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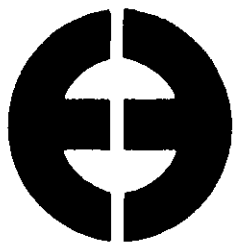
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AP-42 Section Number: 1.8

Reference Number: 50

Title: Okeelanta Corporation Compliance
Particulate Emissions Test Report
Boiler #11

January 1992



Eastmount Engineering

Environmental Consultants — Air Quality Specialists

Ref-38
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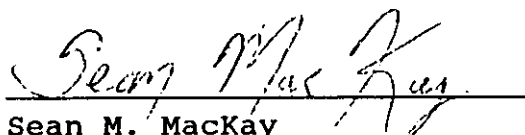
OKEELANTA CORPORATION
COMPLIANCE PARTICULATE EMISSIONS TEST REPORT
BOILER #11

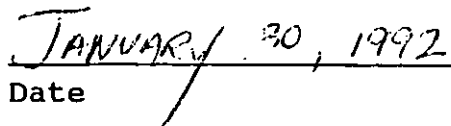
PREPARED FOR: Okeelanta Corporation
Okeelanta Sugar Division
South Bay, Florida 33493

CONCERNING: Particulate Emissions Testing
Okeelanta Corporation
Boiler #11
South Bay Florida Facility
January 21 & 22, 1992

PREPARED BY: Sean M. MacKay
Project Director
Eastmount Engineering, Inc.
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Walpole, MA 02081

I hereby certify that the information presented in this report is accurate and true to the best of my knowledge.


Sean M. MacKay
Project Director


Date

RAISA

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STACK TEST REVIEW DATA INPUT FORM

TEST DATE: January 21, 22, 1992South BayFACILITY: OK ee lauta Sugar Division APIS #: 1005DESCRIPTION: Boiler 11.TESTING FIRM: Castmount Eng., IncPERMIT EMISSION LIMIT: 200 LB/MMBTU OR 40.53 LB/HRAVERAGE HEAT INPUT: 202.66 MMBTU/HRA's (AREA OF STACK): 44.2 FT²

MEASURED PARAMETERS

	Run-1	Run-2	Run-3
1. H ₂ O impingers (V'i), milliliters	<u>290</u>	<u>285</u>	<u>296</u>
2. H ₂ O filter, grams	<u>13</u>	<u>.16</u>	<u>16</u>
3. M'n (particulate weight), grams	<u>138</u>	<u>.148</u>	<u>1487</u>
4. V'm (gas volume metered), FT ³	<u>54.48</u>	<u>54.</u>	<u>53.396</u>
5. Y (dry gas calibration factor)	<u>0.9911</u>	<u>.9911</u>	<u>.9911</u>
6. RDP (average square root dP)	<u>.95</u>	<u>.95</u>	<u>.93</u>
7. dH (average delta H), inches H ₂ O	<u>2.99</u>	<u>2.94</u>	<u>2.88</u>
8. T'm (average meter temperature), F	<u>102.3</u>	<u>102.3</u>	<u>97.5</u>
9. T's (average stack temperature), F	<u>145.3</u>	<u>145.5</u>	<u>147</u>
10. P's (stack pressure, abs.) inches Hg	<u>29.94</u>	<u>29.94</u>	<u>30.95</u>
11. P'b (barometric pressure, abs.) inches Hg	<u>29.99</u>	<u>29.94</u>	<u>30.95</u>
13. D'n (nozzle dia.), inches	<u>.260</u>	<u>.260</u>	<u>.260</u>
14. Sample Time, minutes	<u>60</u>	<u>60</u>	<u>60</u>
15. C'p (pitot tube coefficient)	<u>.84</u>	<u>.84</u>	<u>.84</u>
23. S/T (sample pts./total pts.)	<u>1</u>	<u>1</u>	<u>1</u>

Load:
207.8
199.6
200.6
202.66 / 1R

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Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

1.0 COMPENDIUM

Eastmount Engineering conducted a Compliance Particulate Emissions Test Program on Unit #11 at Okeelanta Corporation's South Bay, Florida facility on January 21 and 22, 1992. The test program consisted of a series of three EPA Method 5 tests.

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, 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 #11 has a maximum rated capacity of 125,000 pounds of steam per hour. The following table summarizes the emission results, the emission standards, and the boiler operating conditions.

RUN #	DATE	EMISSION RATE		ALLOWABLE		LOAD LB/HR	% OF 125 KPH
		LB/MMBtu	LB/HR	LB/MMBtu	LB/HR		
1	01-21-92	.184	38.19	.200	41.56	101,446	81.2%
2	01-22-92	.206	41.18	.200	39.92	97,200	77.8%
3	01-22-92	.199	40.01	.200	40.11	97,500	78.0%
3 RUN AVG.		.196	39.79	.200	40.53	98,715	79.0%

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. Brian Gibson operated the meter box and assisted in the field laboratory. Pat Wildman 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 and acted as liaison between Okeelanta Corporation and the Florida DER. Mr. George Devane was responsible for boiler operations and acquisition of all pertinent process data.

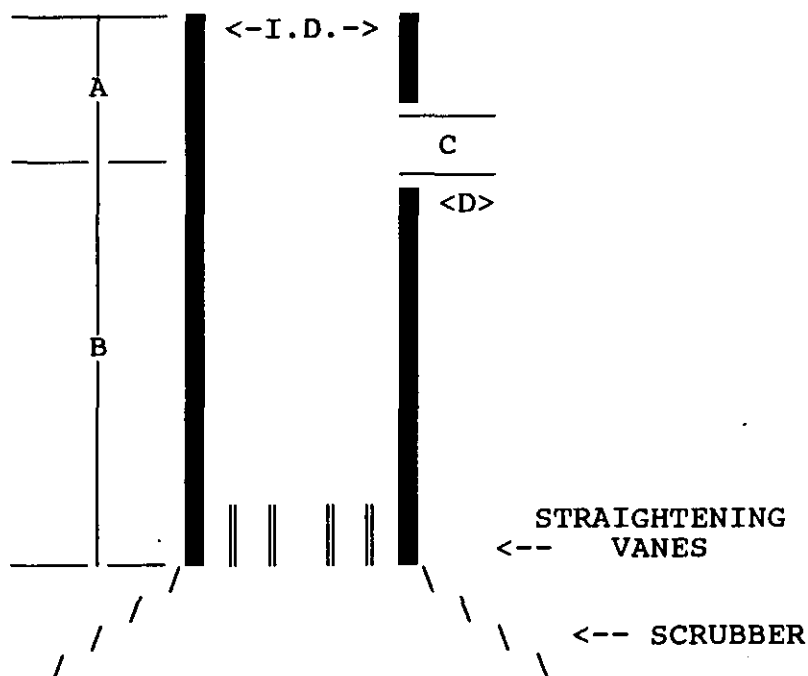
Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

2.0 STACK SCHEMATIC

OKEELANTA CORPORATION
Boiler #11
South Bay, Florida Facility

The following is a schematic of the stack which services Boiler #11 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.



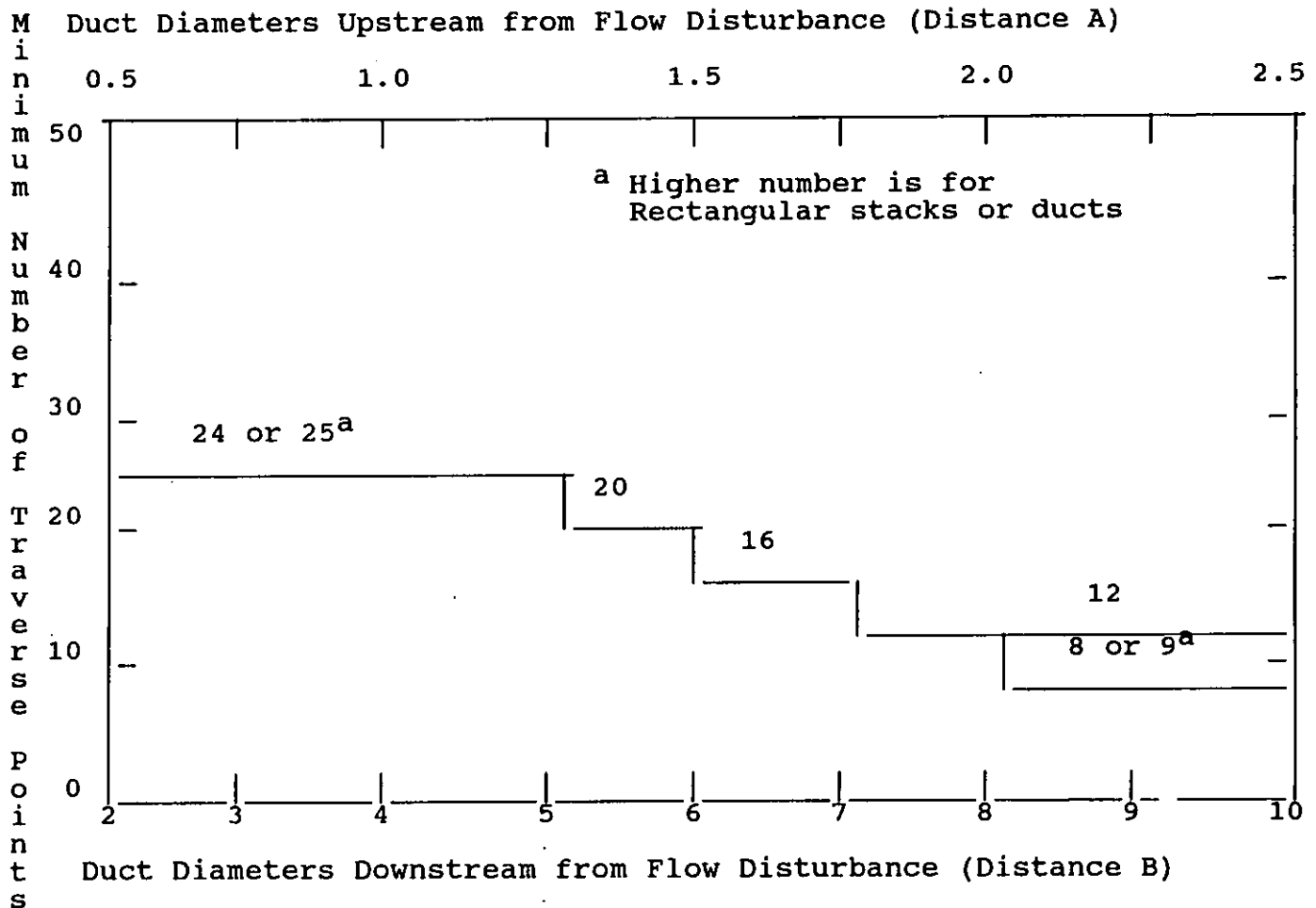
DISTANCE UPSTREAM FROM FLOW DISTURBANCE (A)	4'
DISTANCE DOWNSTREAM FROM FLOW DISTURBANCE (B)	16'
DIAMETER OF PORT SLEEVE (C)	4"
LENGTH OF PORT SLEEVE (D)	3.5"
NUMBER OF PORTS	2
INTERNAL DIAMETER OF STACK AT SAMPLING PORTS	7.5'

SCHEMATIC NOT TO SCALE

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

3.0 TRAVERSE POINT LOCATIONS AND SAMPLING TIME PER POINT

OKEELANTA CORPORATION
Boiler #11
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.

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

3.0 TRAVERSE POINT LOCATIONS AND SAMPLING TIME PER POINT (cont)

OKEELANTA CORPORATION
Boiler #11
South Bay, Florida Facility

DIAMETER OF STACK: 7.5 FEET
PORT SLEEVE LENGTH: 3.5 INCHES

TRAVERSE POINT	DISTANCE % OF DIAMETER	DISTANCE (INCHES)	PROBE MARKING (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.

4.1 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 $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$. 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.

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

4.0 SAMPLING TRAIN AND ANALYTICAL TEST PROCEDURES (cont.)

Gas Density Determination - An ORSAT type combustion analyzer, capable of measuring CO₂, O₂ 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.

4.2 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 relationships.

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.

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

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 $68 \pm 10^\circ\text{F}$ 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).

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

APPENDIX I

COMPUTER INPUT SHEETS

INPUT DATA SHEET

PLANT: OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-1
DATE : 01-21-92

Ds (FT)	7.5							
Dn (IN)	.260							
FILTER#	4395	TRAV	VEL	SQ	DELTA	DRYGAS	DRYGAS	STACK
PIT COEFF	.84	PT	HEAD	ROOT	H	IN	OUT	TEMP
IMP-1 (INT)	100	A1	2.20	1.48	6.60	83	78	145
		2	2.10	1.45	6.30	94	78	145
		3	1.60	1.26	4.80	102	79	145
IMP-2 (INT)	100	4	1.10	1.05	3.30	110	80	145
		5	.78	.88	2.34	117	82	145
IMP-3 (INT)	0	6	.52	.72	1.56	117	82	145
		7	.23	.48	.69	116	83	146
IMP-4 (INT)	500.0	8	.30	.55	.90	114	83	146
		9	.45	.67	1.35	114	84	145
IMP-1 (FIN)	350	10	.58	.76	1.74	117	85	145
		11	.75	.87	2.25	118	85	145
IMP-2 (FIN)	134	12	.75	.87	2.25	122	86	145
IMP-3 (FIN)	6	B1	1.90	1.38	5.70	120	87	144
		2	1.50	1.22	4.50	122	89	145
IMP-4 (FIN)	513.0	3	.96	.98	2.88	130	93	145
		4	.72	.85	2.16	130	90	145
% CO2	6.9	5	.35	.59	1.05	125	91	146
		6	.23	.48	.69	123	90	146
% O2	13.5	7	.66	.81	1.98	121	90	146
		8	1.00	1.00	3.00	122	90	146
% CO	0	9	1.10	1.05	3.30	128	91	146
		10	1.10	1.05	3.30	129	91	146
P BAR	29.99	11	1.30	1.14	3.90	132	92	145
		12	1.70	1.30	5.10	133	92	146
P STK	-.68							
NO. PTS	24							
TEST LNGTH	60							
END METER	542.781							
INT METER	488.300							
BEGIN TIME:	11:30							
END TIME:	12:35							
AVERAGE			1.00	.95	2.99	118.3	86.3	145.3

INPUT DATA SHEET

PLANT: OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-2
DATE : 01-22-92

Ds (FT)	7.5							
Dn (IN)	.260							
FILTER#	4396	TRAV	VEL	SQ	DELTA	DRYGAS	DRYGAS	STACK
PIT COEFF	.84	PT	HEAD	ROOT	H	IN	OUT	TEMP
		B1	2.30	1.52	6.90	100	77	145
IMP-1 (INT)	100	2	2.40	1.55	7.20	117	78	145
		3	1.50	1.22	4.50	120	78	145
IMP-2 (INT)	100	4	1.20	1.10	3.60	127	81	145
		5	.89	.94	2.67	127	82	145
IMP-3 (INT)	0	6	.53	.73	1.59	125	83	145
		7	.42	.65	1.26	123	83	145
IMP-4 (INT)	500.0	8	.49	.70	1.47	120	84	146
		9	.42	.65	1.26	119	84	146
IMP-1 (FIN)	345	10	.41	.64	1.23	118	84	146
		11	.47	.69	1.41	117	85	145
IMP-2 (FIN)	136	12	.44	.66	1.32	117	86	146
IMP-3 (FIN)	4	A1	1.40	1.18	4.20	108	84	146
		2	1.40	1.18	4.20	114	85	146
IMP-4 (FIN)	516.0	3	1.10	1.05	3.30	122	86	146
		4	.71	.84	2.13	122	86	146
% CO2	6.9	5	.46	.68	1.38	120	86	146
		6	.31	.56	.93	119	87	146
% O2	13.5	7	.48	.69	1.44	116	86	146
		8	.75	.87	2.25	118	87	145
% CO	0	9	1.10	1.05	3.30	122	87	145
		10	1.20	1.10	3.60	124	88	145
P BAR	29.94	11	1.50	1.22	4.50	129	89	146
		12	1.60	1.26	4.80	132	90	146
P STK	-.68							
NO. PTS	24							
TEST LNTH	60							
END METER	602.047							
INT METER	548.300							
BEGIN TIME:	09:40							
END TIME:	10:50							
AVERAGE			.98	.95	2.94	119.8	84.4	145.5

INPUT DATA SHEET

PLANT: OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-3
DATE : 01-22-92

Ds (FT)	7.5							
Dn (IN)	.260							
FILTER#	4397	TRAV	VEL	SQ	DELTA	DRYGAS	DRYGAS	STACK
PIT COEFF	.84	PT	HEAD	ROOT	H	IN	OUT	TEMP
		A1	2.20	1.48	6.60	90	78	147
IMP-1 (INT)	100	2	2.10	1.45	6.30	95	79	147
		3	1.60	1.26	4.80	106	79	147
IMP-2 (INT)	100	4	1.10	1.05	3.30	109	80	147
		5	.82	.91	2.46	113	81	146
IMP-3 (INT)	0	6	.52	.72	1.56	114	81	147
		7	.25	.50	.75	112	82	147
IMP-4 (INT)	500.0	8	.25	.50	.75	111	82	147
		9	.36	.60	1.08	111	82	147
IMP-1 (FIN)	354	10	.52	.72	1.56	111	83	147
		11	.65	.81	1.98	114	83	147
IMP-2 (FIN)	139	12	.69	.83	2.07	115	83	148
IMP-3 (FIN)	3	B1	1.50	1.22	4.50	111	86	147
		2	1.20	1.10	3.60	101	84	147
IMP-4 (FIN)	516.0	3	.92	.96	2.76	106	84	147
		4	.62	.79	1.86	110	84	147
% CO2	7.2	5	.45	.67	1.35	111	84	146
		6	.25	.50	.75	111	84	147
% O2	13.2	7	.50	.71	1.50	111	84	147
		8	.89	.94	2.67	117	85	147
% CO	0	9	1.10	1.05	3.30	120	85	147
		10	1.20	1.10	3.60	125	87	146
P BAR	30.95	11	1.70	1.30	5.10	129	87	149
		12	1.60	1.26	4.80	133	89	146
P STK	-.68							
NO. PTS	24							
TEST LGTH	60							
END METER	655.796							
INT METER	602.400							
BEGIN TIME:	12:05							
END TIME:	13:15							
AVERAGE			.96	.93	2.88	111.9	83.2	147.0

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

APPENDIX II

ISOKINETIC CALCULATION SHEETS

ISOKINETIC CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-1
DATE : 01-21-92

TS ('F) = 145.3	% CO2 = 6.9	VM (CF) = 54.481
TS ('R) = 605.3	% O2 = 13.5	DELTA H (ABS) = 30.21
TM ('F) = 102.3	% CO = 0	PS (ABS) = 29.94
TM ('R) = 562.3	% N2 = 79.6	SQRT DELTA P = .954118
VI (TOT) = 303.0	CP = .84	AREA NOZZLE = .000369

		Y = .9911
VM STD = 17.64	(VM) (Y) (DELTA H ABS) ----- (TM)	= 51.17 DSCF
VW STD = .04707	(VI TOT)	= 14.26 CF
BWO =	VW STD ----- VW STD + VM STD	= .218
BWO =	MOISTURE FROM STEAM TABLES	= .225
VI TOT =	ADJUSTED TO SATURATION VOLUME=	N/A ML
1-BWO =	1 - BWO	= .782
Md (DRY) =	.44 (% CO2) +.32 (% O2) +.28 (% CO) +.28 (% N2) -----	= 29.65 LBS/LB MOLE
Ms (WET) =	MD (1-BWO) + 18 (BWO) -----	= 27.11 LBS/LB MOLE
G =	SQRT (TS / PS / MS)	= .86
VS =	85.49 (CP) (G) (SQRT DELTA P)	= 59.2 FPS
H =	0.002669 (VI TOT)	= .81
J =	(DELTA H ABS) (VM) (Y) / (TM)	= 2.90
K =	(H) + (J)	= 3.71
% ISO =	(TS) (K) (1.667) ----- (TIME) (VS) (PS) (AN)	= 95.5

ISOKINETIC CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-2
DATE : 01-22-92

TS ('F) = 145.5	% CO2 = 6.9	VM (CF) = 53.747
TS ('R) = 605.5	% O2 = 13.5	DELTA H (ABS) = 30.16
TM ('F) = 102.1	% CO = 0	PS (ABS) = 29.89
TM ('R) = 562.1	% N2 = 79.6	SQRT DELTA P = .947014
VI(TOT) = 301.0	CP = .84	AREA NOZZLE = .000369

	Y = .9911	
VM STD = 17.64	(VM) (Y) (DELTA H ABS) ----- (TM)	= 50.41 DSCF
VW STD = .04707	(VI TOT)	= 14.17 CF
BWO =	VW STD ----- VW STD + VM STD	= .219
BWO =	MOISTURE FROM STEAM TABLES	= .226
VI TOT =	ADJUSTED TO SATURATION VOLUME	= N/A ML
1-BWO =	1 - BWO	= .781
Md (DRY) =	.44 (% CO2) +.32 (% O2) +.28 (% CO) +.28 (% N2) -----	= 29.65 LBS/LB MOLE
Ms (WET) =	MD (1-BWO) + 18 (BWO) -----	= 27.10 LBS/LB MOLE
G =	SQRT (TS / PS / MS)	= .86
VS =	85.49 (CP) (G) (SQRT DELTA P)	= 58.8 FPS
H =	0.002669 (VI TOT)	= .80
J =	(DELTA H ABS) (VM) (Y) / (TM)	= 2.86
K =	(H) + (J)	= 3.66
% ISO =	(TS) (K) (1.667) ----- (TIME) (VS) (PS) (AN)	= 95.0

ISOKINETIC CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-3
DATE : 01-22-92

TS ('F) = 147.0 Avg = 146 % CO2 = 7.2 VM (CF) = 53.396
 TS ('R) = 607.0 % O2 = 13.2 DELTA H (ABS) = 31.16
 TM ('F) = 97.5 % CO = 0 PS (ABS) = 30.90
 TM ('R) = 557.5 % N2 = 79.6 SQRT DELTA P = .934660
 VI (TOT) = 312.0 CP = .84 AREA NOZZLE = .000369

		Y = .9911
VM STD =	17.64 (VM) (Y) (DELTA H ABS) / (TM)	52.18 DSCF
VW STD =	.04707 (VI TOT)	14.69 CF
BWO =	VW STD / (VW STD + VM STD)	.220
BWO =	MOISTURE FROM STEAM TABLES	.227
VI TOT =	ADJUSTED TO SATURATION VOLUME	N/A ML
1-BWO =	1 - BWO	.780
Md (DRY) =	.44 (% CO2) +.32 (% O2) +.28 (% CO) +.28 (% N2)	29.68 LBS/LB MOLE
Ms (WET) =	MD (1-BWO) + 18 (BWO)	27.12 LBS/LB MOLE
G =	SQRT (TS / PS / MS)	.85
VS =	85.49 (CP) (G) (SQRT DELTA P)	57.1 FPS
H =	0.002669 (VI TOT)	.83
J =	(DELTA H ABS) (VM) (Y) / (TM)	2.96
K =	(H) + (J)	3.79
% ISO =	(TS) (K) (1.667) / ((TIME) (VS) (PS) (AN))	98.2

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

APPENDIX III

ENTHALPY CALCULATION SHEETS

ENTHALPY CALCULATION SHEET

PLANT : OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-1
DATE : 01-21-92

	STEAM PRESSURE	STEAM TEMPERATURE	FEEED WATER TEMPERATURE
	345	680	260
	340	680	
	320	680	
	320	680	
	335	680	
AVERAGE	332.0 PSIG	680.0	260.0
P ABS =	346.7 PSIA		
ENTHALPY @	700 'F AND	350 PSIA =	1366.2
ENTHALPY @	600 'F AND	350 PSIA =	1311.4
ENTHALPY @	680.0 'F AND	350 PSIA =	1355.2
ENTHALPY OF FEED WATER =		228.76	
AVERAGE ENTHALPY =		1126.5	BTU/LB OF STEAM

ENTHALPY CALCULATION SHEET -----

PLANT : OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-2
DATE : 01-22-92

	STEAM PRESSURE	STEAM TEMPERATURE	FEED WATER TEMPERATURE
	370	690	260
	365	690	
	380	690	
	335	690	
	345	690	
	350	690	
 AVERAGE	 357.5 PSIG	 690.0	 260.0
 P ABS =	 372.2 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 =		 228.76	
AVERAGE ENTHALPY =		1129.4	BTU/LB OF STEAM

ENTHALPY CALCULATION SHEET

PLANT : OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-3
DATE : 01-22-92

	STEAM PRESSURE	STEAM TEMPERATURE	FEED WATER TEMPERATURE
	345	690	260
	345	690	
	355	690	
	350	690	
	350	690	
	330	690	
 AVERAGE	 345.8 PSIG	 690.0	 260.0
 P ABS =	 360.5 PSIA		
 ENTHALPY @	 700 'F AND	 360 PSIA =	 1365.6
ENTHALPY @	600 'F AND	360 PSIA =	1310.6
ENTHALPY @	690.0 'F AND	360 PSIA =	1360.1
 ENTHALPY OF FEED WATER =		 228.76	
AVERAGE ENTHALPY =		1131.3	BTU/LB OF STEAM

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

APPENDIX IV
HEAT INPUT CALCULATION SHEETS

HEAT INPUT CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-1
DATE: 01-21-92

	<u>STEAM INTEGRATOR READINGS</u>		<u>TIME</u>		<u>INTEGRATOR FACTOR</u>
					100
END	727023		12: 35		
BEGIN	725924		11: 30		<u>LBS/HR STEAM</u>
	<u> </u>		<u> </u>		
NET	1099	X	100	/ 65 MINS =	101446

101446 LBS/HR STEAM / 55% EFF. = 184448 EQUIV.

184448 LBS/HR STEAM X 1126 BTU/LB = 207.8 BTU(e6)/HR

	<u>OIL INTEGRATOR READINGS</u>		<u>TIME</u>		<u>GALS/HR</u>
END	0		12: 35		
BEGIN	0		11: 30		
	<u>---</u>		<u>---</u>		
NET	0	GALLONS	65	MINS =	0 GPH

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

ALLOWABLE EMISSIONS

BAGASSE	207.8	-	0	X	.2	=	41.6	LBS/HR
OIL			0	X	.1	=	.0	LBS/HR
TOTAL						=	41.6	LBS/HR
							.200	LB/MMBTU

HEAT INPUT CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-2
DATE: 01-22-92

	<u>STEAM INTEGRATOR READINGS</u>	<u>TIME</u>	<u>INTEGRATOR FACTOR</u>
END	750427	10: 50	100
BEGIN	749293	9: 40	<u>LBS/HR STEAM</u>
NET	1134	X 100 / 70	MINS = 97200

97200 LBS/HR STEAM / 55% EFF. = 176727 EQUIV.

176727 LBS/HR STEAM X 1129 BTU/LB = 199.6 BTU(e6)/HR

	<u>OIL INTEGRATOR READINGS</u>	<u>TIME</u>	<u>GALS/HR</u>
END	0	10: 50	
BEGIN	0	9: 40	
NET	0	GALLONS 70	MINS = 0 GPH

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

ALLOWABLE EMISSIONS

BAGASSE	199.6	-	0	X	.2	=	39.9	LBS/HR
OIL			0	X	.1	=	.0	LBS/HR
TOTAL						=	39.9	LBS/HR
							.200	LB/MMBTU

HEAT INPUT CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-3
DATE: 01-22-92

	<u>STEAM INTEGRATOR READINGS</u>	<u>TIME</u>	<u>INTEGRATOR FACTOR</u>
END	752176 752801	12: 40 13:15	100
BEGIN	751638 752364	12: 5 12:50	LBS/HR STEAM
NET	538 437	X 100 / 60 MINS =	97500

97500 LBS/HR STEAM / 55% EFF. = 177273 EQUIV.

177273 LBS/HR STEAM X 1131 BTU/LB = 200.6 BTU(e6)/HR

	<u>OIL INTEGRATOR READINGS</u>	<u>TIME</u>	<u>GALS/HR</u>
END	0	12: 40 13:15	
BEGIN	0	12: 5 12:50	
NET	0 GALLONS	60 MINS =	0 GPH

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

ALLOWABLE EMISSIONS

BAGASSE	200.6	-	0	X	.2	=	40.1	LBS/HR
OIL			0	X	.1	=	.0	LBS/HR
TOTAL						=	40.1	LBS/HR
							.200	LB/MMBTU

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

APPENDIX V

PARTICULATE EMISSION CALCULATION SHEETS

PARTICULATE
EMISSION CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-1
DATE: 01-21-92

	SAMPLES		BLANKS		
	FILTER	BEAKER	FILTER	ACETONE	
	-----	-----	-----	-----	
NO. :	4395	C1	4398	6	
FINAL:	.7219	71.1600	.6022	69.8709	
TARE :	.6037	71.1399	.6020	69.8707	
	-----	-----	-----	-----	
NET :	.1182	.0201	.0002	.0002/200ML	
	VOLUME OF RINSE				280
WEIGHT =	138.30				
RESIDUE =	-	.28			
Mn =	138.02	Mg	AS =	44.2	SQ FT
Qs =	$3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)$		=	6420766	DSCFH
CS =	$(2.205 \times 10^{-6})(Mn) / (VM \text{ STD})$		=	5.947e-6	LBS/SCF
CS' =	$0.0154 (Mn) / (VM \text{ STD})$		=	.04	GRAINS /SCF
PMR =	$(QS) (CS)$		=	38.19	LBS/HR
LOAD=	MILLIONS OF BTU / HOUR INPUT		=	207.8	BTU e6 / HR
E =	LBS / MILLION BTu		=	.184	LBS/ BTu e6
ALLOWABLE			=	41.56	LBS/HR
			=	.200	LBS/ BTu e6

PARTICULATE
EMISSION CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-2
DATE: 01-22-92

	SAMPLES		BLANKS		
	FILTER	BEAKER	FILTER	ACETONE	
	-----	-----	-----	-----	
NO. :	4396	C2	4398	6	
FINAL:	.7130	71.5950	.6022	69.8709	
TARE :	.5954	71.5642	.6020	69.8707	
	-----	-----	-----	-----	
NET :	.1176	.0308	.0002	.0002/200ML	
			VOLUME OF RINSE 290		
WEIGHT =	148.40				
RESIDUE =	-	.29			
Mn =	148.11	Mg	AS =	44.2	SQ FT
Qs =	$3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)$		=	6356788	DSCFH
CS =	$(2.205 \times 10^{-6})(Mn) / (VM \text{ STD})$		=	6.479e-6	LBS/SCF
CS' =	$0.0154 (Mn) / (VM \text{ STD})$		=	.05	GRAINS /SCF
PMR =	(QS) (CS)		=	41.18	LBS/HR
LOAD=	MILLIONS OF BTU / HOUR INPUT		=	199.6	BTU e6 / HR
E =	LBS / MILLION BTu		=	.206	LBS/ BTu e6
ALLOWABLE			=	39.92	LBS/HR
			=	.200	LBS/ BTu e6

PARTICULATE
EMISSION CALCULATION SHEET

PLANT: OKEELANTA
LOCATION: UNIT 11

RUN #: COMP-3
DATE: 01-22-92

	SAMPLES		BLANKS	
	FILTER -----	BEAKER -----	FILTER -----	ACETONE -----
NO. :	4397	5	4398	6
FINAL:	.7200	70.3304	.6022	69.8709
TARE :	.6041	70.2973	.6020	69.8707
	-----	-----	-----	-----
NET :	.1159	.0331	.0002	.0002/200ML
			VOLUME OF RINSE	300
WEIGHT =	149.00			
RESIDUE =	-.30			
Mn =	148.70	Mg	AS =	44.2 SQ FT
Qs =	3600 (1-BWO) (VS) (AS) (17.64) (PS) / (TS)		=	6366803 DSCFH
				<i>Avg = 6,381,452</i>
CS =	(2.205 X 10 ⁻⁶) (Mn) / (VM STD)		=	6.284e-6 LBS/SCF
CS' =	0.0154 (Mn) / (VM STD)		=	.04 GRAINS / SCF
PMR =	(QS) (CS)		=	40.01 LBS/HR
LOAD=	MILLIONS OF BTU / HOUR INPUT		=	<i>Avg = 202.7</i> 200.6 BTU e6 / HR
E =	LBS / MILLION BTu		=	.199 LBS / BTu e6
ALLOWABLE			=	40.11 LBS/HR
			=	.200 LBS / BTu e6

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

APPENDIX VI
NOMENCLATURE SHEETS

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

NOMENCLATURE SHEET

PARTICULATE EMISSIONS 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.

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

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 Fahrenheit.
TS (°R)	The temperature of the stack in degrees Rankine.
T (Hot Box)	Temperature around the filter box, degrees Fahrenheit.
TM (°F)	Average temperature of the dry gas meter in degrees Fahrenheit.

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

NOMENCLATURE (cont'd)

TM ($^{\circ}$ 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.

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

APPENDIX VII

FIELD DATA SHEETS - UNIT OPERATING CONDITIONS

CAPACITY 125,000
INT. FACTOR 100
RUN 1 11-1

BOILER 1 11

QUALITY CONSTANT TESTING
DATE: 1-21-92
TESTED BY: ESTHOMAT E29

TIME	STEAM INTERGRATOR	OIL METER	STEAM PRESS.	TEMP.	LOADING LES/HR.	FEED WATER PRESS.	TEMP.	BOILER PRESSURE DROP
11:30 AM	725924	964770	345	680	100,500	620	260	OVERFIRE AIR PRESS. AIR HEATER INLET OUT (92) 5.5 5.5 5.5 5.5
11:45	726170		340	680	97,500	630	"	UNDERGRATE AIR PRESS. WIND BOX PRESSURE
12:00 PM	726430		320	680	102,000	610	"	FURNACE PRESSURE BLR. OUTLET PRESSURE
12:15	726689		320	680	102,000	610	"	DUST COLLECTOR OUT. SCRUBBER DIFF.
12:35	727023	964720	335	680	102,000	610	"	
								BOILER TEMPERATURE
								BOILER OUTLET : 660 660 660 660
								AIR HEATER GAS OUT
								AIR HEATER AIR OUT
								I.D. FAN
								S.H. STEAM TEMP. 680 680 680 680
								PANEL SETTINGS
								FURNACE PRESSURE
								F.D. FAN PRESSURE (1) (2) (3)
								BAGASSE FEED 92 30 25
								UNDERGRATE AIR
								OVERFIRE AIR

TEST RESULTS

OIL USED	None	GALS.
TOTAL TEST TIME	65	MINS.
INTERGRATOR TIME	1099	COUNT
INTERGRATOR STEAM	101,446	P.P.H
CHART READING	504,000	TOTAL
CHART AVERAGE	100,800	P.P.H
I.D. FAN TURBINE	4800	RPM
STACK TEMPERATURE	145	°F
GRATE TEMPERATURE	N.A.	°F
SCRUBBER WATER	Est	700 G.P.M.

COMMENTS:

"A" 85
"B" 85 F.P.H.
(1) Mill speed
(2) using no oil burner

Allowed =

Actual =

PLANT READINGS BY George Dabney
% OF CAPACITY

DATE: 1-22-92
TESTED BY: EAGLE

TEST RESULTS			
OIL USED	NONE	GALS.	
TOTAL TEST TIME	70	MINS.	
INTERGATOR TIME	1134	COUNT	
INTERGATOR STEAM	97,200	P. O. H.	
CHART READING	524,500	TOTAL	
CHART AVERAGE	95,750	P. O. H.	
L.O. FAN TURBINE	4800	RPM	
STACK TEMPERATURE	145	F	
GRATE TEMPERATURE	N.A.	°C	
SCRUBBER WATER	760	G.P.H.	Est

REMARKS: "A" 85 "B" 85 F.P.H.
(1) Mil speed (2) using no oil burners.

Actual =

2025

CAPACITY 125,000
 INT. FACTOR 1.00
 RUN 1 11-3

BOILER 1 11

COLLECTION COMPLETION TESTING
 DATE: 1-22-92
 TESTED BY: EASTMONT E-9

TIME	STEAM INTERGRATOR	OIL METER		STEAM		READING LBS/HR.	FEED WATER		BOILER PRESSURE DROP			
		WORTH	SOUPA	PRESS.	TEMP.		PRESS.	TEMP.	OVERFIRE AIR PRESS.	AIR HEATER AIR OUT	UNDERGRATE AIR PRESS.	WIND BOX PRESSURE
12:05 PM	751638	964420	1077010	345	690	100,500	610	260				
12:20	751888			345	680	97,500	620	"				
12:35	752140			355	690	100,500	640	"			4.3	1.3
12:40	752126	538		MILL STOP								
12:50	752364	964420	1077010	350	690	97,500	620	260				
1:05 PM	752613			350	690	100,500	660	"				
1:15	752801	437		330	690	102,500	600	"				
		538										
		725										
BOILER TEMPERATURE												
									BOILER OUTLET	620	620	620
									AIR HEATER GAS OUT			
									AIR HEATER AIR OUT			
									I.D. FAN			
									S.H. STEAM TEMP.	690	690	690
PANEL SETTINGS												
									FURNACE PRESSURE			
									F.D. FAN PRESSURE	11	12	13
									BAGASSE FEED	28	32	32
									UNDERGRATE AIR			
									OVERFIRE AIR			

TEST RESULTS

OIL USED	None	GALS.
TOTAL TEST TIME	60	MINS.
INTERGRATOR TIME	925	COUNT
INTERGRATOR STEAM	97,500	P.O.H.
CHART READING	599,000	TOTAL
CHART AVERAGE	99,833	P.P.H.
I.D. FAN TURBINE	4800	RPM
STACK TEMPERATURE	146	°F
GRATE TEMPERATURE	N.A.	°F
SCRUBBER WATER	Est	700 G.P.M.

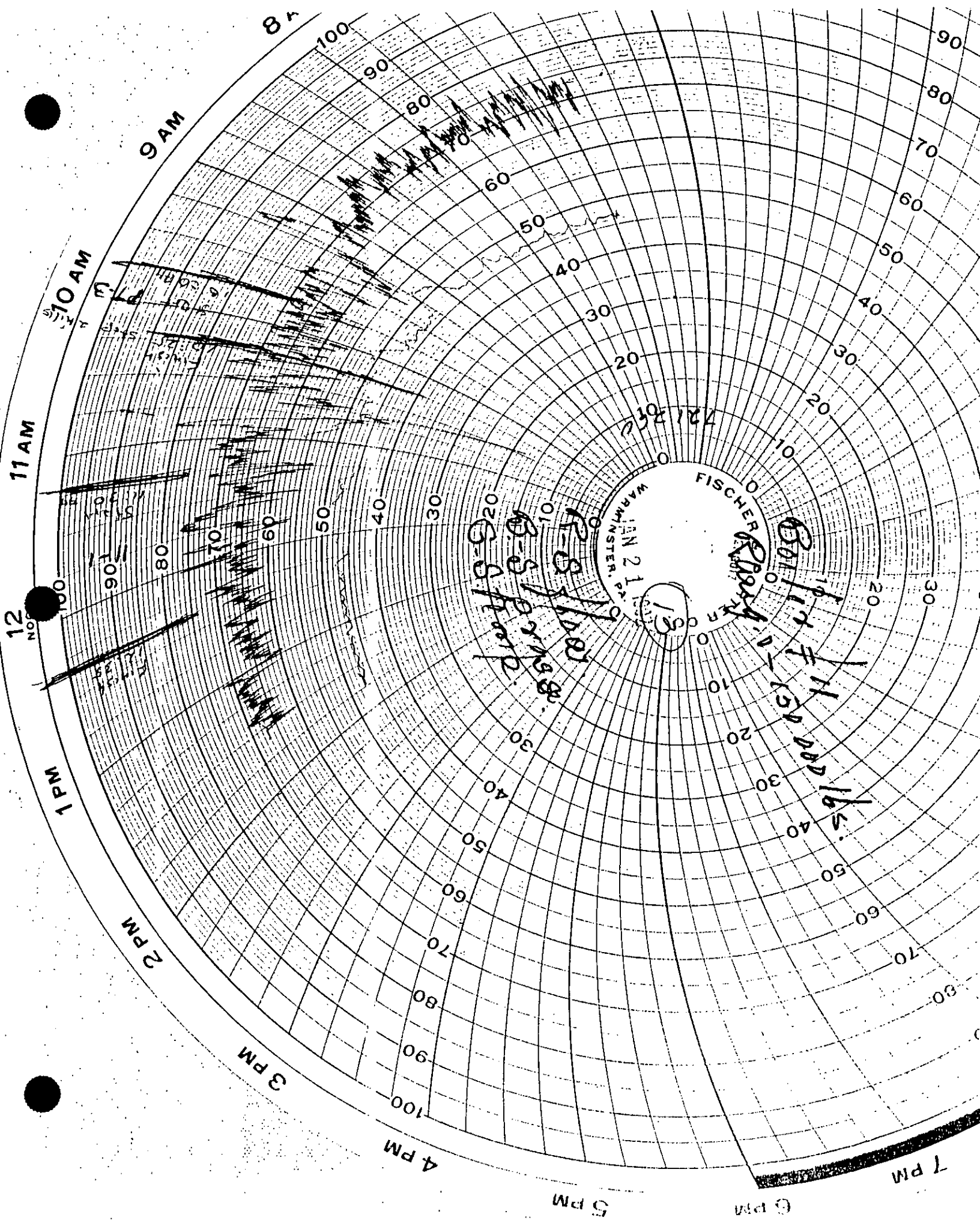
COMMENTS:

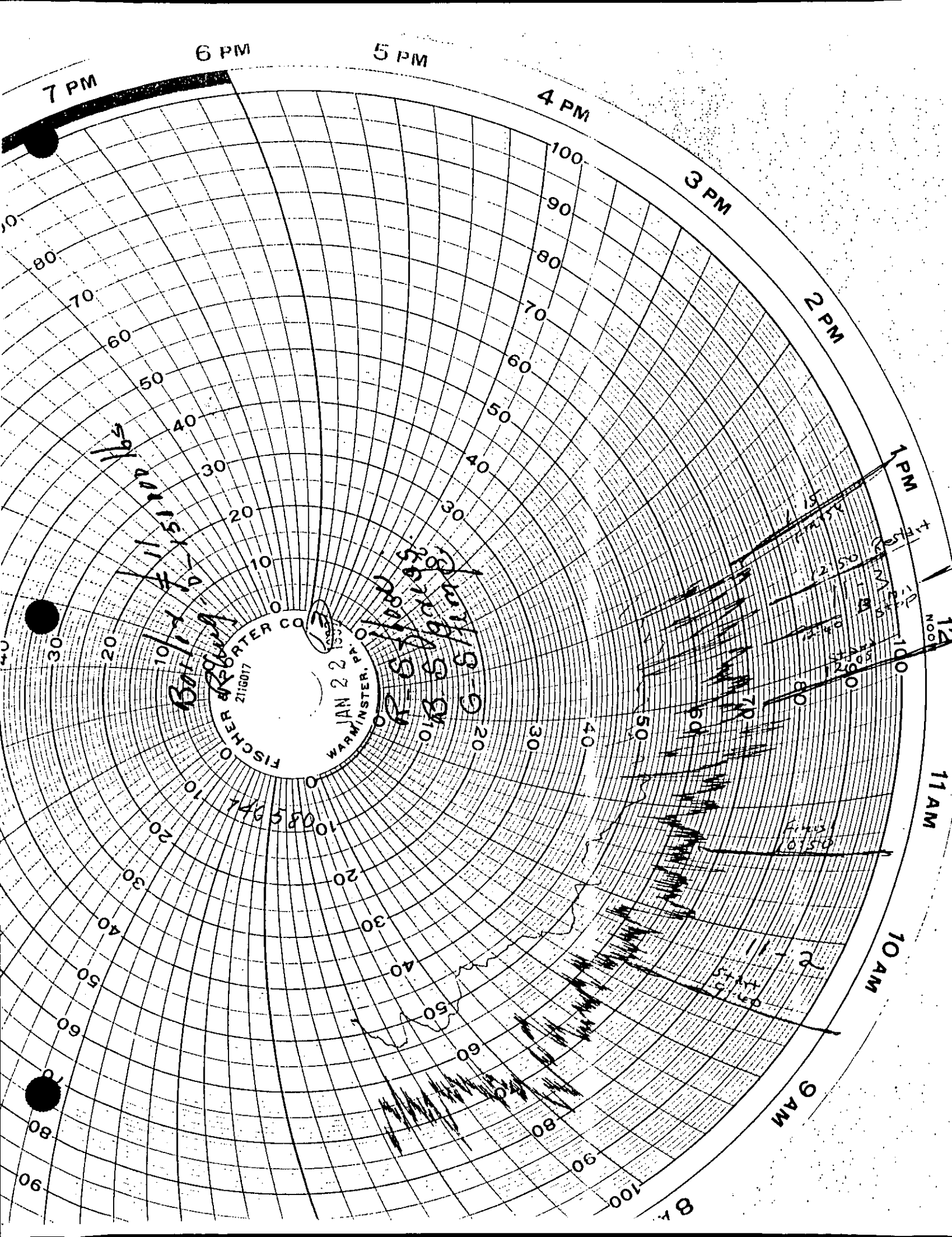
- (1) Mill speed 85 F.P.H.
- (2) Using 40 oil burners.
- (3) 12:40 Mill B stop test
- (4) 12:50 Restart test

Allowed =

Actual =

PLANT READINGS BY George Pollock
 % OF CAPACITY





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APPENDIX VIII

FIELD DATA SHEETS - STACK TESTING

FIELD DATA SHEET
GENERAL INFORMATION

Plant:	<u>OKEE/ANTA</u>	Run #:	<u>comp-1</u>
Location:	<u>UNIT 11</u>	Date:	<u>21 JAN 92</u>
Ds (ft):	<u>7.5</u>	No. Points:	<u>24</u>
Dn (in):	<u>.260</u>	Test Length:	<u>60 MIN</u>
Filter #:	<u>4395</u>	End Meter Reading:	<u>542.781</u>
Cp:	<u>.84</u>	Int Meter Reading:	<u>488.300</u>
P bar:	<u>29.99</u>	Begin Time:	<u>11:30</u>
P stack:	<u>-.68</u>	End Time:	<u>12:35</u>

IMP-1 (INT)	<u>100 ML</u>	IMP-1 (FINAL) $212 + 138 =$	<u>350</u>
IMP-2 (INT)	<u>100 ML</u>	IMP-2 (FINAL)	<u>134</u>
IMP-3 (INT)	<u>0 ML</u>	IMP-3 (FINAL)	<u>6</u>
IMP-4 (INT)	<u>500.0g</u>	IMP-4 (FINAL)	<u>513.0</u>

	TEST 1	TEST 2	TEST 3
% CO ₂	<u>6.9</u>	<u> </u>	<u> </u>
% O ₂	<u>13.5</u>	<u> </u>	<u> </u>
% CO	<u>0</u>	<u> </u>	<u> </u>

Project Director:	<u>S. MACKAY</u>	Field Laboratory:	<u>MACKAY/GIBSON</u>
Meter Box Operator:	<u>S. MACKAY</u>	Chain of Custody:	<u>S. MACKAY</u>
Probe Operator:	<u>B. GIBSON</u>	Plant Coordinator:	<u>G. DEVANE</u>
Orsat Analyst:	<u>S. MACKAY</u>	Agency Rep:	<u>K. TUCKER</u>

Comments:

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

PAGE 1 OF 2

SAMPLING TIME PER POINT

2 1/2 MIN

PLANT OKEELANTA

RUN #

comp-1

LOCATION UNIT 11

DATE

21 JAN 92

488.300

TRAV. NO.	DELTA P	DELTA H	METER READING	DGM IN	DGM OUT	HOT BOX	IMPG TEMP	STACK TEMP	VAC
A1	2.20	6.60	491.65	83	78	267	50	145	12
2	2.10	6.30	494.8	94	78	260	51	145	12
3	1.60	4.80	497.8	102	79	263	52	145	10
4	1.10	3.30	500.1	110	80	270	55	145	6
5	.78	2.94	502.6	117	82	271	55	145	4
6	.52	1.56	504.4	117	82	269	55	145	2
7	.23	.69	505.6	116	83	259	56	146	1
8	.30	.90	507.0	114	83	261	56	146	1
9	.45	1.35	508.6	114	84	265	56	145	1
10	.58	1.74	510.3	117	85	266	56	145	2
11	.75	2.25	512.4	118	85	268	55	145	4
12	.75	2.25	514.5	122	86	265	55	145	4

02%

COMMENTS:

DELTA P x 3.0 = DELTA H
 BOX # 11 Y = .9911 DELTA H @ - 1.80
 START TIME: 11:30
 END TIME: 12:35
 INITIAL LEAK CHECK .003 AT 15 INCHES HG
 FINAL LEAK CHECK .0 AT 12 INCHES HG

PITOT LEAK CHK - 9600 @ 5" H₂O

EASTMOUNT ENGINEERING INC. • 420 MAIN STREET • WALPOLE, MA 02081 • (508) 668-9005

Box - S.M.K. , Probe - G.B.

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

PAGE 2 OF 2

SAMPLING TIME PER POINT 2 1/2 MIN

PLANT OKEECHANT A

RUN # COMP-1

LOCATION UNIT 11

DATE 21 JAN 92

TRAV. NO.	DELTA P	DELTA H	METER READING	DGM IN	DGM OUT	HOT BOX	IMPG TEMP	STACK TEMP	VAC
B1	1.90	5.70	517.6	120	87	264	54	144	12
2	1.50	4.50	520.6	122	89	268	55	145	10
3	.96	2.88	523.2	130	93	268	57	145	6
4	.72	2.16	525.3	130	90	267	58	145	5
5	.35	1.05	526.8	125	91	267	58	146	2
6	.23	.69	528.1	123	90	267	59	146	1
7	.66	1.98	529.9	121	90	266	58	146	4
8	1.00	3.00	532.6	122	90	260	57	146	7
9	1.10	3.30	534.8	128	91	267	58	146	8
10	1.10	3.30	537.2	129	91	267	59	146	8
11	1.30	3.90	539.8	132	92	268	59	145	10
12	1.70	5.10	542.781	133	92	267	61	146	12

COMMENTS:

DELTA P x 30 = DELTA H

BOX # Y = DELTA H @ =

START TIME :

END TIME :

INITIAL LEAK CHECK AT INCHES HG

FINAL LEAK CHECK AT INCHES HG

FIELD DATA SHEET
GENERAL INFORMATION

Plant:	<u>CKEE/WNTA</u>	Run #:	<u>COMP-2</u>
Location:	<u>UNIT 11</u>	Date:	<u>22 JAN 92</u>
Ds (ft):	<u>7.5</u>	No. Points:	<u>24</u>
Dn (in):	<u>.260</u>	Test Length:	<u>60</u>
Filter #:	<u>4396</u>	End Meter Reading:	<u>602.047</u>
Cp:	<u>.84</u>	Int Meter Reading:	<u>548.300</u>
P bar:	<u>29.94</u>	Begin Time:	<u>09:40</u>
P stack:	<u>-.68</u>	End Time:	<u>10:50</u>

IMP-1 (INT)	<u>100 ML</u>	IMP-1 (FINAL)	<u>345</u>
IMP-2 (INT)	<u>100 ML</u>	IMP-2 (FINAL)	<u>136</u>
IMP-3 (INT)	<u>0 ML</u>	IMP-3 (FINAL)	<u>4</u>
IMP-4 (INT)	<u>500.0g</u>	IMP-4 (FINAL)	<u>516</u>

	TEST 1	TEST 2	TEST 3
% CO ₂	<u>6.9</u>	<u> </u>	<u> </u>
% O ₂	<u>13.5</u>	<u> </u>	<u> </u>
% CO	<u>0</u>	<u> </u>	<u> </u>

Project Director: S. MacKay
Meter Box Operator: B. Gibson
Probe Operator: P. Wiloman
Orsat Analyst: S. MacKay

Field Laboratory: S. MacKay/B. Gibson
Chain of Custody: S. MacKay
Plant Coordinator: G. Devane
Agency Rep: K. Tucker

Comments:

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

PAGE 1 OF 2

SAMPLING TIME PER POINT

PLANT C. velutina

RUN # C-2

LOCATION Unit 15

DATE 22 JAN 92

[illegible]

COMMENTS:

$$\Delta P \approx \frac{3.0}{\text{---}} = \Delta H$$

BOX # 11 Y = 1991 DELTA H B = 1.80

START TIME : 0940

END TIME :

INITIAL LEAK CHECK 0.0 AT 15 INCHES HG

FINAL LEAK CHECK _____ AT _____ INCHES HG

Pito p.p. at ± 7 in h₂O

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

PAGE 2 OF 2
 PLANT Okeelanta
 LOCATION Unit #11

SAMPLING TIME PER POINT 2.5
 RUN # C-2
 DATE 22 JAN 92

TRAV. NO.	DELTA P	DELTA H	METER READING	DGM IN	DGM OUT	HOOT BOX	IMPG TEMP	STACK TEMP	VAC	
A 1	1.4	4.2	577.3	108	84	242	62	146	5	13.6
5 2	1.4	4.2	580.0	114	85	238	59	146	5	
3	1.1	3.3	582.7	122	86	240	60	146	5	13.5
10 4	.71	2.13	584.6	122	86	249	61	146	4	
5	.46	1.38	586.3	120	86	254	63	146	2	13.5
15 6	.31	.93	587.7	119	87	255	63	146	2	
7	.48	1.44	589.3	116	86	247	64	146	2	13.5
20 8	.75	2.25	591.3	118	87	252	62	145	3	
9	1.0	3.30	593.6	122	87	247	63	145	5	
25 10	1.02	3.6	596.3	124	88	248	63	145	6	13.5
11	1.5	4.5	599.0	129	89	246	64	146	7	
30 12	1.6	4.8	602.047	132	90	246	66	146	9	13.6

COMMENTS: DELTA P x 3.6 = DELTA H
 BOX # 11 Y = .9911 DELTA H @ = 1.80
 START TIME : 0940
 END TIME : _____
 INITIAL LEAK CHECK 0.0 AT 15 INCHES HG
 FINAL LEAK CHECK .002 AT 11 INCHES HG
 Pits 0.0 I 7 in 20

FIELD DATA SHEET
GENERAL INFORMATION

Plant:	<u>CKEE/ANTA</u>	Run #:	<u>Comp-3</u>
Location:	<u>UNIT 11</u>	Date:	<u>82 JAN 92</u>
Ds (ft):	<u>7.5</u>	No. Points:	<u>24</u>
Dn (in):	<u>.260</u>	Test Length:	<u>60 MIN</u>
Filter #:	<u>4397</u>	End Meter Reading:	<u>655.796</u>
Cp:	<u>.84</u>	Int Meter Reading:	<u>602.400</u>
P bar:	<u>30.95</u>	Begin Time:	<u>12:05</u>
P stack:	<u>SA - 68</u>	End Time:	<u>13:15</u>

IMP-1 (INT)	<u>100 ML</u>	IMP-1 (FINAL)	<u>354</u>
IMP-2 (INT)	<u>100 ML</u>	IMP-2 (FINAL)	<u>139</u>
IMP-3 (INT)	<u>0 ML</u>	IMP-3 (FINAL)	<u>3</u>
IMP-4 (INT)	<u>500.0g</u>	IMP-4 (FINAL)	<u>516.0</u>

	TEST 1	TEST 2	TEST 3
% CO ₂	<u>7.2</u>	<u> </u>	<u> </u>
% O ₂	<u>13.2</u>	<u> </u>	<u> </u>
% CO	<u>0</u>	<u> </u>	<u> </u>

Project Director:	<u>S. MacKay</u>	Field Laboratory:	<u>S. MacKay/B. Gibson</u>
Meter Box Operator:	<u>B. Gibson</u>	Chain of Custody:	<u>S. MacKay</u>
Probe Operator:	<u>P. Wiloman</u>	Plant Coordinator:	<u>G. Devane</u>
Orsat Analyst:	<u>S. MacKay</u>	Agency Rep:	<u>K. Tucker</u>

Comments:

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

PAGE 1 OF 2
 PLANT Okaloosa
 LOCATION Unit #11

SAMPLING TIME PER POINT 2.5
 RUN # C-3
 DATE 22 JAN 92

602.4

TRAV. NO.	DELTA P	DELTA H	METER READING	DGM IN	DGM OUT	HOT BOX	IMPG TEMP	STACK TEMP	VAC
A1	2.2	6.6	605.7	90	78	254	65	147	11
2	2.1	6.3	609.0	95	79	246	67	147	13
3	1.6	4.8	612.1	106	79	254	68	147	11
4	1.1	3.3	614.5	109	80	263	66	147	5
5	.82	2.46	616.8	113	81	250	68	146	3
6	.52	1.56	618.6	114	81	258	68	147	2
7	.25	.75	620.1	112	82	246	65	147	2
8	.25	.75	621.4	111	82	248	69	147	2
9	.36	1.08	622.4	111	83	245	63	147	2
10	.52	1.56	624.8	111	83	247	61	147	2
11	.65	1.98	626.5	114	83	248	62	147	3
12	.69	2.07	628.497	115	83	245	63	148	3

COMMENTS: DELTA P * 3 = DELTA H
 BOX # 11 Y = .9911 DELTA H @ = 1.08
 START TIME : 1205
 END TIME : 1316
 INITIAL LEAK CHECK .002 AT 15 INCHES HG
 FINAL LEAK CHECK AT INCHES HG

FIELD DATA SHEET

TRAVERSE POINT INFORMATION

PAGE 2 OF 2

SAMPLING TIME PER POINT 2.5

PLANT Okeelanta

RUN # C-3

LOCATION Unit #11

DATE 22 JAN 91

TRAV. NO.	DELTA P	DELTA H	METER READING	DGM IN	DGM OUT	HOT BOX	IMPG TEMP	STACK TEMP	VAC
B1	1.5	4.5	631.3	111	86	265	66	147	10
2	1.2	3.6	633.9	101	84	248	64	147	7
3	.92	2.76	636.2	106	84	255	64	147	5
4	.62	1.86	638.1	110	84	252	67	147	3
5	.45	1.35	639.8	111	84	248	65	146	3
6	.25	.75	641.1	111	84	248	61	147	2
7	.50	1.5	642.8	111	84	254	59	147	2
8	.89	2.67	644.9	117	85	261	58	147	6
9	1.1	3.3	647.3	120	85	257	58	147	8
10	1.2	3.6	649.8	125	87	247	60	146	9
11	1.7	5.1	652.7	129	87	240	59	149	14
12	1.6	4.8	655.796	133	89	243	60	146	14

COMMENTS:

DELTA P = 3 - DELTA H

BOX # 11 Y = .9911 DELTA H @ - 1.80

START TIME : _____

END TIME : _____

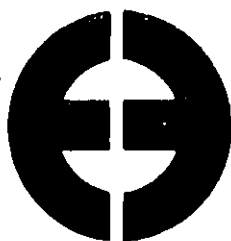
INITIAL LEAK CHECK .602 AT 15 INCHES HG

FINAL LEAK CHECK .003 AT 18 INCHES HG (13)

1240 mill down 1250 Restart

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

APPENDIX IX
LABORATORY RESULTS



Eastmount Engineering

Environmental Consultants — Air Quality Specialists

LABORATORY SUMMARY OF RESULTS

PROJECT NUMBER: 91-102
PROJECT NAME: OKEELANTA CORPORATION
BOILER #11

ANALYST: M. WAYT
ANALYSIS: EPA METHOD 5

FILTER

SAMPLE DESCRIPTION	FILTER #	TEST DATE	TARE WEIGHT (g)	FINAL WEIGHT (g)
C-1	4395	1-21-92	0.6037	0.7219
C-2	4396	1-21-92	0.5954	0.7130
C-3	4397	1-21-92	0.6041	0.7200
BLANK	4398	1-21-92	0.6020	0.6022

WASH

SAMPLE DESCRIPTION	BKR#	TEST DATE	TARE WEIGHT (g)	FINAL WEIGHT (g)	VOLUME (ml)
C-1	C1	1-21-92	71.1399	71.1600	280
C-2	C2	1-21-92	71.5642	71.5950	290
C-3	5	1-21-92	70.2973	70.3304	300
BLANK	6	1-21-92	69.8707	69.8709	200

Okeelanta Corporation - Boiler #11
Particulate Emissions Test Report

APPENDIX X

EQUIPMENT CALIBRATION SHEETS

POST
METER BOX CALIBRATION SHEET

BOX #: 11
PRES BAR: 29.98

DATE: 27 JAN 92
VACUUM: 16 IN Hg

RUN #	VOLUME WET	VOLUME DRY	DELTA H	DELTA H /13.6	PRES BAR (ABS)	TIME (MINS)
1	10.00	10.217	2.00	.147	30.13	12.54
2	10.00	10.320	2.00	.147	30.13	12.58
3	10.00	10.324	2.00	.147	30.13	12.59

RUN #	TEMP WET (°F)	TEMP DRY INLET	TEMP DRY OUT	TEMP DRY (AVG)	Y	DELTA H @
1	69.0	108.0	86.3	97.2	1.026	1.80
2	69.0	123.7	88.7	106.2	1.032	1.80
3	69.0	127.7	91.3	109.5	1.038	1.80
AVERAGE					1.032	1.80
MAX % DEV					.59	
ALLOWABLE % DEV					2.00	

PRE CAL Y = .9911 % DIFFERENCE = 3.95 %
ALLOWABLE = 5.00 %

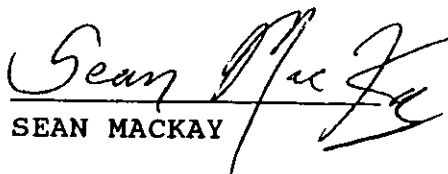
FORMULAS:

Y=

DELTA H @=

$$Y = \frac{(V w) (P b) (T d)}{(V d) (P b) (ABS) (T w)} \quad \Delta H @ = \frac{0.0317 (\Delta H)}{(P b) (T d)} * \left[\frac{(T w) (TIME)^2}{(V w)} \right]$$

CALIBRATION BY:


SEAN MACKAY

THERMOCOUPLE CALIBRATION SHEET

TC #: RAC - 2 - 170

DATE: 1/11/91

STANDARD ('F)	THERMOCOUPLE ('F)	% DIFFERENCE (ABSOLUTE)
32.0	32	.00
516.2	519	.29
212	213	.15
	MAXIMUM	.29
	ALLOWABLE	1.50

CALIBRATION BY:

Kieran Nolan

KIERAN NOLAN

METER BOX CALIBRATION SHEET

BOX NUMBER: 11
PRESS BAR : 30.19

DATE: 15 OCT 91
DUE: 15 APR 92

RUN #	VOLUME WET	VOLUME DRY	DELTA H	DELTA H /13.6	PRES BAR (ABS)	TIME (MINS)
1	5	5.168	.50	.0368	30.23	12.48
2	5	5.195	1.00	.0735	30.26	8.97
3	10	10.456	1.50	.1103	30.30	14.83
4	10	10.539	2.00	.1471	30.34	13.28
5	10	10.581	3.00	.2206	30.41	10.82
6	10	10.613	4.00	.2941	30.48	9.50

RUN #	TEMP WET (F)	TEMP DRY INLET	TEMP DRY OUT	TEMP DRY (AVG)	Y	DELTA H @
1	71.0	82.7	76.0	79.3	.9815	1.71
2	69.7	95.3	77.0	86.2	.9900	1.73
3	69.0	107.0	79.0	93.0	.9961	1.75
4	69.0	114.7	82.7	98.7	.9972	1.86
5	69.0	114.3	85.0	99.7	.9926	1.84
6	68.7	114.7	86.3	100.5	.9893	1.89
AVERAGE					.9911	1.80

MAX % DEVIATION .97
ALLOWABLE % DEV 2.00

FORMULAS:

Y=

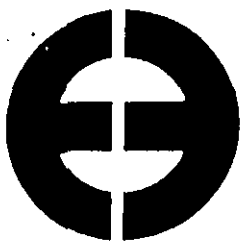
DELTA H @=

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

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

CALIBRATION BY:


JEM JARDIN



Sean

Eastmount Engineering

Environmental Consultants — Air Quality Specialists

WET TEST METER CALIBRATION

WET TEST METER:- Model AL-19, Serial No. P-468

BELL PROVER :- Chain Compensated Gasometer
Warren E. Collins Inc.
Serial NO. 2874
Factor 133.2 cc/mm

(Maintained by E.P.A. region 1)

CALIBRATED BY :- Anthony Stratton and Kieran Nolan

DATE CALD. :- March 28 1991

DATE DUE :- March 28 1992

RESULTS :-

-----	RUN #	C.F.M.	% DIFF.
	1	.55	+.31
	2	.55	+.20
	3	.55	+.10
	-----	-----	-----
AVERAGE :-		.55	+.20

NOZZLE CALIBRATION SHEET

PROJECT NAME: CKEELANTA Corp

PROJECT NUMBER: 91-102

POINT# NOZZLE # 1/4-5 NOZZLE # 1/4-13 NOZZLE # 5/16-14 NOZZLE # 5/16-3

1 .265 .260 .310 .315

2 .264 .258 .310 .314

3 .266 .261 .310 .313

AVG. .265 .260 .310 .314

SEAN MACKAY

CALIBRATED BY:

DEC 9, 1991

DATE:

TRANSCAT

"CAL-LAB"

Certificate of Calibration

TRANSCAT certifies that this instrument has been calibrated to manufacturer's specifications using measurement standards traceable to the National Institute of Standards and Technology (NIST) and as required by The National Research Council of Canada, Division of Physics, within the limitations of the Council's calibrations services. TRANSCAT's calibration system meets or exceeds the requirements of MIL-STD-45662A.

Complete records of all work performed is maintained by TRANSCAT and is available upon request.

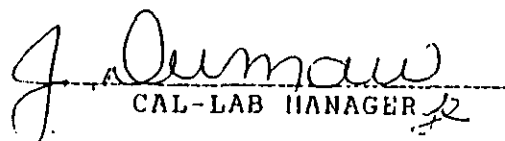
TEMPERATURE 68° F.

RELATIVE HUMIDITY OF 59%.

Customer : EASTMONT ENGINEERING
Manufacturer : TRANSHATION
Model Number : 1261
Serial Number : 8277
Description : THERMOCOUPLE CALIBRA
Calibrated : 08/02/91
Date Due : 08/01/92
Repair Number : 17-7047-00

ITEM RECEIVED IN TOLERANCE

ASSETS	MANUFACTURER	MODEL	DESCRIPTION	CALIBRATED	DATE DUE
2485	DATA PRECISION	9200	DC CALIB.	01/03/91	01/03/92
2486	FLUXB	9842A	DNH	03/19/91	03/19/92
2471	KAYE	140-4	ICR FT. REF.	03/14/91	03/13/92
2482	NBS	172144-K	STD THERMOCOUPLE	04/19/91	04/19/93


CAL-LAB MANAGER

TEMPERATURE INDICATOR CALIBRATION FORM

INDICATOR S/N: 650 - 6

CAL DATE: 8 AUG 91

REFERENCE S/N:1061-8277

DUE DATE: 8 AUG 92

CHANNEL NO.	REFERENCE SET POINT							
	0	32	200	250	320	600	800	1000
1	0	33	199	249	320	600	800	1000
2	0	32	199	249	320	599	800	1000
3	0	32	199	249	320	599	800	1000
4	0	32	199	249	320	600	800	1001
5	0	32	199	250	320	600	800	1000
6	0	32	199	249	320	599	800	1000
7								
8								
9								
10								
% DIFF:	.06							

CALIBRATED BY _____ KIERAN NOLAN *KN*

TEMPERATURE INDICATOR CALIBRATION FORM

INDICATOR S/N: 650 - 7

CAL DATE: 13 SEP 91

REFERENCE S/N:1061-8277

DUE DATE: 13 SEP 92

CHANNEL NO.	REFERENCE SET POINT							
	0	32	200	250	320	600	800	1000
1	1	32	199	249	320	599	798	999
2	1	32	200	250	320	599	799	999
3	1	33	200	250	320	599	799	999
4	1	32	200	250	320	599	799	999
5	0	32	199	249	320	600	799	998
6	0	32	199	250	320	599	799	998
7								
8								
9								
10								
% DIFF:	.04							

CALIBRATED BY _____ KIERAN NOLAN *KN*

THERMOCOUPLE CALIBRATION SHEET

SET #: METER BOX 11-IN

DATE: 08-11-86

STANDARD ('F)	THERMOCOUPLE ('F)	% DEVIATION OF ABSOLUTE
34	29	1.01
211	210	.15
404	403	.12
	MAXIMUM	1.01
	ALLOWABLE	1.50

SET #: METER BOX 11-OUT

DATE: 08-11-86

STANDARD ('F)	THERMOCOUPLE ('F)	% DEVIATION OF ABSOLUTE
34	28	1.21
211	210	.15
404	401	.35
	MAXIMUM	1.21
	ALLOWABLE	1.50

CALIBRATION BY:

G. ZWILLING

THERMOCOUPLE CALIBRATION SHEET

SET #: 7.75' - 9

DATE 3/6/91

STANDARD ('F)	THERMOCOUPLE ('F)	% DIFFERENCE (ABSOLUTE)
32	32	.00
212	213	.15
466	479	1.43
	MAXIMUM	1.43
	ALLOWABLE	1.50

CALIBRATION BY:

Kieran Nolan

KIERAN NOLAN

THERMOCOUPLE CALIBRATION SHEET

SET #: 8.5' - 6

DATE: 07/07/89

STANDARD ('F)	THERMOCOUPLE ('F)	% DIFFERENCE (ABSOLUTE)
87	86	.18
212	211	.15
430	436	.67
	MAXIMUM	.67
	ALLOWABLE	1.50

CALIBRATION BY:

S. MacKay

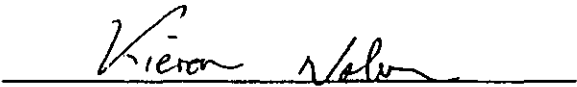
THERMOCOUPLE CALIBRATION SHEET

TC #: 4THIMP-210

DATE: 2/27/91

STANDARD ('F)	THERMOCOUPLE ('F)	% DIFFERENCE (ABSOLUTE)
32.0	32	.00
157.1	157	.02
212	214	.30
	MAXIMUM	.30
	ALLOWABLE	1.50

CALIBRATION BY:


KIERAN NOLAN