GAS TURBINE EMISSION TESTING FOR McCLURE GENERATING STATION

December 18, 1989

(56)

Acurex Project 6581

For

Modesto Irrigation District

1231 Eleventh Street

Modesto, California 95352

by

Acurex Corporation

Environmental Systems Division

485 Clyde Avenue

P.O. Box 7044

Mountain View, California 94039

ACUREX Corporation

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December 19, 1989

Mr. Spencer Tacke
Senior Electrical Engineer
Modesto Irrigation District
1231 Eleventh Street
Modesto, California 95352

Reference: Gas Turbine Emission Monitoring for
McClure Generating Station
Acurex Project # 6581

Subject: Final Report

Dear Mr. Tacke,

Enclosed is one copy of the final report of Gas Turbine Emission Monitoring for McClure Generating Station. Testing was performed on gas turbine number 1 on October 17, 18, 19,1989.

We have enjoyed working with you on this project, and would welcome the opportunity to do so again.

Sincerely,
Acurex Corporation

Joseph W. MacDonell
Contracts Manager

cc:WHB

485 Clyde Avenue, P.O. Box 7044, Mountain View, CA 94039 (415) 961-5700 Telex: 325961 FAX: (415) 964-5145

1.0 INTRODUCTION

Environmental Systems Division of Acurex Corporation (ESD) was contracted by Modesto Irrigation District (MID) to conduct compliance monitoring and engineering tests on emissions from one of the two gas turbines at the McClure Generating Station. The facility is located on South McClure Road, Modesto, California. Gas Turbine No. 1 was monitored for oxides of nitrogen (NOx), carbon monoxide (CO), carbon dioxide (CO_2), oxygen (O_2), polycyclic aromatic hydrocarbons (PAHs), and formaldehyde. Stack gas flowrate and moisture content were also measured. Fuel samples of No. 2 distillate were taken and analyzed for metals, radionuclides, specific gravity, and ultimate characteristics. NOx, CO, CO_2, and O_2 were monitored to assess compliance with turbine permit requirements. Engineering tests were also conducted for these four gaseous parameters to determine the optimum turbine operating parameters. The PAHs, formaldehyde, and fuel analyses were conducted to comply with California Assembly Bill (AB) 2588, the Air Toxics "Hot Spots" Information and Assessment Act of 1987. Field testing was conducted on October 17, 18, 19, 1989. Spencer Tacke of MID coordinated the test program.

Gas Turbine No.1 was operating at 100% load and fired on No.2 distillate fuel oil during compliance testing. During the engineering tests, the load, fuel mixture, and water injection rates were varied to determine the optimum turbine operating efficiency. Turbine operating data are presented in the appendix.

2.0 CONCLUSIONS

Table 2-1 summarizes the results from the NO_x and CO compliance tests. The measured emissions determined from this test program and the regulatory limits are presented. The test results were below each of the four regulatory limits for the gas turbines at McClure Generating Station. Gas turbine No. 1 is operating within the compliance limits set by the Stanislaus County Air Pollution Control District (APCD) and the EPA.

AB 2588 requires MID to inform the APCD of the emission rates of formaldehyde and PAHs from the gas turbines at McClure Generating Station. Table 2-2 summarizes the results of formaldehyde and PAH testing from gas turbine No. 1. The emission rates of these organics are presented. Formaldehyde was the most prevalent organic found. Of the PAHs, naphthalene and phenanthrene were the two most prevalent PAHs. Only nine of the fifteen PAHs analyzed were found in all three samples.

Table 2-1. Summary of NO_x and CO results

Gas Turbine No. 1, McClure Generating Station

Parameter	Regulatory Agency	Limit	Measured Emission
NO_x	Stanislaus County APCD	140 lb/hr	112 lb/hr
NO_x	EPA	0.23 lb/mBtu	0.165 lb/mBtu
NO_x	EPA	46.5 ppm	42.3 ppm[a]
CO	EPA	0.05 lb/mBtu	0.035 lb/mBtu

ESD T0559

[a]Concentration corrected to 15% O_2

Table 2-2. Summary of organic emission results

Gas Turbine No. 1, McClure Generating Station

Parameter	Measured Emission
Formaldehyde	0.13 lb/hr
PAHs:	
Naphthalene	81×10^{-4} lb/hr
Phenanthrene	45×10^{-4} lb/hr
Fluoranthrene	6.0×10^{-4} lb/hr
Fluorene	5.7×10^{-4} lb/hr
Chrysene	3.0×10^{-4} lb/hr
Pyrene	2.6×10^{-4} lb/hr
Anthracene	2.3×10^{-4} lb/hr
Benzo (b) fluoranthene	$<1.3 \times .10^{-4}$ lb/hr
Benzo (k) fluoranthene	$<0.94 \times 10^{-4}$ lb/hr

ESD T0558

Note: Fifteen PAHs were monitored during this test program. Only the nine reported here were found in every sample.

3.0 NO_x AND CO TEST RESULTS

3.1 Compliance Test Results

The results for the NO_x and CO compliance tests are shown in Table 3-1. The eight sampling points - A-1,2,3,4 and E-1,2,3,4 - used as the test matrix were predetermined by MID. NO_x test results are reported in concentrations uncorrected for oxygen content and concentrations corrected to 15 percent oxygen. NO_x and CO emission results are reported in terms of pounds per million BTU and pounds per hour. The F-factor used to determine the emission rate in terms of million BTU was 9,271. The F-factor, the ratio of the volume of dry flue gases generated to the caloric content of the fuel, was calculated based on the ultimate and proximate fuel analyses. The average NO_x emission rate was 112 pounds per hour and 0.165 pounds per million BTU. NO_x concentrations corrected to 15 percent O_2 averaged 42.3 ppm with a range of 40.5 ppm to 44.2 ppm. The average CO emission rate was 24.1 pounds per hour and 0.035 pounds per million BTU. CO concentrations were steady with a average value of 14 ppm.

Table 3-1. NO_x and CO compliance test results — gas turbine No. 1, McClure Generating Station

Test	Time	Dry Uncorrected Conclusion				Concentration Corrected to 15% Oxygen	Emission Rates				Flue Gas			
							NO_x (as NO_2)		CO		Flow Rate		Moisture (Vol %)	Temperature (°F)
		O_2	CO_2	CO	NO_x	NO_x	(lb /MBTU)	(lb/hr)	(lb/MBTU)	(lb/hr)	ACFM	DSCFM		
A	1312/1408	15.4	4.0	15	37.8	40.5	0.158	120	0.038	29.0	1,240,650	445,544	3.4	952
B	1432/1522	15.3	4.0	14	40.2	42.2	0.165	102	0.035	21.7	974,430	357,044	2.8	936
C	1552/1701	15.2	4.1	13	42.5	44.2	0.171	115	0.032	21.5	1,091,978	380,576	5.6	969
Average		15.3	4.0	14	40.2	42.3	0.165	112	0.035	24.1	1,102,352	394,388	3.9	952

ESD T0470

Note
— Tests were held October 18, 1989.
— All test numbers have been corrected for drift as per EPA Method 6C, equation 6C-1.
— Test A flue gas temperature averaged from tests B and C.

4.0 FORMALDEHYDE AND PAHs TEST RESULTS

To comply with AB 2588, gas turbine No.1 was monitored for formaldehyde and PAHs. The results from the formaldehyde tests are shown in Table 4-1. Formaldehyde was sampled and analyzed in triplicate in accordance with CARB Method 430. The emission rate of formaldehyde from gas turbine No. 1 was determined to be 0.13 lb/hr. Since the field blank indicated higher levels of formaldehyde than any of the three samples, the laboratory method blank was used to conservatively correct for background levels of formaldehyde in the samples.

The results from the PAH tests are shown in Table 4-2. PAH testing was sampled and analyzed in triplicate using guidelines established in CARB 429. Of the fifteen PAH compounds analyzed, only nine were found in all three samples. The each of the remaining six PAH compounds were detected at low levels in at least one of the three samples. Naphthalene and phenanthrene are the most prevalent PAHs detected in this test program. Significant amounts of fluoranthrene and fluorene were also found. Chrysene, pyrene, anthracene, benzo(b)fluoranthrene, and benzo(k)fluoranthrene were also detected in every sample. Significant amounts of naphthalene were detected in the field blank; however, only trace levels of naphthalene were found in the method blank and in the pre-test analysis of the XAD resin.

Table 4-1. Formaldehyde results

Gas Turbine No. 1, McClure Generating Station

	Run 1A	Run 2A	Run 3A	Average
Formaldehyde collected, µg/train	9.0	13	16	—
Method blank, µg/train	2.0	4.8	3.9	—
Net weight collected, µg/train	7.0	8.2	12	—
Sample volume, DSCF	3.96	3.77	3.50	—
Concentration, µg/DSCF	1.8	2.2	3.4	2.5
Flowrate, DSCFM	445, 544	357, 044	380, 576	394, 388
Emission rate, lb/hr	0.11	0.10	0.17	0.13

ESD T0661

Results were blank-corrected with the method blank, not the field blank. The field blank indicated high levels of formaldehyde, 23 µg/train. Consequently, results were conservatively corrected using the method blank instead.

Table 4-2. PAH results

Gas Turbine No. 1, McClure Generating Station

PAH	Average Concentration (ng/DSCF)	Average Emission Rate (lb/hr)	Detected in All Samples
Naphthalene	155	8.1×10^{-3}	Yes
Phenanthrene	87	4.5×10^{-3}	Yes
Fluoranthrene	11.6	6.0×10^{-4}	Yes
Fluorene	11.0	5.7×10^{-4}	Yes
Chrysene	5.7	3.0×10^{-4}	Yes
Pyrene	5.0	2.6×10^{-4}	Yes
Anthracene	4.4	2.3×10^{-4}	Yes
Benzo (b) fluoranthene	<2.5	$<1.3 \times 10^{-4}$	Yes
Benzo (k) fluoranthene	<1.8	$<9.4 \times 10^{-5}$	Yes
Acenaphthene	<4.6	$<2.4 \times 10^{-4}$	No
Acenaphthylene	<2.0	$<1.0 \times 10^{-4}$	No
Benzo (g,h,i) perylene	<1.14	$<5.9 \times 10^{-5}$	No
Benzo (a) anthracene	<0.82	$<4.3 \times 10^{-5}$	No
Dibenzo (a,h) anthracene	<0.71	$<3.7 \times 10^{-5}$	No
Indeno (1,2,3-cd) pyrene	<0.47	$<2.4 \times 10^{-5}$	No

ESD T0560

Average flowrate = 394,388 DSCFM
Data from three samples taken by CARB 429

5.0 FUEL ANALYSES

One grab sample of the feed oil, No. 2 distillate fuel oil, was taken in accordance with EPA Method S004 for tap sampling. The analytical results of the fuel analyses are shown in Table 5.1. The predominant metal in the fuel sample was nickel at a level of 51.9 ppm. Total chromium levels were found to be 3.7 ppm; however, no hexavalent chromium was detected in the fuel sample. Trace levels of copper, lead, manganese, and zinc were also found. No arsenic, beryllium, cadmium, mercury, or selenium was detected in the sample. The fuel was found to contain 85.76% carbon and 14.08% hydrogen with trace levels of sulfur, chlorine and oxygen. The viscosity was determined to be 2.16 cst (50C), with a specific gravity of 0.8612. The heating value was 19,680 BTUs/lb. The radionuclide analyses indicated a gross alpha level of 11 pCi/L and gross beta level of 24 pCi/L.

Table 5-1. Results of fuel analyses — No. 2 distillate fuel oil

Parameter	Method	Amount	Units
Metals:			
Arsenic	EPA 7060	<0.5	mg/kg
Beryllium	EPA 6010	<0.5	mg/kg
Cadmium	EPA 6010	<0.5	mg/kg
Chromium	EPA 6010	3.7	mg/kg
Chromium (hex.)	EPA 7196	<1.0	mg/kg
Copper	EPA 6010	1.5	mg/kg
Lead	EPA 7421	0.73	mg/kg
Manganese	EPA 6010	2.0	mg/kg
Mercury	EPA 7470	<0.02	mg/kg
Nickel	EPA 6010	51.9	mg/kg
Selenium	EPA 7740	<0.005	mg/kg
Zinc	EPA 6010	3.2	mg/kg
Ultimate Analyses:			
Carbon	PE 240C	85.76	%
Hydrogen	PE 240C	14.08	%
Nitrogen	PE 240C	<0.01	%
Sulfur	ASTM D129	0.04	%
Ash	ASTM D95	<0.001	%
Chlorine	ASTM D808	0.05	%
Oxygen	Difference	0.07	%
Viscosity, 50°C	ASTM D445	2.16	cst
Spec. gravity, 60°C	ASTM D287	0.8612	—
Heating value	ASTM D2382	19,680	BTU/lb
Radionuclides:			
Gross alpha	SM 703	11	pCi/L
Gross beta	SM 703	24	pCi/L
Radian – 226	HASL 300, D-04	<2	pCi/L
Radium – 228	HASL 300, D-04	<3	pCi/L
Total Radium	EPA 900.0	<2	pCi/L

Metals samples were prepared by Parr Bomb

ESD T0469

6.0 SAMPLING AND ANALYSIS PROCEDURES

6.1 Procedures for NO_x and CO Monitoring

Gas Turbine No. 1 was monitored for NO_x and CO. Stack gas was extracted continuously on analyzers housed in the Acurex Emissions Monitoring Lab. A schematic of the extractive sampling system is shown in Figure 6-1. A response time test was performed indicating that the response time in the sampling system was approximately 50 seconds. Nitrogen oxides were sampled and analyzed in accordance with EPA Method 20 using a Thermo Electron Model 10AR chemiluminescent analyzer. CO was monitored according to guidelines established in EPA Method 10 using a Horiba Model PIR-2000 nondispersive infrared analyzer. Instrument calibrations were performed at the beginning of each test with a span check at the conclusion of each test to assess instrument drift. An interference test was also performed to ensure that the NO_x analyzer was free of interference of other pollutants. A calibration gas containing O_2, CO, and CO_2 was analyzed and read zero during this test. A NO_x converter efficiency test was also performed during the test program. Leak checks were performed at the start and end of each test.

Stack gas flowrate, temperature, moisture, O_2, and CO_2 were also measured during the test program. Stack gas flowrate was measured in accordance with EPA Method 2. An Omega digital readout with a K-type thermocouple was used to determine stack temperature. Stack gas moisture was determined gravimetrically using EPA Method 4. Stack O_2 and CO_2 were determined using EPA Method 3A with a Teledyne fuel cell and an Anarad nondispersive infrared analyzer, respectively.

6.2 Procedures for Formaldehyde and PAH monitoring

Gas turbine No.1 was monitored for formaldehyde and PAH using CARB methods. Formaldehyde was sampled and analyzed using CARB Method 430. Sample gas was pulled through a series of two, midget impingers. The line was not heated since stack gas temperatures were generally above 900F. The first impinger contained 10mL of DNPH solution, while the second contained 15mL of DNPH solution. The sampling rate was approximately 0.8 to 0.9 L/min. Sampling was conducted until 3.5 to 4.0 DSCF of sample gas had been collected. Three replicate samples and a field blank were taken. Matrix spike and matrix spike duplicate analyses were conducted at the laboratory. Reagent blank analyses were also performed indicating non-detectable levels of formaldehyde. For best results during rinsing, all glassware was cleaned using organic-free water and absolute ethanol. Derivatization of the DNPH complex was conducted for one-hour to ensure complete recovery of formaldehyde. After derivatization, the samples were analyzed using high performance liquid chromatography. Leak checks were performed at the start and end of each test.

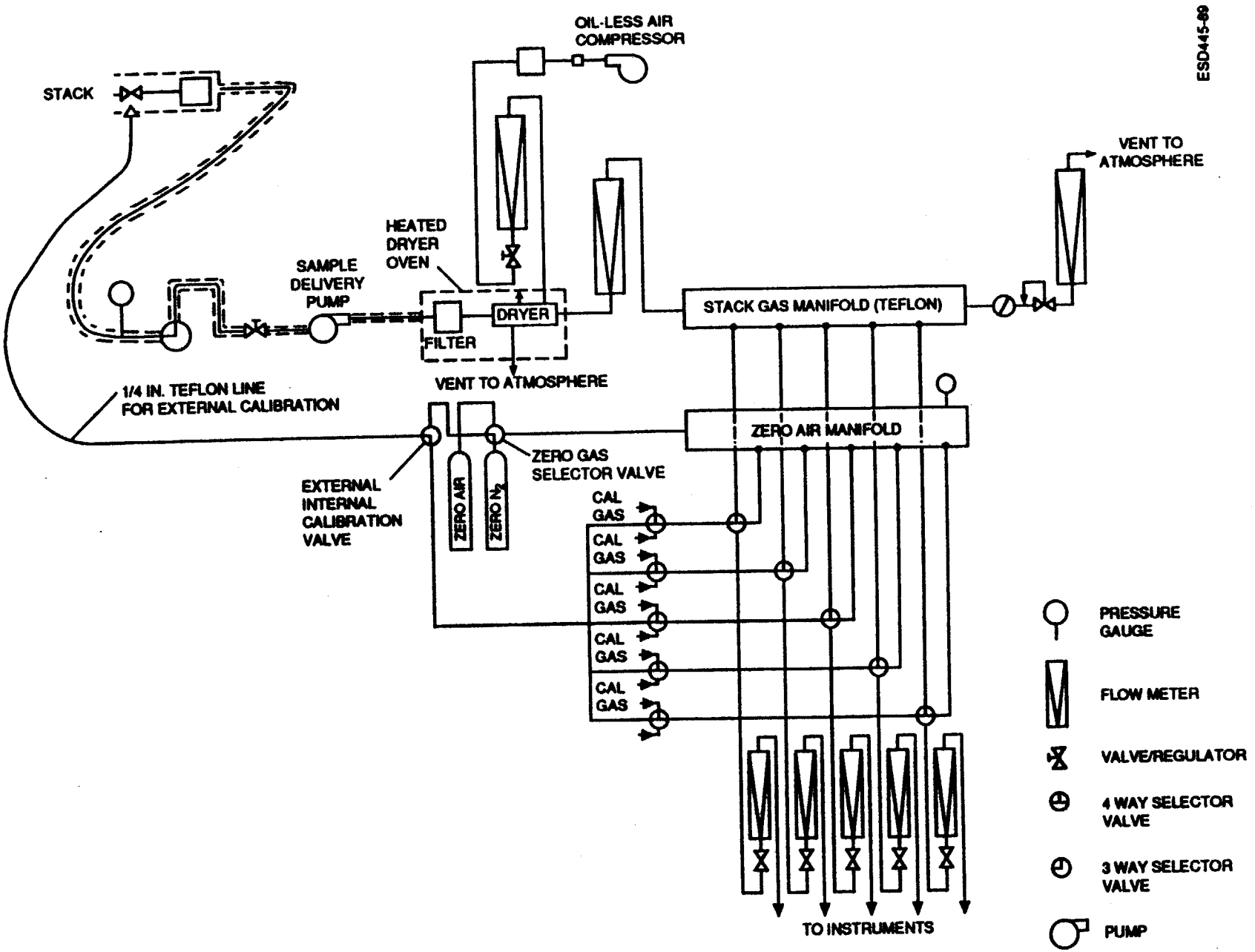


Figure 6-1. Schematic of CEM sampling system

PAHs were sampled and analyzed using CARB Method 429. A ten-foot, glass-lined probe was used to traverse the stack. Stack gas was pulled through the probe into a filter, which was housed in an oven at 250F. Gaseous PAHs passing through the filter were collected on XAD-2 resin, which was maintained below 65F throughout each test. The XAD temperature was maintained with a water jacket around the XAD trap and a condenser to cool the sample gas prior to entering the XAD trap. Two empty impingers, an impinger with 100mL of organic-free water, and silica gel desiccant were used to determine moisture in the stack gas. During sample recovery, glassware was rinsed with methanol, toluene, and methylene chloride. Leak checks were performed before and after each test.

Samples were composited and analyzed according to CARB 429. PAHs in the samples were identified by gas chromatography/mass spectroscopy. Quantitation of PAH compounds was performed using the isotope dilution technique. Surrogate compounds were spiked into each analytical sample to assess the recovery of compounds from the each sample.

7.0 QUALITY ASSURANCE

This section examines the quality assurance program implemented for this test program. Data quality for this test program was determined to be adequate. The quality assurance program for the NO_x and CO is discussed separately from the quality assurance program for formaldehyde and PAHs.

7.1 NO_x and CO Tests

Three quality procedures for the NO_x and CO tests were employed. NBS traceable standards were used to calibrate all CEM monitors. Second, all CEM monitors were calibrated before each test. Third, drift checks using a calibration gas closest to the concentration level observed during the test were performed after each test to determine any deviations from the measured values.

7.2 Formaldehyde and PAH Tests

Five quality control procedures for formaldehyde and PAHs were employed:

* Triplicate Samples
* Field Blanks
* Laboratory Method Blank
* Matrix Spike
* Matrix Spike Duplicate Analysis

Three replicate samples of formaldehyde by CARB Method 430 and three replicate samples of PAH were taken in the field. Reproducibility between samples appear to be adequate. Field blanks were taken for each test method. Furthermore, laboratory method blanks, matrix spikes of surrogates, and duplicate analyses of matrix spikes were conducted to ensure quality during this test program.

* Gas Turbine Operating Data

MCCLURE GENERATION

UNIT # 1

E.P.A. COMPLIANCE TEST 1989

10-17-89

HOURLY LOG:
17OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
12:38	70.9	32.06	.411	.384	75.

HOURLY LOG:
17OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
13:38	84.5	47.84	.566	.542	77.

HOURLY LOG:
17OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
14:38	83.9	47.46	.566	.538	79.

HOURLY LOG:
17OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
15:38	83.2	46.07	.554	.533	81.
16:38	82.9	45.87	.553	.531	82.

HOURLY LOG:
17OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
16:38	82.9	45.87	.553	.531	82.

HOURLY LOG:
17OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
17:38	83.0	45.86	.552	.531	82.

HOURLY LOG:
17OCT89 ----------ROLLING AVG----------

STOP

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
18:38	83.6	46.39	.555	.535	80.

HOURLY LOG:
17OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
19:38	69.1	30.59	.404	.368	76.

WATER INJECTION
OUT OF COMPLIANCE DATA SUMMARY

DATE: 10-18-89

UNIT # 1

TRIP TIME 1523

LOAD IN MW'S 53

GPM FUEL 81.7

REQUIRED GPM OF WATER 44.0

ACTUAL GPM OF WATER 39.

REASON FOR TRIP

20WN FAILED

RESTORATION TIME: 1528

MW LOAD 53

GPM OF FUEL 82.1

REQUIRED GPM OF WATER 42

ACTUAL GPM OF WATER 45

TOTAL TIME OUT OF COMPLIANCE: 5 MIN

REPAIRS MADE AND/OR RECOMMENDATION TO ELIMINATE FUTURE FAILURES

BYPASSED 20WN (WILL REPAIR LATER)

MCCLURE GENERATION

E.P.A. COMPLIANCE TEST 1989

UNIT # 1

10-18-89

HOURLY LOG:
18OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
09:31	78.8	41.02	.503	.484	59.

HOURLY LOG:
18OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
10:31	83.3	46.13	.554	.533	62.

HOURLY LOG:
18OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
11:31	83.3	46.70	.560	.533	65.

HOURLY LOG:
18OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
12:31	84.1	47.65	.567	.539	77.

HOURLY LOG:
18OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
13:31	83.7	47.40	.566	.536	80.

HOURLY LOG:

18OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
14:31	82.8	46.19	.558	.530	83.

ALARM LOG:

18OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
15:26	81.7	42.60	.516	.521	84.
1 HOUR HISTORICAL DATA					
15:26	76.6	6.95	.007	.473	85.
15:25	76.2	.77	.010	.476	85.
15:24	77.1	5.32	.007	.483	85.
15:23	81.7	43.98	.482	.522	85.
15:22	81.7	44.56	.545	.522	85.
15:21	81.7	44.55	.546	.521	85.
15:20	81.7	44.56	.545	.521	85.
15:19	81.6	44.55	.546	.521	85.
15:18	81.6	44.56	.546	.521	85.
15:17	81.6	44.56	.546	.521	85.
15:16	81.7	44.56	.545	.522	85.
15:15	81.8	44.56	.545	.522	85.
15:14	81.7	44.56	.546	.521	85.
15:13	81.6	44.56	.546	.521	85.
15:12	81.7	44.56	.545	.522	85.
15:11	82.0	44.56	.544	.524	84.
15:10	81.9	44.55	.535	.523	84.
15:09	81.9	44.18	.540	.523	85.
15:08	81.8	44.18	.540	.522	85.
15:07	81.7	44.20	.541	.521	85.
15:06	81.7	44.22	.541	.521	85.
15:05	81.7	44.25	.542	.522	85.
15:04	81.7	44.26	.542	.522	85.
15:03	81.7	44.28	.542	.521	85.
15:02	81.7	44.29	.542	.522	85.
15:01	81.8	44.31	.542	.522	84.
15:00	81.9	44.32	.541	.523	84.
14:59	81.9	44.33	.541	.523	84.
14:58	81.9	44.36	.542	.523	84.
14:57	81.9	44.40	.542	.523	84.
14:56	81.9	44.38	.542	.523	84.
14:55	81.9	44.43	.542	.523	85.
14:54	81.8	44.46	.544	.522	85.
14:53	81.8	44.46	.543	.522	84.
14:52	81.8	44.46	.543	.522	84.
14:51	81.9	44.50	.543	.523	84.
14:50	81.9	44.54	.544	.523	84.
14:49	81.9	44.60	.544	.523	84.
14:48	82.0	44.60	.544	.524	84.
14:47	82.1	44.61	.544	.524	84.
14:46	82.1	44.42	.541	.525	83.
14:45	82.1	44.41	.541	.525	84.
14:44	82.0	44.42	.542	.524	84.

14:42	82.0	44.44	.542	.524	84.
14:41	82.1	44.47	.542	.525	83.
14:40	82.2	44.49	.541	.526	83.
14:39	82.2	44.34	.539	.526	83.
14:38	82.2	44.36	.540	.525	83.
14:37	82.2	44.43	.541	.525	84.
14:36	82.1	44.58	.543	.525	84.
14:35	82.2	44.77	.545	.525	84.
14:34	82.2	44.45	.541	.525	84.
14:33	82.1	44.66	.544	.525	84.
14:32	82.4	45.76	.556	.527	84.
14:31	82.5	46.17	.560	.527	84.
14:30	82.5	46.18	.560	.528	84.
14:29	82.6	46.18	.559	.528	83.
14:28	82.5	46.19	.560	.527	84.
14:27	82.5	46.19	.560	.527	84.

?A

ALARM LOG:
18OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
NOT ONE HOUR YET					
1 HOUR HISTORICAL DATA					
15:32	81.8	45.43	.555	.523	85.
15:31	81.9	45.42	.554	.523	85.
15:30	81.8	45.43	.555	.522	85.
15:29	81.7	45.48	.556	.522	85.
15:28	81.8	45.43	.556	.522	85.
15:27	80.6	39.00	.394	.503	85.

HOURLY LOG:
18OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
16:26	81.5	44.18	.540	.520	85.

HOURLY LOG:
18OCT89 ----------ROLLING AVG----------

TIME	LIQ FUEL FLOW GPM	WATER FLOW GPM	ACTUAL RATIO	REQUIRED RATIO	AMBIENT TEMP F
17:26	81.5	43.96	.539	.520	85.

DATE: 10-17-89

MODESTO IRRIGATION DISTRICT
McCLURE GENERATING STATION
GAS TURBINE No. 1
2ND START FOR C.P.A. COMPLIANCE TEST

OPERATING DATA LOG

DATA IS TO BE RECORDED AT ANY LOAD SUSTAINED OVER 30 MINUTES..
IF MACHINE IS AT FULL LOAD, RECORD DATA ONCE PER HOUR.

START-UP DATA

START TIME: 1125
EMERGENCY STOPS: 108
START-UP TIME: 10
FIRED TIME (HRS): 4140.7

LUBE TANK LEVEL: Full
COOLING WATER TANK LEVEL: Full
NATURAL GAS SHUT-OFF VALVE: N/A
FUEL SELECTED: DIST
GAS PRESSURE: N/A

SHUT-DOWN DATA

EMERGENCY STOPS: 108
FIRED TIME (HRS): 4149.4
RUN TIME (HRS): 8.7
MANUAL INITIATED START COUNTER: 694
FAST LOAD START COUNTER: 5
TOTAL START COUNTER: 713
GENERATOR BREAKER COUNTER: 724
FUEL FLOW METER: RESETTABLE: 38007 + 132 = 38139
FUEL TANK IN USE (No.): 2
LUBE PUMP / TURNING GEAR ON: ✓
GAS SHUT-OFF VALVE CLOSED: ✓

PG&E NATURAL GAS METER:
START: N/A STOP: N/A cf
DIFF: ____ x 1,000 = ____ cf
DANIEL'S FLOW COMPUTER TOTALIZED:
START: ____ STOP: ____ lbs
DIFF: ____ x 228 = ____ cf
PG&E vs. DANIEL'S FLOW IN % ERROR ____
TOTALIZED: 10947980
LEVEL: 29'5"
LUBE TANK LEVEL: ✓
FUEL OIL SELECTED: ✓

☑ - READINGS TAKEN

☐ - NO READINGS TAKEN

DATE: 10-17-89

MODESTO IRRIGATION DISTRICT
McCLURE GENERATING STATION
GAS TURBINE No. 1

E.P.A. Compliance test Run.

O P E R A T I N G D A T A L O G

DATA IS TO BE RECORDED AT ANY LOAD SUSTAINED OVER 30 MINUTES..
IF MACHINE IS AT FULL LOAD, RECORD DATA ONCE PER HOUR.

Unit tripped at 1058 Combustion trouble
changed out 4 check-valve #2,3,4,8

S T A R T - U P D A T A

START TIME: 1045

EMERGENCY STOPS: 107

START-UP TIME: N/A

FIRED TIME (HRS): 4140.5

LUBE TANK LEVEL: Full

COOLING WATER TANK LEVEL: Full

NATURAL GAS SHUT-OFF VALVE: n/a

FUEL SELECTED: Dest

GAS PRESSURE: n/a

S H U T - D O W N D A T A

EMERGENCY STOPS: 108

FIRED TIME (HRS): 4140.7

RUN TIME (HRS): _____

MANUAL INITIATED START COUNTER: 694

FAST LOAD START COUNTER: 5

TOTAL START COUNTER: 712

GENERATOR BREAKER COUNTER: 723

FUEL FLOW METER: RESETTABLE: 132

FUEL TANK IN USE (No.): 2

LUBE PUMP / TURNING GEAR ON: —

GAS SHUT-OFF VALVE CLOSED: —

PG&E NATURAL GAS METER:

START: N/A STOP: N/A cf

DIFF: _____ x 1,000 = _____ cf

DANIEL'S FLOW COMPUTER TOTALIZED:

START: _____ STOP: _____ lbs

DIFF: _____ x 228 = _____ cf

PG&E vs. DANIEL'S FLOW IN % ERROR _____

TOTALIZED: 10709773

LEVEL: N/A

LUBE TANK LEVEL: —

FUEL OIL SELECTED: —

☐ - READINGS TAKEN

☒ - NO READINGS TAKEN

MEMORY LOCATION					
	TIME	BASE@1215 56MWS	1500	1530	1630	1730
	LOAD	: 76°F INLET	53.86	53.86	53.86	53.86
	FUEL	NO EVAPS	DIST	DIST	DIST	DIST
01	HP TURBINE SPEED %		100	100	100	100
02	VCE		12.42	12.37	12.36	12.36
0B	MAX. ALLOWABLE SPREAD		97	97	97	97
0C	SPREAD 1		64	64	61	63
0D	SPREAD 2		61	60	59	61
0E	LCE		12.42	12.41	12.39	12.40
0F	GCE		N/A	N/A	N/A	N/A
10	DIST. FUEL FLOW (gpm)		83.2	83.1	82.7	83.1
64	GAS FUEL FLOW #/sec.		N/A	N/A	N/A	N/A
12	WATER FLOW		45.88	45.84	45.92	45.84
17	INLET AIR (F)		81	82	82	82
33	AMBIENT AIR (F) / HUMIDITY		N/A	N/A	N/A	N/A
	EVAPORATIVE COOLER		OFF	OFF	OFF	OFF
	PRESSURES (PSIG)					
03	COMPRESSOR DISCHARGE (PCD)		113.9	113.7	113.5	114.1
11	SRV INTERVOLUME PRESSURE (VOLTS)		N/A	N/A	N/A	N/A
DANIELS COMPUTER	1. RATE					
	2. PRESSURE					
	3. TEMPERATURE					
	4. Δp H1 OR H2					
	5. P/T					
	GAS PRESSURE TRENCH					
	GAS PRESSURE MANIFOLD					
	GAS PRESS. CNTRL VALVE OUTLET					
	GAS PRESSURE INTERVOLUME					
	PG&E GAS FLOW CU. FT./MIN.					
	PG&E GAS FLOW #/HOUR (cal.)					

PRESSURES (PSIG)

FUEL OIL AFTER MAIN FILTER	66	65	66	66
FUEL OIL FILTER DIFFERENTIAL	0	0	0	0
LUBRICANT - MAIN PUMP DISCHARGE	105	104	104	104
LUBRICANT - BEARING HEADER	25.5	25.5	25.5	25.5
ATOMIZING AIR MANIFOLD	183	183	183	183
COOLING & SEALING AIR DISCHARGE	119	120	120	120
COOLING WATER HEADER	85	85	86	86
TRIP OIL	1390	1390	1380	1380
HYDRAULIC FILTER DIFFERENTIAL	0	0	0	0
LUBE FILTER DIFFERENTIAL	4	4	4	4
FUEL NOZZLE - No. 1	388	385	385	385
FUEL NOZZLE - No. 2	359	360	360	360
FUEL NOZZLE - No. 3	380	380	380	380
FUEL NOZZLE - No. 4	363	365	365	365
FUEL NOZZLE - No. 5	391	390	390	390
FUEL NOZZLE - No. 6	384	385	380	380
FUEL NOZZLE - No. 7	368	370	370	370
FUEL NOZZLE - No. 8	361	360	360	360
FUEL NOZZLE - No. 9	387	390	390	390
FUEL NOZZLE - No. 10	359	360	360	360
HP FUEL FILTER - OUT	410	410	410	410
HP FUEL FILTER - DIFFERENTIAL	0	0	0	0

TEMPERATURES (F)				
07 TURBINE EXHAUST M.I.D. VALUE	978	978	979	979
1A COMPRESSOR DISCHARGE No.1 (TCD-1)	592	592	593	592
1B COMPRESSOR DISCHARGE No.2 (TCD-2)	603	603	604	603
21 TURBINE EXHAUST - No.1 (TTX-1)	1015	1019	1019	1019
22 TURBINE EXHAUST - No.2 (TTX-2)	997	999	998	998
23 TURBINE EXHAUST - No.3 (TTX-3)	979	979	979	979
24 TURBINE EXHAUST - No.4 (TTX-4)	978	978	978	979
25 TURBINE EXHAUST - No.5 (TTX-5)	978	979	978	978
26 TURBINE EXHAUST - No.6 (TTX-6)	999	999	999	999
27 TURBINE EXHAUST - No.7 (TTX-7)	975	974	974	974
28 TURBINE EXHAUST - No.8 (TTX-8)	1003	1002	1004	1003
29 TURBINE EXHAUST - No.9 (TTX-9)	974	974	976	976
2A TURBINE EXHAUST - No.10 (TTX-10)	969	969	970	970
2B TURBINE EXHAUST - No.11 (TTX-11)	954	953	956	953
2C TURBINE EXHAUST - No.12 (TTX-12)	957	957	958	957
2D TURBINE EXHAUST - No.13 (TTX-13)	972	972	974	972
34 1ST.-STAGE FORWARD WHEELSPACE (1F01)	806	808	812	816
35 1ST.-STAGE FORWARD WHEELSPACE (1F02)	823	827	831	836
36 1ST.-STAGE AFT WHEELSPACE (1A01)	829	829	830	829
37 1ST.-STAGE AFT WHEELSPACE (1A02)	823	823	824	824
38 2ND.-STAGE FORWARD WHEELSPACE (2F01)	799	799	800	800
39 2ND.-STAGE FORWARD WHEELSPACE (2F02)	804	805	806	806
3A 2ND.-STAGE AFT WHEELSPACE (2A01)	642	643	644	644
3B 2ND.-STAGE AFT WHEELSPACE (2A02)	642	643	644	644
3C 3RD.-STAGE FORWARD WHEELSPACE (3F01)	661	663	664	664
3D 3RD.-STAGE FORWARD WHEELSPACE (3F02)	677	678	681	680
3E 3RD.-STAGE AFT WHEELSPACE (3A01)	505	507	509	510
3F 3RD.-STAGE AFT WHEELSPACE (3A02)	512	514	516	516
LUBE BEARING HEADER	129	127	130	____
LUBE TANK	150	150	152	____
	74	74	74	

L-9 SEQUENCE

VIBRATION DATA

CHANNEL No. 1 - TURBINE No. 1 BEARING:	.08	.08	.08	.07
CHANNEL No. 2 - TURBINE No. 2 BEARING:	.13	.11	.14	.14
CHANNEL No. 3 - No. 1 GENERATOR BEARING:	.40	N/A	.08	N/A
CHANNEL No. 4 - No. 2 GENERATOR BEARING:	.40	.41	.40	.45

TK-20

Suspect Readings on #3 #4 - TK-20 Shows Normal Vol. Levels

GENERATOR

OUTPUT VOLTAGE KV 1-2:	14.35	14.4	14.45	14.75
OUTPUT VOLTAGE KV 2-3:	14.40	14.5	14.50	14.80
OUTPUT VOLTAGE KV 3-1:	14.35	14.4	14.45	14.75
PHASE CURRENT KA 1:	2.21	2.21	2.20	2.18
PHASE CURRENT KA 2:	2.25	2.25	2.23	2.20
PHASE CURRENT KA 3:	2.20	2.20	2.19	2.16
M - VARS:	0	0	0	2
INCOMING VOLTAGE KV:	14.35	14.4	14.45	14.75
FIELD CURRENT:	305	300	300	310
FIELD VOLTS:	158	157	160	170
STATOR TEMPERATURE (C) 1 - TEST:	70	70	70	70
2 - ACTUAL:	91	92	94	95
3 - ACTUAL:	85	85	86	86
4 - ACTUAL:	85	86	87	87
5 - ACTUAL:	87	89	90	90
6 - ACTUAL:	85	85	86	87
7 - ACTUAL:	35	36	36	36
8 - ACTUAL:	34	34	35	35

McCLURE REVENUE AND
FUEL INFORMATION

DATE 10-17-89

GENERATION

#1 generator KWH (#857) 1340677

#1 KVARH Out (#662) 0120.9

#2 generator KWH (#917) _____

#2 KVARH Out (#194) _____

#1 Primary Out (#661) 2373.8

#1 Back-up Out (#878) 2389.9

#2 Primary Out (#663) _____

#2 Back-up Out (#646) _____

AUXILIARY AND STA. SERV.

#1 Aux (#876) Start 03322.6

Stop 03324.0

#2 Aux (#093) Start 3094.6

Stop 3094.9

STATION SERVICE

Meter #895 Start 0319.1

Stop 0319.5

#1 DEMAND

Machine _____ Time _____

System _____ Time _____

#2 DEMAND

Machine 1.02 Time 1215

System .97 Time 1700

REMARKS:

DATE: 10/18/89

MODESTO IRRIGATION DISTRICT
McCLURE GENERATING STATION
GAS TURBINE No. 1

DAY #2 E.P.A. COMPLIANCE TESTING

OPERATING DATA LOG

DATA IS TO BE RECORDED AT ANY LOAD SUSTAINED OVER 30 MINUTES..
IF MACHINE IS AT FULL LOAD, RECORD DATA ONCE PER HOUR.

START-UP DATA

START TIME: 817
EMERGENCY STOPS: 108
START-UP TIME: 10
FIRED TIME (HRS): 4149.4

LUBE TANK LEVEL: Full
COOLING WATER TANK LEVEL: Full
NATURAL GAS SHUT-OFF VALVE: CLOSED
FUEL SELECTED: DIST
GAS PRESSURE: N/A

SHUT-DOWN DATA

EMERGENCY STOPS: 108
FIRED TIME (HRS): 4159.4
RUN TIME (HRS): 16
MANUAL INITIATED START COUNTER: 695
FAST LOAD START COUNTER: 5
TOTAL START COUNTER: 714
GENERATOR BREAKER COUNTER: 725
FUEL FLOW METER: RESETTABLE: 46039
FUEL TANK IN USE (No.): 2
LUBE PUMP / TURNING GEAR ON: ✓
GAS SHUT-OFF VALVE CLOSED: ✓

PG&E NATURAL GAS METER:
START: N/A STOP: N/A cf.
DIFF: ____ x 1,000 = ____ cf
DANIEL'S FLOW COMPUTER TOTALIZED:
START: ____ STOP: ____ lbs
DIFF: ____ x 228 = ____ cf
PG&E vs. DANIEL'S FLOW IN % ERROR ____
TOTALIZED: 109 94019
LEVEL: 27'1"
LUBE TANK LEVEL: ✓
FUEL OIL SELECTED: ✓

☑ - READINGS TAKEN ☐ - NO READINGS TAKEN

MEMORY LOCATION					
	TIME 55mw 0845	1030	1130	1230	1330
	LOAD	54.57	54.5	54.5	53.86
	FUEL	DIST	DIST	DIST	DIST
01	HP TURBINE SPEED %	100	100	100	100
02	VCE	12.37	12.37	12.45	12:38
0B	MAX. ALLOWABLE SPREAD	93	96	97	97
0C	SPREAD 1	64	60	60	63
0D	SPREAD 2	59	60	54	57
0E	LCE	12.43	12.44	12.54	12.45
0F	GCE	N/A	.21	.21	N/A
10	DIST. FUEL FLOW (gpm)	83.1	83.0	84.2	83.2
64	GAS FUEL FLOW #/sec.	N/A	N/A	N/A	N/A
12	WATER FLOW	46.7	46.65	47.42	47.33
17	INLET AIR (F)	61	76	80	81
33	AMBIENT AIR (F) / HUMIDITY	N/A	N/A	N/A	N/A
	EVAPORATIVE COOLER	OFF	OFF	OFF	OFF
	PRESSURES (PSIG)				
03	COMPRESSOR DISCHARGE (PCD)	117.4	115.2	114.8	113.9
11	SRV INTERVOLUME PRESSURE (VOLTS)	N/A	2.13	2.11	N/A
DANIELS COMPUTER	1. RATE		N/A	N/A	
	2. PRESSURE				
	3. TEMPERATURE				
	4. Δp H1 OR H2				
	5. P/T				
	GAS PRESSURE TRENCH				
	GAS PRESSURE MANIFOLD				
	GAS PRESS. CNTRL VALVE OUTLET				
	GAS PRESSURE INTERVOLUME				
	PG&E GAS FLOW CU. FT./MIN.				
	PG&E GAS FLOW #/HOUR (cal.)		N/A	N/A	

TEMPERATURES (F)

07	TURBINE EXHAUST M.I.D. VALUE	924	959	975	979
1A	COMPRESSOR DISCHARGE No.1 (TCD-1)	562	582	588	592
1B	COMPRESSOR DISCHARGE No.2 (TCD-2)	575	595	601	604
21	TURBINE EXHAUST - No.1 (TTX-1)	962	1000	1014	1020
22	TURBINE EXHAUST - No.2 (TTX-2)	942	979	995	1000
23	TURBINE EXHAUST - No.3 (TTX-3)	926	961	976	980
24	TURBINE EXHAUST - No.4 (TTX-4)	924	959	975	978
25	TURBINE EXHAUST - No.5 (TTX-5)	927	962	980	981
26	TURBINE EXHAUST - No.6 (TTX-6)	944	982	999	1000
27	TURBINE EXHAUST - No.7 (TTX-7)	916	954	975	976
28	TURBINE EXHAUST - No.8 (TTX-8)	946	986	1002	1004
29	TURBINE EXHAUST - No.9 (TTX-9)	917	952	970	971
2A	TURBINE EXHAUST - No.10 (TTX-10)	913	950	966	968
2B	TURBINE EXHAUST - No.11 (TTX-11)	900	939	951	955
2C	TURBINE EXHAUST - No.12 (TTX-12)	905	941	956	960
2D	TURBINE EXHAUST - No.13 (TTX-13)	919	954	970	974
34	1ST.-STAGE FORWARD WHEELSPACE (1F01)	769	784	799	803
35	1ST.-STAGE FORWARD WHEELSPACE (1F02)	789	801	816	821
36	1ST.-STAGE AFT WHEELSPACE (1A01)	789	814	826	829
37	1ST.-STAGE AFT WHEELSPACE (1A02)	982	808	819	823
38	2ND.-STAGE FORWARD WHEELSPACE (2F01)	760	785	795	798
39	2ND.-STAGE FORWARD WHEELSPACE (2F02)	764	791	801	805
3A	2ND.-STAGE AFT WHEELSPACE (2A01)	609	628	638	641
3B	2ND.-STAGE AFT WHEELSPACE (2A02)	610	628	638	641
3C	3RD.-STAGE FORWARD WHEELSPACE (3F01)	624	645	657	660
3D	3RD.-STAGE FORWARD WHEELSPACE (3F02)	642	662	673	676
3E	3RD.-STAGE AFT WHEELSPACE (3A01)	473	489	501	506
3F	3RD.-STAGE AFT WHEELSPACE (3A02)	480	496	508	512
	LUBE BEARING HEADER	115	123	125	128
	LUBE TANK	137	144	148	150
	FUEL FORWARDING	71	73	74	

VIBRATION DATA

CHANNEL No. 1 - TURBINE No. 1 BEARING:	.10	.10	.09	.09
CHANNEL No. 2 - TURBINE No. 2 BEARING:	.14	.14	.15	.14
CHANNEL No. 3 - No. 1 GENERATOR BEARING: TK-20 DIRECT	V. .040 B. .045	V. .054 B .036	V. .059 B. .038	V. .088 B. .042
CHANNEL No. 4 - No. 2 GENERATOR BEARING:	.10	.14	.23	.30

GENERATOR

OUTPUT VOLTAGE KV 1-2:	14.5	14.5	14.45	14.45
OUTPUT VOLTAGE KV 2-3:	14.55	14.5	14.5	14.5
OUTPUT VOLTAGE KV 3-1:	14.5	14.5	14.5	14.45
PHASE CURRENT KA 1:	2.21	2.20	2.22	2.20
PHASE CURRENT KA 2:	2.25	2.24	2.26	2.24
PHASE CURRENT KA 3:	2.21	2.20	2.22	2.20
M - VARS:	0	0	0	1
INCOMING VOLTAGE KV:	14.5	14.45	14.45	14.45
FIELD CURRENT:	307	305	308	310
FIELD VOLTS:	155	158	164	164
STATOR TEMPERATURE (C) 1 - TEST:	70	70	70	70
2 - ACTUAL:	82	89	90	92
3 - ACTUAL:	75	81	83	85
4 - ACTUAL:	78	89	85	86
5 - ACTUAL:	76	86	93	88
6 - ACTUAL:	75	87	84	85
7 - ACTUAL;	27	38	38	35
8 - ACTUAL:	26	35	33	34

MEMORY LOCATION					
	TIME	1430	1537	1640	
	LOAD	52.89	52.81		
	FUEL	DIST	DIST	DIST	
01	HP TURBINE SPEED %	100	100	100	
02	VCE	12.29	12.21	12.19	
0B	MAX. ALLOWABLE SPREAD	97	97	97	
0C	SPREAD 1	60	61	60	
0D	SPREAD 2	54	56	53	
0E	LCE	12.34	12.24	12.27	
0F	GCE	-21	N/A	N/A	
10	DIST. FUEL FLOW (gpm)	81.9	81.8	81.5	
64	GAS FUEL FLOW #/sec.	N/A	N/A	N/A	
12	WATER FLOW	44.68	44.13	43.92	
17	INLET AIR (F)	84	86	86	
33	AMBIENT AIR (F) / HUMIDITY	N/A	N/A	N/A	/
	EVAPORATIVE COOLER	OFF	OFF	OFF	
	PRESSURES (PSIG)				
03	COMPRESSOR DISCHARGE (PCD)	112.9	112.7	112.7	
11	SRV INTERVOLUME PRESSURE (VOLTS)	N/A	N/A	N/A	
DANIELS COMPUTER	1. RATE				
	2. PRESSURE				
	3. TEMPERATURE				
	4. Δp H1 OR H2				
	5. P/T				
	GAS PRESSURE TRENCH				
	GAS PRESSURE MANIFOLD				
	GAS PRESS. CNTRL VALVE OUTLET				
	GAS PRESSURE INTERVOLUME				
	PG&E GAS FLOW CU. FT./MIN.				
	PG&E GAS FLOW #/HOUR (cal.)	N/A			

PRESSURES (PSIG)

FUEL OIL AFTER MAIN FILTER	66	66	66	
FUEL OIL FILTER DIFFERENTIAL	0	0	0	
LUBRICANT - MAIN PUMP DISCHARGE	104	104	104	
LUBRICANT - BEARING HEADER	25.5	25.5	25.5	
ATOMIZING AIR MANIFOLD	181	181	181	
COOLING & SEALING AIR DISCHARGE	118	119	119	
COOLING WATER HEADER	87	87	87	
TRIP OIL	1390	1390	1380	
HYDRAULIC FILTER DIFFERENTIAL	0	0	0	
LUBE FILTER DIFFERENTIAL	4	4	4	
FUEL NOZZLE - No. 1	380	375	380	
FUEL NOZZLE - No. 2	355	350	350	
FUEL NOZZLE - No. 3	375	375	375	
FUEL NOZZLE - No. 4	360	355	355	
FUEL NOZZLE - No. 5	385	385	385	
FUEL NOZZLE - No. 6	375	370	370	
FUEL NOZZLE - No. 7	360	360	360	
FUEL NOZZLE - No. 8	355	355	355	
FUEL NOZZLE - No. 9	380	380	380	
FUEL NOZZLE - No. 10	355	355	355	
HP FUEL FILTER - OUT	405	405	405	
HP FUEL FILTER - DIFFERENTIAL	0	0		

TEMPERATURES (F)

07	TURBINE EXHAUST M.I.D. VALUE	979	981	980	
1A	COMPRESSOR DISCHARGE No.1 (TCD-1)	595	596	597	
1B	COMPRESSOR DISCHARGE No.2 (TCD-2)	606	608	608	
21	TURBINE EXHAUST - No.1 (TTX-1)	1018	1019	1020	
22	TURBINE EXHAUST - No.2 (TTX-2)	998	998	998	
23	TURBINE EXHAUST - No.3 (TTX-3)	981	984	983	
24	TURBINE EXHAUST - No.4 (TTX-4)	980	981	980	
25	TURBINE EXHAUST - No.5 (TTX-5)	985	985	984	
26	TURBINE EXHAUST - No.6 (TTX-6)	1006	1006	1009	
27	TURBINE EXHAUST - No.7 (TTX-7)	977	978	978	
28	TURBINE EXHAUST - No.8 (TTX-8)	1006	1006	1008	
29	TURBINE EXHAUST - No.9 (TTX-9)	975	976	977	
2A	TURBINE EXHAUST - No.10 (TTX-10)	971	972	973	
2B	TURBINE EXHAUST - No.11 (TTX-11)	959	956	959	
2C	TURBINE EXHAUST - No.12 (TTX-12)	962	963	965	
2D	TURBINE EXHAUST - No.13 (TTX-13)	973	973	975	
34	1ST.-STAGE FORWARD WHEELSPACE (1F01)	810	810	812	
35	1ST.-STAGE FORWARD WHEELSPACE (1F02)	827	830	832	
36	1ST.-STAGE AFT WHEELSPACE (1A01)	831	832	833	
37	1ST.-STAGE AFT WHEELSPACE (1A02)	826	827	828	
38	2ND.-STAGE FORWARD WHEELSPACE (2F01)	801	803	804	
39	2ND.-STAGE FORWARD WHEELSPACE (2F02)	808	810	810	
3A	2ND.-STAGE AFT WHEELSPACE (2A01)	645	646	647	
3B	2ND.-STAGE AFT WHEELSPACE (2A02)	645	647	648	
3C	3RD.-STAGE FORWARD WHEELSPACE (3F01)	664	665	667	
3D	3RD.-STAGE FORWARD WHEELSPACE (3F02)	681	683	684	
3E	3RD.-STAGE AFT WHEELSPACE (3A01)	509	510	511	
3F	3RD.-STAGE AFT WHEELSPACE (3A02)	515	517	579	
	LUBE BEARING HEADER	131	133	134	
	LUBE TANK	152	154	155	
	FUEL FORWARDING	75	75	75	

VIBRATION DATA

CHANNEL No. 1 - TURBINE No. 1 BEARING:	.09	.09	.09	
CHANNEL No. 2 - TURBINE No. 2 BEARING:	.14 V. .65	.15 V. .700	.14 V. .70	
CHANNEL No. 3 - No. 1 GENERATOR BEARING: (TK-20 DIRECT)	B. .043	B. .047	B. .05	
CHANNEL No. 4 - No. 2 GENERATOR BEARING:	.22	.23	.21	

GENERATOR

OUTPUT VOLTAGE KV 1-2:	14.3	14.3	14.4	
OUTPUT VOLTAGE KV 2-3:	14.4	14.4	14.5	
OUTPUT VOLTAGE KV 3-1:	14.3	14.3	14.4	
PHASE CURRENT KA 1:	2.19	2.17	2.16	
PHASE CURRENT KA 2:	2.22	2.20	2.20	
PHASE CURRENT KA 3:	2.19	2.16	2.16	
M - VARS:	0	0	0	
INCOMING VOLTAGE KV:	14.3	14.3	14.35	
FIELD CURRENT:	304	300	300	
FIELD VOLTS:	160	160	160	
STATOR TEMPERATURE (C) 1 - TEST:	70	70	70	
2 - ACTUAL:	99	95	95	
3 - ACTUAL:	100	87	88	
4 - ACTUAL:	97	89	90	
5 - ACTUAL:	95	90	91	
6 - ACTUAL:	95	88	89	
7 - ACTUAL:	42	37	37	
8 - ACTUAL:	37	36	36	

McCLURE REVENUE AND
FUEL INFORMATION

DATE 10 | 18 | 89

GENERATION

#1 generator KWH (#857) 134584.2

#1 KVARH Out (#662) 0121.0

#2 generator KWH (#917) _____

#2 KVARH Out (#194) _____

#1 Primary Out (#661) 2382.7

#1 Back-up Out (#878) 2394.0

#2 Primary Out (#663) _____

#2 Back-up Out (#646) _____

AUXILIARY AND STA. SERV.

#1 Aux (#876) Start 03324.7

Stop 03326.2

#2 Aux (#093) Start 3095.1

Stop 3095.5

STATION SERVICE

Meter #895 Start 320.0

Stop 0320.7

#1 DEMAND

Machine 1.00 Time 1200

System .95 Time 1700

#2 DEMAND

Machine _____ Time _____

System _____ Time _____

REMARKS:

DATE: 10/19/89

MODESTO IRRIGATION DISTRICT
McCLURE GENERATING STATION
GAS TURBINE No. 1

EMISSIONS TESTING ON MIX FUEL
OPERATING DATA LOG

DATA IS TO BE RECORDED AT ANY LOAD SUSTAINED OVER 30 MINUTES..
IF MACHINE IS AT FULL LOAD, RECORD DATA ONCE PER HOUR.

START-UP DATA

START TIME: 0815
EMERGENCY STOPS: 108
START-UP TIME: 10
FIRED TIME (HRS): 4161.0

LUBE TANK LEVEL: Full
COOLING WATER TANK LEVEL: Full
NATURAL GAS SHUT-OFF VALVE: OPEN
FUEL SELECTED: Dist
GAS PRESSURE: 261

SHUT-DOWN DATA

EMERGENCY STOPS: 108
FIRED TIME (HRS): 4171.2
RUN TIME (HRS): 10.2
MANUAL INITIATED START COUNTER: 697
FAST LOAD START COUNTER: 5
TOTAL START COUNTER: 916
GENERATOR BREAKER COUNTER: 727
FUEL FLOW METER: RESETTABLE: 7657
FUEL TANK IN USE (No.): 2
LUBE PUMP / TURNING GEAR ON: ✓
GAS SHUT-OFF VALVE CLOSED: ✓

PG&E NATURAL GAS METER:
START: 109620 STOP: 113983 cf
DIFF: 4363 x 1,000 = 4,363,000 cf
DANIEL'S FLOW COMPUTER TOTALIZED:
START: 2284728 STOP: 2304176 lbs
DIFF: 19,448 x 228 = 4,434,144 cf
PG&E vs. DANIEL'S FLOW IN % ERROR 1.7%
TOTALIZED: 11005855
LEVEL: 26' 6"
LUBE TANK LEVEL: Full
FUEL OIL SELECTED: ✓

☐ - READINGS TAKEN ☒ - NO READINGS TAKEN

McCLURE REVENUE AND
FUEL INFORMATION

DATE 10 | 19 | 89

GENERATION

#1 generator KWH (#857) 135023.6

#1 KVARH Out (#662) 121.2

#2 generator KWH (#~~0857~~) _____

#2 KVARH Out (#~~0662~~) _____

#1 Primary Out (#661) 2390.6

#1 Back-up Out (#878) 2401.9

#2 Primary Out (#~~0661~~) _____

#2 Back-up Out (#~~0878~~) _____

AUXILIARY AND STA. SERV.

#1 Aux (#876) Start 3327.1

Stop 3328.8

#2 Aux (#093) Start 3095.9

Stop 3096.2

STATION SERVICE

Meter #895 Start 321.1

Stop 321.6

#1 DEMAND

Machine .98 Time 1230

System .62 Time 1630

#2 DEMAND

Machine _____ Time _____

System _____ Time _____

REMARKS:

UNIT #1
PERFORMANCE (EPA) 89 — 10/19/89

LOAD	VCE	LCE	GCE	O3 PCD	GAS C4 #/SEC	10 GPM FUEL	H20 INJ.	MW RU
50	9.13	6.22	6.95	88.3	3.28	23.0	~~0~~	59
50	9.13	6.22	6.95					59
30	9.13	5.55	7.64	88.3	3.99	16.8	11	79
30	9.13	5.55	7.64	88.3	3.99	16.8	11	60
45	10.62	6.68	7.97	110.~~0~~	4.3	27.6		70
45	10.62	6.00	8.65	109.6	5.05	21.1		80
45	10.58	5.35	9.27	109.~~0~~	5.68	15		80
54	11.72	5.58	10.19	113.3	6.56	17		70
54	11.72	6.46	9.43	113.5	5.78	25.3		60
54	11.58	7.1~	8.55	112.5	4.95	31.7		90
54	11.86	4.79	11.11	113.5	7.46	9.4		90
45	10.72	4.7	10.09	108.4	6.45	8.5		

DATE: 10/19/89

MODESTO IRRIGATION DISTRICT
McCLURE GENERATING STATION
GAS TURBINE No. 1

EMISSIONS TESTING ON MIX FUEL
OPERATING DATA LOG

DATA IS TO BE RECORDED AT ANY LOAD SUSTAINED OVER 30 MINUTES..
IF MACHINE IS AT FULL LOAD, RECORD DATA ONCE PER HOUR.

START-UP DATA

START TIME: 0815
EMERGENCY STOPS: 108
START-UP TIME: 10
FIRED TIME (HRS): 4161.0

LUBE TANK LEVEL: Full
COOLING WATER TANK LEVEL: Full
NATURAL GAS SHUT-OFF VALVE: OPEN
FUEL SELECTED: Dist
GAS PRESSURE: 261

SHUT-DOWN DATA

EMERGENCY STOPS: 108
FIRED TIME (HRS): 4171.2
RUN TIME (HRS): 10.2
MANUAL INITIATED START COUNTER: 697
FAST LOAD START COUNTER: 5
TOTAL START COUNTER: 916
GENERATOR BREAKER COUNTER: 727
FUEL FLOW METER: RESETTABLE: 7657
FUEL TANK IN USE (No.): 2
LUBE PUMP / TURNING GEAR ON: ✓
GAS SHUT-OFF VALVE CLOSED: ✓

PG&E NATURAL GAS METER:
START: 109620 STOP: 113983 cf
DIFF: 4363 x 1,000 = 4,363,000 cf
DANIEL'S FLOW COMPUTER TOTALIZED:
START: 2284728 STOP: 2304176 lbs
DIFF: 19,448 x 228 = 4,434,144 cf
PG&E vs. DANIEL'S FLOW IN % ERROR 1.7%
TOTALIZED: 11005855
LEVEL: 26' 6"
LUBE TANK LEVEL: Full
FUEL OIL SELECTED: ✓

☐ - READINGS TAKEN ☑ - NO READINGS TAKEN

McCLURE REVENUE AND
FUEL INFORMATION

DATE 10/19/89

GENERATION

#1 generator KWH (#857) 135023.6

#1 KVARH Out (#662) 121.2

#2 generator KWH (~~#857~~) _____

#2 KVARH Out (~~#662~~) _____

#1 Primary Out (#661) 2390.6

#1 Back-up Out (#878) 2401.9

#2 Primary Out (~~#661~~) _____

#2 Back-up Out (~~#878~~) _____

AUXILIARY AND STA. SERV.

#1 Aux (#876) Start 3327.1

Stop 3328.8

#2 Aux (#093) Start 3095.9

Stop 3096.2

STATION SERVICE

Meter #895 Start 321.1

Stop 321.6

#1 DEMAND

Machine .98 Time 1230

System .62 Time 1630

#2 DEMAND

Machine _____ Time _____

System _____ Time _____

REMARKS:

UNIT #1
PERFORMANCE (EPA) 89 — 10/19/89

LOAD	VCE	LCE	GCE	O3 PCD	GAS GA #/SEC	10 GPM FUEL	H20 INJ.	MW RUN
30	9.13	6.22	6.95	88.3	3.28	23.0	0	59/
30	9.13	6.22	6.95					59/
30	9.13	5.55	7.64	88.3	3.99	16.8	11	70/
45	10.62	6.68	7.97	110.0	4.3	27.6		60/
15	10.62	6.00	8.65	109.6	5.05	21.1		70/
15	10.58	5.35	9.27	109.0	5.68	15		80/
54	11.72	5.58	10.19	113.3	6.56	17		80/
54	11.72	6.46	9.13	113.5	5.78	25.3		70/
54	11.58	7.1	8.55	112.5	4.95	31.7		60/
54	11.86	4.79	11.11	113.5	7.46	9.4		90/
15	10.72	4.7	10.09	108.4	6.45	8.5		90/

Turbine Operation Data

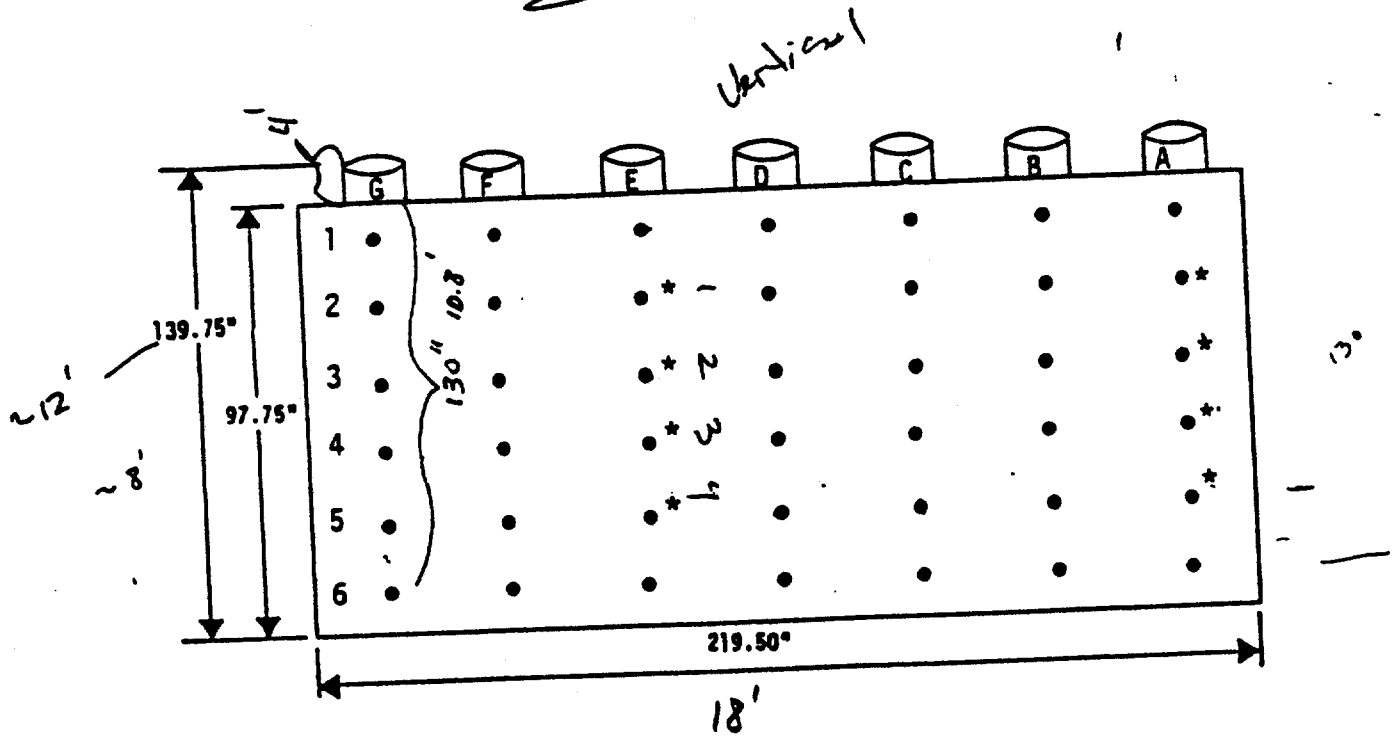
Turbine Identification:	GE MS 7001 B		
Serial Number			
Type	#1	#2	#3
Ambient temperature (°F)	82	71	85
Barometric pressure	29.98	30.0	29.94
Fuel flow (~~lb/hr~~) (GPM)	83.2	83.6	81.5
Water flowrate (GPM)	46.0	47.0	44.1
Operating load (%)	100	→	→
Fuel	* 2 Distillate	→	→
Date	10-17-89	10-18-89	10-18-89

* Test Data represents daily average

* 100 % operated load represented 55 Mega watts

* Field Data

Modesto



Sampling Points

Traverse Point No.	Distance from Outside Edge of Sampling Port in Inches
1	50
2	66
3	82
4	98
5	114
6	130

* Denotes the selected traverse points used for compliance testing.

Figure 4-1 Sectional Diagram of stack and selected traverse point locations.

1st A

FIELD DATA SHEET

ACUREX Aerotherm

Plant McClain Generating Station - MID

Location Turbine A (1)

Operator Johnston

Date 10-18-99

Load Range 100% 55 Mega Watts

Ambient Temperature 81 °F

Barometric Pressure 30.04

Static Pressure Duct ± 3"

Fuel #2 Diesel

Evaporation Units are Off

Time	Sample Point	Load MW	Steam Flow lb/hr x1000	DRY UNCORRECTED O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	NO_2 ppm	CORRECTED TO 3% O_2 DRY NO ppm	NO_x ppm	NO_2 ppm	HYDROCARBONS (HC) Total HC	Methane	Non-Methane HC	H_2O %	Stack Gas Temp °F	COMMENTS
1312	A-1	55		15.4	4.0	17			42			44.5						~950	
22	-2			15.5	3.9	17			39			42.5							
29	-3			15.5	3.9	16			40			43.6							
38	-4			15.4	4.0	15			40			42.8							
1350	E-1			15.2	4.2	13			42			43.7							
56	-2			15.3	4.1	14			42			44.1							
1402	-3			15.4	4.0	14			41			43.6							
08	-4			15.5	4.0	16			40			43.6							
AVG				15.4	4.0	15			40.8			43.6							
Corrected for Drift				15.4					37.8			40.5							
																			AVERAGE

032

Test —

ACUREX Aerotherm

FIELD DATA SHEET

Plant McClure Generating Station (M.I.D.)
Location Turbine A (1)
Operator Johnston
Date 10-18-84
Load Range 100% 55 Mg Watts

Ambient Temperature 82
Barometric Pressure 29.98
Static Pressure Duct -3.0
Fuel #2 Diesel

Evaporation Units Off

Time	Sample Point	Load MW	Steam Flow lb/hr x1000	DRY UNCORRECTED O_2 %	CO_2 %	CO ppm	~~SO_2 ppm~~	~~NO ppm~~	NO_x ppm	~~NO_2 ppm~~	CORRECTED TO 15% O_2 DRY ~~NO ppm~~	NO_x ppm	~~NO_2 ppm~~	HYDROCARBONS (HC) Total HC	Methane	Non-Methane HC	H_2O %	Stack Gas Temp °F	COMMENTS
1432	E-1	55		15.3	4.1	15			41			43.1							
38	-2			15.3	4.1	14			43			45.1							
45	-3			15.4	4.0	13			42			44.9							
	-4			15.6	3.8	14			40			44.4							
1503	A-1			15.5	3.9	13			41			44.7							
09	-2			15.2	4.1	15			44			45.7							
15	-3			15.3	4.1	13			43			45.1							
22	-4			15.2	4.2	14			44			45.8							
AVG				15.3	4.0	14			42.3			44.9							
Corrected for Dryer				15.3					40.2			42.2							
																			AVERAGE

0:12

Test C

ACUREX Aerotherm

FIELD DATA SHEET

Plant McClun Generating Station (M.L.D.)
Location Turbine A (1)
Operator Johnston
Date 10-18-89
Load Range 100%

Ambient Temperature 84
Barometric Pressure 29.94
Static Pressure Duct -3.0
Fuel #2 Diesel

(Evaporation Units Off)

Time	Sample Point	Load MW	Steam Flow lb/hr x1000	DRY UNCORRECTED O_2 %	DRY UNCORRECTED CO_2 %	DRY UNCORRECTED CO ppm	DRY UNCORRECTED SO_2 ppm	DRY UNCORRECTED NO ppm	DRY UNCORRECTED NO_x ppm	DRY UNCORRECTED NO_2 ppm	CORRECTED TO 3% O2 DRY NO ppm	CORRECTED TO 3% O2 DRY NO_x ppm	CORRECTED TO 3% O2 DRY NO_2 ppm	HYDROCARBONS (HC) Total HC	HYDROCARBONS (HC) Methane	HYDROCARBONS (HC) Non-Methane HC	H_2O %	Stack Gas Temp °F	COMMENTS
1552	A-1	55		15.4	3.9	12			43			46.0						900	
59	-2			15.3	3.9	12			43			45.1							
1605	-3			15.3	4.1	13			43			45.1							
14	-4			15.2	4.1	15			43			44.7							
1630	E-1			15.1	4.1	13			45			45.7							Don't Use
37	-2			15.4	4.0	14			43			46.0							
44	-3			15.4	4.0	15			42			44.9							Ref to points E2,3,4,9 do to possible in Leakage & probe starts
52	-2			15.1	4.2	15			44			45.5							
57	-3			15.1	4.2	13			44			45.5							
1701	-4			15.1	4.2	14			43			43.1							
AVG				15.2	4.1	13			43.5			45.2							
Corrected for Drift				15.2					42.5			44.2							
																			AVERAGE

012

AIR PRODUCTS AND CHEMICALS, INC.
SPECIALTY GAS DEPARTMENT
23320 S. ALAMEDA STREET
LONG BEACH, CA 90810
TELEPHONE (213) 518-0430

DATE: 05/17/89
PAGE: 1

****
* CERTIFICATE OF ANALYSIS *
****

ACUREX
485 CLYDE AVE.
MOUNTAIN VIEW CA 94043

CUSTOMER ACCOUNT : A1666
CUSTOMER ORDER NO : E6242030
ORDER NO : 236-000284
ORDER DETAIL SEQ : 1

** ANALYSIS **

GAS MIXTURE: NITRIC OXIDE IN NITROGEN

	CYL NO	COMPONENT REQUESTED	CONCENTRATION REQUESTED	ANALYTICAL RESULT	UNIT OF MEASURE
BATCH NO: 02909M	CC27031A	NITRIC OXIDE	80	71.4	MOLAR PPM
ANAL DATE: 05/16/89		NOX		75.4	MOLAR PPM

CERTIFICATION

THIS ANALYSIS HAS BEEN PERFORMED UTILIZING APPROVED ANALYTICAL METHOD(S) AND IS CORRECT TO WITHIN THE ANALYTICAL ACCURACIES OF THIS (THESE) METHOD(S).

AUTHORIZED SIGNATURE

AIR PRODUCTS

Air Products and Chemicals, Inc.

Specialty Gas Department
23320 S. Alameda Street
Long Beach, CA 90810
(213) 518-0430

STATEMENT OF TRACEABILITY

FOR GAS MIXTURES

Specialty Gas mixtures supplied by Air Products and Chemicals, Inc. (APCI), Industrial Gas Division, are analyzed by comparing with standards that are traceable to the National Bureau of Standards (NBS) by the following two methods:

Method #1: Secondary standards are analyzed by comparing with Standard Reference material purchased from NBS. Six categories are available (Oxygen in Nitrogen, Propane in Air, Carbon Dioxide in Nitrogen, Carbon Monoxide in Nitrogen, Nitric Oxide in Nitrogen and Sulfur Dioxide in Nitrogen).

Method #2: Secondary Standards are analyzed by comparing with gravimetrically prepared primary standard produced by APCI and made with a balance using Class "S" weights traceable to NBS. The standard deviation of this balance is ± .003 grams at a 95% confidence level.

The methods described above represent the standard method of traceability used by Air Products and Chemicals, Inc. IGD.

Date 5/16/89 Cylinder No. CC 27031A Analysis 72.4ppm NO
75.4ppm NO_x Bal N_2

AIR PRODUCTS AND CHEMICALS, INC.
SPECIALTY GAS DEPARTMENT
23320 S. ALAMEDA STREET
LONG BEACH, CA 90810
TELEPHONE (213) 518-0430

DATE: 01/30/89
PAGE: 1

****
* CERTIFICATE OF ANALYSIS *
****

ACUREX
685 CLYDE AVE.
MOUNTAIN VIEW CA 94043

CUSTOMER ACCOUNT : A1646
CUSTOMER ORDER NO : ER187520
ORDER NO : 863-000901
ORDER DETAIL SEQ : 6

** ANALYSIS **

GAS MIXTURE: NITRIC OXIDE IN NITROGEN

	CYL NO	COMPONENT REQUESTED	CONCENTRATION REQUESTED	ANALYTICAL RESULT	UNIT OF MEASURE
BATCH NO: 02130M ANAL DATE: 01/30/89	SG861648NB	NITRIC OXIDE	20	18	MOLAR PPM
		NOX		19	MOLAR PPM

CERTIFICATION

THIS ANALYSIS HAS BEEN PERFORMED UTILIZING APPROVED ANALYTICAL METHOD(S) AND IS CORRECT TO WITHIN THE ANALYTICAL ACCURACIES OF THIS (THESE) METHOD(S).

AUTHORIZED SIGNATURE

AIR PRODUCTS

Air Products and Chemicals, Inc.

Specialty Gas Department
23320 S. Alameda Street
Long Beach, CA 90810
(213) 518-0430

STATEMENT OF TRACEABILITY

FOR GAS MIXTURES

Specialty Gas mixtures supplied by Air Products and Chemicals, Inc. (APCI), Industrial Gas Division, are analyzed by comparing with standards that are traceable to the National Bureau of Standards (NBS) by the following two methods:

Method #1: Secondary standards are analyzed by comparing with Standard Reference material purchased from NBS. Six categories are available (Oxygen in Nitrogen, Propane in Air, Carbon Dioxide in Nitrogen, Carbon Monoxide in Nitrogen, Nitric Oxide in Nitrogen and Sulfur Dioxide in Nitrogen).

Method #2: Secondary Standards are analyzed by comparing with gravimetrically prepared primary standard produced by APCI and made with a balance using Class "S" weights traceable to NBS. The standard deviation of this balance is ± .003 grams at a 95% confidence level.

The methods described above represent the standard method of traceability used by Air Products and Chemicals, Inc. IGD.

Date	Cylinder No.	Analysis
1/27/89	SG 8616 NB	18 ppm NO
		19 ppm NO
		B.A. Mix

AIR PRODUCTS AND CHEMICALS, INC.
SPECIALTY GAS DEPARTMENT
[illegible] S. ALAMEDA STREET
LONG BEACH, CA [illegible]
TELEPHONE [illegible]

DATE: [illegible]
PAGE: [illegible]

CERTIFICATE OF ANALYSIS

ACUREX
[illegible] CLYDE AVE.
MOUNTAIN VIEW CA [illegible]

CUSTOMER ACCOUNT [illegible]
CUSTOMER ORDER NO [illegible]
ORDER NO [illegible]-[illegible]
ORDER DETAIL SEQ [illegible]

** ANALYSIS **

CERTIFIED GAS MIXTURE: 2 COMPONENTS IN NITROGEN

	CYL NO	COMPONENT REQUESTED	CONCENTRATION REQUESTED	ANALYTICAL RESULT	UNIT OF MEASURE
BATCH NO. [illegible]	SG16[illegible]	CARBON DIOXIDE	10	[illegible]	MOLAR %
ANAL DATE: 10/09/89		CARBON MONOXIDE	[illegible]	417	MOLAR PPM

[illegible]

THIS ANALYSIS HAS BEEN PERFORMED UTILIZING [illegible] ANALYTICAL METHODS [illegible] CORRECT [illegible] THE ANALYTICAL ACCURACIES [illegible] THESE [illegible]

[illegible] SIGNATURE

AIR PRODUCTS

Air Products and Chemicals, Inc.

Specialty Gas Department
23320 S. Alameda Street
Long Beach, CA 90810
(213) 518-0430

STATEMENT OF TRACEABILITY

FOR GAS MIXTURES

Specialty Gas mixtures supplied by Air Products and Chemicals, Inc. (APCI), Industrial Gas Division, are analyzed by comparing with standards that are traceable to the National Bureau of Standards (NBS) by the following two methods:

Method #1: Secondary standards are analyzed by comparing with Standard Reference material purchased from NBS. Six categories are available (Oxygen in Nitrogen, Propane in Air, Carbon Dioxide in Nitrogen, Carbon Monoxide in Nitrogen, Nitric Oxide in Nitrogen and Sulfur Dioxide in Nitrogen).

Method #2: Secondary Standards are analyzed by comparing with gravimetrically prepared primary standard produced by APCI and made with a balance using Class "S" weights traceable to NBS. The standard deviation of this balance is ± .003 grams at a 95% confidence level.

The methods described above represent the standard method of traceability used by Air Products and Chemicals, Inc. IGD.

Date	Cylinder No.	Analysis
10/5/89	SG 1640NB	417 ppm CO
		16.1% CO2
		Bal N2

Darrel F. O'Connell

Facility Manager

AIR PRODUCTS AND CHEMICALS, INC.
SPECIALTY GAS DEPARTMENT
23020 S. ALAMEDA STREET
LONG BEACH, CA 90810
TELEPHONE (213) 830-2400

DATE: 10/13/89
PAGE 1

CERTIFICATE OF ANALYSIS

ACUREX
485 CLYDE AVE.
MOUNTAIN VIEW CA 94043

CUSTOMER ACCOUNT : A1...
CUSTOMER ORDER NO : E8...
ORDER NO : 0...
ORDER DETAIL SEQ : 1

** ANALYSIS **

CERTIFIED GAS MIXTURE: 3 COMPONENTS IN NITROGEN

	CYL NO	COMPONENT REQUESTED	CONCENTRATION REQUESTED	ANALYTICAL RESULT	UNIT OF MEASURE
BATCH NO: 04210M	SG66835NB	CARBON DIOXIDE	6 %	6.02	MOLAR %
ANAL DATE: 10/13/89		CARBON MONOXIDE	175 %	173	MOLAR PPM
		OXYGEN 7 %	7 %	7.00	MOLAR %

CERTIFICATION

THE ANALYSIS HAS BEEN PERFORMED UTILIZING APPROVED ... CORRECT ... THE ...

...

FORM 3805-1 (REV. 8/88)

DATE 10-23-89

SC 479 PROBE LENGTH 10'

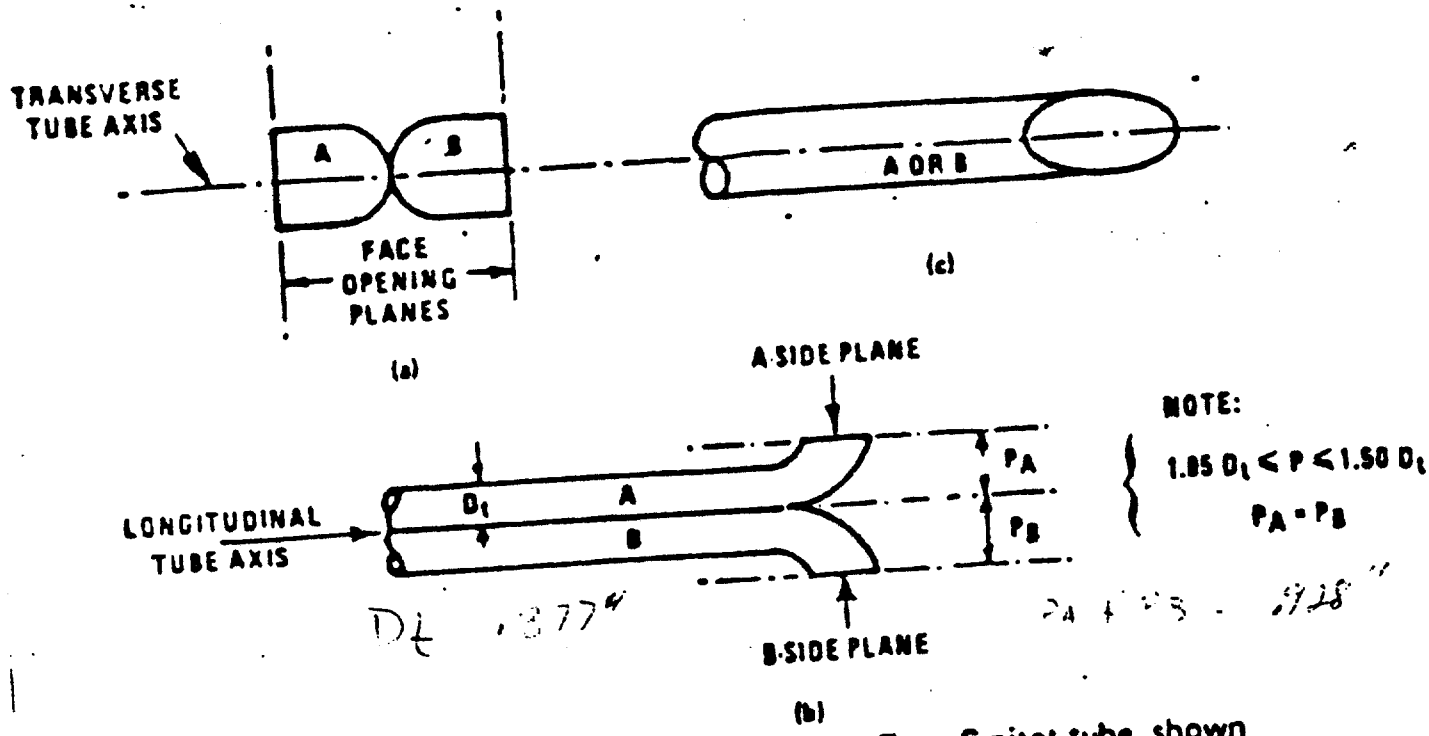
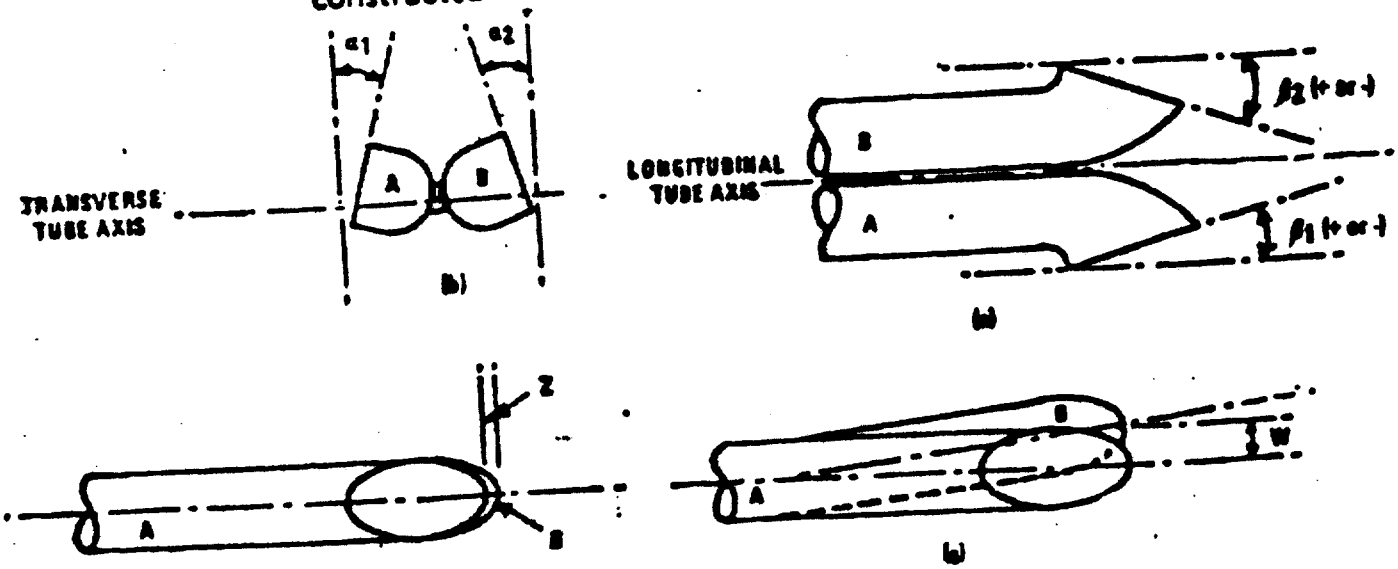


Figure 2-2. Properly constructed Type S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis; (b) top view; face opening planes parallel to longitudinal axis; (c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.



α_1 -3° LESS THAN 10°

α_2 0°

z $0''$ LESS THAN .32cm (1/8")

β_1 $+2.5^\circ$ LESS THAN 5°

β_2 $+2.5^\circ$

w $< 1/32''$ LESS THAN .08cm (1/32")

Figure 2-3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of Cp(s) as long as α_1 and $\alpha_2 < 10^\circ$, β_1 and $\beta_2 < 5^\circ$, $z < 0.32$ cm (1/8 in.) and $w <$

VOST METER CALIBRATION SHEET

Signature [signature] Date 10-24-80

Test Meter No. 433583

Dry Gas Meter Identification #1

Test Meter Correction Factor

Barometric Pressure (P_b) 30.13 in. Hg

Run No	Initial Test Meter Reading	Final Test Meter Reading	Initial Dry Gas Meter Reading	Final Dry Gas Meter Reading	Test Meter Volume (V_s) liters	Dry Gas Meter Volume (V_{dg}) liters	Temperatures: Test Meter (t_w) °F	Temperatures: Dry Gas Meter: Inlet (t_d) °F	Temperatures: Dry Gas Meter: Outlet (t_d) °F	Temperatures: Dry Gas Meter: Average ($\bar{t}_d$) °F	Dry Gas Meter Pressure (ΔP) in. H_2O	Test Meter Pressure in. H_2O	Time (θ) min	Meter Coefficient (Y_{ds})	Average Meter Coefficient ($\bar{Y}_{ds}$)
#1	189.4 cf	190.379 cf	000.0 ℓ	0028.0 ℓ	27.721 ℓ	28.0 ℓ	78.8	78.8	78.8	78.8	2.0		16.9	.985	
#2	190.379 cf	191.363 cf	0028.0 ℓ	0056.5 ℓ	27.863 ℓ	28.5 ℓ	80.6	84.0	84.2	85.1	1.2		28.95	.983	
#3	191.363 cf	192.234 cf	56.5 ℓ	0082.5 ℓ	24.663 ℓ	26.0 ℓ	81.5	95.	95.	95.	.95		46.65	.970	
														.979	
														Average	

#1 55.140
#2 55.75
#3 [illegible]

$$Y_{ds} = \frac{V_s}{V_{dg}} \cdot \frac{(\bar{t}_d + 460)}{(t_w + 460)} \cdot \frac{P_b}{\left(P_b + \frac{\Delta P}{13.6}\right)}$$

Form 483 11/85

CONTROL MODULE CALIBRATION

Module I.D. D-555

Date 10-9-80

Barometric Pressure (in. Hg) 30.[illegible]

Primary Meter I.D. 4[illegible]3554

Ambient Temperature (°F) 70°

Operator [illegible]

Orifice Setting ΔH (in H_2O)	Primary Meter Gas Volume V_p (ft^3)	Meter Box Gas Volume V_d (ft^3)	Temperature Primary Meter Inlet T_{pi} (°F)	Primary Meter Outlet T_{po} (°F)	Primary Meter Average T_p (°F)	Meter Box Meter Inlet T_{di} (°F)	Meter Box Meter Outlet T_{do} (°F)	Meter Box Meter Average T_d (°F)	Time (min)	Meter Correction Factor Y	Orifice Coefficient K_o
2.5	764.0 → 776.5 (12.5)	354.35 → 370.683 (16.33)	72°	73°	74°	70°	87°	89°	16.5	1.006	.735
1.5	776.5 → 788.547 (12.047)	[illegible] → 554.24 (13.57)	[illegible]	73°	74°	89°	87°	88°	11.25	1.012	.734
1.0	788.547 → 800.8 (12.253)	554.24 → 570.765 (16.525)	75°	73°	74°	88°	87°	87.5°	19.3	1.006	.732
.5	800.8 → 813.7 (12.9)	570.765 → 589.057 (18.292)	76°	74°	75°	86°	86°	86°	31.4	1.011	.734

Orifice Setting	Avg. Y	Avg. K_o
[illegible]	1.009	.735

POST-TEST METER CONSOLE CALIBRATION

Signature _____ Date _____

Barometric Pressure, P_b = 29.95 in. Hg

Test Meter No 433513

Meter Box No D 555

Dry Gas Meter No _____

Test Meter Correction Factor _____

Orifice Manometer Setting, (ΔH), in H_2O	Gas Volume: Wet Test Meter (V_w), ft³	Gas Volume: Dry Gas Meter (V_d), ft³	Temperature: Wet Test Meter (t_w), °F	Temperature: Dry Gas Meter: Inlet (t_{d_i}), °F	Temperature: Dry Gas Meter: Outlet (t_{d_o}), °F	Temperature: Dry Gas Meter: Average ($\bar{t}_d$), °F	Time (θ), min	Vacuum Setting, in Hg	Y_i	$\frac{V_w P_b (\bar{t}_d + 460)}{V_d P_b + \frac{\Delta H}{13.6}(t_w + 460)}$	
1.0	10	10.050	72	71	71	71	20.0	5		.994	k_a .747
1.9	10.1	10.098	72	71	73	72	20.0	5		1.005	K_a .744
2.7	10.2	10.174	72	71	74	72	20.0	5		1.004	K_a .744
									Y =	1.003	

Form 486 11/85

V_P V_d

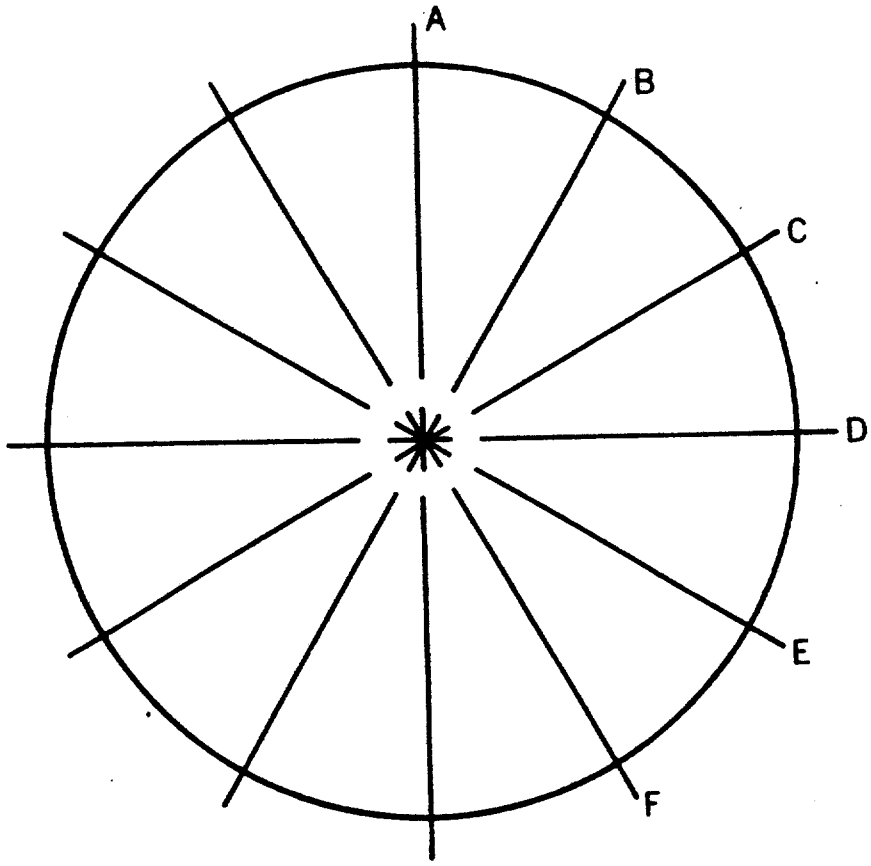
1 START 167.050 → 16.2 | 606.729 → 10.500
START 158.50

2 START 175.15 → 11.1 | 714.695 → 11.316
START 167.050 | 703.295

3 START 155.55 → 11.2 | 225.6[illegible] → 11.[illegible]
START [illegible] | [illegible]

ACUREX Corporation

NOZZLE MEASUREMENT



DIAMETER DIMENSION

A .177
B .177
C .179
D .178
E .179
F

AVG.

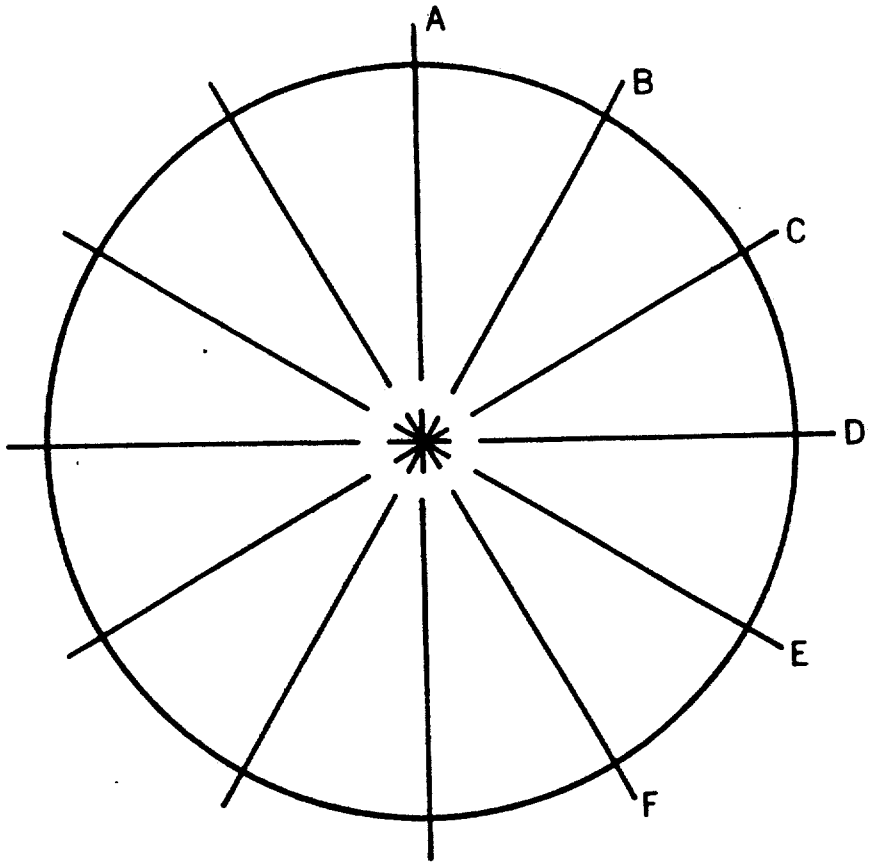
NOZZLE SERIAL .178

DATE 10-20-85

RECORDED BY

ACUREX Corporation

NOZZLE MEASUREMENT



DIAMETER DIMENSION

A .212

B .213

C .212

D .212

E _____

F _____

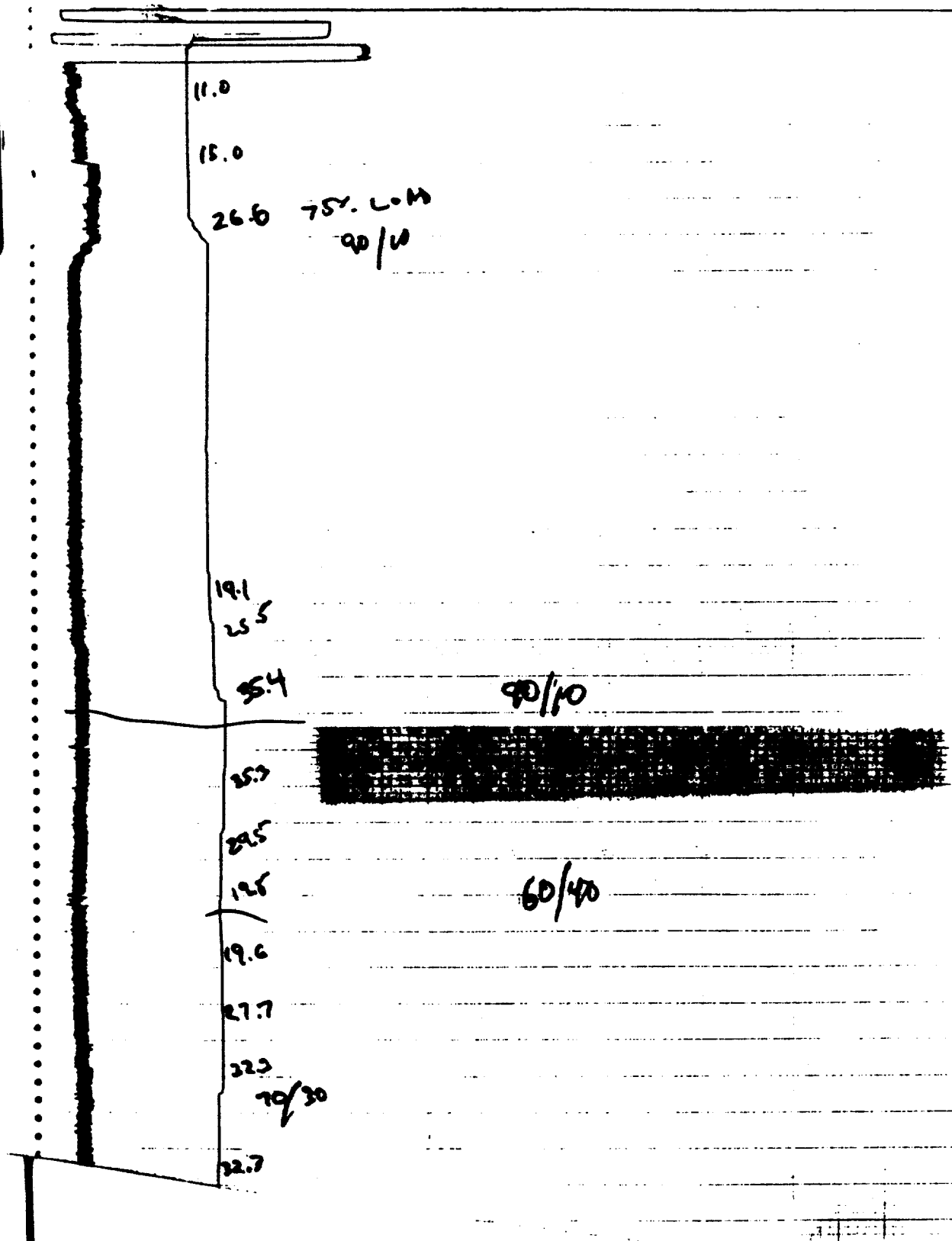
AVG. _____

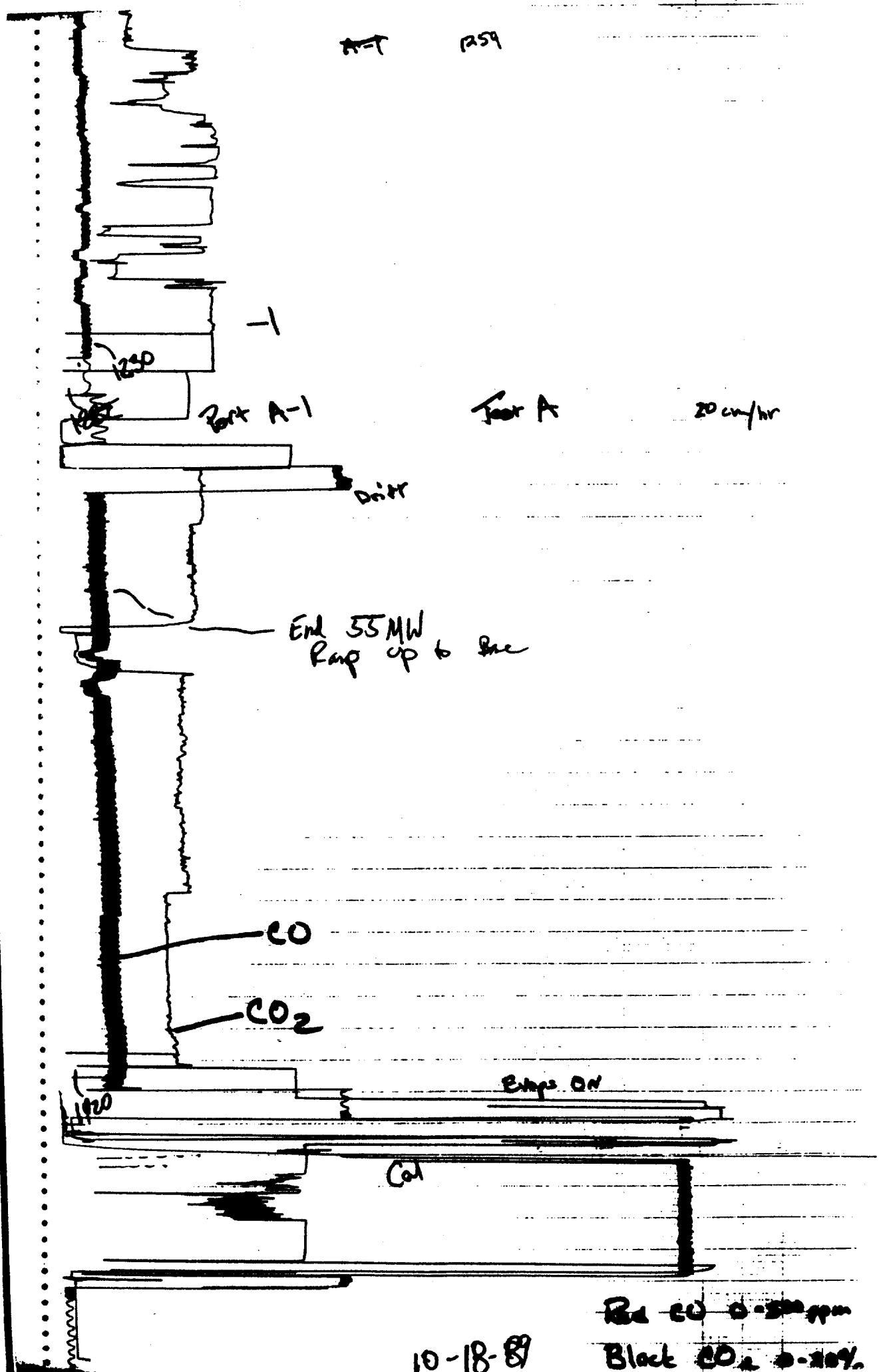
NOZZLE SERIAL .212

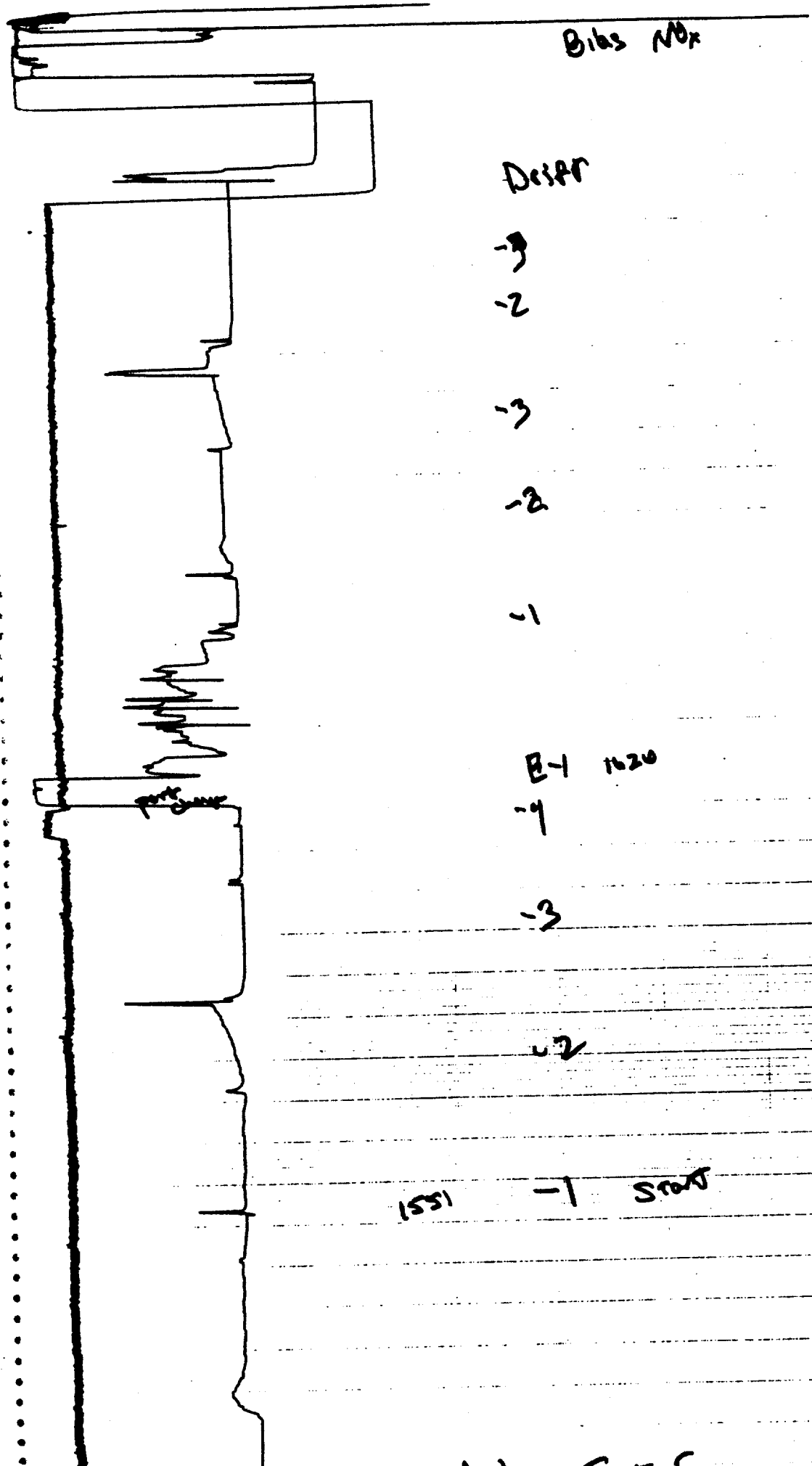
DATE 10-20-85

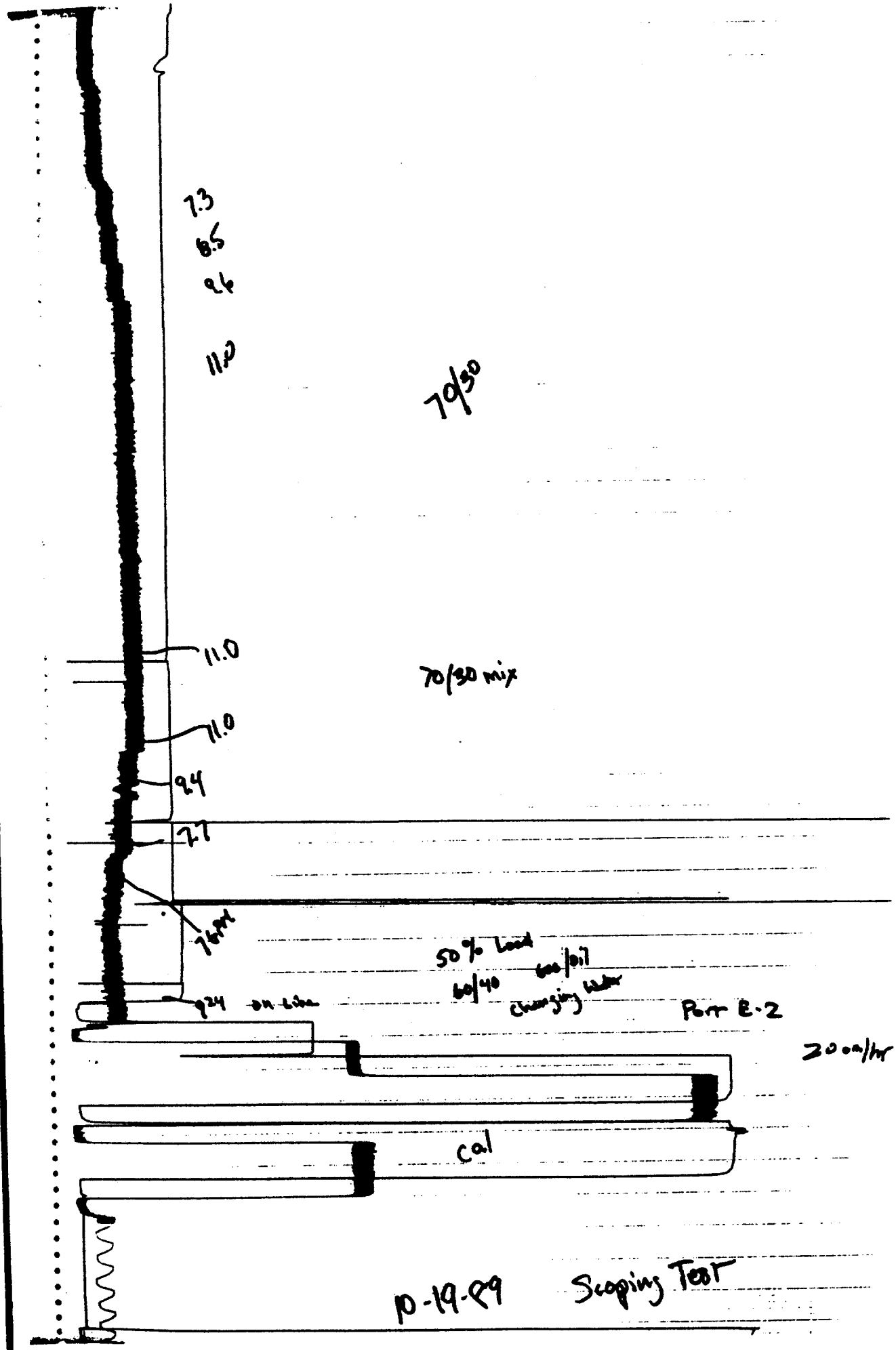
RECORDED BY BJ

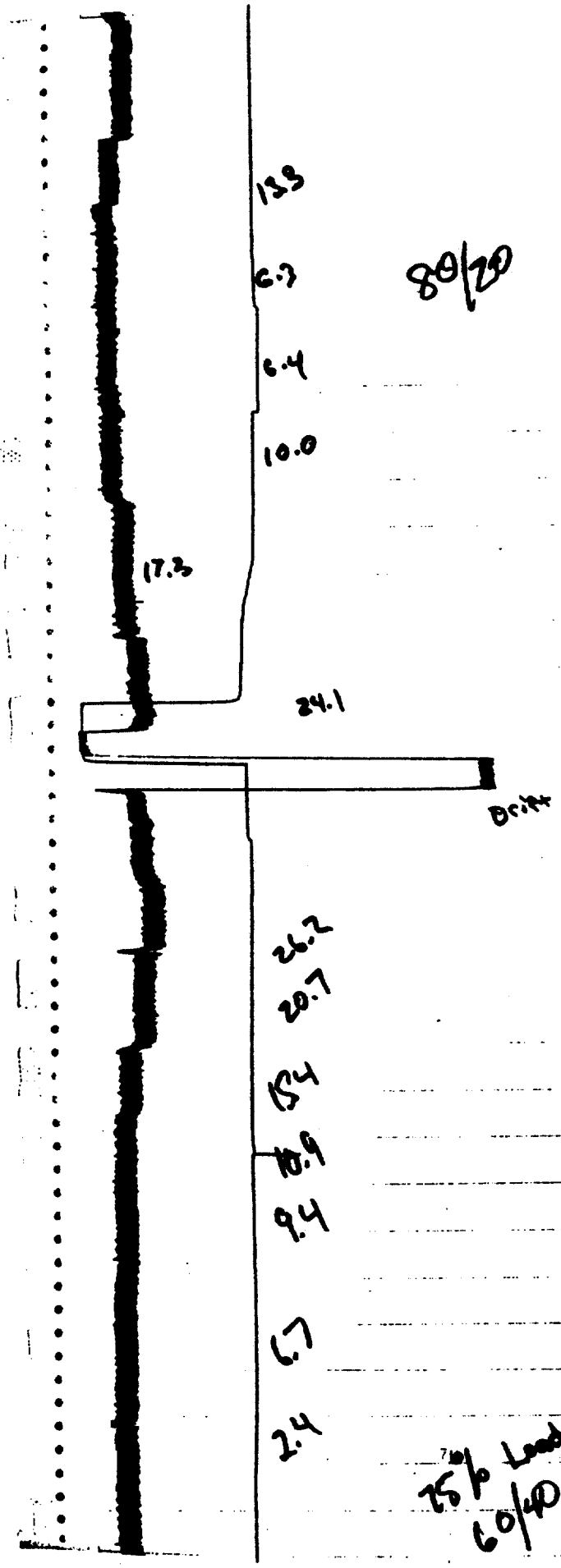
~90/10

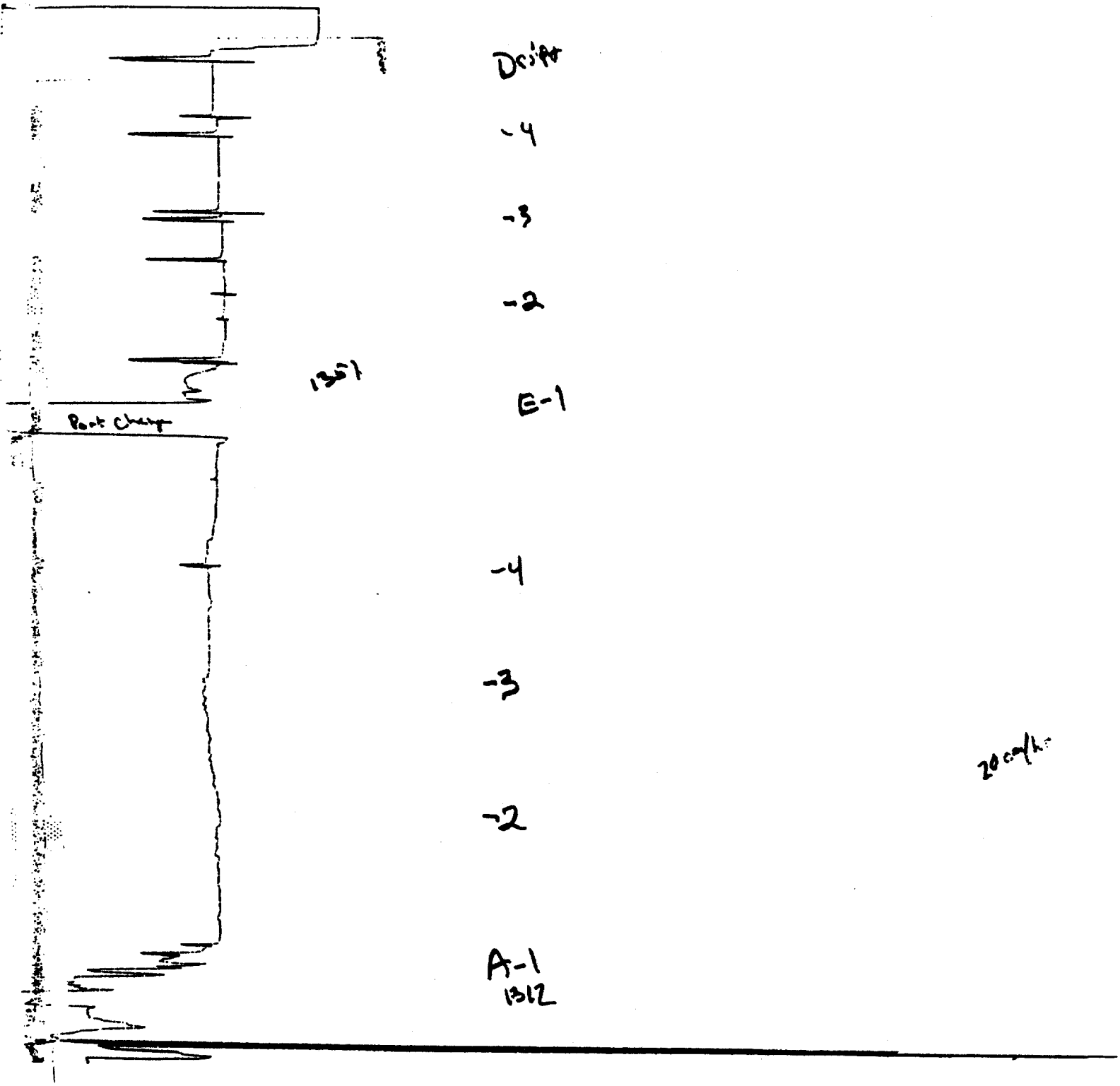

11.0
15.0
26.0
75% L.M
90/10
19.1
25.5
95.4
90/10
35.3
39.5
42.5
60/40
49.6
27.7
32.3
70/30
32.7

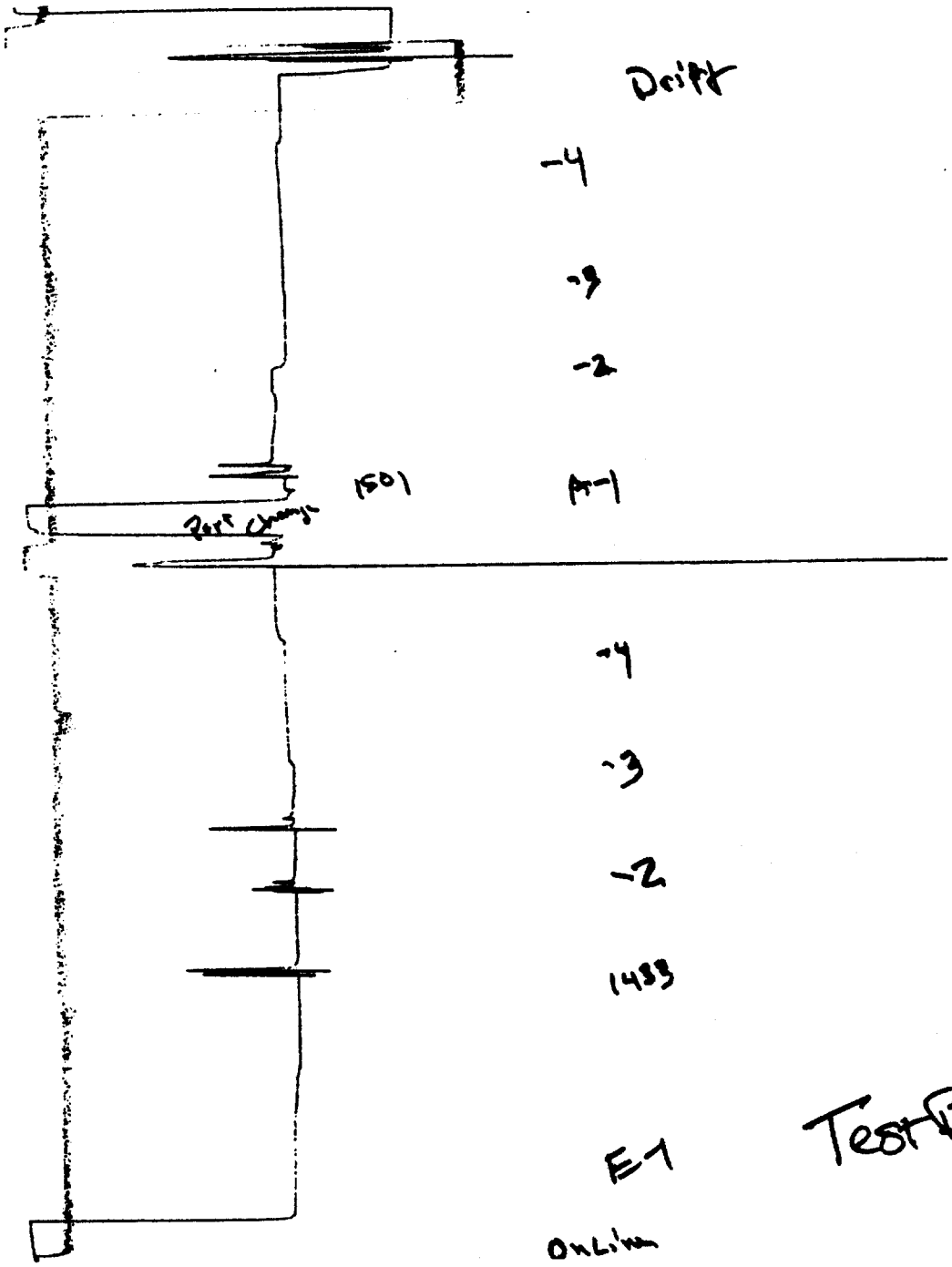

A-T 1259
-1
1250
Port A-1
Test A
20 cm/hr
Drift
End 55 MW
Ramp up to Bne
CO
CO_2
1420
Bumps ON
Cal
Red CO 0-500 ppm
Black CO_2 0-10%
10-18-89

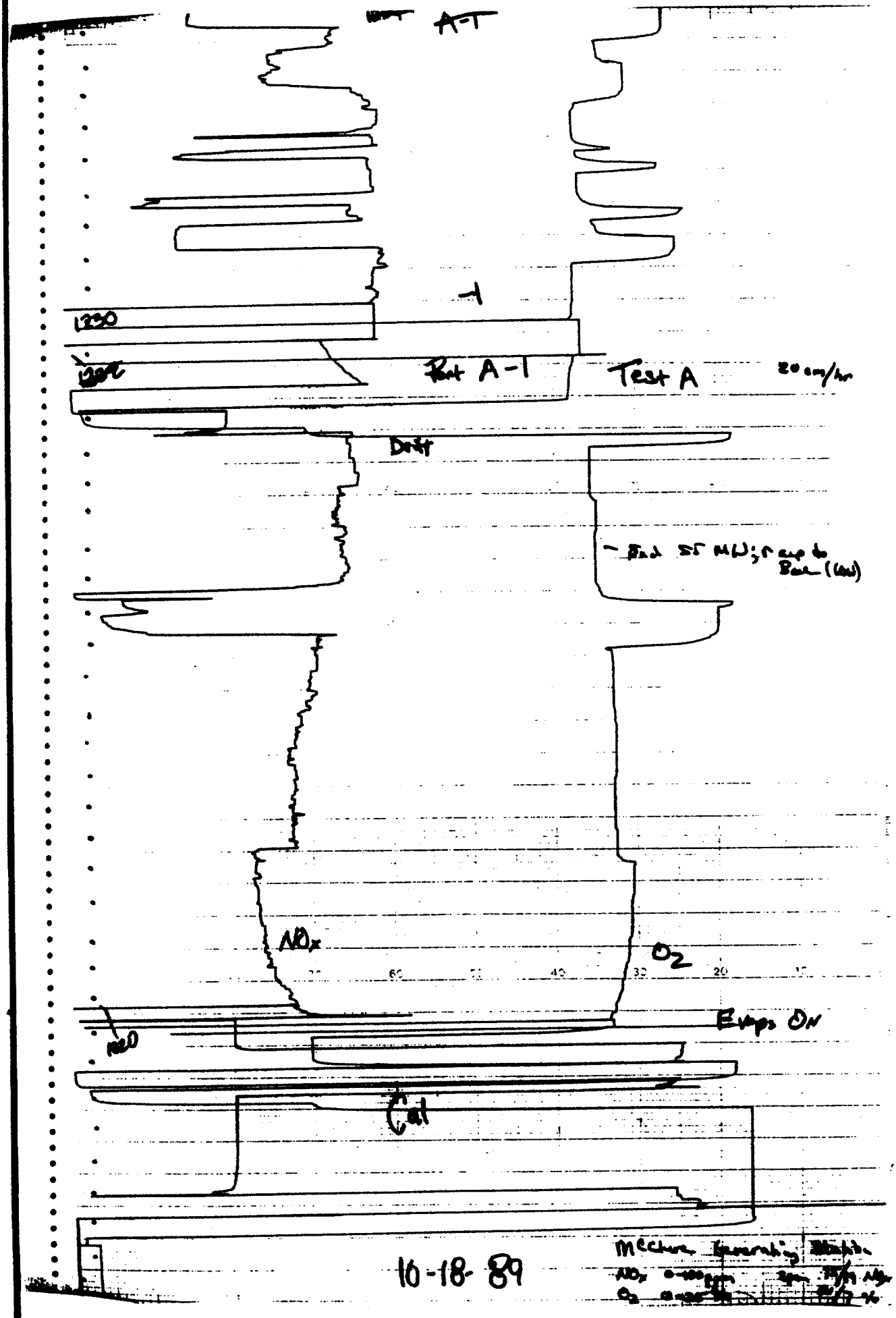

Bias NOx
Desper
-3
-2
-3
-2
-1
E-1 1020
-4
-3
-2
(55) -1 Start

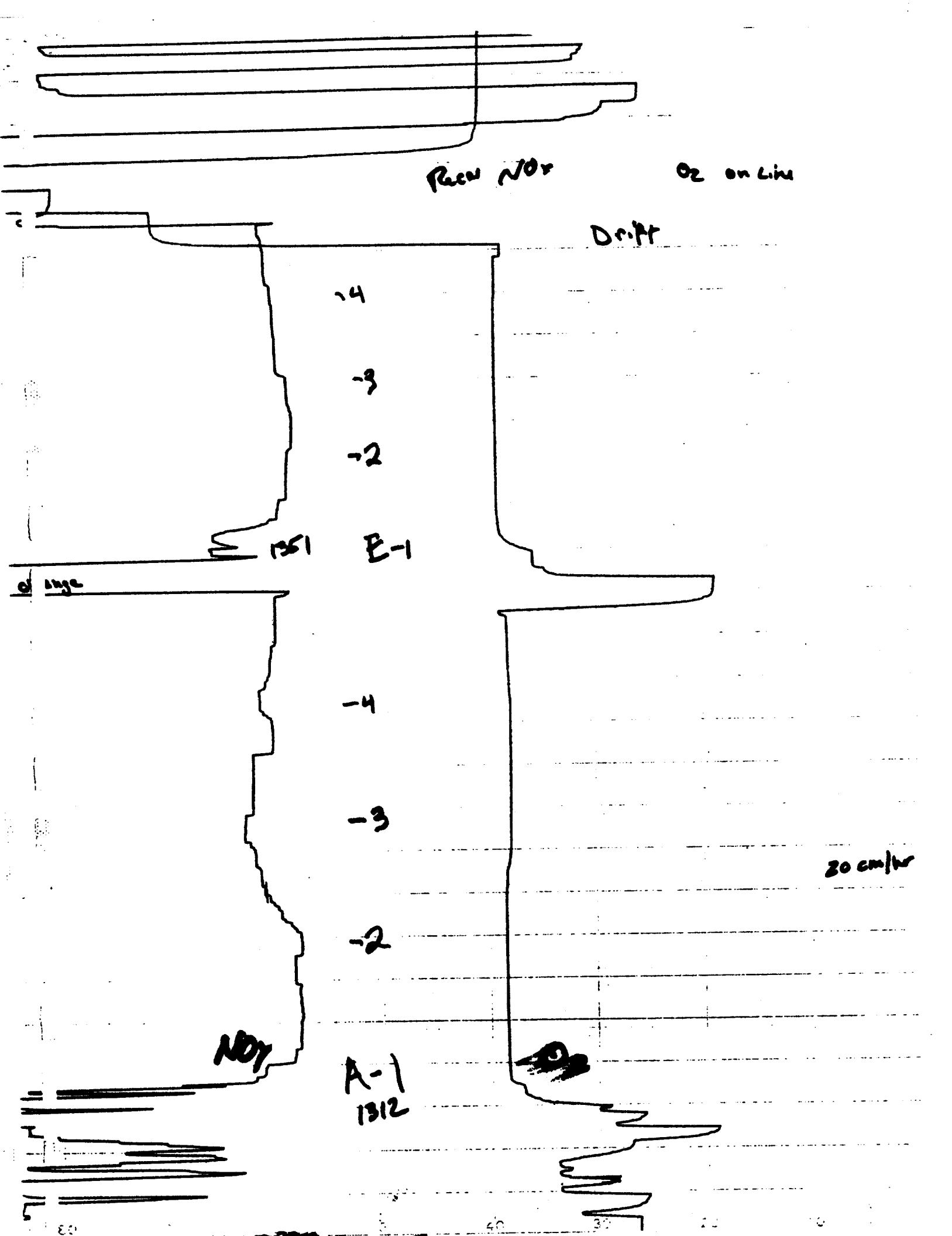

7.3
8.5
9.6
11.0
70/30
11.0
70/30 mix
11.0
9.4
7.7
7.0ml
50% Load
60/40 coal/oil
(changing water
9.24 on line
Port E-2
20 cm/hr
cal
10-19-99 Scoping Test

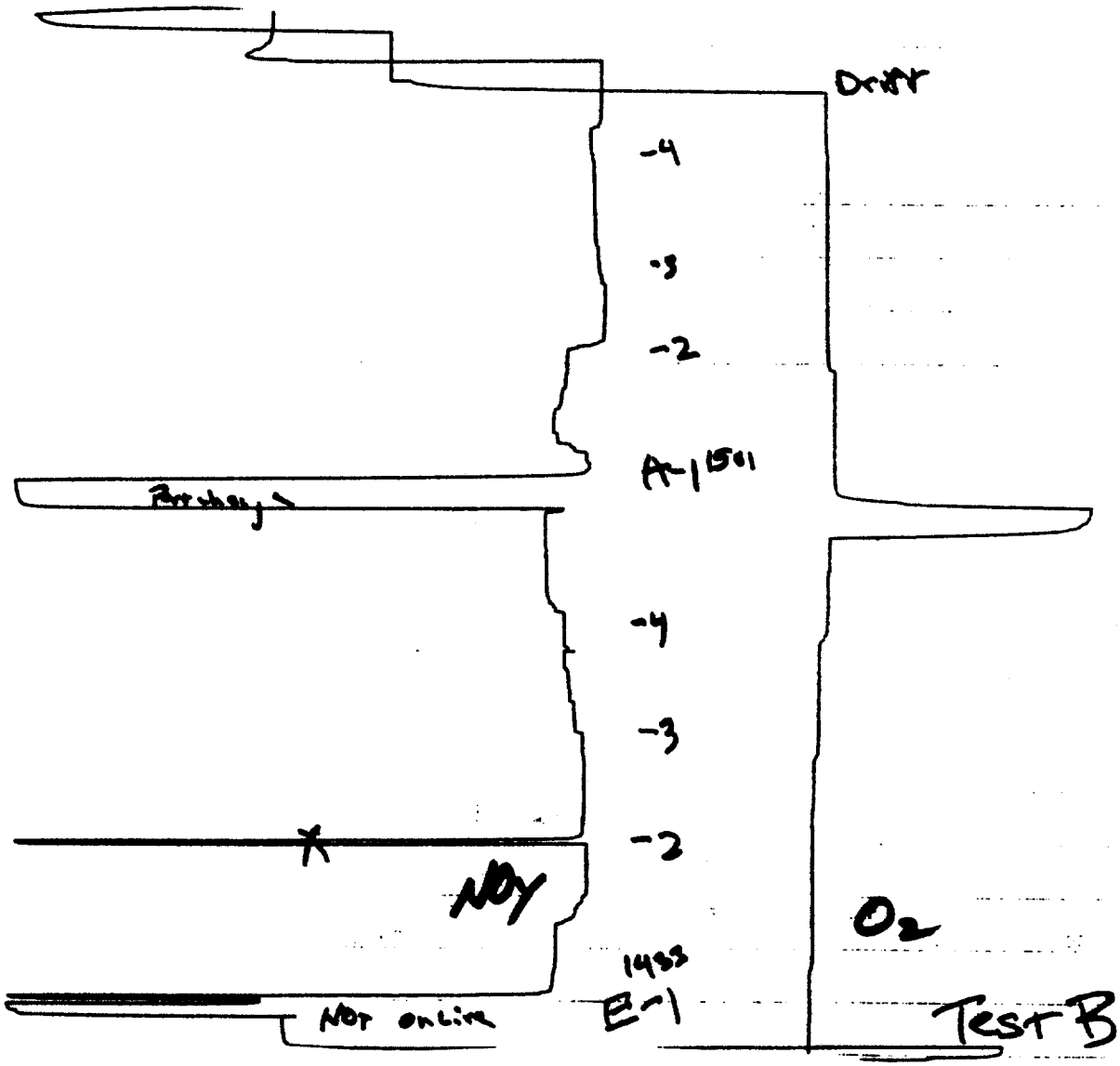

13.3
6.3
80/20
6.4
10.0
17.3
24.1
70/30
1150
Drift
26.2
20.7
15.4
10.9
9.4
6.7
2.4
75% Load
60/40

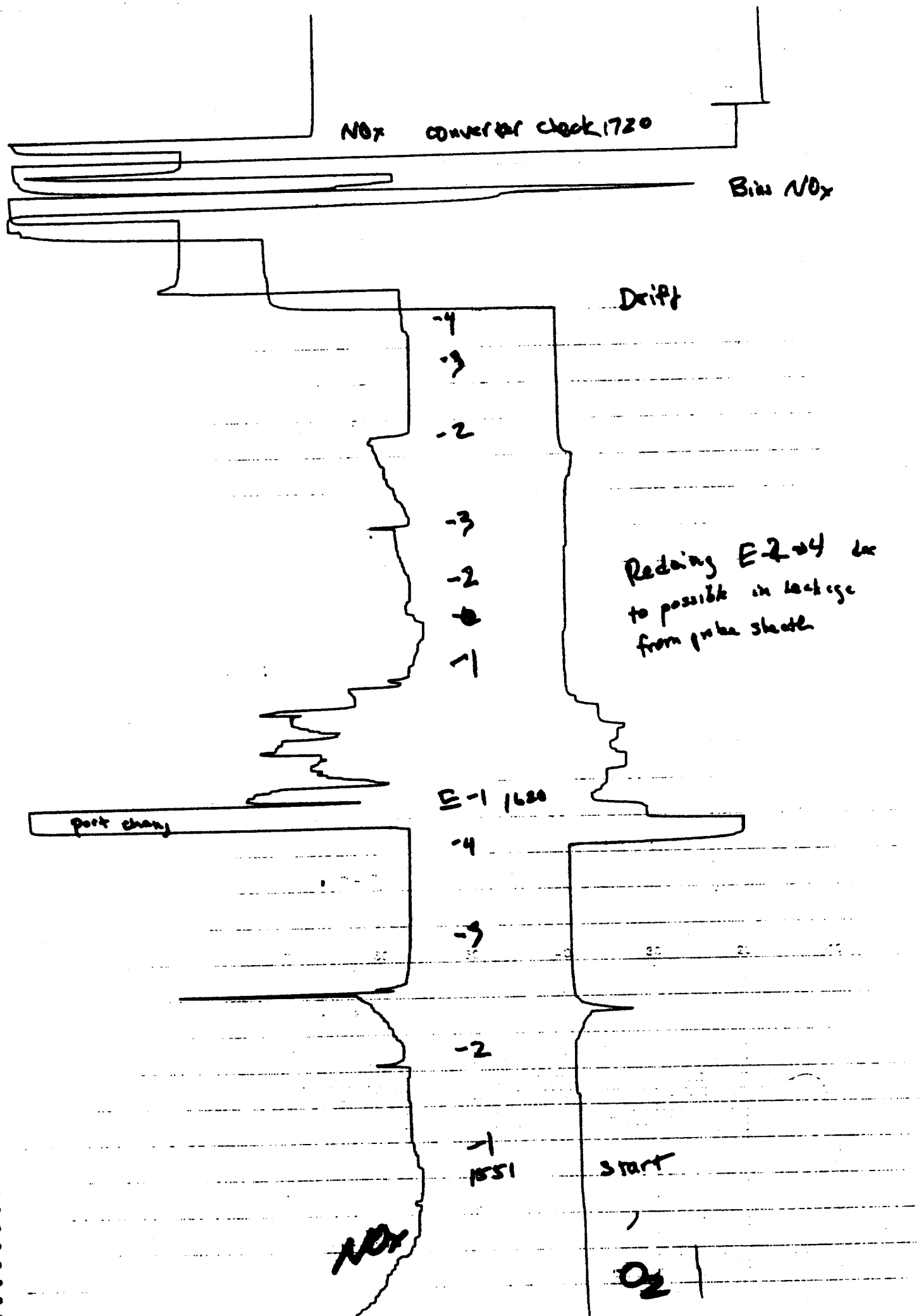

Dash
-4
-3
-2
1351
E-1
Post Charge
-4
-3
20 cm/hr
-2
A-1
1312


Drift
-4
-3
-2
1501
A-1
-4
-3
-2
1499
E-1
Test B
Online


A-T
1
1230
Test A-1
Test A
20 cm/hr
Drift
NOx
O2
Evap ON
Cat
10-18-89


Raw NOx
O2 on Line
Drift
-4
-3
-2
1351
E-1
-4
-3
20 cm/hr
-2
NO2
A-1
1312


Drift
-4
-3
-2
A-1 1501
Bypass
-4
-3
-2
NOy
O2
1493
E-1
Not online
Test B


NOx converter clock 1720
Bias NOx
Drift
-4
-3
-2
-3
-2
-1
Redoing E-2 to 4 due to possible air leakage from probe sheath
E-1 1620
port change
-4
-3
-2
-1
1551
start
NOx
O2

* PAH Data

PAH Worksheet

Client: M.I.D.

Blank-Corrected Results: total µg

	RUN 1A	RUN 2A	RUN 3A
Naphthalene	7.0	15	6.2
Acenaphthylene	0.14	< 0.049	< 0.25
Acenaphthene	< 0.23	< 0.35	< 0.30
Florene	0.66	0.78	0.70
Phenanthrene	1.4	9.8	2.0
Anthracene	0.31	0.43	0.049
Flouranthrene	0.30	1.2	0.60
Pyrene	0.25	0.44	0.25
Benzo(a) anthracene	0.037	< 0.083	< 0.027
Chrysene	0.052	0.37	0.75
Benzo(b)flouree	0.14	< 0.11	0.28
Benzo(k) flouree	0.048	< 0.020	0.34
Dibenzo(a,h) anthracene	< 0.063	< 0.030	< 0.054
Benzo (g,h,i) perylene	< 0.061	< 0.12	< 0.021
Indeno (1,2,3-cd) pyrene	< 0.064	< 0.013	< 0.019
SAMPLE VOLUME (DSCF)	69.94	52.28	80.45

Concentrations (ng/DSCF)

	RUN 1A	RUN 2A	RUN 3A	AVE*
Naphthalene	100	287	77	155
Acenaphthylene	2.0	< 0.94	< 3.1	< 2.0 **
Acenaphthene	< 3.3	< 6.7	< 3.7	< 4.6 **
Florene	9.4	14.9	8.7	11.0
Phenanthrene	50.0	187	24.9	87
Anthracene	4.4	8.2	0.61	4.4
Flouranthrene	4.3	23.0	7.5	11.6
Pyrene	3.6	8.4	3.1	5.0
Benzo(a) anthracene	0.53	< 1.59	< 0.34	< 0.82
Chrysene	0.74	7.08	9.32	5.7
Benzo(b) flouranthene	2.0	< 2.1	3.5	< 2.5 **
Benzo(K) flouranthene	0.69	< 0.38	4.23	< 1.8 **
Dibenzo (a,h) anthracene	< 0.90	< 0.57	< 0.67	< 0.71
Benzo (g,h,i) perylene	< 0.87	< 2.30	< 0.26	< 1.14
Indeno (1,2,3-cd) pyrene	< 0.92	< 0.25	< 0.24	< 0.47 **

+ Detection Limit values used where necessary

* Detected in one sample ** Detected in two samples *** Detected in three samples

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: MODESTO IRRIGATION
Date: 10/17/89

Performed by: TMH
Sample Location: TURBINE #1

Test No./Type: RUN #1a/PAH
Start/Stop Time: 1515-1825

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.178
Pitot Tube Correction Factor	C(p)	0.8400
Gas Meter Correction Factor	(alpha)	1.0090
Barometric Pressure (in Hg)	P(b)	29.98
Stack Pressure (in H2O)	P(stack)	-3.000
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(120.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	0.00
Length (if rectangular)	L	219.50
Width (if rectangular)	W	96.75
Area of Stack (sq ft)	A(s)	(147.48)
Gas Meter Initial Reading (cu ft)		413.45
Gas Meter Final Reading (cu ft)		489.25
Net Gas Sample Volume (cu ft)	V(m)	(75.80)
Vol of Liquid Collected (ml)	Vl(c)	53.0
Vol of Liq @ Std. Conds. (scf)	V(w std)	(2.495)
Wt. of Filter Particulate (gm)		0.0000
Wt. of Probe Wash Particulate (gm)		0.0000
Wt of Combined Particulate (gm)	M(p)	(0.0000)
O2 Concentration (by CEM)	% O2	15.60
CO2 Concentration (by CEM)	% CO2	3.90
CO Concentration (by CEM)	% CO	0.0
N2 Concentration (by diff.)	% N2	(80.50)

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg) =	2.417
Avg Orifice Meter Reading (in H2O)	dH(avg) =	1.035
Avg Stack Temperature (degF)	T(s avg)=	952.0 *
Average Meter Temperature (degF)	T(m avg)=	109.5
Avg SQRT(dP)	=	1.523

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)=	69.94
Stack Gas Water Vapor Proportion	B(wo) =	0.034
Mol. Wt., Stack Gas Dry	M(d) =	29.25
Mol. Wt., Stack Gas Wet	M(s) =	28.86
Abs Stack Pressure (in Hg)	P(s) =	29.76
Avg Stack Velocity (ft/sec)	V(s avg)=	140.2
Isokineticity (%)	% I =	111.7
Stack Gas STD Vol Flow (dscfm)	Q(s) =	445544
Actual Stack Gas Vol Flow (acfm)	Q(a) =	1240650
Particulate Loading, dry (gr/dscf)	C(s std)=	0.0000
Particulate Loading, @7% O2(mg/dscm)	C(s std)=	0
Particulate Loading, dry @7% O2 (gr/dscf)	=	0.0000
Particulate Emission Rate(lb/hr)	E(p) =	0.000

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Temp (degF) in	Gas Temp (degF) out	SQRT(dP)
A-1	5	4.00	1.7200	952.0	108.0	107.0	2.0000
A-2	5	4.00	1.7200	952.0	113.0	112.0	2.0000
A-3	5	3.00	1.3000	952.0	112.0	110.0	1.7321
A-4	5	2.00	0.8600	952.0	116.0	112.0	1.4142
B-1	5	3.00	1.3000	952.0	110.0	108.0	1.7321
B-2	5	2.50	1.0800	952.0	110.0	109.0	1.5811
B-3	5	2.50	1.0800	952.0	114.0	112.0	1.5811
B-4	5	2.50	1.0800	952.0	111.0	109.0	1.5811
D-1	5	2.00	0.8600	952.0	111.0	110.0	1.4142
D-2	5	2.00	0.8600	952.0	114.0	112.0	1.4142
D-3	5	2.50	1.0900	952.0	114.0	112.0	1.5811
D-4	5	2.50	1.0900	952.0	111.0	109.0	1.5811
E-1	5	3.00	1.3000	952.0	112.0	111.0	1.7321
E-2	5	3.00	1.3000	952.0	113.0	111.0	1.7321
E-3	5	3.00	1.3000	952.0	113.0	112.0	1.7321
E-4	5	1.50	0.6300	952.0	113.0	110.0	1.2247
F-1	5	3.00	1.2980	952.0	110.0	108.0	1.7321
F-2	5	3.00	1.0800	952.0	109.0	108.0	1.7321
F-3	5	2.50	1.0800	952.0	109.0	107.0	1.5811
F-4	5	2.00	0.8900	952.0	109.0	107.0	1.4142
G-1	5	2.00	0.8600	952.0	104.0	102.0	1.4142
G-2	5	1.50	0.6400	952.0	105.0	104.0	1.2247
G-3	5	0.50	0.2100	952.0	104.0	103.0	0.7071
G-4	5	0.50	0.2100	952.0	102.0	102.0	0.7071
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	120	58.00	24.8380	22848.0	2647.0	2607.0	36.5460

* Temp Avg of Tests 2+3

Temp of 701°F was used for the sampling (Erroneous)

K 94 13

ACUREX Corporation

Ambient Temp 83F

PARTICULATE TEST FIELD DATA SHEET

Plant Modesto Irrigation Dist. Barometric Pressure 30 29.98

Date 10/17/89 Static Pressure -3

Test Location Turbine #1 Stack Pressure

Run Number #1 Probe Number

Stack Diameter inches Pitot Coefficient 0.84

Duct Dimensions in. x in. Pitot Number

Start Time 1515 Meter Box Number D 555

Operator TMH Orifice Coefficient 1.009 / 0.735

Nozzle Size & Number 0.175

Molecular Weight

BWO 0.05

FILTER DATA

NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		TIME	CO_2	O_2	CO
SILICA GEL					

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT³	TEMPERATURES °F							PUMP VACUUM in. Hg	√ΔP	
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
A1	1515	4.0	1.72	413.454	700	230	68	40	259	108	107	2		Pre Leak Check
A2	1520	4.0	1.72	417.2	705	230	67	40	250	113	112	3		0.015 @ 15 in
A3	1525	2.0	1.30	421.4	702	230	67	40	256	112	110	2.5		
A4	1530	2.0	0.86	424.9	702	230	67	40	258	116	112	3		
				428.001										
B1	1543	3.0	1.30	428.001	705	230	67	40	237	110	108	4		
B2	1548	2.5	1.08	431.3	705	230	67	40	270	110	109	4		
B3	1553	2.5	1.08	434.7	705	230	67	40	249	114	112	4		
B4	1558	2.5	1.08	437.7	700	230	67	40	242	111	109	4.5		
				440.940										
D3	1608	2.0	0.86	440.940	700	230	66	40	245	111	110	3		
D2	1613	2.0	0.86	443.9	700	230	66	40	249	114	112	3.5		
D3	1618	2.5	1.09	448.2	700	230	66	40	247	114	112	4		
D4	1623	2.5	1.09	449.9	700	230	66	40	246	14	109	4		
				452.804										
AVG/TOTAL														

1/79

ACUREX Corporation

PARTICULATE TEST FIELD DATA SHEET

Plant Modesto Irrigation Dist. Barometric Pressure 30

Date 10/17/85 Static Pressure -3

Test Location Turbine #1 Stack Pressure

Run Number #1 Probe Number

Stack Diameter inches Pitot Coefficient 0.84

Duct Dimensions in. x in. Pitot Number

Start Time 1515 Meter Box Number

Operator TMH Orifice Coefficient 1.004 / 0.735

Nozzle Size & Number 0.178

Molecular Weight

BWO 0.05

FILTER DATA

NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		TIME	CO_2	O_2	CO
SILICA GEL					

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT³	TEMPERATURES °F							PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
E1	1655	3.0	1.30	452.805	700	230	67	40	240	112	111	2.0		
E2	1700	3.0	1.30	456.3	700	230	67	40	246	113	111	2.5		
E3	1705	3.0	1.30	459.8	700	230	67	40	252	113	112	2.0		
E4	1710	1.5	0.63	463.0	700	230	67	40	253	113	110	3.0		
				466.501										
F1	1745	3.0	1.298	466.501	700	230	67	40	260	110	108	3.0		
F2	1750	3.0	1.08	470	700	230	67	40	260	109	108	3.5		
F3	1755	2.5	1.08	473.3	700	230	67	40	252	109	107	4.0		
F4	1800	2.0	0.86	476.5	700	230	67	40	254	109	107	5.0		
				480.002										
G1	1810	2.0	0.86	480.002	700	230	67	40	270	104	102	5.0		
G2	1815	1.5	0.64	483.1	700	230	67	40	262	105	104	4.5		
G3	1820	0.5	0.21	485.7	700	230	67	40	255	104	103	3.0		
G4	1825	0.5	0.21	487.7	700	230	67	40	257	102	102	3.0		
				489.850										
AVG/TOTAL														

035 1/79

IMPINGER CATCH -PAHs

Sample No. 1A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)
1	Blank	0 mL		Final 35.0 Initial 0.0 Wt. gain 35.0 gms
2	Organic Free H_2O	150 mL		Final 150.0 Initial 150.0 Wt. gain 0.0 gms
3	Blank	0 mL		Final 0 mL Initial 0 mL Wt. gain 0.0 g
4	Silica Gel	500.0 gm		Final 518.4 Initial 500.0 Wt. gain 18.4
5				Final Initial Wt. gain
6				Final Initial Wt. gain
Flask				Final Initial Wt. gain

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 53.4

Date

Signature

002647

003407

WEST ANALYSIS RESULTS

003405

Gas Fractional Part

CO_2

003406 O_2

CO

N_2

003404

Date

Time

Signature

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: MODESTO IRRIGATION
Date: 10/18/89

Performed by: TMH
Sample Location: TURBINE #1

Test No./Type: RUN #2a/PAH
Start/Stop Time: 1003-1251

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.178
Pitot Tube Correction Factor	C(p)	0.8400
Gas Meter Correction Factor	(alpha)	1.0090
Barometric Pressure (in Hg)	P(b)	30.00
Stack Pressure (in H2O)	P(stack)	-1.500
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(120.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	0.00
Length (if rectangular)	L	219.50
Width (if rectangular)	W	96.75
Area of Stack (sq ft)	A(s)	(147.48)
Gas Meter Initial Reading (cu ft)		530.29
Gas Meter Final Reading (cu ft)		585.21
Net Gas Sample Volume (cu ft)	V(m)	(54.93)
Vol of Liquid Collected (ml)	Vl(c)	65.4
Vol of Liq @ Std. Conds. (scf)	V(w std)	(3.078)
Wt. of Filter Particulate (gm)		0.0000
Wt. of Probe Wash Particulate (gm)		0.0000
Wt of Combined Particulate (gm)	M(p)	(0.0000)
O2 Concentration (by CEM)	% O2	15.40
CO2 Concentration (by CEM)	% CO2	4.00
CO Concentration (by CEM)	% CO	0.0
N2 Concentration (by diff.)	% N2	(80.60)

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg) =	1.833
Avg Orifice Meter Reading (in H2O)	dH(avg) =	0.625
Avg Stack Temperature (degF)	T(s avg)=	969.3
Average Meter Temperature (degF)	T(m avg)=	91.8
Avg SQRT(dP)	=	1.330

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)=	52.28
Stack Gas Water Vapor Proportion	B(wo) =	0.056
Mol. Wt., Stack Gas Dry	M(d) =	29.26
Mol. Wt., Stack Gas Wet	M(s) =	28.63
Abs Stack Pressure (in Hg)	P(s) =	29.89
Avg Stack Velocity (ft/sec)	V(s avg)=	123.4
Isokineticity (%)	% I =	97.8
Stack Gas STD Vol Flow (dscfm)	Q(s) =	380576
Actual Stack Gas Vol Flow (acfm)	Q(a) =	1091978
Particulate Loading, dry (gr/dscf)	C(s std)=	0.0000
Particulate Loading, @7% O2(mg/dscm)	C(s std)=	0
Particulate Loading, dry @7% O2 (gr/dscf)	=	0.0000
Particulate Emission Rate(lb/hr)	E(p) =	0.000

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Temp in	Meter (degF) out	SQRT(dP)
G-4	5	0.75	0.2500	955.0	76.0	75.0	0.8660
G-3	5	0.75	0.2500	945.0	77.0	77.0	0.8660
G-2	5	2.00	0.6000	951.0	78.0	77.0	1.4142
G-1	5	1.50	0.6000	937.0	80.0	79.0	1.2247
F-4	5	1.00	0.3600	946.0	81.0	81.0	1.0000
F-3	5	1.50	0.5100	950.0	82.0	81.0	1.2247
F-2	5	2.50	0.8500	948.0	86.0	84.0	1.5811
F-1	5	2.00	0.7000	945.0	84.0	83.0	1.4142
E-4	5	1.00	0.3400	946.0	84.0	83.0	1.0000
E-3	5	1.00	0.3400	948.0	89.0	88.0	1.0000
E-2	5	1.50	0.5100	957.0	90.0	88.0	1.2247
E-1	5	2.50	0.8500	965.0	92.0	91.0	1.5811
D-4	5	1.50	0.5200	942.0	97.0	95.0	1.2247
D-3	5	1.50	0.5100	977.0	98.0	96.0	1.2247
D-2	5	2.50	0.8500	979.0	96.0	94.0	1.5811
D-1	5	2.50	0.8500	982.0	98.0	97.0	1.5811
C-4	5	1.50	0.5100	990.0	101.0	99.0	1.2247
C-3	5	2.00	0.6700	999.0	101.0	99.0	1.4142
C-2	5	2.00	0.6700	1001.0	101.0	100.0	1.4142
C-1	5	2.50	0.8500	998.0	104.0	103.0	1.5811
B-4	5	1.50	0.5100	998.0	103.0	103.0	1.2247
B-3	5	2.50	0.8500	1000.0	106.0	105.0	1.5811
B-2	5	3.00	1.0200	1002.0	107.0	105.0	1.7321
B-1	5	3.00	1.0200	1002.0	108.0	106.0	1.7321
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	120	44.00	14.9900	23263.0	2219.0	2189.0	31.9131

ACUREX Corporation

PARTICULATE TEST FIELD DATA SHEET

Plant MODESTO Irrigation Dist. Barometric Pressure 30.0

Date 10/18/85 Static Pressure −1.5

Test Location ~~#2~~ Turbine #1 Stack Pressure

Run Number #2 Probe Number

Stack Diameter inches Pitot Coefficient

Duct Dimensions in. x in. Pitot Number

Start Time 1003 Meter Box Number D555

Operator TMH Orifice Coefficient 1.009 / 0.735

Nozzle Size & Number 0.178

Molecular Weight

BWO 0.05

FILTER DATA

NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		TIME	CO_2	O_2	CO
SILICA GEL					

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT³	TEMPERATURES °F							PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
G4	1003	6.75	0.25	530.285	955	270	67	41	260	76	75	~~4~~		Pre-Leak check
G3	1008	0.75	0.25	531.8	945	285	67	41	252	77	77			0.015 @ 6"
G2	1013	2.0	0.6	533.5	951	301	66	41	271	78	77	1.0		
G1	1018	1.5	0.6	535	937	250	66	41	260	80	78	1.5		
				536.686										
F4	1036	1.0	0.36	536.686	946	240	66	40	274	81	81			
F3	1041	1.5	0.51	539.2	950	228	66	40	265	82	81	3.5		
F2	1046	2.5	0.85	541.5	948	228	66	40	274	86	84	4.5		
F1	1051	2.0	0.70	544.2	945	220	66	40	279	84	83			
				546.408										
E4	1100	1.0	0.34	546.408	946	220	65	40	276	84	83			
E3	1105	1.0	0.34	548.2	948	220	65	40	261	89	88	4.0		
E2	1110	1.5	0.51	550.0	957	213	65	40	269	90	88	3.5		
E1	1115	2.5	0.85	552.3	965	213	65	40	271	92	91	4.5		
				554.727										
AVG/TOTAL														

1/79

ACUREX Corporation

PARTICULATE TEST FIELD DATA SHEET

Ambient Temp 87F

Plant Modesto Irrigation Dist. Barometric Pressure 30.12

Date 10/18/89 Static Pressure -1.5

Test Location Turbine #1 Stack Pressure

Run Number #2 Probe Number

Stack Diameter inches Pitot Coefficient

Duct Dimensions in. x in. Pitot Number

Start Time 1003 Meter Box Number D 555

Operator TMH Orifice Coefficient 1.009 / 0.735

Nozzle Size & Number 0.178

Molecular Weight

BWO 0.05

FILTER DATA

NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		TIME	CO_2	O_2	CO
SILICA GEL					

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT³	TEMPERATURES °F							PUMP VACUUM in. Hg	√ΔP	
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
D4	1128	1.5	0.52	544.727	942	223	67	42	278	97	95	5.0		Post Leak ~~Pre-test~~
D3	1133	1.5	0.51		977	210	67	42	273	98	96	5.0		Check
D2	1138	2.5	0.85	560	979	221	67	42	276	96	94	4.9		~~0.015~~ @ ~~Hg~~
D1	1143	2.5	0.85	563	982	228	67	42	277	98	97	4.9		0.015 / 13 mm
				564.891										
C4	1205	1.5	0.51	564.891	990	242	65	40	283	101	99	4.0		
C3	1210	2.0	0.67	567	999	238	65	40	277	101	99	4.0		
C2	1215	2.0	0.67	569.7	1001	232	65	40	273	101	100	4.0		
C1	1220	2.5	0.85	571.7	998	231	65	40	273	104	103	4.0		
				574.338										
B4	1236	1.5	0.51	574.338	998	230	65	46	280	103	103	4.0		
B3	1241	2.5	0.85	577.3	1000	228	65	46	279	106	105	5.0		
B2	1246	3.0	1.02	579.[illegible]	1002	232	65	46	286	107	105	5.0		
B1	1251	3.0	1.02	583	1002	242	65	46	282	108	106	5.0		
				585.212										
AVG/TOTAL														

IMPINGER CATCH – PAHs

Sample No. 2A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)
1	Blank	0 ml		Final 494.1 Initial 441.6 Wt. gain 52.5
2	milliQ + H_2O	150		Final 701.8 Initial 697.3 Wt. gain 4.5
3	Blank	0 ml		Final 449.3 Initial ~~stuf~~ 449.3 Wt. gain
4	Silica gel	~~721.6~~ 521.6		Final 732.2 Initial ~~721.6~~ 721.6 Wt. gain 10.6
5				Final Initial Wt. gain
6				Final Initial Wt. gain
Flask				Final Initial Wt. gain

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 65.8 gm

Date

Signature

003402

003401

003399

003398

ORSAT ANALYSIS RESULTS

Gas Fractional Part

CO_2

O_2

CO

N_2

003409

Condensate 40 ml

I-2 153 ml

Date

Time

Signature

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: MODESTO IRRIGATION | Performed by: TNH | Test No./Type: RUN #3a/PAH
Date: 10/18/89 | Sample Location: TURBINE #1 | Start/Stop Time: 1543-1829

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.212
Pitot Tube Correction Factor	C(p)	0.8400
Gas Meter Correction Factor	(alpha)	1.0090
Barometric Pressure (in Hg)	P(b)	29.94
Stack Pressure (in H2O)	P(stack)	-1.500
# of Sample Points	#	28
Total Sampling Time (min)	(theta)	(140.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	0.00
Length (if rectangular)	L	219.50
Width (if rectangular)	W	96.75
Area of Stack (sq ft)	A(s)	(147.48)
Gas Meter Initial Reading (cu ft)		587.02
Gas Meter Final Reading (cu ft)		674.23
Net Gas Sample Volume (cu ft)	V(m)	(87.21)
Vol of Liquid Collected (ml)	Vl(c)	49.9
Vol of Liq @ Std. Conds. (scf)	V(w std)	(2.349)
Wt. of Filter Particulate (gm)		0.0000
Wt. of Probe Wash Particulate (gm)		0.0000
Wt of Combined Particulate (gm)	M(p)	(0.0000)
O2 Concentration (by CEM)	% O2	15.20
CO2 Concentration (by CEM)	% CO2	4.20
CO Concentration (by CEM)	% CO	0.0
N2 Concentration (by diff.)	% N2	(80.60)

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg) =	1.563
Avg Orifice Meter Reading (in H2O)	dH(avg) =	1.181
Avg Stack Temperature (degF)	T(s avg)=	935.9
Average Meter Temperature (degF)	T(m avg)=	109.1
Avg SQRT(dP)	=	1.206

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)=	80.45
Stack Gas Water Vapor Proportion	B(wo) =	0.028
Mol. Wt., Stack Gas Dry	M(d) =	29.28
Mol. Wt., Stack Gas Wet	M(s) =	28.96
Abs Stack Pressure (in Hg)	P(s) =	29.83
Avg Stack Velocity (ft/sec)	V(s avg)=	110.1
Isokineticity (%)	% I =	96.9
Stack Gas STD Vol Flow (dscfm)	Q(s) =	357044
Actual Stack Gas Vol Flow (acfm)	Q(a) =	974430
Particulate Loading, dry (gr/dscf)	C(s std)=	0.0000
Particulate Loading, @7% O2(mg/dscm)	C(s std)=	0
Particulate Loading, dry @7% O2 (gr/dscf)	=	0.0000
Particulate Emission Rate(lb/hr)	E(p) =	0.000

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Temp in	Meter (degF) out	SQRT(dP)
A-4	5	2.00	1.1300	987.0	116.0	113.0	1.4142
A-3	5	1.50	1.1200	1002.0	118.0	116.0	1.2247
A-2	5	2.00	1.4900	1002.0	118.0	116.0	1.4142
A-1	5	1.50	1.1700	1004.0	113.0	111.0	1.2247
B-4	5	2.00	1.4800	1001.0	111.0	109.0	1.4142
B-3	5	1.50	1.1000	1001.0	112.0	110.0	1.2247
B-2	5	1.50	1.1000	1006.0	112.0	110.0	1.2247
B-1	5	1.50	1.1100	1007.0	113.0	112.0	1.2247
C-4	5	1.50	1.1300	978.0	110.0	109.0	1.2247
C-3	5	2.00	1.4900	1009.0	112.0	110.0	1.4142
C-2	5	2.00	1.4800	1006.0	112.0	111.0	1.4142
C-1	5	3.00	2.2000	1009.0	114.0	112.0	1.7321
D-4	5	2.50	1.8300	1010.0	110.0	109.0	1.5811
D-3	5	2.50	1.8300	1011.0	110.0	109.0	1.5811
D-2	5	2.50	1.8300	1005.0	110.0	110.0	1.5811
D-1	5	2.00	1.4700	1010.0	110.0	110.0	1.4142
E-4	5	1.00	1.0900	1011.0	108.0	106.0	1.0000
E-3	5	1.50	1.1000	1014.0	109.0	108.0	1.2247
E-2	5	1.50	1.1000	1011.0	109.0	108.0	1.2247
E-1	5	2.00	1.4600	1010.0	109.0	108.0	1.4142
F-4	5	1.00	0.7800	930.0	107.0	106.0	1.0000
F-3	5	0.75	0.5500	1000.0	108.0	106.0	0.8660
F-2	5	1.25	0.9200	1000.0	108.0	106.0	1.1180
F-1	5	2.00	1.5800	1000.0	108.0	106.0	1.4142
G-4	5	0.25	0.2300	664.0	103.0	102.0	0.5000
G-3	5	0.25	0.2600	535.0	102.0	102.0	0.5000
G-2	5	0.25	0.0300	490.0	100.0	100.0	0.5000
G-1	5	0.50	1.0000	490.0	100.0	100.0	0.7071
TOTALS	140	43.75	33.0600	26205.0	3072.0	3035.0	33.7783

ACUREX Corporation

Ambient Temp 87 F

PARTICULATE TEST FIELD DATA SHEET

Plant Modesto Irrigation — Barometric Pressure 29.94

Date 10/18/89 — Static Pressure -1.5

Test Location Turbine #1 — Stack Pressure

Run Number #3 — Probe Number

Stack Diameter inches — Pitot Coefficient

Duct Dimensions in. x in. — Pitot Number

Start Time 1543 — Meter Box Number D-555

Operator TMA — Orifice Coefficient 1.009 / .735

Nozzle Size & Number .212

Molecular Weight

BWO 0.05

FILTER DATA

NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		TIME	CO_2	O_2	CO
SILICA GEL					

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT³	TEMPERATURES °F							PUMP VACUUM in. Hg	√ΔP	
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
A-4	1543	2.0	1.13	587.016	987	230	67	61	254	116	113	6.5		Pretest Leak
A-3	1548	1.5	1.12	591	1002	243	67	68	258	118	116	7.0		Clock 18 mm Hg
A-2	1553	2.0	1.49	593.6	1002	238	66	60	278	118	116	7.5		0.015/min
A-1	1558	1.5	1.17	596.9	1004	256	66	60	274	113	111	7.5		
				600.105										
B 4	16.06	2.0	1.48	600.105	1001	230	67	60	273	111	109	7.5		
B 3	16.11	1.5	1.10	603.4	1001	236	66	60	275	112	110	8.0		
B 2	16.16	1.5	1.10	607.1	1006	236	65	62	277	112	110	8.0		
B 1	16.21	1.5	1.11	610.1	1007	242	65	56	270	113	112	7.5		
				613.435										
C 4	1637	1.5	1.13	613.435	978	242	64	56	273	110	108	7.0		
C 3	1642	2.0	1.49	617	1009	220	63	55	274	112	110	8.0		
C 2	1647	2.0	1.48	620.1	1008	220	63	55	272	112	111	8.0		
C 1	1652	3.0	2.20	624.1	1009	230	63	55	280	114	112	10.0		
D 4	1700	2.5	1.83	627.225	1010	190	60	51	263	110	109	11.0		
D 3	1705	2.5	1.83	630.6	1011	216	60	52	261	110	109	11.0		
D 2	1710	2.5	1.83	635	1005	239	61	52	262	110	110	11.0		
D 1	1715	2.0	1.47	639	1010	220	60	50	270	110	110	10.0		
AVG/TOTAL		2		642.738										

ACUREX Corporation

PARTICULATE TEST FIELD DATA SHEET

Plant Modesto Irrigation Dist. Barometric Pressure 29.9

Date 10/18 Static Pressure -1.5

Test Location Turbine #1 Stack Pressure

Run Number #3 Probe Number

Stack Diameter inches Pitot Coefficient

Duct Dimensions in. x in. Pitot Number

Start Time 1543 Meter Box Number D-555

Operator TMH Orifice Coefficient 1.009 / 0.735

Nozzle Size & Number 0.212

Molecular Weight

BWO 0.05

FILTER DATA

NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		TIME	CO_2	O_2	CO
SILICA GEL					

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT³	TEMPERATURES °F							PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
E4	1725	1.0	1.09	642.738	1011	200	61	40	266	108	105	7.5		
E3	1730	1.5	1.10	646.0	1014	210	61	40	270	109	108	8.0		
E2	1735	1.5	1.10	649.3	1011	217	61	40	273	109	108	7.5		
E1	1740	2.0	1.96	652.4	1010	213	61	40	269	109	108	7.5		
				655.888										
F4	1751	1.0	0.78	655.888	930	250	60	41	265	107	106	6.0		
F3	1756	0.75	0.55	658	1000	262	60	41	270	108	106	5.5		
F2	1801	1.25	0.92	661	1000	260	60	41	270	108	106	5.5		
F1	1806	2.0	1.58	664	1000	260	60	41	272	108	106	5.0		
				667.318										
G4	1814	0.25	0.23	667.318	664	222	60	41	265	103	102	5.0		
G3	1819	0.25	0.26	668	535	234	60	41	265	102	102	4.0		
G2	1824	0.25	0.03		490				267	100	100	3.0		
G1	1824	0.15	(1.0 est)		490					100	100			
				674.227										
AVG/TOTAL														

075 1/79

IMPINGER CATCH - PAHs

Sample No. 3A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)	
1		0 mL		Final [illegible]	33mL
				Initial [illegible]	
				Wt. gain 33.1	
2	Organic-Free Water	145 mL		Final 590.7	146mL
				Initial 592.1	
				Wt. gain -1.4	
3	Blank	0 mL		Final 460.0	0
				Initial 460.0	
				Wt. gain 0.0	
4	Silica	Gel		Final 728.6	
				Initial 710.0	
				Wt. gain 18.6	
5				Final	
				Initial	
				Wt. gain	
6				Final	
				Initial	
				Wt. gain	
Flask				Final	
				Initial	
				Wt. gain	

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 50.3

Date

Signature

003396

003392

ORSAT ANALYSIS RESULTS

Gas Fractional Part

CO_2

O_2

CO

N_2

003394

003395

Date

Time

Signature

003393

Field Blank PAHs

IMPINGER CATCH

Sample No. 4A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)	
1	BL			Final	452.8
				Initial	452.4
				Wt. gain	0.4
2	H_2O	100 ml		Final	599.2
				Initial	599.2
				Wt. gain	.0
3	BL			Final	460.8
				Initial	460.8
				Wt. gain	0
4	Silica Gel			Final	698.3
				Initial	698.3
				Wt. gain	.0
5				Final	
				Initial	
				Wt. gain	
6				Final	
				Initial	
				Wt. gain	
Flask				Final	
				Initial	
				Wt. gain	

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 0.4 gms

003386

Date

Signature

003387

ORSAT ANALYSIS RESULTS

Gas Fractional Part

CO_2

O_2

CO

N_2

003389

Date

Time

Signature

003388

* Formaldehyde Data

Volatile Organic Sampling Sampling Train (VOST) Data Sheet

Plant: McClure Generating Station
Date: 10/17/89
Sample Location: Gas Turbine Stack
Run No.: 1A

Project No.: 6581
Operator: RP
Barometric Pressure (in. Hg): 29.98
Ambient Temperature (°F): 83

Trap Set	Trap I.D.	Clock Time 24 Hour	Elapsed Time (minutes)	Dry Gas Meter (L)	Volume Sampled (L)	Temperature (°F) BGM	Probe	Heated Line	Tenax Inlet	Rotometer Setting	Pump Vacuum (in. Hg)	Leak Rate LPM at Vacuum	Comments
A		Start: 14:35	0.0	39.1									
		Stop:											
B		Start: 14:40	1.0		0.89								0.89 L/min
		Stop:											
C		Start:	31	57.0									
		Stop:	62	083									
D		Start:	64	816									
		Stop:											
E		Start:	72.6	091.1									
		Stop:											
F		Start:	90.8	106									
		Stop:	100	1136									
Summary			110	122									
			120										

Notes:

Impgr 1 – 10ml DNPH
2 – 15ml DNPH
3 – O
4 – Silica gel

Leak Check Finish

130 138.4

140 146.7 Stop

Black CV 140

50 - 03

IMPINGER CATCH — Formaldehyde

Sample No. 1A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)
1	DNPH/2N HCl	10mL	STD. needle	Final 14mL Initial 10mL Wt. gain 4g
2	DNPH/2N HCl	15mL	STD. needle	Final 15mL Initial 15mL Wt. gain 0.0g
3	Blank Silica gel	0 mL	STD. needle	Final 100.7 gms Initial 100.7 gms Wt. gain
4	Silica Gel	100.7 gm	open shot	Final 101.6 Initial 100.7 gms. Wt. gain 0.9
5				Final Initial Wt. gain
6				Final Initial Wt. gain
Flask				Final Initial Wt. gain

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 4.9 gms.

Date 10/17/89

Signature

00261G

ORSAT ANALYSIS RESULTS

Gas Fractional Part

CO_2 _____

O_2 _____

CO _____

N_2 _____

Date _____

Time _____

Signature _____

Volatile Organic Sampling Sampling Train (VOST) Data Sheet

Plant: MW2
Date: 10/17/89
Sample Location: GOL Turbine
Run No.: 2A

Project No.: 65F1
Operator: BR
Barometric Pressure (in. Hg): 29.98
Ambient Temperature (°F): 83

Trap Set	Trap I.D.	Clock Time 24 Hour	Elapsed Time (minutes)	Dry Gas Meter (L)	Volume Sampled (L)	Temperature (°F)				Rotameter Setting	Pump Vacuum (in. Hg)	Leak Rate LPM at Vacuum	Comments
						DGM	Probe	Heated Line	Tenax Inlet				
A		Start: 1725	0.0	146.8									
		Stop:		148.36									
B		Start:	1.0 / 2.0		0.8C								0.80 L/min
		Stop:		149.16									
C		Start:	13.0 / 14.0	157.31	0.74								0.74 L/min.
		Stop:		158.01									
D	•	Start:	15.0 / 16.0	158.89	0.8C								0.8C L/m.
		Stop: 1750		159.77									
E		Start:	350 / 360	175.1	1.0								
		Stop:		204.2									
F		Start:	/ 370		89								
		Stop:		249.5									
Summary													

Notes: Re-Leak check is fine!

IMPINGER CATCH - Formaldehyde

Sample No. 2A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)	
1	DNPH	10 ml	Long Stem	Final 98.0 Initial 95.9 Wt. gain 2.1	11.7 ml
2	DNPH	15 ml	Long Stem	Final 98.8 Initial 98.8 Wt. gain 0	15.0 ~~15 ml~~ ~~98.8~~
3	Blank	0 ml	Short Stem	Final 79.9 Initial 79.0 Wt. gain .9	0
4	Silica gel	98.2g	open	Final 99.1 Initial 98.2 g Wt. gain .9	
5				Final Initial Wt. gain	
6				Final Initial Wt. gain	
Flask				Final Initial Wt. gain	

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 3.9

Date _____

Signature _____

003408

ORSAT ANALYSIS RESULTS

Gas Fractional Part

CO_2 _____

O_2 _____

CO _____

N_2 _____

Date _____

Time _____

Signature _____

Volatile Organic Sampling Sampling Train (VOST) Data Sheet

Plant MID
Date 10/18/89
Sample Location Gas Turbine 1
Run No. 3A

VOS #2
$\alpha = 1.07$

Project No. 6581
Operator BB, TM
Barometric Pressure (in. Hg) 30.04
Ambient Temperature (°F) 77

Trap Set	Trap I.D.	Clock Time 24 Hour	Elapsed Time (minutes)	Dry Gas Meter (L)	Volume Sampled (L)	Temperature (°F) DGM	Probe	Heated Line	Tenax Inlet	Rotometer Setting	Pump Vacuum (in. Hg)	Leak Rate LPM at Vacuum	Comments
A		Start: 1224	0.0	~~239.56~~	~~249.56~~								
		Stop: 1230	1.0	241.9									
B		Start:	3.0	241.6	0.7								
		Stop:	4.0	245.3									
C		Start:	6.0	247.1	1.8								.9 L/m
		Stop:	7.0	249.9									
D		Start:	9.1	270.9									
		Stop:	10.1	303.5									
E		Start:											
		Stop:	180.2	324.5									
F		Start:		333.5									
		Stop:											
Summary													

Notes: Leak clock fine
OK @ 5 Hg
:1 @ 1.002

333.5
335.6 } 1 min

IMPINGER CATCH Formaldehyde Method Blanks

Sample No. 4A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)
1	DNPH	16mL		Final 107.7 gm Initial 107.7 gm Wt. gain
2	DNPH	16mL		Final 91.8 gm Initial 91.8 gm Wt. gain
3	Blanks	0	Short	Final 92.2 Initial 92.1 Wt. gain .1 gm
4	Silica gel		Short	Final 100.9 gm Initial 100.8 gm Wt. gain .1 gm
5				Final Initial Wt. gain
6				Final Initial Wt. gain
Flask				Final Initial Wt. gain

10mL

16mL

0mL

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 0.2 gms

Date

Signature

003855

ORSAT ANALYSIS RESULTS

Gas Fractional Part

CO_2

O_2

CO

N_2

Date

Time

Signature

IMPINGER CATCH — Formaldehyde

Sample No. 3A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)
1	DNPH	10 mL	Long Stem	Final 95.4 g Initial 92.5 g Wt. gain 2.9
2	DNPH	15 mL	Long Stem	Final [illegible] Initial [illegible] Wt. gain [illegible]
3	Blank	0 mL	Short	Final [illegible] Initial [illegible] Wt. gain [illegible]
4	Silica Gel	100.7 gm	short	Final 100.8 gm Initial 100.7 gm Wt. gain .1 gms.
5				Final Initial Wt. gain
6				Final Initial Wt. gain
Flask				Final Initial Wt. gain

4 hr

12 mL

15 mL

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 3.1 gms

Date 10/18/89

Signature [signature]

003403

ORSAT ANALYSIS RESULTS

Gas Fractional Part

CO_2 _____

O_2 _____

CO _____

N_2 _____

Date _____

Time _____

Signature _____

ACUREX Corporation

Re: Formaldehyde Tests

Energy & Environmental Division

Meter volume(std),

$$17.64\ (V_m)\ (\alpha)\left(\frac{P_b}{T_m + 460}\right) = V_m \text{ std in Liters}$$

$\alpha = 1.07$ VOSTS CONSOLE #2

	V_M	Corrected Volume	P_b, T_M	$V_{m\,std}$
1A	107.6 L	115.1	29.98, 83F	112.1
7	102.6 L	109.8	29.98, 83F	106.9
3A	93.9 L	100.5	30.04, 77F	99.2
	Moisture Calcs on Reverse			

555 Clyde Avenue, P.O. Box 7555, Mountain View, CA 94039 (415) 964-3200 Telex: 34-6391 TWX: 910-7796593

* Laboratory Results

ACUREX Corporation

Environmental Systems Division

Acurex - Building 2

November 22, 1989
Acurex ID: 8910135
Client PO: 6581

Attention: Bill Buchan

Subject: Analysis of 4 Samples for CARB 429, Received 10/20/89.

Samples were analyzed for PAH's according to CARB method 429. The method may be summarized as follows:

> Filter, XAD, resin and fronthalf rinse samples are soxhlet-extracted separately, concentrated, and the extracts combined. Impinger and impinger rinse samples are extracted 3 times with methylene chloride and concentrated. Each extract is combined with an internal standard solution and injected into a GC/MS. Quantitation is performed by the isotope dilution technique.

Naphthalene was detected in the method blank at 0.026 ug/sample. The lowest concentration detected is more than 10 times this amount.

If you should have any technical questions, please contact the undersigned at (415)964-0844.

Approved by: Robert DeRosier
Client Services Manager

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. PAH Results

	Acurex-Buchan Sample ID				
429 Compounds	GT 1 RUN 1A RINSE & COND	GT 1 RUN 1A PW FILTER XAD	GT 1 RUN 2A RINSE & COND	GT 1 RUN 2A PW FILTER XAD	GT 1 RUN 3A RINSE & COND
	Total ug	Total ug	Total ug	Total ug	Total ug
Naphthalene	0.27	27	0.62	35	0.50
Acenaphthylene	0.097	0.079	0.024	<0.049*	0.022
Acenaphthene	<0.0060	<0.22*	0.049	<0.30*	0.017
Fluorene	0.013	0.66	0.065	0.73	0.021
Phenanthrene	0.065	1.5	0.31	9.6	0.083
Anthracene	<0.013	0.31	0.025	0.42	<0.0045
Fluoranthene	0.038	0.26	0.10	1.1	0.040
Pyrene	0.087	0.18	0.085	0.38	0.047
Benzo(a)anthracene	0.019	0.028	<0.013	<0.083	<0.017
Chrysene	0.023	0.052	0.085	0.31	0.13
Benzo(b)fluoranthene	0.034	0.11	0.024	<0.090	0.068
Benzo(k)fluoranthene	0.022	0.026	<0.0072	0.013	0.11
Benzo(a)pyrene	0.024	<0.039	<0.0090	0.021	<0.0092
Dibenzo(a,h)anthracene	0.029	<0.023	<0.0065	0.0089	<0.0028
Benzo(g,h,i)perylene	0.031	<0.030	<0.12	0.0048	<0.0073
Indeno(1,2,3-cd)pyrene	0.036	<0.028	<0.0080	0.0047	<0.0062
Date Analyzed	11/10/89	11/10/89	11/10/89	11/10/89	11/10/89
Date Extracted	11/2/89	11/2/89	11/2/89	11/2/89	11/2/89
Surrogates	Percent Recovery (%)				
Naphthalene-d8	44	70	59	60	73
Acenaphthylene-d8	ND**	135	70	ND**	86
Acenaphthene-d10	ND**	ND**	73	ND**	138
Fluorene-d10	69	215**	88	129	93
Phenanthrene-d10	68	119	78	114	93
Anthracene-d10	57	106	75	96	85
Fluoranthene-d10	51	72	74	75	94
Pyrene-d10	48	62	73	65	91
Benzo(a)anthracene-d12	56	50	101	61	96
Chrysene-d12	41	50	85	45	59
Benzo(b)fluoranthene-d12	45	33	89	40	72
Benzo(k)fluoranthene-d12	45	36	79	37	60
Benzo(a)pyrene-d12	39	33	80	35	62
Benzo(g,h,i)perylene-d12	36	26	85	32	58
Dibenzo(a,h)anthracene-d12	49	31	102	36	72

* - Maximum possible concentration of compound present

** - Chemical interference

Table 1. PAH Results

	Acurex-Buchan Sample ID		
	GT 1 RUN 3A PW FILTER XAD	GT 1 RUN 4A RINSE & COND	GT 1 RUN 4A PW FILTER XAD
429 Compounds	Total ug	Total ug	Total ug
Naphthalene	26	0.33	20
Acenaphthylene	<0.25*	0.039	<0.0053
Acenaphthene	<0.28	<0.0058	<0.033
Fluorene	0.70	0.018	<0.015
Phenanthrene	2.1	0.032	0.069
Anthracene	0.049	0.019	<0.012
Fluoranthene	0.56	<0.0067	<0.019
Pyrene	0.22	0.020	<0.022
Benzo(a)anthracene	<0.027	0.010	<0.0054
Chrysene	0.65	0.033	<0.054
Benzo(b)fluoranthene	0.21	<0.0063	<0.064
Benzo(k)fluoranthene	0.23	<0.0078	<0.015
Benzo(a)pyrene	<0.045	<0.0079	<0.029
Dibenzo(a,h)anthracene	<0.0092	<0.0016	<0.0038
Benzo(g,h,i)perylene	<0.014	<0.0034	<0.0025
Indeno(1,2,3-cd)pyrene	<0.013	<0.0032	<0.0025
Date Analyzed	11/10/89	11/10/89	11/10/89
Date Extracted	11/2/89	11/2/89	11/2/89
Surrogates	Percent Recovery (%)		
Naphthalene-d8	91	46	57
Acenaphthylene-d8	ND**	28	99
Acenaphthene-d10	ND**	ND**	ND**
Fluorene-d10	153	93	ND**
Phenanthrene-d10	123	97	96
Anthracene-d10	110	78	88
Fluoranthene-d10	77	85	56
Pyrene-d10	73	84	52
Benzo(a)anthracene-d12	62	109	44
Chrysene-d12	43	65	40
Benzo(b)fluoranthene-d12	23	84	35
Benzo(k)fluoranthene-d12	21	64	40
Benzo(a)pyrene-d12	24	60	37
Benzo(g,h,i)perylene-d12	21	44	22
Dibenzo(a,h)anthracene-d12	22	66	31

* - Maximum possible concentration of compound present

** - Chemical interference

ACUREX ANALYTICAL LABORATORY
CHAIN OF CUSTODY

Acurex Proposal Number: ______

Company Name:	Project Manager:
MTD	BUCHAN
Project Number:	**Project Name:**
6561	[illegible] Testing @ [illegible]

Sampled by: (Printed and Written Signature) [illegible]

	SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: CARB 429 for PAH	REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
1B	004417	10/18/89	1400	XAD	Gas Turbine #1	1		RUN 1A
1A	003407	10/18/89	1400	Org	Gas Turbine #1	1		
1B	003404	10/18/89	1400	Filter	Gas Turbine #1	1		
1B	003405	10/18/89	1400	Org	Gas Turbine #1	1		
1A	003406	10/18/89	1500	H_2O	Gas Turbine #1	1		
2A	003402	10/18/89	1300	Org	Gas Turbine #1	1		RUN 2A
2B	003401	10/18/89	1300	Org	Gas Turbine #1	1		
2B	003399	10/19/89	1300	XAD	Gas Turbine #1	1		
2A	003398	10/18/89	1300	H_2O	Gas Turbine #1	1		
2B	003409	10/18/89	1300	Filter	Gas Turbine #1	1		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	10/-/89 / 1700	
Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**
Relinquished by: (Signature)	**Date/Time**	**Received for Laboratory by: (Signature)**
		[signature]

REMARKS: RECORD ALL SAMPLE VOLUMES

Date/Time: 11/20 3:00 PM

ACUREX ANALYTICAL LABORATORY
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Mountain View, CA 94039
(415) 961-5700

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Form 5192 10/P

ACUREX ANALYTICAL LABORATORY
CHAIN OF CUSTODY

Acurex Proposal Number: _____

Company Name: MID	Project Manager: BUCHAN
Project Number: 6561	Project Name: Emission Tests @ McClellan Groundhog Station
Sampled by: (Printed and Written Signature) Buchan, J.L. Bill	

	SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: CARB 429 for THC	REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
3A	003396	10/18/89	1400	H2O	Gas Turbine #1	1		Run 3A
3B	003397	10/18/89	1400	Filter	Gas Turbine #1	1		
3A	003394	10/18/89	1400	Org	Gas Turbine #1	1		
3B	003393	10/18/89	1500	XAD	Gas Turbine #1	1		
3B	003395	10/18/89	1500	Org	Gas Turbine #1	1		
4B	003387	10/18/89	1930	XAD	Field Blank	1		Run 4A
4B	003386	10/18/89	1930	Filter	Field Blank	1		
4A	003390	10/18/89	1930	H2O	Field Blank	1		
4B	003389	10/18/89	1930	Org	Field Blank	1		
4A	003388	10/18/89	1930	Org	Field Blank	1		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	REMARKS:
J.L. Bill	10/19/89 1500		Record Volumes
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature) Marsha Dyer	Date/Time 10/20/89 1500

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Mountain View, CA 94039
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ACUREX ANALYTICAL LABORATORY
CHAIN OF CUSTODY

Acurex Proposal Number: _____

Company Name: M·D	Project Manager: RUCHALIN
Project Number: 6561	Project Name: [illegible]
Sampled by: (Printed and Written Signature) [illegible]	

	SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: CARB 429 for PAH	REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
05	003597	10/18/89	1700	[illegible]	Reagent Blank	1		
06	003591	10/18/89	17 [illegible]	Water	Reagent Blk	1		
07	003850	10/18/89	1930	MeCl2	Reagent Blank	1		
08	003002	10/18/89	1930	XYLD	Reagent Blank	2		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	REMARKS: Analyze only if Required. Report Duplicate
[illegible]	10/20/89 1500		
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature) [illegible]	Date/Time 10/20/89 1500

ACUREX ANALYTICAL LABORATORY
405 Clyde Avenue, Bldg. 12
Mountain View, CA 94039
(415) 961-5700

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Form 5192 10/87

ACUREX Corporation

Environmental Systems Division

Acurex - Building 2

October 10, 1989
Acurex ID: 8910047
Client PO: 6581.030

Attention: Bill Buchan

Subject: Analysis of XAD and Filter Samples, Received 10/6/89.

A filter and 20g of XAD were analyzed for semivolatile organic compounds according to the Modified Method 5 protocol (EPA Method 0010) and EPA method and EPA Method 8270 (SW-846, 3rd. Ed.,1986). Results are presented in Table 1. The method can be summarized as follows:

> Before extraction, surrogate compounds are added to each part to monitor extraction recoveries. The filter and XAD resin are soxhlet extracted. The probe and nozzle wash, and impinger and impinger condensate are extracted separately by shake out at pH >11 and at pH <2. All extractions are prepared using methylene chloride. All extracts are then combined and concentrated to 1 mL. Just prior to injection into a Gas Chromatograph/Mass Spectrometer (GC/MS) internal standards are added. The GC/MS is equipped with a fused silica capillary column and is setup for the analysis of semivolatile priority pollutants.

Qualitative identification of the priority pollutants is performed initially using the relative retention times and the relative abundance of three unique ions. The entire mass spectrum is checked before any final identifications are recorded. Quantitative analysis is performed by the internal standard method using a single characteristic ion and response factors obtained from a daily calibration standard. In the tables, an entry such as "<5" means that the compound was not found at a level above the laboratory's reporting limit. The reporting limit, which is based on EPA reporting levels, has been corrected for any sample dilution.

Prior to analysis, every sample is spiked with surrogate compounds as part of Acurex's Quality Control Program. These compounds simulate the behavior of compounds of interest and confirm that acceptable recoveries are being achieved on every sample. The results of surrogate recoveries are reported with the sample results.

485 Clyde Avenue, P.O. Box 7044, Mountain View, CA 94039 (415) 961-5700 Telex: 325961 FAX: (415) 964-5145

If you should have any technical questions, please contact the undersigned at (415)964-0844.

Approved by: _____
Robert DeRosier
Client Services Manager

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. Modified Method 5 Train Results

Acurex - Buchan Sample ID

8270 Compounds	XAD & FILTER ug/train	Method Blank ug/train	Spike % Recov	Dup Spike % Recov
Phenol	<10	<10	96	95
Bis(2-chloroethyl)ether	<10	<10	NS	NS
2-Chlorophenol	<10	<10	97	97
1,3-Dichlorobenzene	<10	<10	NS	NS
1,4-Dichlorobenzene	<10	<10	90	92
1,2-Dichlorobenzene	<10	<10	NS	NS
Bis(2-chloroisopropyl)ether	<10	<10	NS	NS
N-Nitroso-di-n-propylamine	<10	<10	95	92
Hexachloroethane	<10	<10	NS	NS
Nitrobenzene	<10	<10	NS	NS
Isophorone	<10	<10	NS	NS
2-Nitrophenol	<10	<10	NS	NS
2,4-Dimethylphenol	<10	<10	NS	NS
Bis(2-chloroethoxy)methane	<10	<10	NS	NS
2,4-Dichlorophenol	<10	<10	NS	NS
1,2,4-Trichlorobenzene	<10	<10	107	105
Naphthalene	<10	<10	NS	NS
Hexachlorobutadiene	<10	<10	NS	NS
4-Chloro-3-methylphenol	<10	<10	96	98
Hexachlorocyclopentadiene	<10	<10	NS	NS
2,4,6-Trichlorophenol	<10	<10	NS	NS
2-Chloronaphthalene	<10	<10	NS	NS
Dimethyl phthalate	<10	<10	NS	NS
Acenaphthylene	<10	<10	NS	NS
Acenaphthene	<10	<10	113	109
2,4-Dinitrophenol	<50	<50	NS	NS
4-Nitrophenol	<50	<50	79	104
2,4-Dinitrotoluene	<10	<10	104	105
2,6-Dinitrotoluene	<10	<10	NS	NS
Diethyl phthalate	<10	<10	NS	NS
4-Chlorophenyl phenylether	<10	<10	NS	NS
Fluorene	<10	<10	NS	NS
4,6-Dinitro-2-methylphenol	<50	<50	NS	NS
N-Nitrosodiphenylamine	<10	<10	NS	NS
4-Bromophenyl phenylether	<10	<10	NS	NS
Hexachlorobenzene	<10	<10	NS	NS
Pentachlorophenol	<50	<50	9	2
Phenanthrene	<10	<10	NS	NS
Anthracene	<10	<10	NS	NS
Di-n-Butyl phthalate	<10	<10	NS	NS

Table 1. Semivolatile Organic Results (Continued)

Acurex - Buchan Sample ID

8270 Compounds	XAD & FILTER ug/train	Method Blank ug/train	Spike % Recov	Dup Spike % Recov
Fluoranthene	<10	<10	NS	NS
Pyrene	<10	<10	94	90
Butyl benzyl phthalate	<10	<10	NS	NS
3,3'-Dichlorobenzidine	<20	<20	NS	NS
Benzo(a)anthracene	<10	<10	NS	NS
Bis(2-ethylhexyl)phthalate	83	110	NS	NS
Chrysene	<10	<10	NS	NS
Di-n-octyl phthalate	<10	<10	NS	NS
Benzo(b)fluoranthene	<10	<10	NS	NS
Benzo(k)fluoranthene	<10	<10	NS	NS
Benzo(a)pyrene	<10	<10	NS	NS
Indeno(1,2,3-cd)pyrene	<10	<10	NS	NS
Dibenzo(a,h)anthracene	<10	<10	NS	NS
Benzo(g,h,i)perylene	<10	<10	NS	NS
alpha-BHC	<10	<10	NS	NS
beta-BHC	<10	<10	NS	NS
gamma-BHC	<10	<10	NS	NS
delta-BHC	<10	<10	NS	NS
Heptachlor	<10	<10	NS	NS
Aldrin	<10	<10	NS	NS
Heptachlor epoxide	<10	<10	NS	NS
Endosulfan I	<10	<10	NS	NS
Dieldrin	<10	<10	NS	NS
4,4'-DDE	<10	<10	NS	NS
Endrin	<10	<10	NS	NS
Endosulfan II	<10	<10	NS	NS
4,4'-DDD	<10	<10	NS	NS
Endrin aldehyde	<10	<10	NS	NS
Endosulfan sulfate	<10	<10	NS	NS
4,4'-DDT	<10	<10	NS	NS
Date Analyzed	10/9/89	10/9/89	10/10/89	10/10/89
Date Extracted	10/8/89	10/8/89	10/8/89	10/8/89
Surrogates	**Percent Recovery (%)**			
2-Fluorophenol	94	87	88	88
Phenol-d5	85	86	92	91
Nitrobenzene-d5	100	88	91	90
2-Fluorobiphenyl	121	112	115	107
2,4,6-Tribromophenol	91	91	74	85
p-Terphenyl-d14	90	90	92	89

NS - Not spiked

ACUREX ANALYTICAL LABORATORY
CHAIN OF CUSTODY

R2156

Page 1 of 1

Acurex Proposal Number: _____

Company Name: MID	Project Manager: Buchan
Project Number: 6581.030	Project Name: McClure Emissions Test
Sampled by: (Printed and Written Signature)	

SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: CARB 429	REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
003002	10/6/84	1000	XAD	XAD Method Blank	1	X	Analysis for PAHs (see 20th 517 / Analysis for PAHs attached)
003005	10/6/84	1000	Filter	Filter Method Blank	1	X	Analysis for PAHs attached

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	10/6/84 1230	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)
		[signature]

REMARKS:

Need copy of report by 10/10/84

Date/Time: 12 35 PM 10/6

ACUREX ANALYTICAL LABORATORY
405 Clyde Avenue, Bldg. 12
Mountain View, CA 94039
(415) 961-5700

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Form 5192 10/87

ACUREX Corporation

Environmental Systems Division

Acurex
Building 2

November 1, 1989
Acurex ID: 8910119
Client PO: 6581

Attention: Bill Buchan

Subject: Analysis of 4 Impinger Solutions, Received 10/19/89.

4 impinger samples and accompanying reagent blanks were analyzed for formaldehyde by CARB Method 430 with few modifications. This is a high performance liquid chromatography (HPLC) procedure for the determination of individual aldehydes and ketones in ambient air. During sampling, no keeper (such as isooctane) was added to sample impingers.

Formaldehyde reacts with DNPH to form a stable dinitrophenylhydrazone derivative. Due to the moderately high concentrations of formaldehyde detected in samples, concentration of the derivatized impinger solutions was not required and aliquots were analyzed directly by HPLC on a reverse phase (C18) column with absorbance detection at 360 nm. Quantitation of formaldehyde in samples was based on the average response factor obtained from a four-level initial calibration curve. Response of the formaldehyde-DNPH derivative was very linear over the range of 20 to 2000 ng with 10.5% relative standard deviation. Quality control consisted of analyzing a field blank, matrix spike and matrix spike duplicate. Results are presented in Table 1.

If you should have any technical questions, please contact Bob DeRosier at (415)964-0844.

Submitted by: Mario Lari
Mario Lari
Associate Chemist

Approved by: Michael Flanagan
Michael Flanagan
Research Chemist

Approved by: Robert DeRosier
Robert DeRosier
Client Services Manager

Approved by: David R. Taylor
David R. Taylor, Ph.D.
Quality Assurance Manager

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. Formaldehyde Results

Acurex - Sample ID

	GAS TURBINE #1 RUN 1A	GAS TURBINE #1 RUN 2A	GAS TURBINE #1 RUN 3A	FIELD BLANK RUN 4A	REAGENT BLANK ORG FREE H2O
	ug/train	ug/train	ug/train	ug/train	ng/ml
Formaldehyde	9.0	13	16	23	<8
Sample volume (mL)	54	130	106	55	120

Method Detection Limit: 8 ng/ml

Table 1. Formaldehyde Results

	Acurex - Sample ID				
	REAGENT BLANK DNPH SOLUTION	REAGENT BLANK ETHANOL	Method Blank	Matrix Spike	Dup Matrix Spike
	ng/ml	ng/ml	ng/ml	% Recov	% Recov
Formaldehyde	<8*	<8	37	49	76
Sample volume (mL)	310	65			

* - After correcting for method blank of 37 ng/ml

ACUREX ANALYTICAL LABORATORY
CHAIN OF CUSTODY

Acurex Proposal Number: _____

Company Name:	Project Manager:
MID	BUCHAN
Project Number:	**Project Name:**
6561	Emission Tests @ McClure Generating Station

Sampled by: (Printed and Written Signature)
BUCHAN, William H. Buchan

SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: Carb 430							REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
002646	10/17/89	1530	DNPH	Gas Turbine #1	1	X							RUN 1A
003408	10/17/89	1900	DNPH	Gas Turbine #1	1	X							RUN 2A
003403	10/18/89	1300	DNPH	Gas Turbine #1	1	X							RUN 3A
003855	10/18/89	1600	DNPH	Field Blank	1	X							RUN 4A
003851	10/18/89	1600	H_2O	Reagent Blank	1	X							organic Free water *
003400	10/18/89	1600	DNPH	Reagent Blank	1	X							DNPH Solution *
003654	10/18/89	1600	EtOH	Reagent Blank	1	X							Absolute Ethanol *

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
William H. Buchan	10/19 1100	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)

REMARKS:
* RUN only if Necessary
RECORD ALL SAMPLE VOLUMES

Date/Time: 10/19/89 11:00

ACUREX ANALYTICAL LABORATORY
405 Clyde Avenue, Bldg. 12
Mountain View, CA 94039
(415) 961-5700

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ACUREX Corporation

Environmental Systems Division

Acurex - ESD
Building 2

November 2, 1989
Acurex ID: 8910118
Client PO: 6581.030

Attention: Bill Buchan

Subject: Analysis of 1 Oil Sample, Received 10/19/89.

The sample was digested using EPA method 3050 prior to analysis. The digestate was analyzed for requested metals using Inductively Coupled Argon Plasma Spectroscopy or Atomic Absorption spectrophotometry following Test Methods for Evaluating Solid Waste (SW-846 3rd. Ed.,1986). The EPA method employed is listed alongside of the parameter. The results are presented in Table 1.

Ultimate analysis and specific gravity results are presented in Table 2.

Radioactivity results are presented in Table 3.

If you should have any technical questions, please contact the undersigned at (415)964-0844.

Approved by: Robert DeRosier
Client Services Manager

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. Metals Results

Acurex Bill Sample ID

Parameter	EPA Method	NO. 2 DIST OIL*	Spike	Dup Spike	Method Blank	Method Detection Limit
		mg/kg	% Recov	RPD	mg/L	mg/kg
Arsenic	7060	<0.5	80	6.7	<0.005	0.5
Beryllium	6010	<0.5	99	5.0	<0.005	0.5
Cadmium	6010	<0.5	96	8.6	<0.005	0.5
Chromium	6010	3.7	105	3.3	<0.01	1.0
Chromium (hex.)	7196	<1.0	99	17	<0.01	1.0
Copper	6010	1.5	98	4.5	<0.01	1.0
Lead	7421	0.73	103	6.1	<0.001	0.1
Manganese	6010	2.0	99	1.4	<0.01	1.0
Mercury	7470	<0.02	100	19	<0.0002	0.1
Nickel	6010	51.9	98	8.2	<0.02	2.0
Selenium	7740	<0.005	82	11	<0.005	0.5
Zinc	6010	3.2	101	3.4	<0.01	1.0

* - Sample was Parr Bombed

Table 2. Ultimate and Specific Gravity Results

Acurex Sample ID

Component	Method	NO. 2 DIST OIL
Carbon (%)	PE 240C	85.76
Hydrogen (%)	PE 240C	14.08
Nitrogen (%)	PE 240C	<0.01
Sulfur, %	ASTM D129	0.04
Ash (%)	ASTM D95	<0.001
Chlorine (%)	ASTM D808	0.05
Oxygen (%)	Difference	0.07
Viscosity, cst @ 50°C	ASTM D445	2.16
Spec. Gravity (60°C)	ASTM D287	0.8612
Heating value, BTU's/lb.	ASTM D2382	19680

Table 3. Radioactivity Results

Acurex Sample ID

Measurement	NO. 2 DIST OIL
	pCi/L
Gross alpha	11 ± 8
Gross beta	24 ± 10
Radian - 226	<2
Radium - 228	<3
Total Radium	<2

ACUREX ANALYTICAL LABORATORY
CHAIN OF CUSTODY

Acurex Proposal Number: _____

Company Name: MID	Project Manager: BUCHAN
Project Number: 6581.030	Project Name: Emission Tests @ McClure Generating Station
Sampled by: (Printed and Written Signature) BUCHAN, Wm. H. Buchan	

SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: Gross Alpha, Gross Beta	Radium 226 Radium 228	C_1, H, O, N, S, Cl	Viscosity, Specific gravity	Heat Content	Metals *	REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
003853	10/11/89	1500	Oil	No. 2 Distillate Oil	1	X	X					Sub contract
003852	10/18/89	1600	Oil	No. 2 Distillate Oil	3			X	X	X	X	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Wm. H. Buchan	10/19 1100	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)
		Allan Hart

REMARKS:

* As, Be, Cd, Cr_T, Cr_{+6}, Cu, Pb, Mn, Hg, Ni, Se, ZN.

Date/Time: 10/11/89 11:00

ACUREX ANALYTICAL LABORATORY
405 Clyde Avenue, Bldg. 12
Mountain View, CA 94039
(415) 961-5700

Distribution: White — Laboratory Copy; [illegible] — returned to client with report; [illegible] — File Copy;

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