN	533056	14: 10	
NET	85	70	

85 X 1350 / 70 MINS = 98357

98357 LBS/HR STEAM / 55% EFF. = 178831 EQUIV.

178831 LBS/HR STEAM X 1130 BTU/LB = 202.0 BTU(e6)/HR

	OIL INTEGRATOR READINGS	TIME	GALS/HR
END	0	15: 20	
BEGIN	0	14: 10	
NET	0 GALLONS	70	

0 MINS = 0 GPH

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

ALLOWABLE EMISSIONS

BAGASSE	202.0	-	0	X	.3	=	60.6	LBS/HR
OIL			0	X	.1	=	.0	LBS/HR
TOTAL						=	60.6	LBS/HR

HEAT INPUT CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 3
DATE : 12-11-90

	STEAM INTEGRATOR READINGS	TIME	INTEGRATOR FACTOR
END	534214	10: 35	1350
BEGIN	534133	9: 30	LBS/HR STEAM
NET	81	65	

81 X 1350 / 65 MINS = 100938

100938 LBS/HR STEAM / 55% EFF. = 183524 EQUIV.

183524 LBS/HR STEAM X 1134 BTU/LB = 208.2 BTU(e6)/HR

	OIL INTEGRATOR READINGS		TIME		GALS/HR
END	0		10: 35		
BEGIN	0		9: 30		
NET	0	GALLONS	65	MINS =	0 GPH

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

ALLOWABLE EMISSIONS

BAGASSE	208.2	-	0	X	.3	=	62.5	LBS/HR
OIL			0	X	.1	=	.0	LBS/HR
TOTAL						=	62.5	LBS/HR

APPENDIX V

EMISSION CALCULATION SHEETS

EMISSION CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 1
DATE : 12-10-90

	FILTER	BEAKER	BLANKS FILTER	BLANKS ACETONE
NO. :	3787	EE 204	3777	12
FINAL:	.7722	77.8981	.6443	73.2295
TARE :	.6371	77.8602	.6442	73.2285
NET :	.1351	.0379	.0001	.0010/200ML

VOLUME OF RINSE 340

WEIGHT = 173.00
RESIDUE = - 1.70

Mn = 171.30 Mg AS = 44.2 SQ FT

Qs = 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS) = 3382264 DSCFH

CS = (2.205 X 10-6) (Mn) / (VM STD) = 9.992e-6 LBS/SCF

CS' = 0.0154 (Mn) / (VM STD) = .07 GRAINS /SCF

PMR = (QS) (CS) = 33.80 LBS/HR

LOAD= MILLIONS OF BTU / HOUR INPUT = 190.2 BTU e6 / HR

CS = LBS / MILLION BTu = .178 LBS/ BTu e6

ALLOWABLE = 57.05 LBS/HR

= .30 LBS/ BTu e6

EMISSION CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 2
DATE : 12-10-90

	FILTER	BEAKER	BLANKS FILTER	BLANKS ACETONE
NO. :	3788	EE 209	3777	12
FINAL:	.7733	76.3182	.6443	73.2295
TARE :	.6328	76.3008	.6442	73.2285
NET :	.1405	.0174	.0001	.0010/200ML

VOLUME OF RINSE 200

WEIGHT = 157.90
RESIDUE = - 1.00

Mn = 156.90 Mg AS = 44.2 SQ FT

Qs = 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS) = 3378943 DSCFH

CS = (2.205 X 10-6) (Mn) / (VM STD) = 8.993e-6 LBS/SCF

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

PMR = (QS) (CS) = 30.39 LBS/HR

LOAD= MILLIONS OF BTU / HOUR INPUT = 202.0 BTU e6 / HR

CS = LBS / MILLION BTu = .150 LBS/ BTu e6

ALLOWABLE = 60.60 LBS/HR

= .30 LBS/ BTu e6

EMISSION CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 4

RUN #: COMP - 3
DATE : 12-11-90

	SAMPLES		BLANKS	
	FILTER	BEAKER	FILTER	ACETONE
NO. :	3789	EE217	3777	12
FINAL:	.7781	71.6890	.6443	73.2295
TARE :	.6330	71.6819	.6442	73.2285
NET :	.1451	.0071	.0001	.0010/200ML

VOLUME OF RINSE 200

WEIGHT = 152.20
RESIDUE = - 1.00

Mn = 151.20 Mg AS = 44.2 SQ FT

Qs = 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS) = 3446495 DSCFH

Avg = 3,402,567

CS = (2.205 X 10-6) (Mn) / (VM STD) = 8.672e-6 LBS/SCF

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

PMR = (QS) (CS) = 29.89 LBS/HR

LOAD= MILLIONS OF BTU / HOUR INPUT = 208.2 BTU e6 / HR

Avg = 200.1

CS = LBS / MILLION BTu = .144 LBS/ BTu e6

ALLOWABLE = 62.45 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 90,000
INT. FACTOR 1350
RUN # 4-1

BOILER # 4

POLLUTION COMPLIANCE TESTING
DATE: 12-10-90
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.
11:50	532899	56091	one meter	350	690	90,000	610	260
PM 12:05	532915			340	690	95,000	600	"
12:20	532933			390	700	95,000	720	"
12:35	532950			370	690	85,000	680	"
(6) 12:50	532967			360	690	90,000	640	"
1:00	532979	56091		370	690	90,000	600	"

BOILER PRESSURE DROP						CO_2
OVERFIRE AIR PRESS.						
AIR HEATER AIR OUT						
UNDERGRATE AIR PRESS.						
WIND BOX PRESSURE						
FURNACE PRESSURE	.25	.40	.30	.25	.25	
BLR. OUTLET PRESSURE	1.0	1.0	1.0	1.0	1.0	
DUST COLLECTOR OUT.						
SCRUBBER DIFF.	1.2	1.3	1.3	1.2	1.3	

BOILER TEMPERATURE				
BOILER OUTLET	710	740	720	720
AIR HEATER GAS OUT				
AIR HEATER AIR OUT	570	580	570	570
I.D. FAN	450	450	450	450
S.H. STEAM TEMP.	690	700	690	690

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

TEST RESULTS

OIL USED	None	GALS.
TOTAL TEST TIME	70	MINS.
INTERGATOR TIME	80	COUNT
INTERGRATOR STEAM	92,571	P.P.H
CHART READING	545,000	TOTAL
CHART AVERAGE	90,833	P.P.H.
I.D. FAN TURBINE	3000	RPM
STACK TEMPERATURE	144	°F
GRATE TEMPERATURE	None	°F
SCRUBBER WATER	400	G.P.M.

COMMENTS:

	"A"	"B"
(1) Mill speed	75	X F.P.M.

(2) using no oil burners.

Allowed = 57.00

Actual = 33.50

PLANT READINGS BY [signature]

% OF CAPACITY

CAPACITY 90,000
INT. FACTOR 1.350
RUN # 4-2

BOILER # 4

POLLUTION COMPLIANCE TESTING
DATE: 12-10-90
TESTED BY: Eastmount E&S

TIME	STEAM INTERGRATOR	OIL METER NORTH	OIL METER SOUTH	STEAM PRESS.	STEAM TEMP.	CHART READING LBS/HR.	FEED WATER PRESS.	FEED WATER TEMP.
2:10	533056	56091	One Meter	360	690	90,000	660	260
2:25	533072			355	690	95,000	650	"
2:40	533090			370	690	90,000	690	"
2:55	533108			350	690	95,000	600	"
3:10	533127			340	690	95,000	600	"
3:20	533141	56091		350	690	95,000	640	"

BOILER PRESSURE DROP					CO_2
OVERFIRE AIR PRESS.					
AIR HEATER AIR OUT					
UNDERGRATE AIR PRESS.					
WIND BOX PRESSURE	[redacted]				
FURNACE PRESSURE	.40	.40	.40	.40	
BLR. OUTLET PRESSURE	1.0	1.0	1.0	1.0	
DUST COLLECTOR OUT.					
SCRUBBER DIFF.	1.2	1.3	1.3	1.3	

BOILER TEMPERATURE				
BOILER OUTLET	730	730	720	720
AIR HEATER GAS OUT				
AIR HEATER AIR OUT	570	570	570	580
I.D. FAN	450	450	450	450
S.H. STEAM TEMP.	690	690	690	690

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

TEST RESULTS

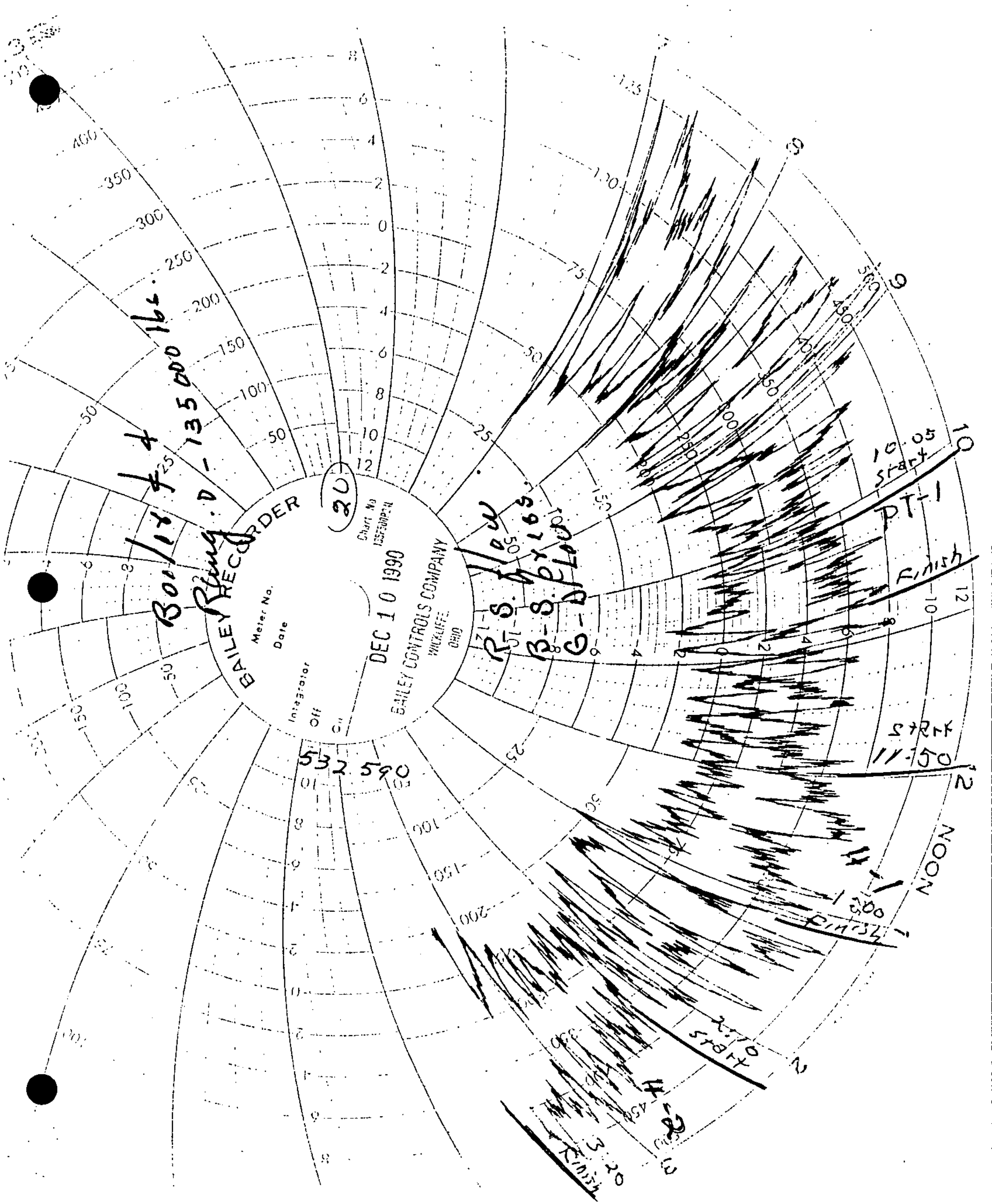
OIL USED	None	GALS.
TOTAL TEST TIME	70	MINS.
INTERGATOR TIME	85	COUNT
INTERGRATOR STEAM	98,357	P.P.H
CHART READING	560,000	TOTAL
CHART AVERAGE	93,333	P.P.H.
I.D. FAN TURBINE	3000	RPM
STACK TEMPERATURE	134	°F
GRATE TEMPERATURE	None	°F
SCRUBBER WATER	400	G.P.M.

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

Allowed = 60.60
Actual = 30.39

PLANT READINGS BY [signature]

% OF CAPACITY


BAILEY RECORDER
Meter No.
Date
Integrator
Off
On
DEC 10 1990
BAILEY CONTROLS COMPANY
WICKLIFFE
OHIO
20
532 590
10:05 Start
PT-1
Finish
Start 11:50
NOON
1:00 Finish
2:10 Start
3:20 Finish
H-1
H-2

CAPACITY 90,000
INT. FACTOR 1350
RUN # 4-3

BOILER # 4

POLLUTION COMPLIANCE TESTING
DATE: 12-11-90
TESTED BY: Eastmount E&G

TIME	STEAM INTERGRATOR	OIL METER North	OIL METER South	STEAM PRESS.	STEAM TEMP.	CHART READING LBS/HR.	FEED WATER PRESS.	FEED WATER TEMP.
9:30	534133	56091	one meter	370	700	95,000	690	260
9:45	534151			380	700	90,000	720	"
10:00	534170			360	700	95,000	680	"
10:15	534188			365	700	95,000	690	"
10:35	534214	56091		350	700	100,000	620	"

BOILER PRESSURE DROP					CO_2
OVERFIRE AIR PRESS.					
AIR HEATER AIR OUT					
UNDERGRATE AIR PRESS.					
WIND BOX PRESSURE					
FURNACE PRESSURE	.30	.30	.30	.30	
BLR. OUTLET PRESSURE	1.0	1.0	1.0	1.0	
DUST COLLECTOR OUT.					
SCRUBBER DIFF.	1.3	1.3	1.3	1.3	

BOILER TEMPERATURE				
BOILER OUTLET	760	740	760	770
AIR HEATER GAS OUT				
AIR HEATER AIR OUT	580	570	590	600
I.D. FAN	450	450	450	450
S.H. STEAM TEMP.	700	700	700	700

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

TEST RESULTS

OIL USED	None	GALS.
TOTAL TEST TIME	65	MINS.
INTERGATOR TIME	81	COUNT
INTERGRATOR STEAM	100,938	P.P.H.
CHART READING	475,000	TOTAL
CHART AVERAGE	95,000	P.P.H.
I.D. FAN TURBINE	3000	RPM
STACK TEMPERATURE	145	°F
GRATE TEMPERATURE	None	°F
SCRUBBER WATER	400	G.P.H.

COMMENTS:

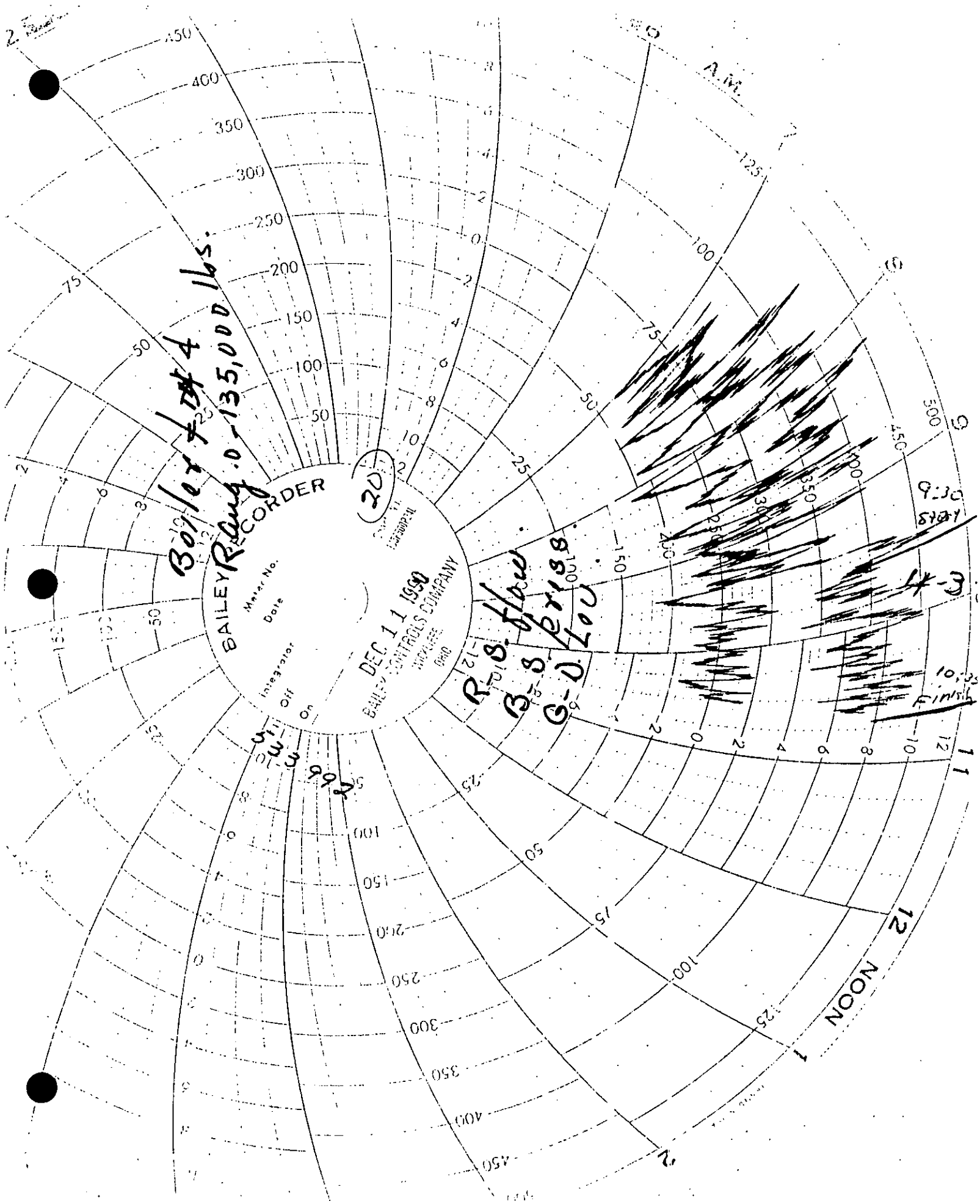
	"A"	"B"	
(1) Mill speed	75	75	F.P.M.

(2) using no oil burners.
(3) 9:50 stopped B mill - 5 Min

Allowed = 62.45
Actual = 29.89

PLANT READINGS BY George Dolan

% OF CAPACITY



BAILEY RECORDER
Meter No.
Date
Integrator
Off
On
DEC 11 1990
BAILEY CONTROLS COMPANY
ANCHORAGE
OHIO
Boiler #4
Rang. 0-135,000 lbs.
R-S flow
B-S Press
G-D Low
9:30 Start
10:35 Finish
A.M.
NOON

APPENDIX VIII

FIELD DATA SHEETS - STACK TESTING

FIELD DATA SHEET

GENERAL INFORMATION

Plant:	OKEELANTA	Run #:	Comp-1
Location:	UNIT 4	Date:	10 DEC 90
Ds (ft):	7.5 FT	No. Points:	24
Dn (in):	.305	Test Length:	60 min
Filter #:		End Meter Reading:	720.448
Cp:	.84	Int Meter Reading:	741.835
P bar:		Begin Time:	11:50
P stack:	.1	End Time:	13:00
IMP-1 (INT)	100 ml	IMP-1 (FINAL)	274
IMP-2 (INT)	100 ml	IMP-2 (FINAL)	118
IMP-3 (INT)	0 ml	IMP-3 (FINAL)	3ml
IMP-4 (INT)	500.0g	IMP-4 (FINAL)	516.5

	TEST 1	TEST 2	TEST 3
% CO2			
% O2			
% CO			

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

Comments:

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

Page 1 of 2

Sampling time per point: 2.5 min/pt

Plant: OKEE/ANTA

Run #: Compl. compliance-1

Location: UNIT 1

Date: 10 DEC 90

	Trav. No.	Delta P	Delta H	Meter Reading	5 DGM In	6 DGM Out	1 Hot Box	3 Impg Temp	2 Stack Temp	Vac
				741.835						
	A1	.18	1.188	743.285	76	76	288	56	140	1
12.0	2	.21	1.39	744.75	77	77	254	51	~~254~~ 140	1
	3	.23	1.52	746.50	80	77	252	53	142	1
	4	.23	1.51	747.66	82	77	238	56	143	1
	5	.24	1.58	749.29	82	77	270	56	145	1
10.5	6	.25	1.65	750.88	83	78	240	59	144	1
	7	.23	1.52	752.25	84	78	250	60	145	1
	8	.25	1.65	753.44	84	78	270	62	145	1
10.0	9	.25	1.65	755.62	86	79	270	59	141	1
	10	.25	1.65	757.19	87	80	240	56	142	1
	11	.26	1.72	758.54	87	81	245	54	145	1
	12	.25	1.65	760.515	88	80	262	53	144	1

Comments: DELTA P * 6.6 = DELTA H
BOX # 4 ; Y = 1.0001 , DELTA H @ = 2.03
START TIME : 1150
STOP TIME : 1300
INITIAL LEAK CHECK dead AT 15 INCHES HG
FINAL LEAK CHECK dead AT 1 INCHES HG

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

Page 2 of 2 | Sampling time per point: 2.5 min/pt

Plant: Okeelanta | Run #: compliance D

Location: UNIT 4 | Date: 10 DEC 90

	Trav. No.	Delta P	Delta H	Meter Reading	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
				760.667						
9:02	B 1	.20	1.32	762.11	82	81	270	55	142	1
11:4	2	.25	1.65	763.69	84	81	240	50	141	1
	3	.26	1.72	765.36	86	81	238	49	140	2
11:3	4	.27	1.78	767.05	87	82	253	52	142	2.5
	5	.27	1.78	768.72	88	82	265	52	141	3.0
11:9	6	.26	1.72	770.49	89	82	249	53	140	2.5
	7	.23	1.52	772.02	89	83	249	53	143	2.5
	8	.26	1.72	773.65	90	83	251	53	145	3.0
9:8	9	.26	1.72	775.29	90	84	258	53	145	3.0
	10	.28	1.85	777.01	90	84	253	53	143	3.5
10:2	11	.28	1.85	778.72	91	84	251	55	144	3.5
	12	.28	1.85	780.448	91	85	272	55	145	4.0

Comments: DELTA P = 6.6 = DELTA H
BOX # 4 ; Y = 1.001 , DELTA H @ = 2.03
START TIME : ____
STOP TIME : ____
INITIAL LEAK CHECK dodd AT 1. INCHES HG
FINAL LEAK CHECK .003 cu ft/min AT 4.0 INCHES HG

FIELD DATA SHEET

GENERAL INFORMATION

Plant:	OKEE/ANTA	Run #:	Comp-2
Location:	UNIT 4	Date:	10 DEC 90
Ds (ft):	7.5	No. Points:	24
Dn (in):	.305	Test Length:	60
Filter #:	3788	End Meter Reading:	820.025
Cp:	.84	Int Meter Reading:	780.700
P bar:	30.14	Begin Time:	14.15
P stack:	.1	End Time:	15:20
IMP-1 (INT)	100 ml	IMP-1 (FINAL)	295.0
IMP-2 (INT)	100 ml	IMP-2 (FINAL)	118.0
IMP-3 (INT)	0 ml	IMP-3 (FINAL)	3.0
IMP-4 (INT)	500.0 g	IMP-4 (FINAL)	511.1 g

	TEST 1	TEST 2	TEST 3
% CO2	8.6		
% O2	11.6		
% CO	0		

Project Director:	SEAN MACKAY	Field Laboratory:	MacKay/Nolan/Wescott
Meter Box Operator:	M. WESCOTT	Chain of Custody:	MACKAY
Probe Operator:	K. NOLAN	Plant Coordinator:	G. DEVANNE
Orsat Analyst:	MACKAY	Agency Rep:	K. TUCKER

Comments:

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

Page 1 of 2 | Sampling time per point: 2½

Plant: OKEELANTA | Run #: COMP - 2

Location: UNIT 4 | Date: 10 DEC 90

O_2 %	Trav. No.	Delta P	Delta H	Meter Reading	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
				780.700						
	A 1	.19	1.27	782.15	78	77	265	60	134	1
11.4	2	.23	1.54	783.68	78	77	262	53	143	1
	3	.25	1.68	785.32	80	77	263	52	143	1
	4	.27	1.81	787.05	80	77	264	53	142	1
	5	.28	1.87	788.75	83	79	262	54	144	1
11.0	6	.26	1.74	790.38	84	78	268	56	145	1
	7	.26	1.74	792.05	84	78	257	56	145	1
10.4	8	.26	1.74	793.71	86	78	265	56	145	1
	9	.27	1.81	795.48	86	80	266	57	145	1
	10	.26	1.74	797.10	87	81	259	57	145	1
10.6	11	.26	1.74	798.76	88	81	266	57	144	1
	12	.25	1.68	800.398	88	81	260	57	143	1

Comments: DELTA P * 6.7 = DELTA H
BOX # 4 ; Y = 1.001 , DELTA H @ 2.03
START TIME : 14:15
STOP TIME : 15:20
INITIAL LEAK CHECK .0 AT 15 INCHES HG
FINAL LEAK CHECK _____ AT _____ INCHES HG
INITIAL Pitot leak chk - 9000 @ 5" H_2O

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

Page 2 of 2 | Sampling time per point: 2½

Plant: OKEELANTA | Run #: Comp-2

Location: UNIT 4 | Date: 10 DEC 90

O2 %	Trav. No.	Delta P	Delta H	Meter Reading	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
				800.600						
	B1	.18	1.21	801.99	84	81	258	56	145	1
10.4	2	.22	1.47	803.45	85	82	262	51	144	1
	3	.25	1.68	805.05	87	82	263	51	144	1
10.5	4	.26	1.74	806.695	87	83	262	51	145	2
	5	.26	1.74	808.35	89	83	262	52	145	2
10.0	6	.25	1.68	809.99	89	83	263	53	143	2
	7	.25	1.68	811.63	90	83	261	53	145	2
	8	.26	1.74	813.28	90	83	255	53	147	2
	9	.26	1.74	814.935	90	84	253	53	146	2.5
	10	.27	1.81	816.63	90	84	253	54	148	3.0
9.0	11	.27	1.81	818.335	91	84	252	55	147	3.0
	12	.27	1.81	820.025	91	85	258	55	147	3.0

Comments: DELTA P * 6.7 = DELTA H
BOX # 4 ; Y = 1.0001 , DELTA H @ 2.03
START TIME : _____
STOP TIME : 15:20
INITIAL LEAK CHECK _____ AT _____ INCHES HG
FINAL LEAK CHECK _____ AT _____ INCHES HG

INTERMEDIATE LEAK CHK - good @ 5" Hg

FIELD DATA SHEET

GENERAL INFORMATION

Plant:	OKEELANTA	Run #:	Comp-3
Location:	UNIT 4	Date:	11 DEC 90
Ds (ft):	7.5 ft	No. Points:	24
Dn (in):	.305	Test Length:	60
Filter #:	3789	End Meter Reading:	820.920
Cp:	.84	Int Meter Reading:	860.055
P bar:	30.10	Begin Time:	09:30
P stack:	.1	End Time:	10:35
IMP-1 (INT)	100 ML	IMP-1 (FINAL)	268
IMP-2 (INT)	100 ML	IMP-2 (FINAL)	118
IMP-3 (INT)	0 ML	IMP-3 (FINAL)	0
IMP-4 (INT)	500.0g	IMP-4 (FINAL)	512.5g

	TEST 1	TEST 2	TEST 3
% CO2	8.9		
% O2	11.3		
% CO	0		

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

Comments:

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

TRAVERSE DATA SHEET

Page 1 of 2 | Sampling time per point: 2.5 min/pt

Plant: Okeelanta | Run #: Compliance-3

Location: Unit #4 | Date: 11 Dec 90

% O_2	Trav. No.	Delta P	Delta H	Meter Reading 820.920	ch 5 DGM In	ch 6 DGM Out	ch 1 Hot Box	ch 3 Impg Temp	ch 2 Stack Temp	Vac
	A 1	.21	1.71	822.485	69	66	269	48	141	1
11.0	2	.23	1.54	824.004	72	67	270	44	143	1
	3	.24	1.61	825.645	74	68	270	45	143	1
	4	.25	1.68	827.295	77	69	270	47	143	1.5
11.5	5	.27	1.81	828.90	79	70	267	47	141	1.5
	6	.25	1.68	830.63	80	71	248	48	141	2.0
11.0	7	.25	1.68	832.265	82	73	242	49	141	2.0
	8	.25	1.68	833.59	83	74	241	49	145	2.0
13.0	9	.26	1.74	835.53	83	75	255	50	140	2.0
	10	.25	1.68	837.15	85	76	266	51	142	2.0
11.0	11	.25	1.68	838.78	85	77	270	52	141	2.0
	12	.24	1.61	840.38	86	77	268	53	143	2.0

Relationship: 6.7
Box #: 4 Y: 1.001 Delta H@: 2.03
Start Time: 0930 End Time: _____
Pre Leak Ck: dead CFM @ 15 "Hg
Mid Leak Ck: dead CFM @ 20 "Hg (Vol: _____)
Post Leak CK: .0 CFM @ 5 "Hg
Pitot Leak CK: dead @ 5.6 "H2O
Box Oper: Mark Wagoll Probe Oper: Kieran Nolan
and intermediate leak check - dead @ 10 "Hg

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

Page ___ of ___ | Sampling time per point: 2.5 min/pt

Plant: Okeelanta | Run #: Unit 4 Compliance - 3

Location: Unit 4 | Date: 11 Dec 90

	Trav. No.	Delta P	Delta H	Meter Reading	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
				840.64						
% O_2 11.0	1	.21	1.41	841.95	82	78	270	51	142	2.0
	2	.23	1.54	843.535	84	79	268	48	143	2.0
	3	.25	1.68	845.004	86	80	270	49	143	2.0
11.5	4	.27	1.81	846.695	86	80	254	49	140	3.0
	5	.27	1.81	848.39	86	80	238	50	140	3.0
12.0	6	.25	1.68	850.004	87	81	246	51	142	3.0
	7	.23	1.54	851.63	87	81	270	52	142	3.0
11.5	8	.20	1.74	853.25	87	81	270	52	141	3.0
	9	.27	1.81	854.945	87	81	245	52	141	3.5
12.0	10	.27	1.81	856.645	87	81	251	53	143	4.0
	11	.27	1.81	858.355	87	81	270	53	142	4.0
11.0	12	.20	1.74	860.055	88	82	265	53	142	4.5

Comments: DELTA P * _____ = DELTA H
BOX # _____ ; Y = _____ , DELTA H @ _____
START TIME : _____
STOP TIME : _____
INITIAL LEAK CHECK _____ AT 15 INCHES HG
FINAL LEAK CHECK _____ AT _____ INCHES HG

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 BCG 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=

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

DELTA H @=

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

CALIBRATION BY: S. MacKAY

NOZZLE CALIBRATION SHEET

PROJECT NAME: OKEELANTA PROJECT NUMBER: 90 102

POINT#	NOZZLE# 19/64-1	NOZZLE # 1/4-2	NOZZLE#	NOZZLE #
1	.305	.256		
2	.305	.258		
3	.305	.257		
AVG.	.305	.257		

SEAN MACKAY
CALIBRATED BY:

30 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

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

December 26, 1990

RECEIVED
DEC 28 1990
Division of Environmental Engineering
PALM BEACH COUNTY
HEALTH DEPARTMENT

Fla. Dept. of Environmental Regulation
2269 Bay St.
Ft. Myers, Fla. 33901-2896

Attention: Mr. David Knowles, P.E.

Re: Atlantic Sugar Association - Belle Glade
Particulate Emissions Compliance Stack Tests
Boilers #3 and 4

Dear Mr. Knowles:

Enclosed are the Compliance Stack Test Reports for the referenced Boilers at Atlantic Sugar Assn.

You will observe that the test results verify that these boilers are operating in compliance with the applicable particulate emission standard.

Sincerely,

Frank S. Kleeman

Frank S. Kleeman, P.E.

Enclosures: 2

cc: Palm Beach County Health Unit - Air Pollution Section
Atlantic Sugar Assn. - Hector Cardentey

STACK TEST REVIEW DATA INPUT FORM

TEST DATE: _____

==========

FACILITY: Okeelanta Corporation APIS #: _____

DESCRIPTION: Boiler # 4

TESTING FIRM: Eastmount Corporation

PERMIT EMISSION LIMIT: .3 LB/MMBTU OR _____ LB/HR

AVERAGE HEAT INPUT: 200 MMBTU/HR

A's (AREA OF STACK): 44.2 FT2

==========

MEASURED PARAMETERS

		Run-1	Run-2	Run-3
1.	H2O impingers (V'i), milliliters	211.5	227.1	198.5
2.	H2O filter, grams	—	—	—
3.	M'n (particulate weight), grams	.1713	.1569	.1512
4.	V'm (gas volume metered), FT3	38.461	39.123	38.875
5.	Y (dry gas calibration factor)	1.001	1.001	1.001
6.	RDP (average square root dP)	.50	.50	.50
7.	dH (average delta H), inches H2O	1.66	1.69	1.65
8.	T'm (average meter temperature), F	83.0 ~~83.5~~	83.5	79.6
9.	T's (average stack temperature), F	142.8 ~~143~~	144.3	141.9
10.	P's (stack pressure, abs.) inches Hg	30.11 ~~30.15~~	30.15	30.11
11.	P'b (barometric pressure, abs.) inches Hg	30.10	30.14	30.10
13.	D'n (nozzle dia.), inches	.305	.305	.305
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

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 = 200 MBTU/HR
ALL REQUIRED LEAK TESTS ACCEPTABLE
ASSUMED M 'D=30.0 (COMBUSTION GASES)

COMMENT.....

RUN 1 :
ACTUAL A 'N = .0005074 SQ FT

COMMENT.....

RUN 2 :
ACTUAL A 'N = .0005074 SQ FT

COMMENT.....

RUN 3 :
ACTUAL A 'N = .0005074 SQ FT

COMMENT.....

DATE 04/25/91 FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
PARTICULATE STACK TEST VERIFICATION
DER METHOD 5

FACILITY NAME: OKEELANTA APIS #

COMPANY CONDUCTING TEST: EASTMOUNT TEST DATE 12 10 1990

SOURCE DESCRIPTION: BOILER 4

STACK TEST DATA SUMMATION

		RUN1	RUN2	RUN3
1.H2O	(VOL.MEAS.),ML	211.5	227.1	198.5
2.H2O	(MASS MEAS.),GM	0	0	0
3.M'N	PARTICULATE WEIGHT, GM	.1713	.1569	.1512
4.V'M	VOLUME METERED,CF	38.461	39.123	38.875
5.Y	DRY GAS MTR. CALIB.FCTR.	1.001	1.001	1.001
6.RDP	AVG SQR D.P-SAMPLING	.5	.5	.5
7.DH	AVG DELTA H,IN.H2O	1.66	1.69	1.65
8.T'M	AVG MTR. TEMP,DEG.F	83	83.5	79.6
9.T'S	AVG STACK TEMP,DEG.F	142.8	144.3	141.9
10.P'S	STACK PRESS,''HG(ABS)	30.11	30.13	30.11
11.P'B	BAROMETRIC PRESS,''HG	30.1	30.14	30.1
13.D'N	ACTUAL NOZZLE DIAM,IN	.305	.305	.305
14.T	ACTUAL SAMPLE TIME,MIN	60	60	60
15.C'P	PITOT TUBE COEFFICIENT	.84	.84	.84
23.S/T	VALUE:SAMPLE PTS/TOT PTS	1	1	1

RUN	VOLUME SAMPLED DSCF	MOISTURE CONTENT PERCENT	STACK VEL FPS	FLOW RATE DSCF/H	PERCENT ISO-KINETIC	ACTUAL EMISS LB/HR	ACTUAL EMISS LB/MBTU	ALLOW EMISS LB/MBTU
1	37.80	20.85	30.64	3,399,934	96.86	33.96	0.170	0.300
2	38.47	21.75	30.72	3,364,877	99.60	30.25	0.151	0.300
3	38.45	19.55	30.53	3,448,434	97.14	29.89	0.149	0.300
MEAN	38.24	20.71	30.63	3,404,415	97.87	31.37	0.157	0.300