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: 63

Title: Okeelanta Corporation Particulate Emissions Test Reprot Boiler #14

February 1991

Eastmount Engineering

Environmental Consultants — Air Quality Specialists

OKEELANTA CORPORATION

COMPLIANCE PARTICULATE EMISSIONS TEST REPORT

BOILER #14

PREPARED FOR:

Okeelanta Corporation
Okeelanta Sugar Division
South Bay, Florida 33493

CONCERNING:

Particulate Emissions Testing
Okeelanta Corporation
Boiler #14
South Bay Florida Facility
February 4 & 5, 1991

PREPARED BY:

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

Sean MacKay
Project Director

28 FEB 91
Date

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1.0 COMPENDIUM

Eastmount Engineering Inc., conducted a Compliance Particulate Emissions Test Program on Unit #14 at Okeelanta Corporation's South Bay, Florida facility on February 4 and 5, 1991. 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's 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 and oil as fuel. Boiler No. 14 is rated at 150,000 pounds of steam per hour. Results of the test program indicate Boiler No. 14 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 150 KPH
1	02-04-91	.105	30.19	.183	52.44	145029	96.7%
2	02-04-91	.123	35.06	.183	52.22	144277	96.2%
3	02-05-91	.130	35.87	.181	49.98	139800	93.2%
3 RUN AVG.		.119	33.71	.182	51.55	143035	95.4%

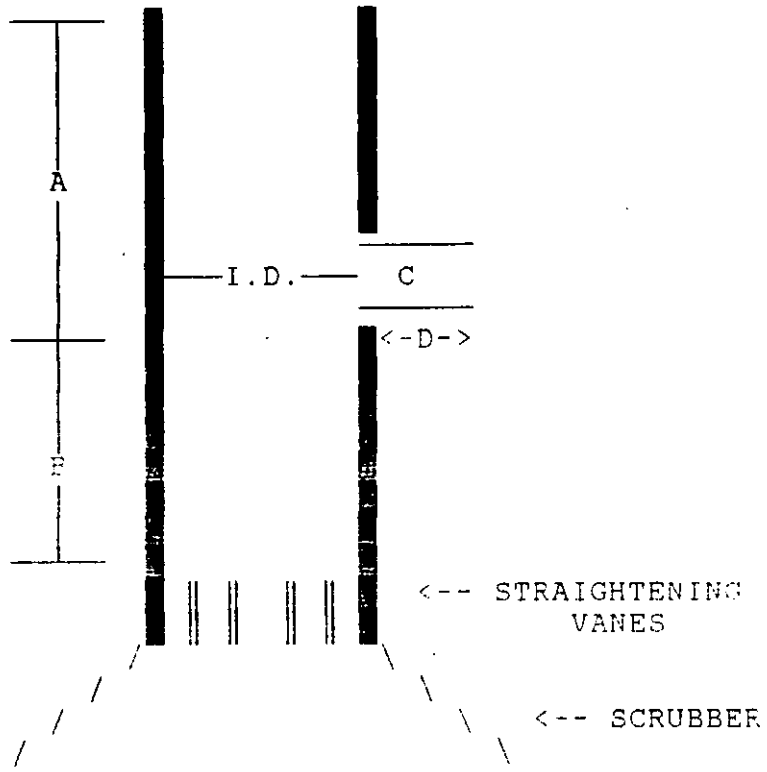
Sean MacKay, Project Director, was in charge of and responsible for all stack testing, conducted all calculations and maintained chain of custody of all samples. Mark Wescott operated the meter box and performed the field laboratory aspects of the program. Jim Jardin located the probe at the proper traverse point locations and assisted where required. Mr. Sherrel Culliver 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 # 14
SOUTH BAY, FLORIDA FACILITY

The following is a schematic of the stack which services Boiler #14 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.

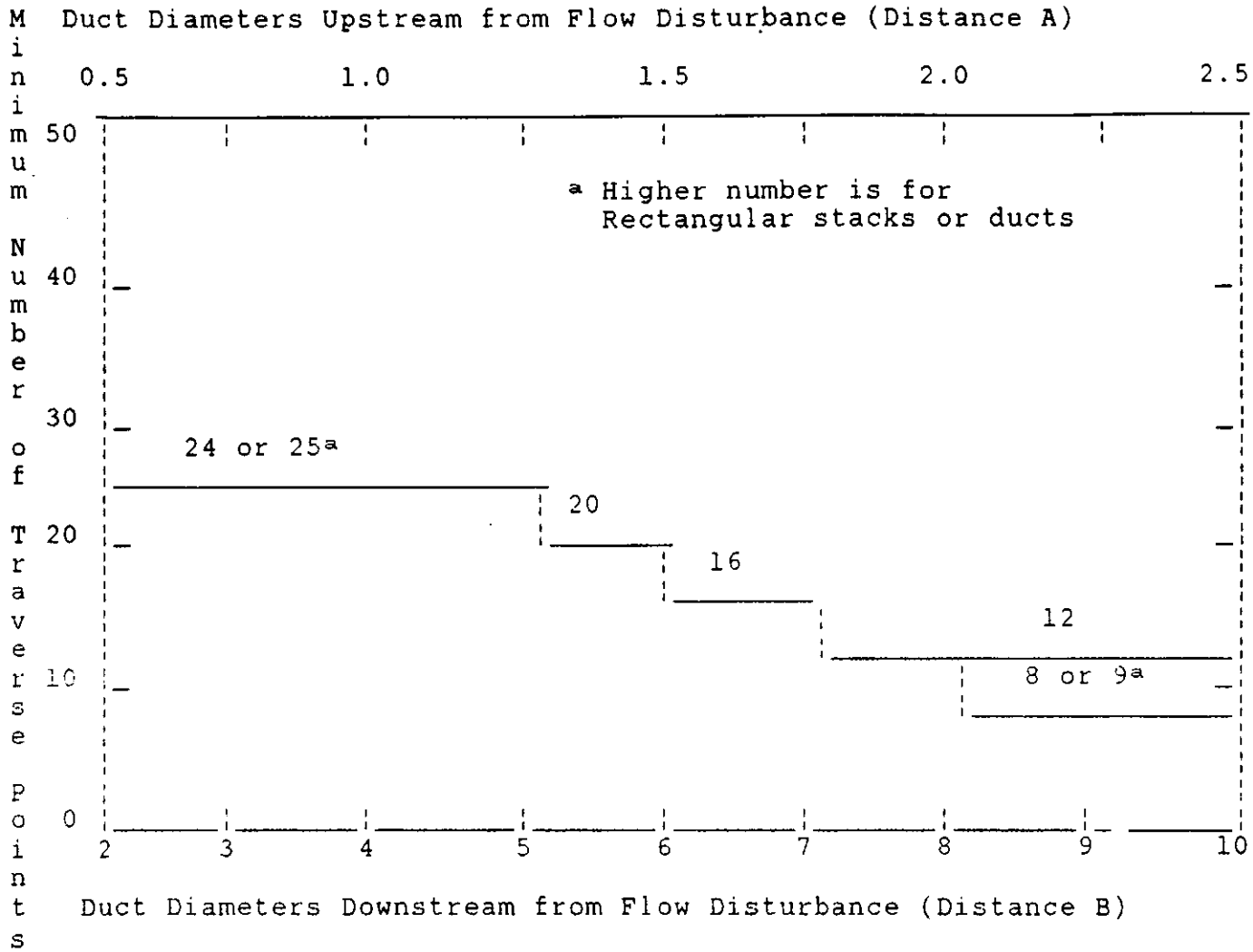


DISTANCE UPSTREAM FROM FLOW DISTURBANCE (A)	4'
DISTANCE DOWNSTREAM FROM FLOW DISTURBANCE (B)	16'
DIAMETER OF PORT SLEEVE (C)	4"
LENGTH OF PORT SLEEVE (D)	3.5"
NUMBER OF PORTS	2
INTERNAL DIAMETER OF STACK AT SAMPLING PORTS	7.5'

Drawing not to scale

3.0 NUMBER OF TRAVERSE POINTS AND SAMPLING TIME PER POINT

OKEELANTA CORPORATION
UNIT # 14
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 # 14
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 14

RUN #: COMP-1
DATE : 02-04-91

Ds (FT)	7.5
Dn (IN)	.305
FILTER#	3757
PIT COEFF	.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	500.0
IMP-1 (FIN)	229
IMP-2 (FIN)	134
IMP-3 (FIN)	2
IMP-4 (FIN)	516.9
% CO2	8.6
% O2	11.6
% CO	0
P BAR	30.12
P STK	.20
NO. PTS	24
TEST LNGTH	60
END METER	848.701
	.170
INT METER	798.662
BEGIN TIME:	12:00
END TIME:	13:10

TRAV PT	VEL HEAD	SQ ROOT	DELTA H	DRYGAS IN	DRYGAS OUT	STACK TEMP
A1	.33	.57	2.38	76	75	132
2	.36	.60	2.59	78	76	133
3	.40	.63	2.88	80	75	132
4	.41	.64	2.95	82	76	132
5	.42	.65	3.02	83	76	133
6	.42	.65	3.02	84	77	132
7	.43	.66	3.09	84	77	132
8	.45	.67	3.24	86	78	133
9	.44	.66	3.17	87	79	132
10	.45	.67	3.24	87	79	132
11	.45	.67	3.24	88	80	133
12	.42	.65	3.02	88	80	133
B1	.28	.53	2.02	84	80	132
2	.32	.57	2.30	85	80	133
3	.35	.59	2.52	87	81	132
4	.38	.62	2.74	87	81	132
5	.37	.61	2.66	88	82	132
6	.38	.62	2.52	89	82	132
7	.42	.65	3.02	89	82	132
8	.45	.67	3.24	90	83	132
9	.43	.66	3.10	90	83	133
10	.43	.66	3.10	90	82	132
11	.45	.67	3.24	91	83	132
12	.45	.67	3.24	92	84	132
AVERAGE	.40	.63	2.90	86.0	79.6	132.3

INPUT DATA SHEET

PLANT: OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-2
DATE : 02-04-91

Ds (FT)	7.5
Dn (IN)	.257
FILTER#	3758
PIT COEFF	.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	500.0
IMP-1 (FIN)	218
IMP-2 (FIN)	115
IMP-3 (FIN)	1
IMP-4 (FIN)	510.0
% CO2	8.8
% O2	11.4
% CO	0
P BAR	30.11
P STK	.20
NO. PTS	24
TEST LNGTH	60
END METER	886.513
	.189
INT METER	849.048
BEGIN TIME:	13:55
END TIME:	15:00

TRAV PT	VEL HEAD	SQ ROOT	DELTA H	DRYGAS IN	DRYGAS OUT	STACK TEMP
A1	.37	.61	1.37	78	78	131
2	.36	.60	1.33	78	78	132
3	.37	.61	1.37	81	79	132
4	.40	.63	1.48	82	78	132
5	.43	.66	1.59	83	79	131
6	.42	.65	1.55	83	79	131
7	.43	.66	1.59	84	79	131
8	.45	.67	1.67	85	80	131
9	.45	.67	1.67	85	80	134
10	.48	.69	1.78	86	80	132
11	.46	.68	1.70	87	81	132
12	.43	.66	1.59	86	81	135
B1	.28	.53	1.04	83	81	132
2	.28	.53	1.04	84	81	133
3	.31	.56	1.15	85	82	134
4	.34	.58	1.26	85	82	132
5	.38	.62	1.41	87	82	132
6	.38	.62	1.41	87	82	132
7	.43	.66	1.59	87	83	131
8	.46	.68	1.70	88	83	130
9	.45	.67	1.67	87	83	131
10	.45	.67	1.67	88	83	132
11	.42	.65	1.55	89	85	132
12	.44	.66	1.63	88	83	133
AVERAGE	.40	.63	1.49	84.8	80.9	132.0

INPUT DATA SHEET

PLANT: OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-3
DATE : 02-05-91

Ds (FT)	7.5
Dn (IN)	.257
FILTER#	3759
PIT COEFF	.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	500.0
IMP-1 (FIN)	226
IMP-2 (FIN)	110
IMP-3 (FIN)	2
IMP-4 (FIN)	510.8
% CO2	8.6
% O2	11.6
% CO	0
P BAR	30.11
P STK	.20
NO. PTS	24
TEST LNGTH	60
END METER	927.367
	.177
INT METER	892.318
BEGIN TIME:	10:00
END TIME:	11:10

TRAV PT	VEL HEAD	SQ ROOT	DELTA H	DRYGAS IN	DRYGAS OUT	STACK TEMP
A1	.25	.50	.95	75	75	131
2	.32	.57	1.22	76	75	133
3	.34	.58	1.29	78	75	132
4	.36	.60	1.37	79	76	132
5	.36	.60	1.37	80	76	126
6	.35	.59	1.33	82	77	127
7	.36	.60	1.37	82	77	126
8	.37	.61	1.41	83	78	126
9	.38	.62	1.44	84	78	128
10	.39	.62	1.48	85	79	127
11	.38	.62	1.44	85	79	126
12	.39	.62	1.48	86	80	125
B1	.27	.52	1.03	82	80	122
2	.29	.54	1.10	83	81	125
3	.29	.54	1.10	84	81	127
4	.30	.55	1.14	85	82	127
5	.31	.56	1.18	86	82	128
6	.31	.56	1.18	86	82	128
7	.35	.59	1.33	87	83	128
8	.39	.62	1.48	87	83	128
9	.40	.63	1.52	88	83	129
10	.41	.64	1.56	89	83	130
11	.37	.61	1.41	88	83	128
12	.37	.61	1.41	89	84	131
AVERAGE	.35	.59	1.32	83.7	79.7	127.9

APPENDIX II

ISOKINETIC CALCULATION SHEETS

ISOKINETIC CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-1
DATE : 02-04-91

TS (`F)=	132.3	% CO2=	8.6	VM (CF) =	49.869
TS (`R)=	592.3	% O2=	11.6	DELTA H (ABS)=	30.33
TM (`F)=	82.8	% CO=	0	PS (ABS) =	30.13
TM (`R)=	542.8	% N2=	79.8	SQRT DELTA P =	.634275
VI(TOT)=	181.9	CP=	.84	AREA NOZZLE =	.000507

Y = 1.001

VM STD = $17.64 \dfrac{(VM)(Y)(DELTA\ H\ ABS)}{(TM)}$ = 49.21 DSCF

VW STD = .04707 (VI TOT) = 8.56 CF

BWO = $\dfrac{VW\ STD}{VW\ STD + VM\ STD}$ = .148

BWO = MOISTURE FROM STEAM TABLES = .160

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

1-BWO = 1 - BWO = .852

Md (DRY) = .44 (% CO2)
+.32 (% O2)
+.28 (% CO)
+.28 (% N2)

= 29.84 LBS/LB MOLE

Ms (WET) = MD (1-BWO)
+ 18 (BWO)

= 28.09 LBS/LB MOLE

G = SQRT (TS / PS / MS) = .84

VS = 85.49(CP)(G)(SQRT DELTA P) = 38.1 FPS

H = 0.002669 (VI TOT) = .49

J = (DELTA H ABS)(VM)(Y) /(TM) = 2.79

K = (H) + (J) = 3.27

% ISO = $\dfrac{(TS)\ (K)\ (1.667)}{(TIME)\ (VS)\ (PS)\ (AN)}$ = 92.5

ISOKINETIC CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-2
DATE : 02-04-91

TS (`F)=	132.0	% CO2=	8.8	VM (CF) =	37.276
TS (`R)=	592.0	% O2=	11.4	DELTA H (ABS)=	30.22
TM (`F)=	82.9	% CO=	0	PS (ABS) =	30.12
TM (`R)=	542.9	% N2=	79.8	SQRT DELTA P =	.633128
VI(TOT)=	144.0	CP=	.84	AREA NOZZLE =	.000360

Y = 1.001

VM STD = $\frac{17.64 \quad (VM)(Y)(DELTA\ H\ ABS)}{(TM)}$ = 36.64 DSCF

VW STD = .04707 (VI TOT) = 6.78 CF

BWO = $\frac{VW\ STD}{VW\ STD + VM\ STD}$ = .156

BWO = MOISTURE FROM STEAM TABLES = .158

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

1-BWO = 1 - BWO = .844

Md (DRY) = .44 (% CO2)
+.32 (% O2)
+.28 (% CO)
+.28 (% N2)
= 29.86 LBS/LB MOLE

Ms (WET) = MD (1-BWO)
+ 18 (BWO)
= 28.01 LBS/LB MOLE

G = SQRT (TS / PS / MS) = .84

VS = 85.49(CP)(G)(SQRT DELTA P) = 38.1 FPS

H = 0.002669 (VI TOT) = .38

J = (DELTA H ABS)(VM)(Y) /(TM) = 2.08

K = (H) + (J) = 2.46

% ISO = $\frac{(TS)\ (K)\ (1.667)}{(TIME)\ (VS)\ (PS)\ (AN)}$ = 98.0

ISOKINETIC CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-3
DATE : 02-05-91

Avg = 131 Avg = 11.5

TS (`F)=	127.9	% CO2=	8.6	VM (CF) =	34.872
TS (`R)=	587.9	% O2=	11.6	DELTA H (ABS)=	30.21
TM (`F)=	81.7	% CO=	0	PS (ABS) =	30.12
TM (`R)=	541.7	% N2=	79.8	SQRT DELTA P =	.587246
VI(TOT)=	148.8	CP=	.84	AREA NOZZLE =	.000360

Y = 1.001

VM STD = $17.64 \dfrac{(VM)(Y)(DELTA\ H\ ABS)}{(TM)}$ = 34.34 DSCF

VW STD = .04707 (VI TOT) = 7.00 CF

BWO = $\dfrac{VW\ STD}{VW\ STD + VM\ STD}$ = .169

BWO = MOISTURE FROM STEAM TABLES = .142

VI TOT = ADJUSTED TO SATURATION VOLUME= 124.6 ML

1-BWO = 1 - BWO = .858

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

Ms (WET) = MD (1-BWO) + 18 (BWO) = 28.66 LBS/LB MOLE

G = SQRT (TS / PS / MS) = .83

VS = 85.49(CP)(G)(SQRT DELTA P) = 34.8 FPS

H = 0.002669 (VI TOT) = .33

J = (DELTA H ABS)(VM)(Y) /(TM) = 1.95

K = (H) + (J) = 2.28

% ISO = $\dfrac{(TS)\ (K)\ (1.667)}{(TIME)\ (VS)\ (PS)\ (AN)}$ = 98.6

APPENDIX III

ENTHALPY CALCULATION SHEETS

ENTHALPY CALCULATION SHEET

PLANT : OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-1
DATE : 02-04-91

STEAM PRESSURE	STEAM TEMPERATURE	FEED WATER TEMPERATURE
390	620	260
370	620	
380	600	
390	620	
380	600	
380	620	
AVERAGE 381.7 PSIG	613.3	260.0

P ABS = 396.4 PSIA

ENTHALPY @	700	'F AND	400	PSIA =	1362.1
ENTHALPY @	600	'F AND	400	PSIA =	1307.0
ENTHALPY @	613.3	'F AND	400	PSIA =	1314.3

ENTHALPY OF FEED WATER = 228.65

AVERAGE ENTHALPY = 1085.7 BTU/LB OF STEAM

ENTHALPY CALCULATION SHEET

PLANT : OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-2
DATE : 02-04-91

STEAM PRESSURE	STEAM TEMPERATURE	FEED WATER TEMPERATURE
395	620	260
390	600	
380	620	
375	620	
365	620	

AVERAGE	381.0 PSIG	616.0	260.0

P ABS = 395.7 PSIA

ENTHALPY @	700	'F AND	400	PSIA =	1362.1
ENTHALPY @	600	'F AND	400	PSIA =	1307.0
ENTHALPY @	616.0	'F AND	400	PSIA =	1315.8

ENTHALPY OF FEED WATER = 228.65

AVERAGE ENTHALPY = 1087.2 BTU/LB OF STEAM

ENTHALPY CALCULATION SHEET

PLANT : OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-3
DATE : 02-05-91

	STEAM PRESSURE	STEAM TEMPERATURE	FEED WATER TEMPERATURE
	390	620	260
	380	600	
	370	620	
	370	600	
	380	600	
	350	620	
AVERAGE	373.3 PSIG	610.0	260.0

P ABS = 388.0 PSIA

ENTHALPY @	700	'F AND	390	PSIA =	1362.5
ENTHALPY @	600	'F AND	390	PSIA =	1307.7
ENTHALPY @	610.0	'F AND	390	PSIA =	1313.2

ENTHALPY OF FEED WATER = 228.65

AVERAGE ENTHALPY = 1084.5 BTU/LB OF STEAM

APPENDIX IV

HEAT INPUT CALCULATION SHEETS

HEAT INPUT CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-1
DATE : 02-04-91

	STEAM INTEGRATOR READINGS	TIME	INTEGRATOR FACTOR
END	921037	13: 10	100
BEGIN	919345	12: 0	LBS/HR STEAM
NET	1692	70	145029

NET: 1692 X 100 / 70 MINS = 145029

145029 LBS/HR STEAM / 55% EFF. = 263688 EQUIV.

263688 LBS/HR STEAM X 1086 BTU/LB = 286.3 BTU(e6)/HR

	OIL INTEGRATOR READINGS	TIME	GALS/HR
END	709186	13: 10	
BEGIN	708811	12: 0	
NET	375 GALLONS	70	MINS = 321.429 GPH

321.4286 GPH X 150,000 BTU/GAL (EST) = 48.214 BTU(e6)/HR

ALLOWABLE EMISSIONS

BAGASSE	286.3	-	48	X	.2	=	47.6	LBS/HR
OIL			48	X	.1	=	4.8	LBS/HR
TOTAL						=	52.4	LBS/HR

HEAT INPUT CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-2
DATE : 02-04-91

	STEAM INTEGRATOR READINGS	TIME	INTEGRATOR FACTOR
END	923668	15: 0	100
BEGIN	922105	13: 55	LBS/HR STEAM
NET	1563 X 100	/ 65	MINS = 144277

144277 LBS/HR STEAM / 55% EFF. = 262322 EQUIV.

262322 LBS/HR STEAM X 1087 BTU/LB = 285.2 BTU(e6)/HR

	OIL INTEGRATOR READINGS	TIME	GALS/HR
END	709775	15: 0	
BEGIN	709427	13: 55	
NET	348 GALLONS	65	MINS = 321.231 GPH

321.2308 GPH X 150,000 BTU/GAL (EST) = 48.185 BTU(e6)/HR

ALLOWABLE EMISSIONS

BAGASSE	285.2	-	48	X	.2	=	47.4	LBS/HR
OIL			48	X	.1	=	4.8	LBS/HR
TOTAL						=	52.2	LBS/HR

HEAT INPUT CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-3
DATE : 02-05-91

	STEAM INTEGRATOR READINGS	TIME	INTEGRATOR FACTOR
			100
END	949727	11: 10	
			LBS/HR STEAM
BEGIN	948096	10: 0	
NET	1631	70	

1631 X 100 / 70 MINS = 139800

139800 LBS/HR STEAM / 55% EFF. = 254182 EQUIV.

254182 LBS/HR STEAM X 1085 BTU/LB = 275.7 BTU(e6)/HR

Avg = 282.4

	OIL INTEGRATOR READINGS	TIME	GALS/HR
END	715916	11: 10	
BEGIN	715515	10: 0	
NET	401 GALLONS	70	

Avg = 328.791

401 GALLONS 70 MINS = 343.714 GPH

343.7143 GPH X 150,000 BTU/GAL (EST) = 51.557 BTU(e6)/HR

Avg = 49.319

Total = 331.72

ALLOWABLE EMISSIONS

BAGASSE	275.7	-	52	X	.2	=	44.8	LBS/HR
OIL			52	X	.1	=	5.2	LBS/HR
TOTAL						=	50.0	LBS/HR

APPENDIX V

EMISSION CALCULATION SHEETS

EMISSION CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-1
DATE : 02-04-91

	SAMPLES		BLANKS	
	FILTER	BEAKER	FILTER	ACETONE
NO. :	3757	214	3747	216
FINAL:	.7824	74.921	.6434	79.1329
TARE :	.6424	74.9153	.6430	79.1327
NET :	.1400	.0057	.0004	.0002/200ML

VOLUME OF RINSE 270

WEIGHT = 145.70
RESIDUE = - .27

Mn = 145.43 Mg AS = 44.2 SQ FT

Qs = 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS) = 4632793 DSCFH

CS = (2.205 X 10-6) (Mn) / (VM STD) = 6.517e-6 LBS/SCF

CS' = 0.0154 (Mn) / (VM STD) = .05 GRAINS /SCF

PMR = (QS) (CS) = 30.19 LBS/HR

LOAD= MILLIONS OF BTU / HOUR INPUT = 286.3 BTU e6 / HR

CS = LBS / MILLION BTu = .105 LBS/ BTu e6

ALLOWABLE = 52.44 LBS/HR

= .183 LBS/ BTu e6

EMISSION CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-2
DATE : 02-04-91

	SAMPLES		BLANKS	
	FILTER	BEAKER	FILTER	ACETONE
NO. :	3758	216	3747	211
FINAL:	.7621	75.3177	.6435	79.1329
TARE :	.6434	75.3092	.6430	79.1327
NET :	.1187	.0085	.0005	.0002/200ML

VOLUME OF RINSE 220

WEIGHT = 127.20
RESIDUE = - .22

Mn = 126.98 Mg AS = 44.2 SQ FT

Qs = 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS) = 4587897 DSCFH

CS = (2.205 X 10-6) (Mn) / (VM STD) = 7.642e-6 LBS/SCF

CS' = 0.0154 (Mn) / (VM STD) = .05 GRAINS /SCF

PMR = (QS) (CS) = 35.06 LBS/HR

LOAD= MILLIONS OF BTU / HOUR INPUT = 285.2 BTU e6 / HR

CS = LBS / MILLION BTu = .123 LBS/ BTu e6

ALLOWABLE = 52.22 LBS/HR

= .183 LBS/ BTu e6

EMISSION CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 14

RUN #: COMP-3
DATE : 02-05-91

	SAMPLES		BLANKS	
	FILTER	BEAKER	FILTER	ACETONE
NO. :	3759	217	3747	211
FINAL:	.7696	76.598	.6434	79.1329
TARE :	.6465	76.5907	.6430	79.1327
NET :	.1231	.0073	.0004	.0002/200ML

VOLUME OF RINSE 285

WEIGHT = 130.40
RESIDUE = - .29

Mn = 130.12 Mg AS = 44.2 SQ FT

Qs = 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS) = 4293054 DSCFH

Avg=4507,581

CS = (2.205 X 10-6) (Mn) / (VM STD) = 8.355e-6 LBS/SCF

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

PMR = (QS) (CS) = 35.87 LBS/HR

LOAD= MILLIONS OF BTU / HOUR INPUT = 275.7 BTU e6 / HR

CS = LBS / MILLION BTu = .130 LBS/ BTu e6

ALLOWABLE = 49.98 LBS/HR

= .181 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.
o	Sampling time in minutes.

APPENDIX VII

FIELD DATA SHEETS - UNIT OPERATING CONDITIONS

CAPACITY 150,000
INT. FACTOR 100
RUN # 14-1

BOILER # 14

POLLUTION COMPLIANCE TESTING
DATE: 2-4-91
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.
PM 12:00	919345	708811	one meter	390	620	145,000	620	260°
12:15	919713			370	620	145,000	600	"
12:30	920074			380	600	145,000	610	"
12:45	920439			390	620	145,000	620	"
1:00	920800			380	600	145,000	610	"
1:10	921037	709186		380	620	135,000	650	"

BOILER PRESSURE DROP

OVERFIRE AIR PRESS.	9	9	9	9	8
AIR HEATER AIR OUT	1.8	1.8	1.9	1.9	1.8
UNDERGRATE AIR PRESS.	0	0	0	.10	.10
WIND BOX PRESSURE	.9	.9	1.0	1.0	1.0
FURNACE PRESSURE	.50	.50	.50	.50	.50
BLR. OUTLET PRESSURE	1.5	1.4	1.5	1.5	1.5
DUST COLLECTOR OUT.	3.8	3.5	3.6	3.8	3.5
SCRUBBER DIFF.	9.5	9.5	9.5	9.0	9.0

BOILER TEMPERATURE

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

PANEL SETTINGS %

FURNACE PRESSURE	.55
F.D. FAN PRESSURE	100
BAGASSE FEED	55
UNDERGRATE AIR	100
OVERFIRE AIR	52

TEST RESULTS

OIL USED	325	GALS.
TOTAL TEST TIME	70	MINS.
INTERGATOR TIME	1692	COUNT
INTERGRATOR STEAM	145,028	P.P.H.
CHART READING	860	TOTAL
CHART AVERAGE	143,333	P.P.H.
I.D. FAN TURBINE	4400	RPM
STACK TEMPERATURE	132	°F
GRATE TEMPERATURE	675	°F
SCRUBBER WATER	400	G.P.M.

COMMENTS:

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

(2) using oil burner - 52%

Allowed =

Actual =

PLANT READINGS BY [illegible]

% OF CAPACITY

3

CAPACITY 150,000
INT. FACTOR 100
RUN # 14-2

BOILER # 14

POLLUTION COMPLIANCE TESTING
DATE: 2-4-91
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.
PM 1:55	922105	709427	one meter	395	620	135,000	620	260°
2:10	922464			390	600	140,000	640	"
2:25	922839			380	620	138,000	630	"
2:40	923188			375	620	145,000	640	"
3:00	923668	709725		365	620	140,000	630	"

BOILER PRESSURE DROP

OVERFIRE AIR PRESS.	9	8	9	9	8
AIR HEATER AIR OUT	1.8	1.8	1.8	1.8	1.5
UNDERGRATE AIR PRESS.	0	7.0	0	0	0
WIND BOX PRESSURE	1.0	.80	1.0	1.0	.90
FURNACE PRESSURE	.50	.50	.50	.50	.50
BLR. OUTLET PRESSURE	1.5	1.5	1.5	1.6	1.5
DUST COLLECTOR OUT.	3.8	3.6	3.5	3.5	3.5
SCRUBBER DIFF.	10	9.5	10	9.5	8.5

BOILER TEMPERATURE

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

PANEL SETTINGS %

FURNACE PRESSURE	.58
F.D. FAN PRESSURE	100
BAGASSE FEED	55
UNDERGRATE AIR	100
OVERFIRE AIR	54

TEST RESULTS

OIL USED	348	GALS.
TOTAL TEST TIME	65	MINS.
INTERGATOR TIME	1563	COUNT
INTERGRATOR STEAM	144,277	P.P.H
CHART READING	698,000	TOTAL
CHART AVERAGE	139,600	P.P.H.
I.D. FAN TURBINE	4400	RPM
STACK TEMPERATURE 132	132	°F
GRATE TEMPERATURE	675	°F
SCRUBBER WATER	400	G.P.M.

COMMENTS:

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

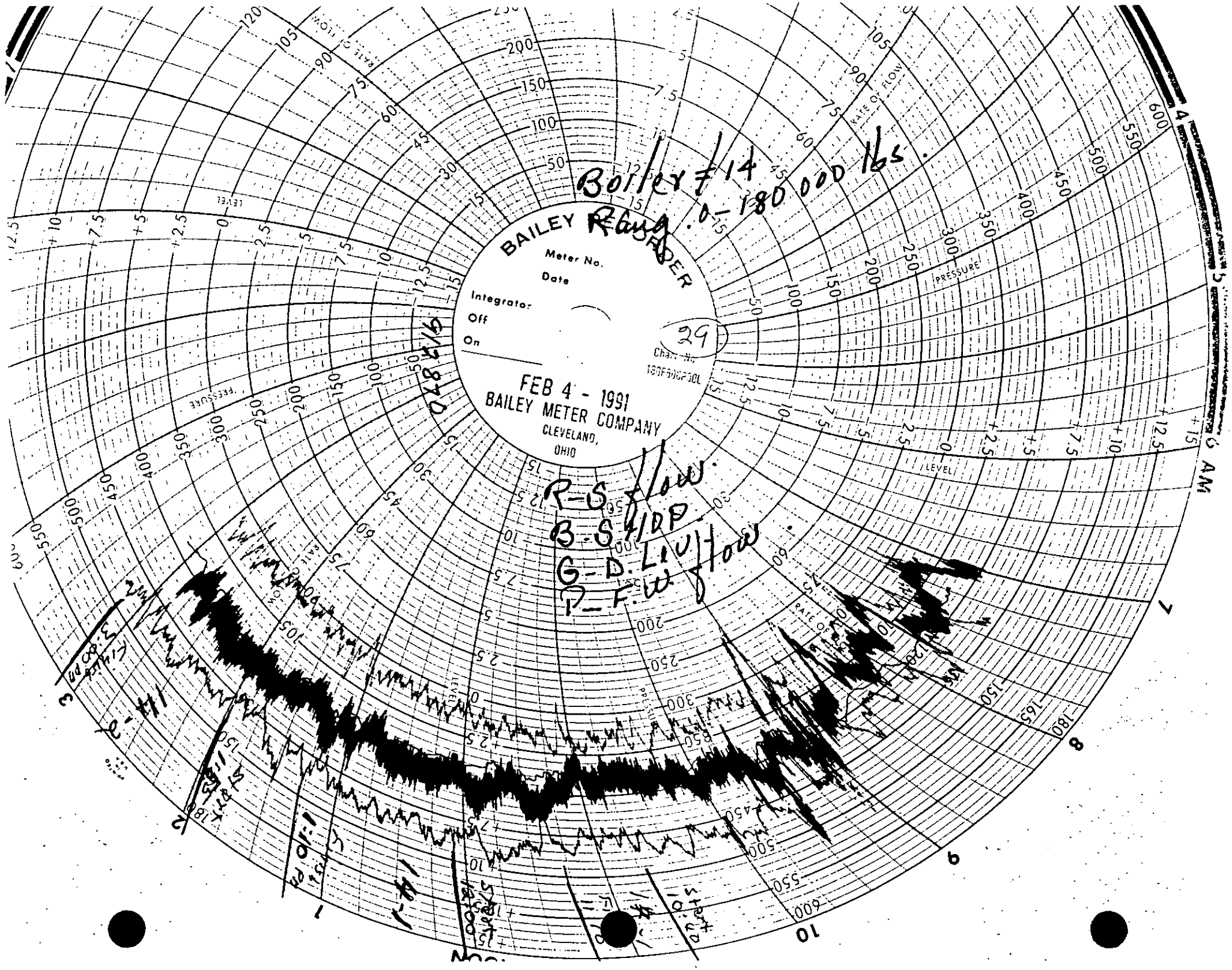
(2) using oil burner @ 52%
(3) "B" Mill stop 5 min. @ 2:45 PM

Allowed =

Actual =

PLANT READINGS BY George Dalton

% OF CAPACITY


Boiler #14
Rang. 0-180 000 lbs.
BAILEY RECORDER
Meter No.
Date
Integrator
Off
On
29
FEB 4 - 1991
BAILEY METER COMPANY
CLEVELAND, OHIO
R-S flow
B-S Δ/DP
G-D. Liu
P-F.W flow
RATE OF FLOW
PRESSURE
LEVEL
6 AM

CAPACITY 150,000
INT. FACTOR 100
RUN # 14-3

BOILER # 14

POLLUTION COMPLIANCE TESTING
DATE: 4-5-91
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.
AM 10:00	948096	715515	One meter	390	620	138,000	680	260
10:15	948448			380	600	135,000	680	"
10:30	948822			370	620	135,000	700	"
10:45	949141			370	600	135,000	680	"
11:00	949493			380	600	135,000	700	"
11:10	949727	715916		350	620	135,000	700	"

BOILER PRESSURE DROP

OVERFIRE AIR PRESS.	9	8	9	9
AIR HEATER AIR OUT	1.5	1.25	1.5	1.5
UNDERGRATE AIR PRESS.	.10	.20	0	0
WIND BOX PRESSURE	.8	.8	.9	.9
FURNACE PRESSURE	.50	.50	.50	.50
BLR. OUTLET PRESSURE	1.4	1.3	1.4	1.4
DUST COLLECTOR OUT.	3.2	3.2	3.0	3.0
SCRUBBER DIFF.	9.0	8.5	7.5	8.0

BOILER TEMPERATURE

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

PANEL SETTINGS %

FURNACE PRESSURE	42			
F.D. FAN PRESSURE	22			
BAGASSE FEED	55			
UNDERGRATE AIR	74			
OVERFIRE AIR	54			

TEST RESULTS

OIL USED	401	GALS.
TOTAL TEST TIME	70	MINS.
INTERGATOR TIME	1631	COUNT
INTERGRATOR STEAM	139,800	P.P.H.
CHART READING	813,000	TOTAL
CHART AVERAGE	135,500	P.P.H.
I.D. FAN TURBINE	4400	RPM
STACK TEMPERATURE	126	°F
GRATE TEMPERATURE	675	°F
SCRUBBER WATER	400	G.P.H.

COMMENTS: "A" "B"

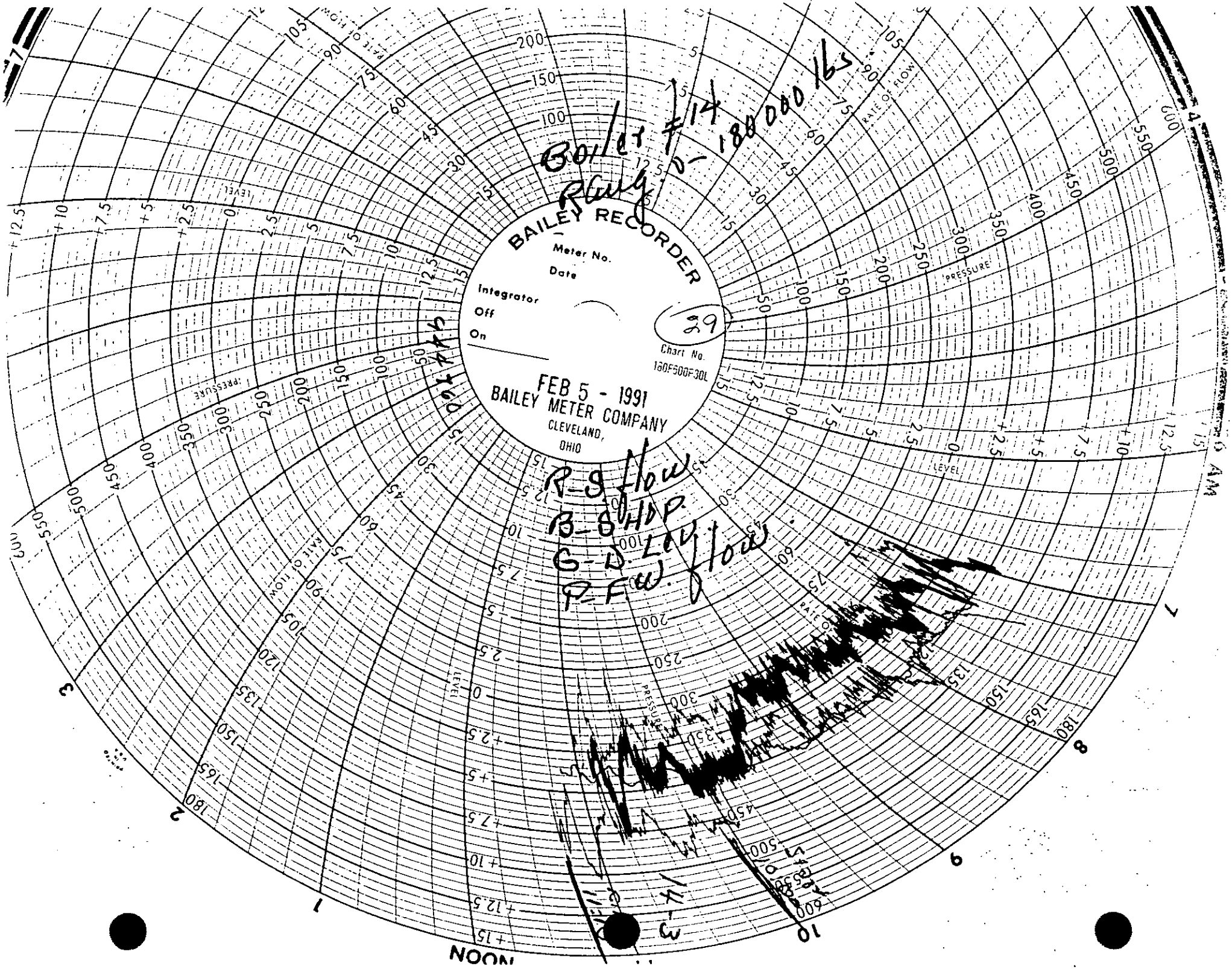
(1) Mill speed ____ ____ F.P.M.
(2) using oil burner @ 52%
(3) started testing with "B" mill down

Allowed =

Actual =

PLANT READINGS BY George Dalton

% OF CAPACITY


BAILEY RECORDER
Meter No.
Date
Integrator
Off
On
Chart No.
160F500F30L
FEB 5 - 1991
BAILEY METER COMPANY
CLEVELAND, OHIO
RATE OF FLOW
PRESSURE
LEVEL
NOON
Boiler #14
Rang 0-180000 lbs
R-S flow
B-S HDP
G-D Lev
P-F W. flow

APPENDIX VIII

FIELD DATA SHEETS - STACK TESTING

FIELD DATA SHEET

GENERAL INFORMATION

Plant:	OKEELANTA	Run #:	COMP-1
Location:	UNIT 14	Date:	4 FEB 91
Ds (ft):	7.5	No. Points:	24
Dn (in):	.305	Test Length:	60 MIN
Filter #:	3857	End Meter Reading:	848.701
Cp:	.84	Int Meter Reading:	798.662
P bar:	30.12	Begin Time:	1206
P stack:	.2	End Time:	1310
IMP-1 (INT)	100 ML	IMP-1 (FINAL)	229
IMP-2 (INT)	100 ML	IMP-2 (FINAL)	134
IMP-3 (INT)	0 ML	IMP-3 (FINAL)	2
IMP-4 (INT)	500.0 g	IMP-4 (FINAL)	516.9

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

Project Director:	S. MACKAY	Field Laboratory:	MACKAY/WESCOTT
Meter Box Operator:	M. WESCOTT	Chain of Custody:	S. MACKAY
Probe Operator:	J. JARDIN	Plant Coordinator:	G. DEVANE
Orsat Analyst:	S. MACKAY	Agency Rep:	K. TUCKER

Comments:

TRAVERSE DATA SHEET

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

Plant: Okeelanta | Run #: Comp-1

Location: Unit #14 | Date: 4 Feb 91

	Trav. No.	Delta P	Delta H	Meter Reading	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
A				798.62						
	1	.33	2.38	800.54	76	75	249	63	132	1.5
11.5	2	.34	2.59	802.53	78	76	263	57	133	2.0
	3	.40	2.88	804.50	80	75	255	59	132	2.0
12.0	4	.41	2.95	806.725	82	76	256	61	132	2.5
	5	.42	3.02	808.86	83	76	257	62	133	3.0
12.0	6	.42	3.02	811.03	84	77	258	64	132	3.0
	7	.43	3.09	813.135	84	77	259	66	132	3.0
	8	.45	3.24	815.295	86	78	258	66	133	3.5
5	9	.44	3.17	817.475	87	79	257	65	132	3.5
	10	.45	3.24	819.64	87	79	262	66	132	4.0
11.0	11	.45	3.24	821.82	88	80	262	66	133	4.0
	12	.42	3.02	823.952	88	80	263	68	133	4.0

Relationship: ~~BTCMW~~ 7.2
Box #: 4 Y: 1.001 Delta H@: 2.03
Start Time: _____ End Time: _____
Pre Leak Ck: dead CFM @ 15 "Hg
Mid Leak Ck: _____ CFM @ _____ "Hg (Vol: _____)
Post Leak CK: 0 CFM @ 6 "Hg
Pitot Leak CK: dead @ 6.5 "H2O
Box Oper: M. Wescott Probe Oper: J. Jordin

TRAVERSE DATA SHEET

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

Plant: Okeelanta | Run #: Comp-1

Location: Unit #14 | Date: 4 Feb 91

	Trav. No.	Delta P	Delta H	Meter Reading 824.122	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
B	1	.28	2.02	825.855	84	80	276	64	132	2.5
	2	.32	2.30	827.755	85	80	268	64	133	3.0
11.0	3	.35	2.52	829.725	87	81	270	66	132	3.0
	4	.38	2.74	831.74	87	81	253	67	132	4.0
11.5	5	.37	2.66	833.77	88	82	249	67	132	4.0
	6	.38	2.52	835.79	89	82	247	64	132	4.0
11.5	7	.42	3.02	837.88	89	82	249	63	132	4.5
	8	.45	3.24	840.055	90	83	268	63	132	5.0
11.5	9	.43	3.10	842.195	90	83	265	64	133	5.0
	10	.43	3.10	844.345	90	82	261	64	132	5.5
	11	.45	3.24	846.525	91	83	263	65	132	6.0
	12	.415	3.24	848.701	92	84	256	66	132	6.0

Relationship: ~~1.001~~ 7.2
Box #: 4 Y: 1.001 Delta H@: 2.03
Start Time: _____ End Time: _____
Pre Leak Ck: dead CFM @ 15 "Hg
Mid Leak Ck: dead CFM @ 4.0 "Hg (Vol: _____)
Post Leak CK: _____ CFM @ _____ "Hg
Pitot Leak CK: dead @ 6.5 "H2O
Box Oper: M. Wescott Probe Oper: J. Jardin

TRAVERSE DATA SHEET

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

Plant: Okeelanta | Run #: Comp-2

Location: Unit #14 | Date: 4 Feb 91

% O_2	Trav. No.	Delta P	Delta H	Meter Reading 849.048	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
	1	.37	1.37	850.555	78	78	267	64	131	1.0
11.5	2	.36	1.33	852.045	79	78	269	60	132	1.0
	3	.37	1.37	853.55	81	79	263	59	132	1.0
11.0	4	.40	1.48	855.10	82	78	263	60	132	1.0
	5	.43	1.59	856.735	83	79	265	60	131	1.0
11.0	6	.42	1.55	858.358	83	79	267	60	131	1.0
	7	.43	1.59	859.955	84	79	263	61	131	1.0
11.5	8	.45	1.67	861.005	85	80	262	61	131	1.0
	9	.45	1.67	863.325	85	80	264	62	134	1.0
11.5	10	.48	1.78	864.945	86	80	264	62	132	1.0
	11	.46	1.70	866.65	87	81	267	62	132	1.0
11.0	12	.43	1.59	868.193	86	81	266	63	135	1.0

Relationship: 3.7

Box #: 4 Y: 1.0001 Delta H@: 2.03

Start Time: 1355 End Time: 1500

Pre Leak Ck: dead CFM @ 15 "Hg

Mid Leak Ck: .0 CFM @ 5 "Hg (Vol: .189)

Post Leak CK: .0 CFM @ 2 "Hg

Pitot Leak CK: dead @ 7.5 "H2O

Box Oper: M. Wescott Probe Oper: J. Bolin

TRAVERSE DATA SHEET

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

Plant: Okeelanta | Run #: Comp-2

Location: Unit # 14 | Date: 4 Feb 91

	Trav. No.	Delta P	Delta H	Meter Reading 868.382	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
B										
O_2	1	.28	1.04	869.635	83	81	241	66	132	1.0
11.5	2	.28	1.04	870.87	84	81	267	64	133	1.0
	3	.31	1.15	872.235	85	82	268	62	134	1.0
11.5	4	.34	1.26	873.69	85	82	265	60	132	1.0
	5	.38	1.41	875.24	87	82	264	60	132	1.0
11.5	6	.38	1.41	876.78	87	82	265	60	132	1.0
	7	.43	1.59	878.41	87	83	267	60	131	1.0
11.5	8	.46	1.70	880.045	88	83	269	59	130	1.0
	9	.45	1.67	881.655	87	83	270	60	131	1.0
11.5	10	.45	1.67	883.301	88	83	268	60	132	1.0
	11	.42	1.55	884.80	89	85	269	62	132	1.0
11.0	12	.44	1.63	886.513	88	83	269	61	133	1.5

Relationship: 3.7
Box #: 4 Y: 1.001 Delta H@: 2.03
Start Time: _____ End Time: _____
Pre Leak Ck: dead CFM @ 15 "Hg
Mid Leak Ck: dead CFM @ 1.0 "Hg (Vol: _____)
Post Leak CK: dead CFM @ ~~7.5~~ "Hg
Pitot Leak CK: dead @ 7.5 "H2O
Box Oper: _____ Probe Oper: _____

FIELD DATA SHEET

GENERAL INFORMATION

Plant:	OKEELANTA	Run #:	COMP-2
Location:	UNIT 14	Date:	4 FEB 91
Ds (ft):	7.5	No. Points:	24
Dn (in):	.257	Test Length:	60 min
Filter #:	3758	End Meter Reading:	886.513
Cp:	.84	Int Meter Reading:	849.048
P bar:	30.11	Begin Time:	13:55
P stack:	.2	End Time:	15:00
IMP-1 (INT)	100 ML	IMP-1 (FINAL)	218
IMP-2 (INT)	100 ML	IMP-2 (FINAL)	115
IMP-3 (INT)	0 ML	IMP-3 (FINAL)	1.0
IMP-4 (INT)	500.09	IMP-4 (FINAL)	510.0

	TEST 1	TEST 2	TEST 3
% CO2	8.8		
% O2	11.4		
% CO	0		

Project Director:	S. MACKAY	Field Laboratory:	MACKAY / WESCOTT
Meter Box Operator:	M. WESCOTT	Chain of Custody:	S. MACKAY
Probe Operator:	J. JAROIN	Plant Coordinator:	G. DEVANE
Orsat Analyst:	S. MACKAY	Agency Rep:	K. TUCKER

Comments:

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

FIELD DATA SHEET

GENERAL INFORMATION

Plant:	OKEELANTA	Run #:	COMP-3
Location:	UNIT 14	Date:	5 FEB 91
Ds (ft):	7.5	No. Points:	24
Dn (in):	.257	Test Length:	60
Filter #:	3759	End Meter Reading:	927.367
Cp:	.84	Int Meter Reading:	892.318
P bar:	30.11	Begin Time:	10:00
P stack:	.2	End Time:	11:00

IMP-1 (INT)	100 ml	IMP-1 (FINAL)	226	126
IMP-2 (INT)	100 ml	IMP-2 (FINAL)	110	10
IMP-3 (INT)	0 ml	IMP-3 (FINAL)	2	2
IMP-4 (INT)	500.0g	IMP-4 (FINAL)	510.8g	10.8
				148.8

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

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

Comments: B Mill NOT OPERATING DURING TEST.

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

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

Plant: Okeelanta | Run #: Comp

Location: Unit #14 | Date: 5 Feb 91

	Trav. No.	Delta P	Delta H	Meter Reading	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
				892.318						
	1	.25	.95	893.535	75	75	258	68	131	2.0
11:5	2	.32	1.22	894.915	76	75	258	63	133	3.0
	3	.34	1.29	896.355	78	75	260	61	132	3.5
11:5	4	.36	1.37	897.845	79	76	257	61	132	4.0
	5	.36	1.37	899.335	80	76	254	62	126	4.0
11:0	6	.35	1.33	900.81	82	77	258	63	127	4.0
	7	.36	1.37	902.29	82	77	261	63	126	4.0
11:0	8	.37	1.41	903.79	83	78	263	64	126	4.5
	9	.38	1.44	905.32	84	78	265	62	128	4.5
	10	.39	1.48	906.855	85	79	255	57	127	5.0
	11	.38	1.44	908.79	85	79	258	57	126	5.0
12:0	12	.39	1.48	909.928	86	80	255	56	125	5.0

Comments: DELTA P = 3.8 = DELTA H
BOX # 4 ; Y = 1.001 , DELTA H @ = 2.03
3.8 Relationship
START TIME : 1200
STOP TIME : 1112
INITIAL LEAK CHECK DEAD AT 15 INCHES HG
FINAL LEAK CHECK .0 AT 6 INCHES HG
Pitot Leak Check : Good at 7.5" H_2O

B mill NOT OPERERATING DURING Test

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

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

Plant: Okeelanta | Run #: Comp-3

Location: Unit #14 | Date: 5 Feb 91

	Trav. No.	Delta P	Delta H	Meter Reading	DGM In	DGM Out	Hot Box	Impg Temp	Stack Temp	Vac
				910.1065						
	1	.27	1.03	911.38	82	80	266	64	122	3.0
12.0	2	.29	1.10	912.72	83	81	270	56	125	3.0
	3	.29	1.10	914.055	84	81	268	56	127	3.0
12.5	4	.30	1.14	915.42	85	82	264	57	127	3.5
	5	.31	1.18	916.81	86	82	261	57	128	3.5
11.5	6	.31	1.18	918.195	86	82	262	57	128	4.0
	7	.35	1.33	919.66	87	83	260	56	128	5.0
11.0	8	.39	1.48	921.155	87	83	257	57	128	5.0
	9	.40	1.52	922.745	88	83	258	56	129	6.0
10.5	10	.41	1.56	924.31	89	83	258	57	130	6.0
	11	.37	1.41	925.845	88	83	257	57	128	5.5
11.0	12	.37	1.41	927.307	89	84	254	58	131	6.0

Comments: DELTA P * 3.8 = DELTA H
BOX # 4 ; Y = 1.001 , DELTA H @ 2.03
START TIME : _____
STOP TIME : _____
INITIAL LEAK CHECK Dead AT 15 INCHES HG
FINAL LEAK CHECK Dead AT 6.0 INCHES HG

APPENDIX IX

EQUIPMENT CALIBRATION SHEETS

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

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

THERMOCOUPLE CALIBRATION SHEET

SET #: METER BOX #4 - IN DATE: 9/11/85

STANDARD ('F)	THERMOCOUPLE ('F)	% DIFFERENCE
32	27	1.02
63	57	1.15
204	201	.45
	MAXIMUM	1.15
	ALLOWABLE	1.50

SET #: METER BOX #4 - OUT DATE: 9/11/85

STANDARD ('F)	THERMOCOUPLE ('F)	% DIFFERENCE
32	27	1.02
63	57	1.15
204	202	.30
	MAXIMUM	1.15
	ALLOWABLE	1.50

CALIBRATION BY: C. LODI

CARL POE CO., INC. 99 REINERMAN ST. • HOUSTON, TEXAS 77007 • 713-861-3816

February 19, 1990

Eastmount Engineering
420 Main
Walpole, MA 02081

Dear Sirs:

This is to certify that your AL-19 American Wet Test Meter, serial no.P-468, has been calibrated with an American five foot bell prover, serial no. 2260. It is traceable to the Bureau of Standards, reference no. 106870, PI-TAPE.

Test Results are as follows:

FLOW RATE	% OF ERROR
60 CFH	+0.3%
30 CFH	0.0%
15 CFH	0.0%

Sincerely,

CARL POE CO., INC.

Carl W. Poe
CWP/mp

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

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 3 DEC 90

CALIBRATED BY: DATE:

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 3 DEC 90

CALIBRATED BY: DATE:

Plant. OKEELANTA
Location. Unit 14.

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

ENTER THE FOLLOWING:

		RUN1 165	RUN2 134	RUN3 138
1. H2O	COLLECTED (ONLY VOL.MEASURED),ML:			
2. H2O	COLLECTED (WEIGHED PART ONLY),GM:	16.9	10	10.8
3. M'N	PARTICULATE WEIGHT, GM:	0.14543	0.12698	0.13012
4. V'M	VOLUME METERED, CF:	49.869	37.276	34.872
5. Y	DRY GAS METER CAL FACTOR:	1.001	1.001	1.001
6. RDP	AVG SQR DELTA P (WHEN SAMPLING):	.634275	.633128	.587246
7. DH	AVG DELTA H, IN H2O:	2.90	1.49	1.32
8. T'M	AVG METER TEMP, DEG F:	82.8	82.9	81.7
9. T'S	AVG STACK TEMP, DEG F:	132.3	132	127.9
10. P'S*	STACK PRESS, *IN ....(.....):	20	20	20
11. P'B	BAROMETRIC PRESS, IN HG:	30.12	30.11	30.11
13. D'N	ACTUAL NOZZLE DIAMETER, IN.:	.305	.257	.257
14. T	ACTUAL SAMPLE TIME, MIN:	60	60	60
15. C'P	PITOT TUBE COEFFICIENT:	.84	.84	.84
OPTION ENTRIES:				
17.	ORSAT/FYRITE - %CO2:	8.6	8.8	8.6
18.	ORSAT/FYRITE - %O2:	11.6	11.4	11.6
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/HR	52.44	52.22	49.98

VI

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 = .0005074 SQ FT
P 'S = 30.32 IN HG

COMMENT.....

RUN 2 :
ACTUAL A 'N = .0003602 SQ FT
P 'S = 30.31 IN HG

COMMENT.....

RUN 3 :
ACTUAL A 'N = .0003602 SQ FT
P 'S = 30.31 IN HG
OVERSATURATED CONDITIONS: SATURATION MOISTURE ASSUMED/GIVEN PG.1

COMMENT.....

15'65

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

FACILITY NAME: plant okeelanta APIS # 0005

COMPANY CONDUCTING TEST: eastmount eng TEST DATE 3/13/1991

SOURCE DESCRIPTION: boiler14

STACK TEST DATA SUMMATION

		RUN1	RUN2	RUN3
1.H2O	(VOL.MEAS.),ML	165	134	138
2.H2O	(MASS MEAS.),GM	16.9	10	10.8
3.M'N	PARTICULATE WEIGHT, GM	.145	.127	.13
4.V'M	VOLUME METERED,CF	49.87	37.28	34.87
5.Y	DRY GAS MTR. CALIB.FCTR.	1.001	1.001	1.001
6.RDP	AVG SQR D.P-SAMPLING	.63	.63	.59
7.DH	AVG DELTA H,IN.H2O	2.9	1.49	1.32
8.T'M	AVG MTR. TEMP,DEG.F	82.8	82.9	81.7
9.T'S	AVG STACK TEMP,DEG.F	132.3	132	127.9
10.P'SG	STACK PRESS,''HG(GAUGE)	.2	.2	.2
11.P'B	BAROMETRIC PRESS,''HG	30.12	30.11	30.11
13.D'N	ACTUAL NOZZLE DIAM,IN	.305	.257	.257
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	49.21	14.82	37.64	4,606,688	93.07	29.921	51.550
2	36.64	15.61	37.70	4,572,067	98.36	34.931	51.550
3	34.33	14.12	35.07	4,358,868	96.68	36.379	51.550
MEAN	40.06	14.85	36.80	4,512,541	96.04	33.744	51.550