

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



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Corporation**

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Environmental Systems Division

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

A handwritten signature in dark ink, appearing to read 'Joseph W. MacDonell'.

Joseph W. MacDonell
Contracts Manager

cc:WHB

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 (CO₂), oxygen (O₂), 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, CO₂, and O₂ 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

^aConcentration corrected to 15% O₂

ESD T0659

**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 T0556

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 O₂ 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 Concentration				Concentration Corrected to 15% Oxygen	Emission Rates				Flue Gas			
		O ₂	CO ₂	CO	NO _x		NO _x (as NO ₂)	CO	Flow Rate		Moisture (Vol %)	Temperature (°F)		
									(lb /MBTU)	(lb/hr)			(lb/MBTU)	(lb/hr)
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

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, $\mu\text{g}/\text{train}$	9.0	13	16	—
Method blank, $\mu\text{g}/\text{train}$	2.0	4.8	3.9	—
Net weight collected, $\mu\text{g}/\text{train}$	7.0	8.2	12	—
Sample volume, DSCF	3.96	3.77	3.50	—
Concentration, $\mu\text{g}/\text{DSCF}$	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 T0561

Results were blank-corrected with the method blank, not the field blank.
 The field blank indicated high levels of formaldehyde, 23 $\mu\text{g}/\text{train}$.
 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
Radium — 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

ESD 10469

Metals samples were prepared by Parr Bomb

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 O₂, CO, and CO₂ 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, O₂, and CO₂ 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 O₂ and CO₂ 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.

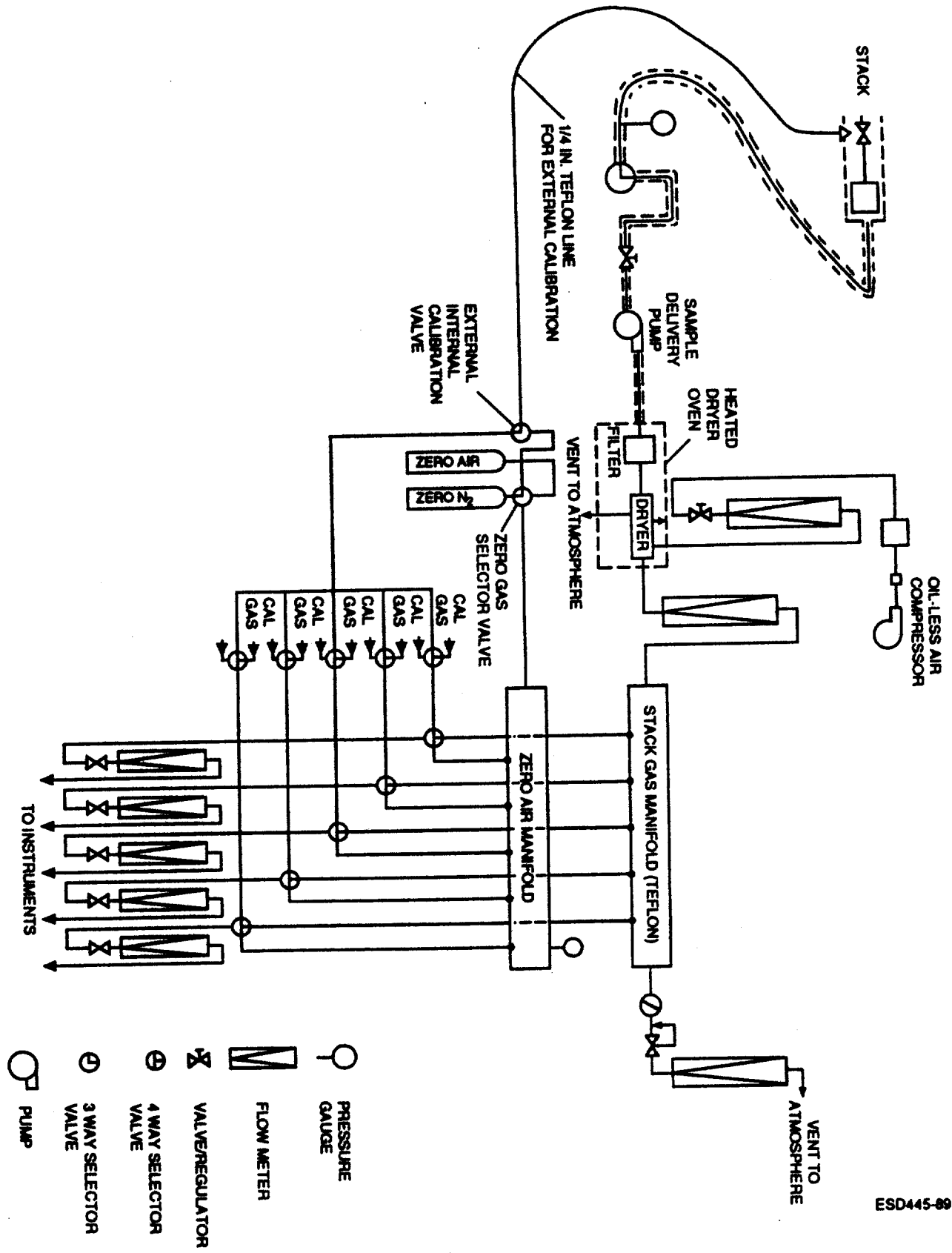


Figure 6-1. Schematic of CEM sampling system

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-----

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: 10-10-89

UNIT # 1

TRIP TIME 15 23

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	84.
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	.527	84.
14:32	82.4	45.76	.556	.527	84.
14:31	82.5	46.17	.560	.528	84.
14:30	82.5	46.18	.560	.528	83.
14:29	82.6	46.18	.559	.527	84.
14:28	82.5	46.19	.560	.527	84.
14:27	82.5	46.19	.560	.527	84.

7A

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: E.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: NIA
FUEL SELECTED: Dist
GAS PRESSURE: NIA

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
FUEL TANK IN USE (No.): 2 ¹³² = 38139
LUBE PUMP / TURNING GEAR ON: /
GAS SHUT-OFF VALVE CLOSED: /
PG&E NATURAL GAS METER:
START: NIA STOP: NIA 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.

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.

*Unit tripped at 1058 Combustion Inlet
changed out 4 check-valve #2,3,4,8*
START-UP DATA
=====

START TIME: 1045 LUBE TANK LEVEL: Full
EMERGENCY STOPS: 107 COOLING WATER TANK LEVEL: Full
START-UP TIME: N/A NATURAL GAS SHUT-OFF VALVE: N/A
FIRED TIME (HRS): 4140.5 FUEL SELECTED: Dist
GAS PRESSURE: N/A

SHUT-DOWN DATA
=====

EMERGENCY STOPS: 108 PG&E NATURAL GAS METER:
FIRED TIME (HRS): 4140.7 START: N/A STOP: N/A cf
RUN TIME (HRS): _____ DIFF: _____ x 1,000 = _____ cf
MANUAL INITIATED START COUNTER: 694 DANIEL'S FLOW COMPUTER TOTALIZED:
FAST LOAD START COUNTER: 5 START: _____ STOP: _____ lbs
TOTAL START COUNTER: 712 DIFF: _____ x 228 = _____ cf
GENERATOR BREAKER COUNTER: 723 PG&E vs. DANIEL'S FLOW IN % ERROR _____
FUEL FLOW METER: RESETTABLE: 132 TOTALIZED: 10709773
FUEL TANK IN USE (No.): 2 LEVEL: N/A
LUBE PUMP / TURNING GEAR ON: - LUBE TANK LEVEL: -
GAS SHUT-OFF VALVE CLOSED: - FUEL OIL SELECTED: _____

☐ - READINGS TAKEN

☒ - NO READINGS TAKEN

MEMORY
LOCATION

TIME	BASE @ 1215 56ms	1500	1530	1630	1730
LOAD	76°F INLET	53.86	53.86	53.86	53.86
FUEL	NO EUAPS	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
D	1. RATE				
A	2. PRESSURE				
N	3. TEMPERATURE				
I	4. ΔP H1 OR H2				
P	5. P/T				
E					
L					
S					
R					
	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.)				

----- P R E S S U R E S (P S I G) -----

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

TEMPERATURES (F)

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

6.9
accuracy

V I B R A T I O N D A T A -----

CHANNEL No. 1 - TURBINE No. 1 BEARING:	<u>.08</u>	<u>.08</u>	<u>.08</u>	<u>.07</u>
CHANNEL No. 2 - TURBINE No. 2 BEARING:	<u>.13</u>	<u>.11</u>	<u>.14</u>	<u>.14</u>
CHANNEL No. 3 - ^{TK-20} No. 1 GENERATOR BEARING:	<u>.40</u>	<u>.14</u>	<u>.08</u>	<u>.14</u>
CHANNEL No. 4 - No. 2 GENERATOR BEARING:	<u>.40</u>	<u>.41</u>	<u>.40</u>	<u>.45</u>

Suspect READINGS on #3; #4 -
TK-20 Shows normal vel. levels

G E N E R A T O R -----

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

McCLURE REVENUE AND FUEL INFORMATION

DATE 10-17-89

GENERATION

#1 generator EIM (1957) 134067.7

#1 KVARE One (#662) 0120.9

#2 generator KWH (#917)_____

#2 KVABH Oct (8194) _____

#1 Primary Out (#661) 2373.8

#1 Back-up Out (#878) 2384.9

#2 Primary Out (1663) _____

#2 Back-up Out (#646) _____

41 DEMAND

Machine _____ Time _____

System _____ **Time** _____

ARMY AND STA. SERV.

01 AUG (1976) Start 03322.6

Step 03324.0

#2 AUG (#093) SCALE 3094.6

Stop 3094.9

STATION SERVICE

Water #895 Start 0319.1

Stop 0319.5.

#2 DEMAND

Machine 1.02 Time 1215

System 97 Time 1700

REMARKS :

This image shows a single sheet of white paper with horizontal black ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. A small dark speck is located near the top center, and another small mark is visible on the right side about halfway down. The paper appears slightly aged or off-white.

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: 10994019
LEVEL: 27'1"
LUBE TANK LEVEL: /
FUEL OIL SELECTED: /

☒ - READINGS TAKEN

☐ - NO READINGS TAKEN

MEMORY
LOCATION

TIME 55min 2 0845

	LOAD	1030	1130	1230	1330
	FUEL	54.57	54.5	54.5	53.86
		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
D	1. RATE		N/A	N/A	
A	2. PRESSURE				
N	3. TEMPERATURE				
M	4. ΔP H1 OR H2				
I	5. P/T				
P					
E					
L					
T					
S					
R					
	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	

----- T E M P E R A T U R E S (F) -----

07	TURBINE EXHAUST M.I.D. VALUE	<u>924</u>	<u>959</u>	<u>975</u>	<u>979</u>
1A	COMPRESSOR DISCHARGE No.1 (TCD-1)	<u>562</u>	<u>582</u>	<u>588</u>	<u>592</u>
1B	COMPRESSOR DISCHARGE No.2 (TCD-2)	<u>575</u>	<u>595</u>	<u>601</u>	<u>604</u>
21	TURBINE EXHAUST - No.1 (TTX-1)	<u>962</u>	<u>1000</u>	<u>1014</u>	<u>1020</u>
22	TURBINE EXHAUST - No.2 (TTX-2)	<u>942</u>	<u>979</u>	<u>995</u>	<u>1000</u>
23	TURBINE EXHAUST - No.3 (TTX-3)	<u>926</u>	<u>961</u>	<u>976</u>	<u>980</u>
24	TURBINE EXHAUST - No.4 (TTX-4)	<u>924</u>	<u>959</u>	<u>975</u>	<u>978</u>
25	TURBINE EXHAUST - No.5 (TTX-5)	<u>927</u>	<u>962</u>	<u>980</u>	<u>981</u>
26	TURBINE EXHAUST - No.6 (TTX-6)	<u>944</u>	<u>982</u>	<u>999</u>	<u>1000</u>
27	TURBINE EXHAUST - No.7 (TTX-7)	<u>916</u>	<u>954</u>	<u>975</u>	<u>976</u>
28	TURBINE EXHAUST - No.8 (TTX-8)	<u>946</u>	<u>986</u>	<u>1002</u>	<u>1004</u>
29	TURBINE EXHAUST - No.9 (TTX-9)	<u>917</u>	<u>952</u>	<u>970</u>	<u>971</u>
2A	TURBINE EXHAUST - No.10 (TTX-10)	<u>913</u>	<u>950</u>	<u>966</u>	<u>968</u>
2B	TURBINE EXHAUST - No.11 (TTX-11)	<u>900</u>	<u>939</u>	<u>951</u>	<u>955</u>
2C	TURBINE EXHAUST - No.12 (TTX-12)	<u>905</u>	<u>941</u>	<u>956</u>	<u>960</u>
2D	TURBINE EXHAUST - No.13 (TTX-13)	<u>919</u>	<u>954</u>	<u>970</u>	<u>974</u>
34	1ST.-STAGE FORWARD WHEELSPACE (1F01)	<u>769</u>	<u>784</u>	<u>799</u>	<u>803</u>
35	1ST.-STAGE FORWARD WHEELSPACE (1F02)	<u>789</u>	<u>801</u>	<u>816</u>	<u>821</u>
36	1ST.-STAGE AFT WHEELSPACE (1A01)	<u>789</u>	<u>814</u>	<u>826</u>	<u>829</u>
37	1ST.-STAGE AFT WHEELSPACE (1A02)	<u>782</u>	<u>808</u>	<u>819</u>	<u>823</u>
38	2ND.-STAGE FORWARD WHEELSPACE (2F01)	<u>760</u>	<u>785</u>	<u>795</u>	<u>798</u>
39	2ND.-STAGE FORWARD WHEELSPACE (2F02)	<u>764</u>	<u>791</u>	<u>801</u>	<u>805</u>
3A	2ND.-STAGE AFT WHEELSPACE (2A01)	<u>609</u>	<u>628</u>	<u>638</u>	<u>641</u>
3B	2ND.-STAGE AFT WHEELSPACE (2A02)	<u>610</u>	<u>628</u>	<u>638</u>	<u>641</u>
3C	3RD.-STAGE FORWARD WHEELSPACE (3F01)	<u>624</u>	<u>645</u>	<u>657</u>	<u>660</u>
3D	3RD.-STAGE FORWARD WHEELSPACE (3F02)	<u>642</u>	<u>662</u>	<u>673</u>	<u>676</u>
3E	3RD.-STAGE AFT WHEELSPACE (3A01)	<u>473</u>	<u>489</u>	<u>501</u>	<u>506</u>
3F	3RD.-STAGE AFT WHEELSPACE (3A02)	<u>480</u>	<u>496</u>	<u>508</u>	<u>512</u>
	LUBE BEARING HEADER	<u>115</u>	<u>123</u>	<u>125</u>	<u>128</u>
	LUBE TANK	<u>137</u>	<u>144</u>	<u>148</u>	<u>150</u>
	FUEL FORWARDING	<u>71</u>	<u>73</u>	<u>74</u>	

VIBRATION DATA

CHANNEL No. 1 - TURBINE No. 1 BEARING:	<u>.10</u>	<u>.10</u>	<u>.09</u>	<u>.09</u>
CHANNEL No. 2 - TURBINE No. 2 BEARING:	<u>.14</u>	<u>.14</u>	<u>.15</u>	<u>.14</u>
CHANNEL No. 3 - ^{TK-20 DIRECT V.} No. 1 GENERATOR BEARING:	<u>.045</u>	<u>.054</u>	<u>.059</u>	<u>.088</u>
CHANNEL No. 4 - No. 2 GENERATOR BEARING:	<u>.10</u>	<u>.14</u>	<u>.23</u>	<u>.30</u>

GENERATOR

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

MEMORY
LOCATION

TIME

LOAD

FUEL

01 HP TURBINE SPEED %

02 VCE

0B MAX. ALLOWABLE SPREAD

0C SPREAD 1

0D SPREAD 2

0E LCE

0F GCE

10 DIST. FUEL FLOW (gpm)

64 GAS FUEL FLOW #/sec.

12 WATER FLOW

17 INLET AIR (F)

33 AMBIENT AIR (F) / HUMIDITY

EVAPORATIVE COOLER

1430

1537

1640

52.89

52.81

DIST

DIST

DIST

100

100

100

12.29

12.21

12.19

97

97

97

60

61

60

54

56

53

12.34

12.24

12.27

-21

N/A

N/A

81.9

81.8

81.5

N/A

N/A

N/A

44.68

44.13

43.92

84

86

86

N/A

N/A

N/A

OFF

OFF

OFF

----- PRESSURES (PSIG) -----

03 COMPRESSOR DISCHARGE (PCD)

11 SRV INTERVOLUME PRESSURE (VOLTS)

D C 1. RATE

A O 2. PRESSURE

N M 3. TEMPERATURE

I P 4. ΔP H1 OR H2

E U 5. P/T

L T

S E

R

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.)

112.9

112.7

112.7

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

N/A

----- P R E S S U R E S (P S I G) -----

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

----- T E M P E R A T U R E S (F) -----

07	TURBINE EXHAUST M.I.D. VALVE	<u>979</u>	<u>981</u>	<u>980</u>	<u> </u>
1A	COMPRESSOR DISCHARGE No.1 (TCD-1)	<u>595</u>	<u>596</u>	<u>597</u>	<u> </u>
1B	COMPRESSOR DISCHARGE No.2 (TCD-2)	<u>606</u>	<u>608</u>	<u>608</u>	<u> </u>
21	TURBINE EXHAUST - No.1 (TTX-1)	<u>1018</u>	<u>1019</u>	<u>1020</u>	<u> </u>
22	TURBINE EXHAUST - No.2 (TTX-2)	<u>998</u>	<u>998</u>	<u>998</u>	<u> </u>
23	TURBINE EXHAUST - No.3 (TTX-3)	<u>981</u>	<u>984</u>	<u>983</u>	<u> </u>
24	TURBINE EXHAUST - No.4 (TTX-4)	<u>980</u>	<u>981</u>	<u>980</u>	<u> </u>
25	TURBINE EXHAUST - No.5 (TTX-5)	<u>985</u>	<u>985</u>	<u>984</u>	<u> </u>
26	TURBINE EXHAUST - No.6 (TTX-6)	<u>1006</u>	<u>1006</u>	<u>1009</u>	<u> </u>
27	TURBINE EXHAUST - No.7 (TTX-7)	<u>977</u>	<u>978</u>	<u>978</u>	<u> </u>
28	TURBINE EXHAUST - No.8 (TTX-8)	<u>1006</u>	<u>1006</u>	<u>1008</u>	<u> </u>
29	TURBINE EXHAUST - No.9 (TTX-9)	<u>975</u>	<u>976</u>	<u>977</u>	<u> </u>
2A	TURBINE EXHAUST - No.10 (TTX-10)	<u>971</u>	<u>972</u>	<u>973</u>	<u> </u>
2B	TURBINE EXHAUST - No.11 (TTX-11)	<u>959</u>	<u>956</u>	<u>959</u>	<u> </u>
2C	TURBINE EXHAUST - No.12 (TTX-12)	<u>962</u>	<u>963</u>	<u>965</u>	<u> </u>
2D	TURBINE EXHAUST - No.13 (TTX-13)	<u>973</u>	<u>973</u>	<u>975</u>	<u> </u>
34	1ST.-STAGE FORWARD WHEELSPACE (1F01)	<u>810</u>	<u>810</u>	<u>812</u>	<u> </u>
35	1ST.-STAGE FORWARD WHEELSPACE (1F02)	<u>827</u>	<u>830</u>	<u>832</u>	<u> </u>
36	1ST.-STAGE AFT WHEELSPACE (1A01)	<u>831</u>	<u>832</u>	<u>833</u>	<u> </u>
37	1ST.-STAGE AFT WHEELSPACE (1A02)	<u>826</u>	<u>827</u>	<u>828</u>	<u> </u>
38	2ND.-STAGE FORWARD WHEELSPACE (2F01)	<u>801</u>	<u>803</u>	<u>804</u>	<u> </u>
39	2ND.-STAGE FORWARD WHEELSPACE (2F02)	<u>808</u>	<u>810</u>	<u>810</u>	<u> </u>
3A	2ND.-STAGE AFT WHEELSPACE (2A01)	<u>645</u>	<u>646</u>	<u>647</u>	<u> </u>
3B	2ND.-STAGE AFT WHEELSPACE (2A02)	<u>645</u>	<u>647</u>	<u>648</u>	<u> </u>
3C	3RD.-STAGE FORWARD WHEELSPACE (3F01)	<u>664</u>	<u>665</u>	<u>667</u>	<u> </u>
3D	3RD.-STAGE FORWARD WHEELSPACE (3F02)	<u>681</u>	<u>683</u>	<u>684</u>	<u> </u>
3E	3RD.-STAGE AFT WHEELSPACE (3A01)	<u>509</u>	<u>510</u>	<u>511</u>	<u> </u>
3F	3RD.-STAGE AFT WHEELSPACE (3A02)	<u>515</u>	<u>517</u>	<u>519</u>	<u> </u>
	LUBE BEARING HEADER	<u>131</u>	<u>133</u>	<u>134</u>	<u> </u>
	LUBE TANK	<u>152</u>	<u>154</u>	<u>155</u>	<u> </u>
	FUEL FORWARDING	<u>75</u>	<u>75</u>	<u>75</u>	<u> </u>

VIBRATION DATA

CHANNEL No. 1 - TURBINE No. 1 BEARING:	<u>.09</u>	<u>.09</u>	<u>.09</u>	_____
CHANNEL No. 2 - TURBINE No. 2 BEARING:	<u>.14</u>	<u>.15</u>	<u>.14</u>	_____
CHANNEL No. 3 - ^{TK-20 DIRECT} No. 1 GENERATOR BEARING:	<u>V. .65</u> <u>B. .043</u>	<u>V. .700</u> <u>B. .047</u>	<u>V. .70</u> <u>B. .05</u>	_____
CHANNEL No. 4 - No. 2 GENERATOR BEARING:	<u>.22</u>	<u>.23</u>	<u>.21</u>	_____

GENERATOR

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

DATE 10 | 18 | 89

#1 generator KWH (#837) 134584.2
#1 KVARE Out (#662) 0121.0
#2 generator KWH (#917) _____
#2 KVARE Out (#194) _____
#1 Primary Out (#661) 2382.7
#1 Back-up Out (#878) 2394.0
#2 Primary Out (#663) _____
#2 Back-up Out (#646) _____

#1 Aug (#876) Start 03324.7
Stop 03326.2

#2 Aug (#093) Start 3095.1
Stop 3095.5

Water #895 Start 320.0
Stop 0320.7

Machine 1.00 Time 1200
System .95 Time 1700

Machine 44 Time 12:05
System 4 Time 17:15

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. A small dark speck is located near the top center of the page. The paper appears slightly aged or off-white.

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: 716
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 1.70
TOTALIZED: 11005855
LEVEL: 26' 6"
LUBE TANK LEVEL: Full
FUEL OIL SELECTED: ✓

☐ - READINGS TAKEN

☒ - NO READINGS TAKEN

DATE 10/14/89

ADDITIONAL AND STA. SERV.

#1 ANN (#876) Start 3327.1
Stop 3328.8

#2 ANN (#093) Start 3095.9
Stop 3096.2

Water #895 Start 321.1
Stop 321.6

#2 DEMAND

Machine _____ Time _____
System _____ Time _____

[illegible]

UNIT 1
Performance (EPA) 89 10/19/89

10/19/89

LOAD	VCE	LCE	GCE	PCD	GAZ CY H/SZC	10 GPM FUEL	H2O G.I.	WATER RATIO
30	9.13	6.22	6.95	88.3	3.28	23.0	0	59/1
30	9.13	6.22	6.95					59/1
30	9.13	5.55	7.64	88.3	3.99	16.8	11	79/3
45	10.62	6.68	7.97	110.0	4.3	27.6		60/2
45	10.62	6.00	8.65	109.6	5.05	21.1		70/2
45	10.58	5.35	9.27	109.0	5.68	15		80/2
54	11.72	5.58	10.19	113.3	6.56	17		80/2
54	11.72	6.46	9.43	113.5	5.78	25.3		70/3
54	11.58	7.1	8.55	112.5	4.95	31.7		60/4
54	11.86	4.79	11.11	113.5	7.46	9.4		90/1
45	10.72	4.7	10.09	108.4	6.45	8.5		90/1

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: 716
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 1.90
TOTALIZED: 11005855
LEVEL: 26' 6"
LUBE TANK LEVEL: Full
FUEL OIL SELECTED: ✓

☐ - READINGS TAKEN

☒ - NO READINGS TAKEN

DATE 10/19/89

#1 generator KWH (#857) 135023.6
#1 KVARE Out (#662) 121.2
#2 generator KWH (#857)
#2 KVARE Out (#662)
#1 Primary Out (#661) 2390.6
#1 Back-up Out (#878) 2401.9
#2 Primary Out (#663)
#2 Back-up Out (#879)

Machine .98 Time 1230
System .62 Time 1630

01 Aug (#876) Start 3327.1
Stop 3328.8

02 Aug (#093) Start 3095.9
Stop 3096.2

Motor #895 Start 321.1
 Stop 321.6

Machine _____ Time _____
System _____ Time _____

[illegible]

UNIT 1

PERFORMANCE (EPA) 89

10/19/89

ORD	VCE	LCE	GCE	PCD	GAZ CY #/SEC	10 GPM FUEL	H2O WT.	WT RA
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	9.43	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		40/
15	10.72	4.7	10.09	108.4	6.45	8.5		90/

Turbine Operation Data

Turbine Identification:
Serial Number
Type

GE ms 7001 B

#1

#2

#3

Ambient temperature (°F)

82

71

85

Barometric pressure

29.98

30.00

29.94

Fuel flow (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

Vertical



Traverse Point No.

9.5

1	50
2	66
3	82
4	98
5	114
6	130

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

Plant McClure Geomining Station - M110
Location Turkey A (1)
Operator Johnston
Date 10-18-59
Load Range 100% 55 Mags Wells

Evaporation Units are Off

072

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

Expiration units off

[illegible]

Plant M^cClure Generating Station (M.L.D.)
Location Turbine A (1)
Operator J. Schuster
Date 10-10-89
Load Range 100%

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

(Evaporation - Units off)

232

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 : A1646
CUSTOMER ORDER NO : E624203D
ORDER NO : 236-000284
ORDER DETAIL SEQ : 1

** ANALYSIS **

GAS MIXTURE: NITRIC OXIDE IN NITROGEN

	<u>CYL NO</u>	<u>COMPONENT REQUESTED</u>	<u>CONCENTRATION REQUESTED</u>	<u>ANALYTICAL RESULT</u>	<u>UNIT OF MEASURE</u>
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).

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

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 : 863-00G901
ORDER DETAIL SEQ : 6

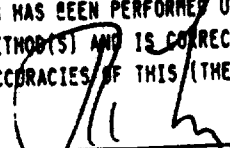
** ANALYSIS **

GAS MIXTURE: NITRIC OXIDE IN NITROGEN

	<u>CYL NO</u>	<u>COMPONENT REQUESTED</u>	<u>CONCENTRATION REQUESTED</u>	<u>ANALYTICAL RESULT</u>	<u>UNIT OF MEASURE</u>
BATCH NO: 02130H	SG861648NB	NITRIC OXIDE	20	18	MOLAR PPM
ANAL DATE: 01/30/89		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

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 $\pm .003$ 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 1/27/89 Cylinder No. SG 86164NB Analysis 18 gm NO
19 gm NA
Bil Me

AIR PRODUCTS AND CHEMICALS, INC.
SPECIALTY GAS DEPARTMENT
10000 N. ALAMEDA STREET
LONG BEACH, CA 90810
TELEPHONE (415) 500-5000

DATE: 10/09/89
PAGE: 1

CERTIFICATE OF ANALYSIS

ACUREA
435 OLIVE AVE.
MOUNTAIN VIEW CA 94040

CUSTOMER ACCOUNT 10048
CUSTOMER ORDER NO 10009180
ORDER NO 100-002670
ORDER DETAIL 800

** ANALYSIS **

CERTIFIED GAS MIXTURE: 2 COMPONENTS IN NITROGEN

CYL NO	COMPONENT REQUESTED	CONCENTRATION REQUESTED	ANALYTICAL RESULT	UNIT OF MEASURE
BATCH NO. 001907 ANAL DATE: 10/09/89	SG1640NE CARBON DIOXIDE CARBON MONOXIDE	10 100	10.1 617	MOLAR % MOLAR PPM

THIS ANALYSIS HAS BEEN PERFORMED UTILIZING APPROVED
ANALYTICAL METHODS AND IS CORRECT TO WITHIN THE
ANALYTICAL ACCURACIES OF THESE METHODS.

[Signature]
ANALYST SIGNATURE



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 $\pm .003$ 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	<u>10/5/89</u>	Cylinder No.	<u>SG 1640NB</u>	Analysis	<u>417 ppm CO</u>
					<u>16.1% CO₂</u>
					<u>Bal N₂</u>

Donald F. O'Connell
Facility Manager

AIR PRODUCTS AND CHEMICALS, INC.
SPECIALTY GAS DEPARTMENT
23020 ST. ALAMEDA STREET
LONG BEACH, CA 90801
TELEPHONE (213) 639-1600

DATE: 10/13/89
PAGE: 1

CERTIFICATE OF ANALYSIS

ACUREA
485 CLYDE AVE.
MOUNTAIN VIEW CA 94043

CUSTOMER ACCOUNT : AL...
CUSTOMER ORDER NO : E811553
ORDER NO : 00-1002670
ORDER DETAIL SEQ :

ANALYSIS

CERTIFIED GAS MIXTURE: 3 COMPONENTS IN NITROGEN

CYL NO	COMPONENT REQUESTED	CONCENTRATION	ANALYTICAL	UNIT OF
		REQUESTED	RESULT	MEASURE
BATCH NO: C4210M ANAL DATE: 10/13/89	CARBON DIOXIDE	6	6.02	MOLAR %
	CARBON MONOXIDE	175	173	MOLAR %
	OXYGEN	7	7.00	MOLAR %

TESTIFICATION

THIS ANALYSIS WAS PERFORMED UTILIZING APPROVED
EVAL. TECH. FOR CORRECT RESULTS
EVAL. TECH. ADJUSTED TO THESE RESULTS

[Signature]
ANALYST

DATE 10-23-89

SC 479

PROBE LENGTH 10'

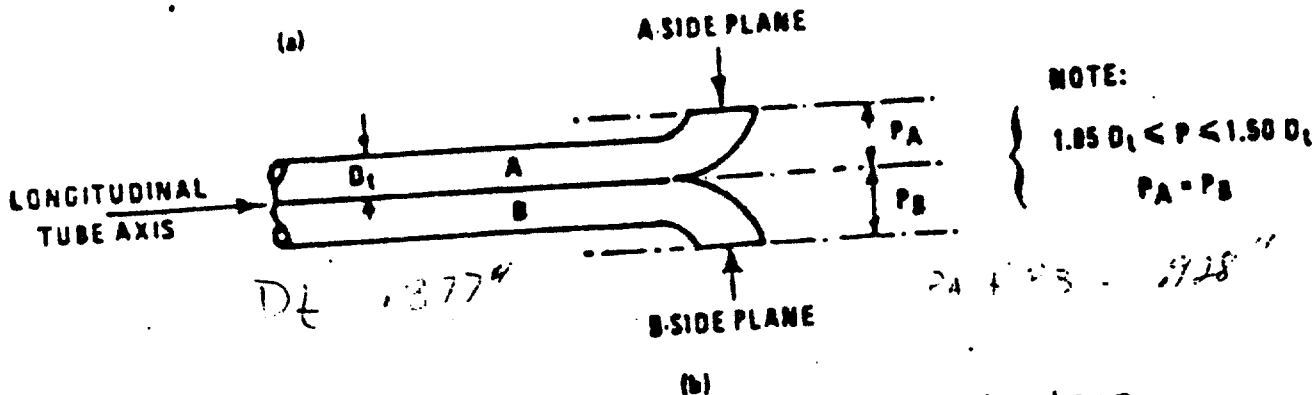
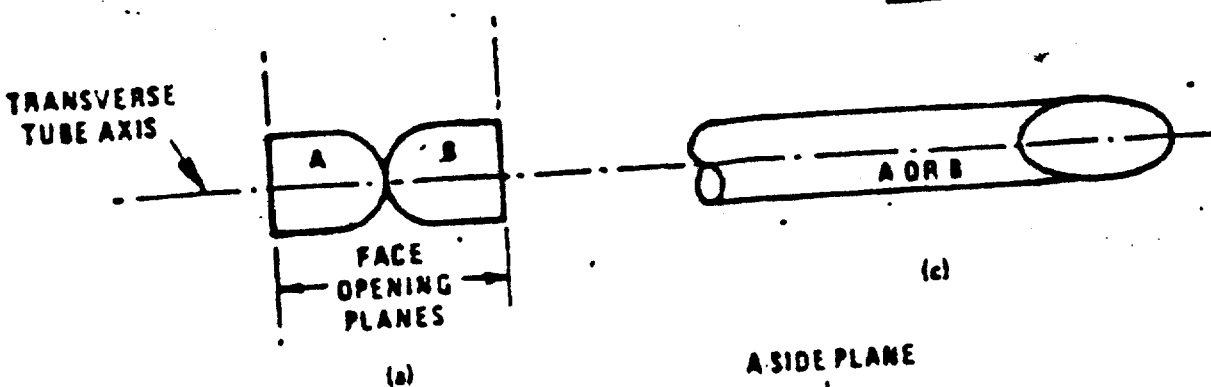


Figure 2-2. Properly constructed Type S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis; (b) top view; face opening planes parallel to longitudinal axis; (c) side view; both legs of equal length and base-centerlines coincident, when viewed from both sides. Baseline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

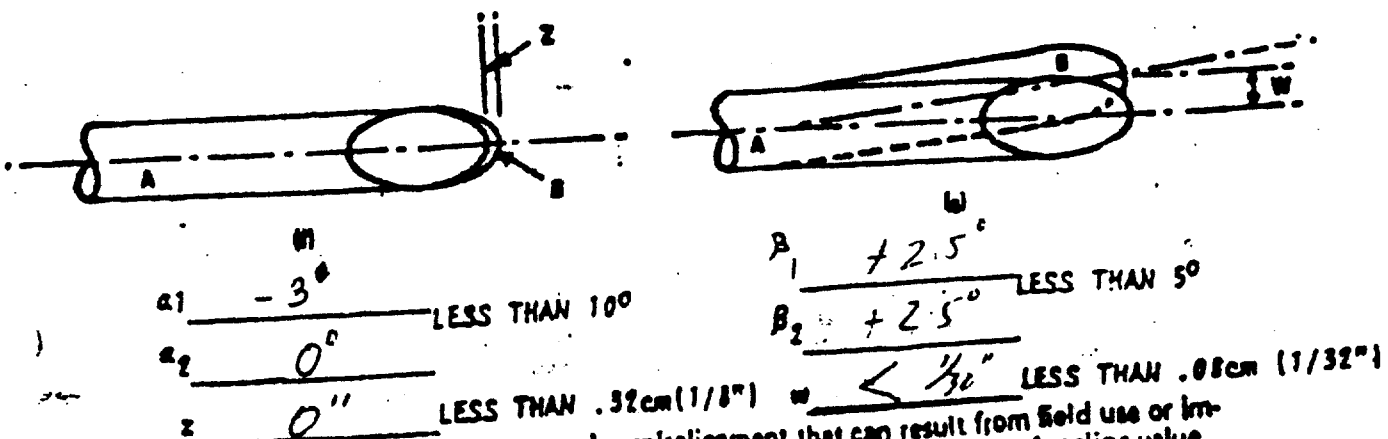
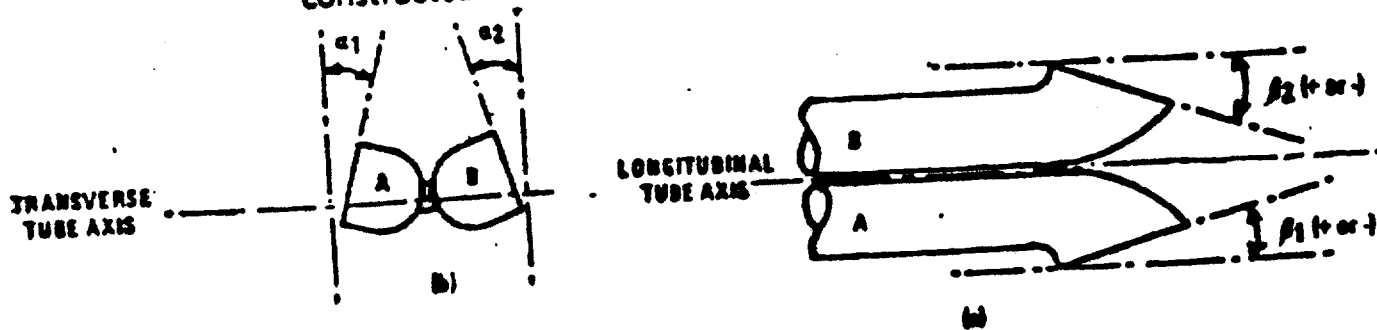


Figure 2-3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of Pitot coefficient as long as $\alpha_1 < 10^\circ$, β_1 and $\beta_2 < 5^\circ$, $z < 0.32 \text{ cm } (1/8 \text{ in.})$ and $w < 0.08 \text{ cm } (1/32 \text{ in.})$.

CONTROL MOUNT CALIBRATION

Instrument No. D-555 Barometric Pressure (in. Hg) 30.1 Percent Temperature 70°
 Date 10-4-50 Primary Meter I.D. 4 3/8 Secondary Meter I.D. 3 1/8

Orifice Size (in. Hg)	Primary Meter Gas Volume (ft ³)	Barometric Pressure (in. Hg)	Primary Meter I.D.	Secondary Meter I.D.	Average T _p (°F)	Inlet T _p (°F)	Outlet T _p (°F)	Average T _g (°F)	Time (min)	Meter Correction Factor	Netifice Coefficient
2.5	164.0	30.1	3 1/8	3 1/8	74°	71°	87°	89°	16.8	1.006	.735
1.5	276.5	30.1	3 1/8	3 1/8	74°	71°	87°	89°	16.8	1.006	.735
1.0	400.8	30.1	3 1/8	3 1/8	74°	71°	87°	89°	16.8	1.006	.735
.5	800.7	30.1	3 1/8	3 1/8	74°	71°	87°	89°	16.8	1.006	.735

Barometric Pressure (in. Hg)	30.1	Percent Temperature	70°
Primary Meter I.D.	4 3/8	Secondary Meter I.D.	3 1/8
Netifice Coefficient	1.006	Netifice Coefficient	.735

POST-TEST METER CONSOLE CALIBRATION

Signature: [Signature] Date: 10-1-77 Meter Box No. D-555

Barometric Pressure, $P_b =$ 29.95 in. Hg Dry Gas Meter No. 1000

Test Meter No. 433513 Test Meter Correction Factor 1.000

Orifice Manometer Setting, (ΔH), in H ₂ O	Gas Volume		Temperature				Time (t_d), min	Vacuum Setting, in Hg	Y_i	$V_w P_b (\bar{t}_d + 460)$ $V_d P_b + \frac{\Delta H}{13.6} t_w + 460$
	Wet Test Meter (V_w), ft ³	Dry Gas Meter (V_d), ft ³	Wet Test Meter (t_w), F	Inlet (t_{i1}), F	Outlet (t_{i2}), F	Average ($\bar{t}_d$), F				
1.0	10.0	10.0	77.0	77.0	77.0	77.0	10.0	6.0		1.000
2.0	10.0	10.0	77.0	77.0	77.0	77.0	10.0	6.0		1.000
3.0	10.0	10.0	77.0	77.0	77.0	77.0	10.0	6.0		1.000
									$Y =$	1.000

Form 486 11/65

VP V_d

1 STOP 167.050 > 167.050 167.050 167.050

START 167.050

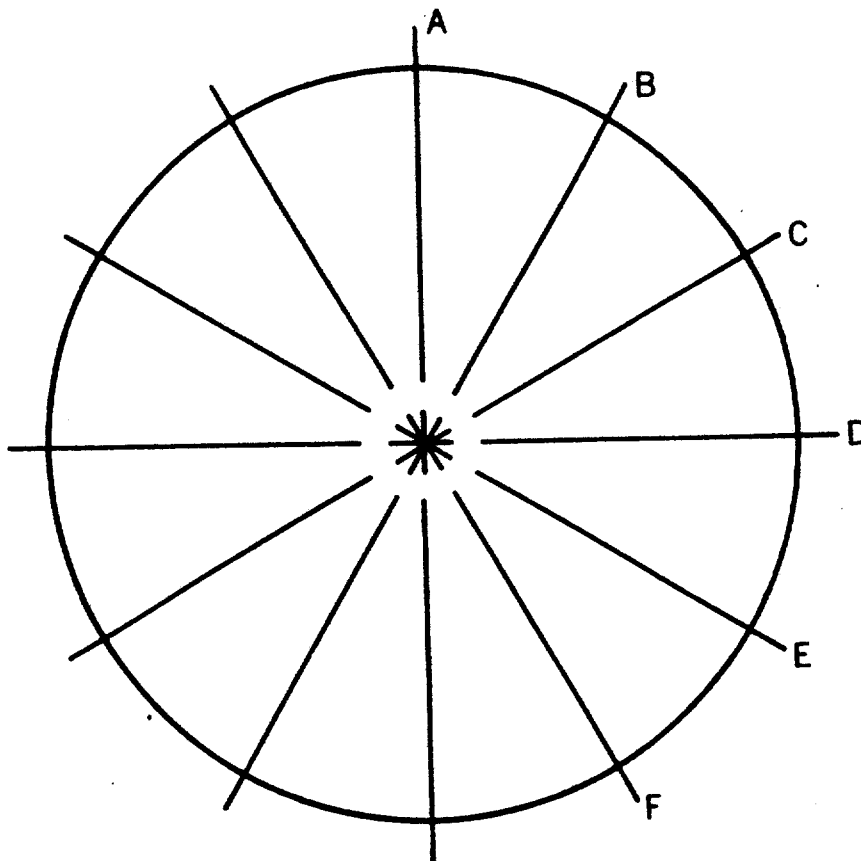
2 STOP 167.15 > 167.15 167.15 167.15

START 167.15

3 STOP 167.55 > 167.55 167.55 167.55

START 167.55

NOZZLE MEASUREMENT



DIAMETER
DIMENSION

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

AVG. _____

NOZZLE SERIAL

.178

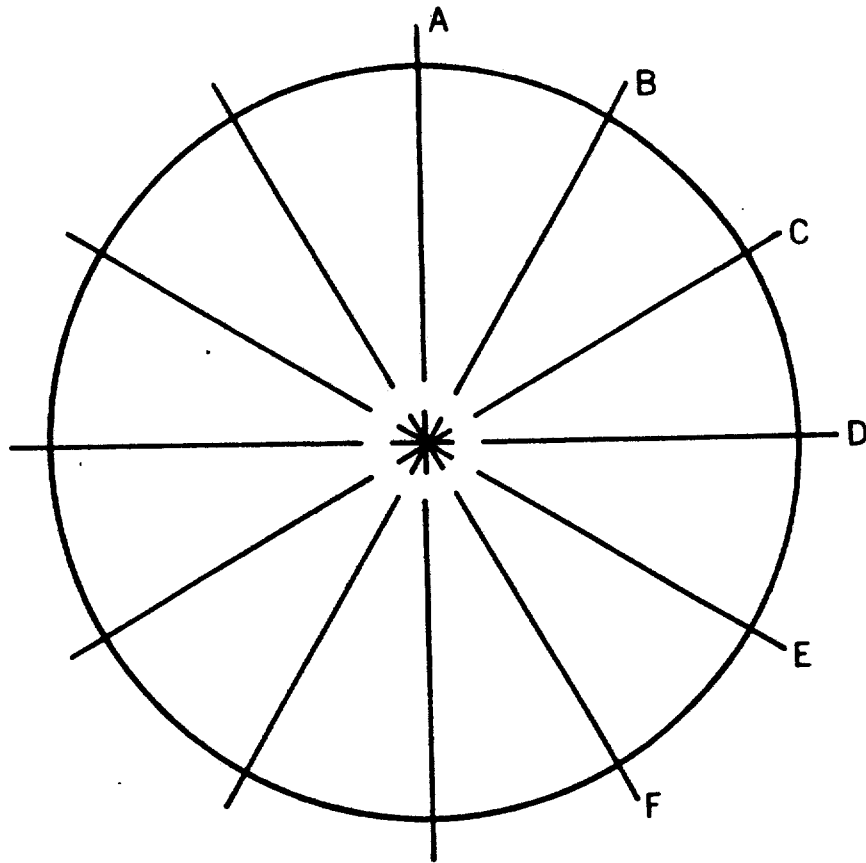
DATE

10-20-85

RECORDED BY

[Signature]

NOZZLE MEASUREMENT



DIAMETER
DIMENSION

A .212

B .213

C .212

D .212

E _____

F _____

AVG. _____

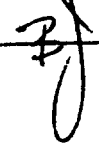
NOZZLE SERIAL

.212

DATE

10-20-87

RECORDED BY



200/00

11.0

15.0

26.6 75% L.M.
90/10

19.1

23.5

35.4

90/10

35.3

29.5

12.5

60/40

19.6

27.7

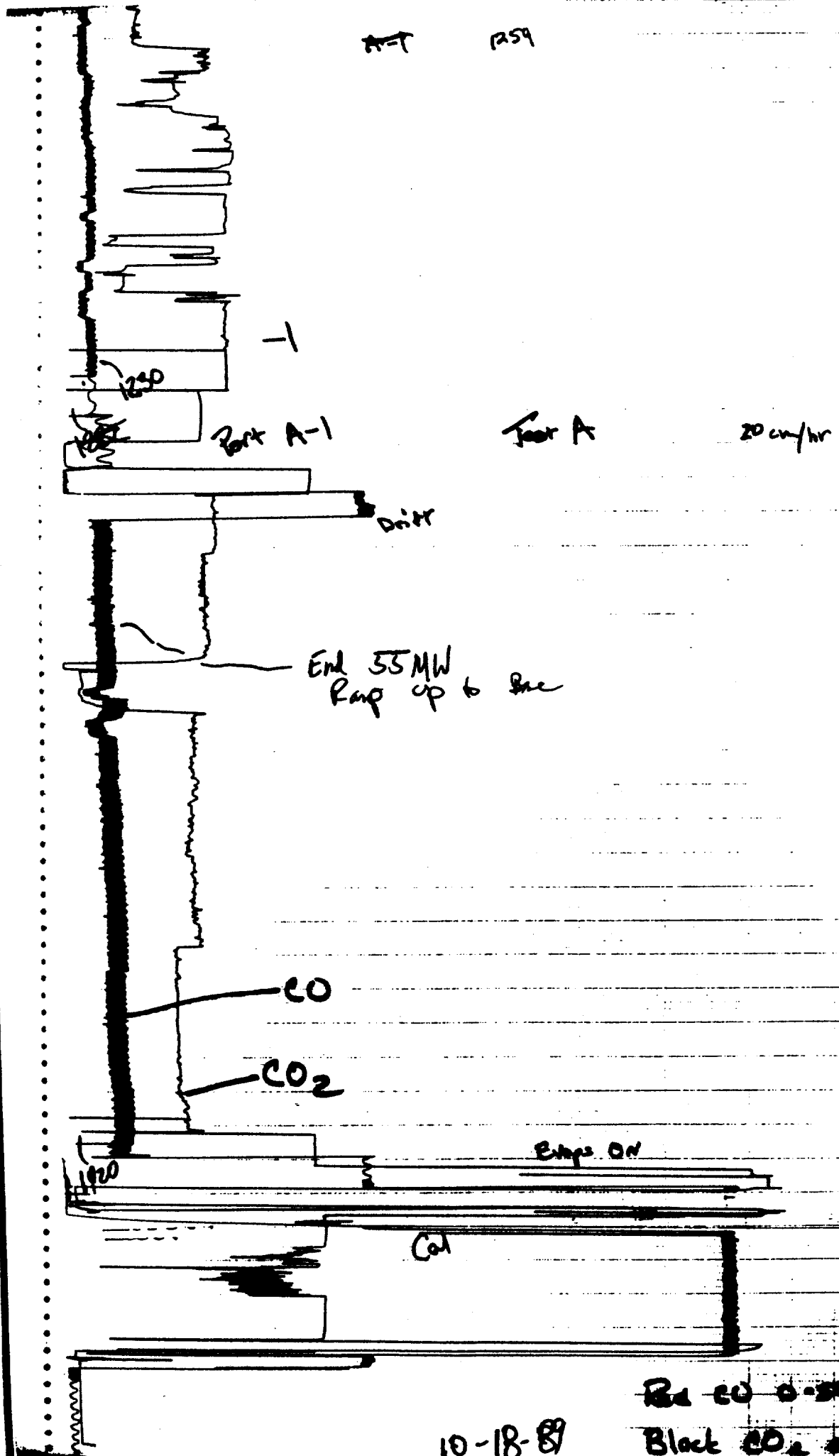
32.3

70/30

32.7

A-T

1259



Part A-1

Foot A

20 cm/hr

Drift

End 35 MW
Pump up to line

CO

CO₂

Edges on

Cal

Re CO 0-200 ppm

Black CO₂ 0-200 ppm

10-18-89

Bibbs Nox

Deser

-3

-2

-3

-2

-1

E-1 1020

-4

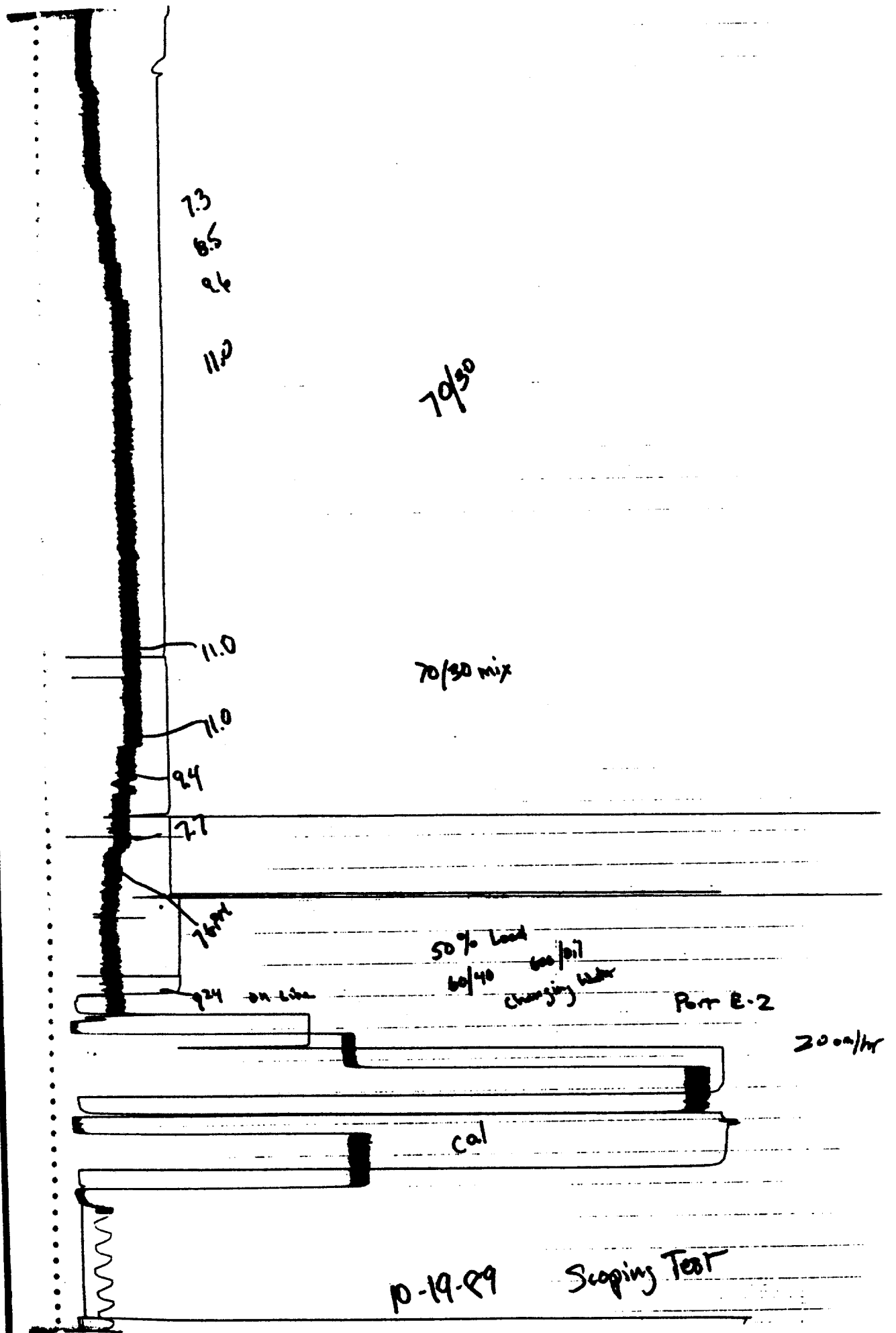
-3

-2

1551

-1

Start



13.9

6.7

6.4

10.0

17.3

24.1

80/20

70/80

1150

Britt

26.2

20.7

15.4

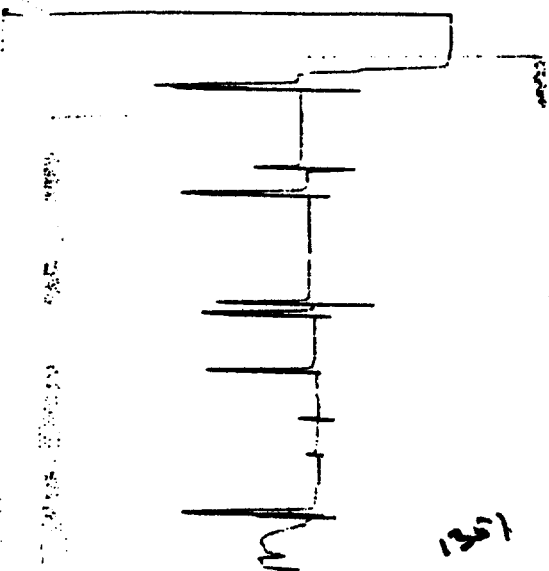
10.9

9.4

6.7

2.4

75% Load
60/40



Drift

-4

-3

-2

E-1

Port Champ

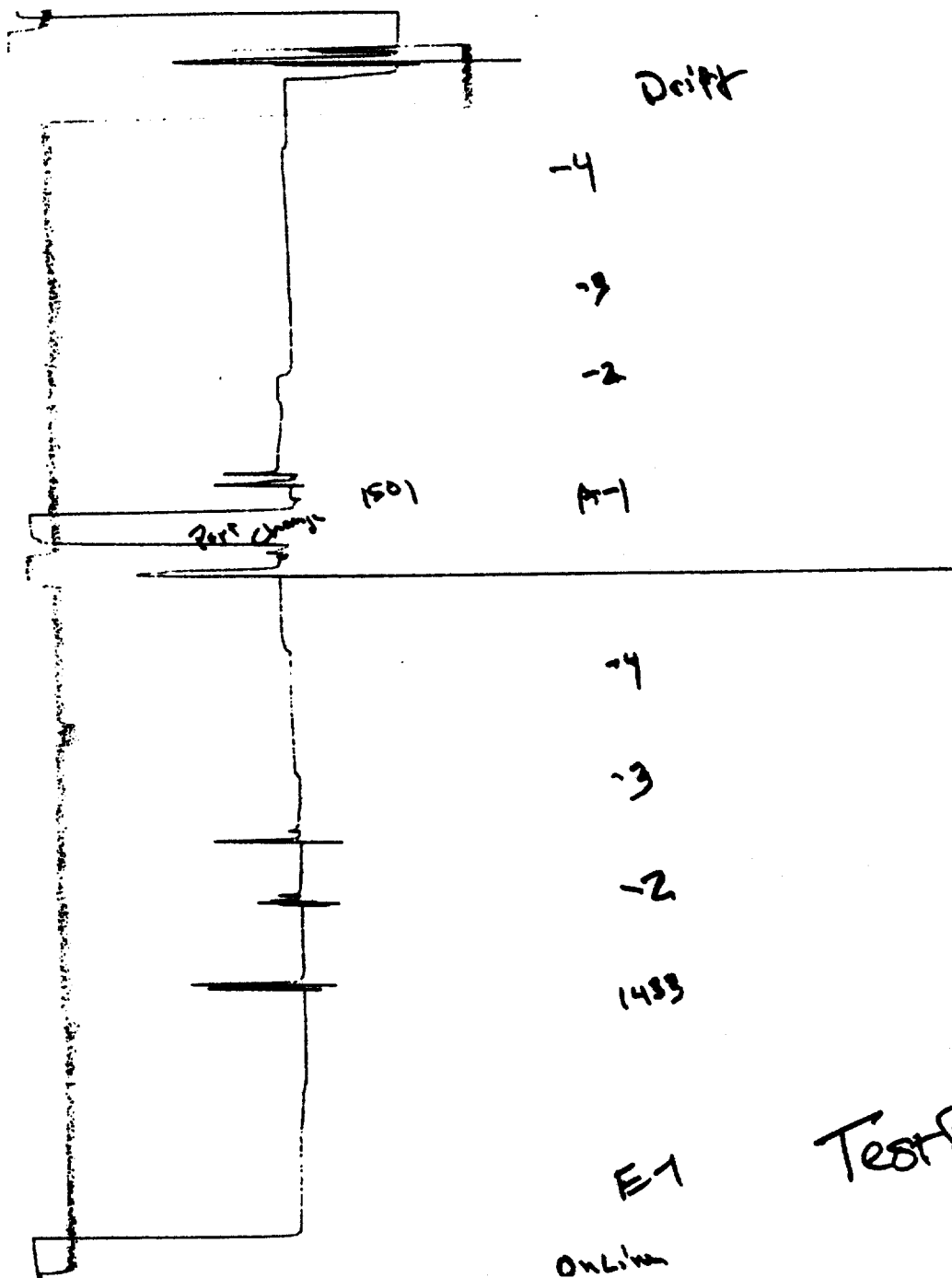
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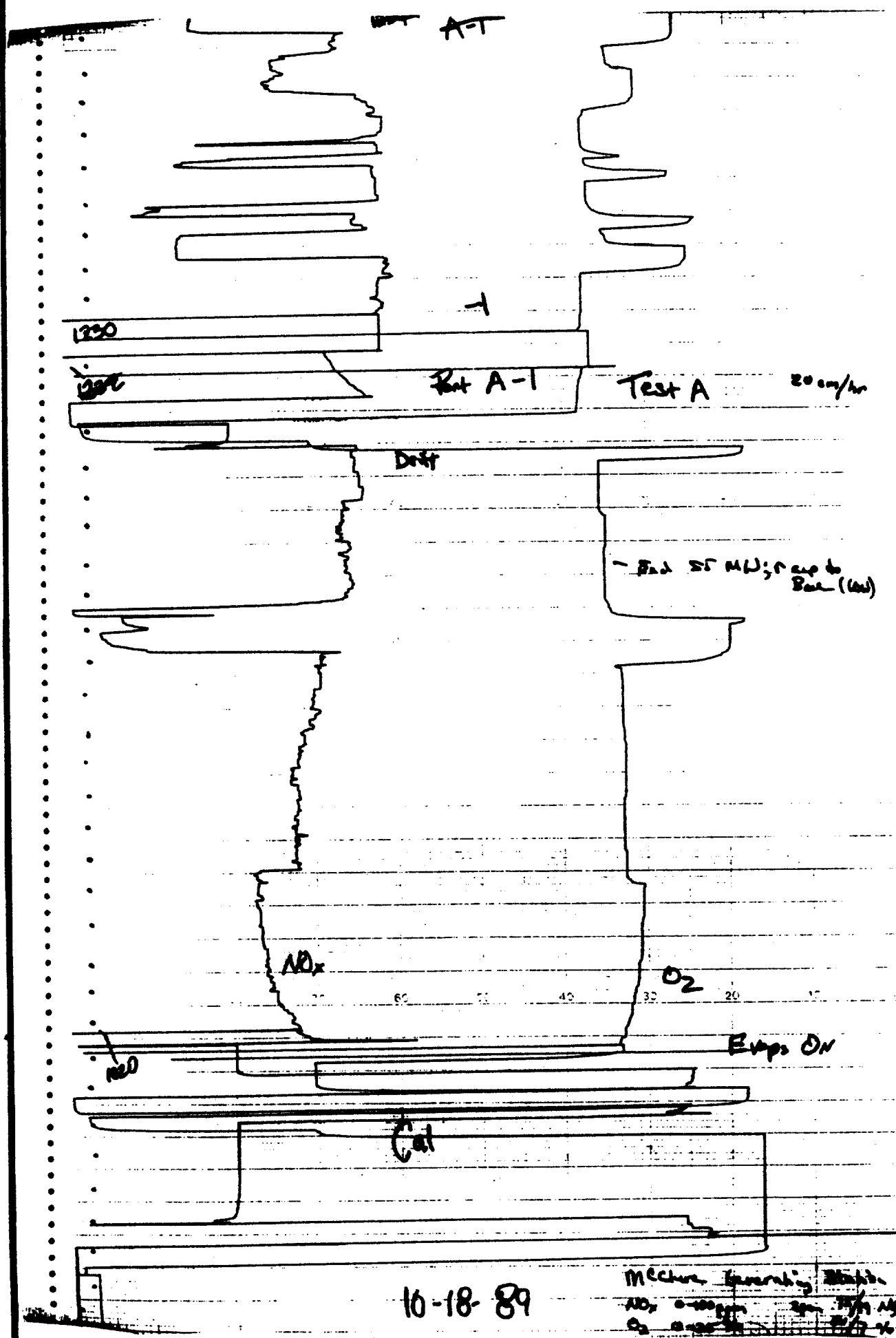
-3

-2

A-1
1312

20 cph





10-18-89

Mechan. Assembly Sketch
NO, 0-100 mm
O2, 0-100 mm

Recd Nov

O2 on line

Drift

-4

-3

-2

1351

E-1

0 mge

-4

-3

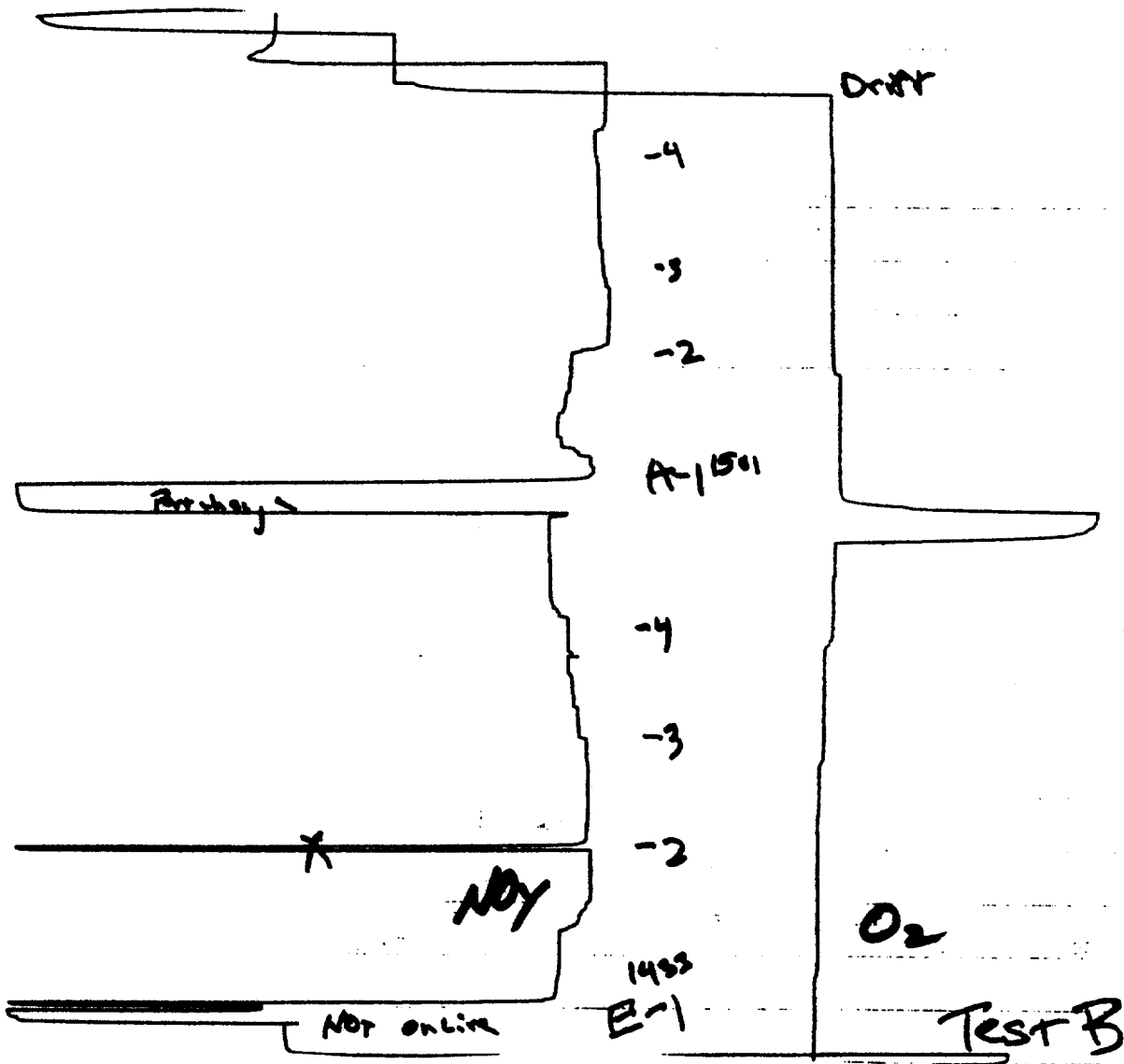
-2

20 cm/hr

NOY

A-1
1312

NOY



NOx converter clock 1720

Bias NOx

Drift

-4
-3
-2
-3
-2
-1
-1

Reading E-2-4 due
to possible in 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:

	Totaling		
	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
Fluorene	0.66	0.78	0.70
Phenanthrene	1.4	9.8	2.0
Anthracene	0.31	0.43	0.049
Fluoranthene	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)fluorene	0.14	< 0.11	0.28
Benzo(k)fluorene	0.048	< 0.020	0.34
Dibenz(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	43.1	< 2.0
Acenaphthene	< 3.3	< 6.7	43.7	< 4.6
Fluorene	9.4	14.9	8.7	11.0
Phenanthrene	50.0	187	24.9	87
Anthracene	4.4	8.2	0.61	4.4
Fluoranthene	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	< 0.62
Chrysene	0.74	7.08	4.32	5.7
Benzo(b)fluorene	2.0	< 2.1	3.5	< 2.5
Benzo(k)fluorene	0.69	< 0.38	4.23	< 1.8
Dibenz(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

+ 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: THH
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	98.75
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, 07% O2 (mg/dscm)	C(s std) = 0
Particulate Loading, dry 07% O2 (gr/dscf)	= 0.0000
Particulate Emission Rate (lb/hr)	E(p) = 0.000

* Temp Avg of Tests 293
Temp of 70°F was used for sampling (Emission)

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter, dH (in H2O)	Stack Temp (degF)	Gas Temp in (degF)	Meter Temp out (degF)	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

Ambient Temp 83 F



ACUREX
Corporation

PARTICULATE TEST FIELD DATA SHEET

Nozzle Size & Number 0.172
Molecular Weight 6.05
BWO

FILTER DATA		
NUMBER	TARE	FINAL WT.

Plant Moderate Illingston Dist. Barometric Pressure 30.21.10

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 0555

Operator Tech Orifice Coefficient 1.009/0.735

IMPINGER VOLUMES	TIME	CO ₂	O ₂	CO
SILICA GEL				

[illegible]



PARTICULATE TEST FIELD DATA SHEET

ACUREX Corporation
Plant PARCITE Incinerator D34 Barometric Pressure 30
Date 02/17/89 Static Pressure -3
Test Location turbine #1 Stack Pressure _____
Run Number #1 Probe Number _____
Stack Diameter inches _____ Pilot Coefficient 0.84
Duct Dimensions in. x in. _____ Pilot Number _____
Start Time 155 Meter Box Number _____
Operator TMH Orifice Coefficient 1.004 / 0.735

IMPINGER VOLUMES	TIME	CO ₂	O ₂	CO
SILICA GEL				

FILTER DATA		
NUMBER	TARE	FINAL WT.

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT ³	STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER		PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	
										IN	OUT			
E1	1655	3.0	1.30	452.806	700	230	67	40	240	112	111	2.0		
E2	1700	3.0	1.30	456.7	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	2.0		
				466.501										
F1	1745	3.0	1.298	466.501	700	230	67	40	260	110	108	2.0		
F2	1750	3.0	1.08	470	700	230	67	40	260	107	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	101	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	277	102	102	3.0		
				489.850										
AVG/TOTAL														

IMPINGER CATCH - PAHs

Sample No. 1A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)
1	<u>Blank</u>	<u>0 ml</u>		Final <u>35.0</u> Initial <u>0.0</u> Wt. gain <u>35.0 gms</u>
2	<u>Organic Free H₂O</u>	<u>150 ml</u>		Final <u>150.0</u> Initial <u>150.0</u> Wt. gain <u>0.0 gms</u>
3	<u>Blank</u>	<u>0 ml</u>		Final <u>0 ml</u> Initial <u>0 ml</u> Wt. gain <u>0.0 g</u>
4	<u>Silica Gel</u>	<u>500.0 gm</u>		Final <u>518.4</u> Initial <u>500.0</u> Wt. gain <u>18.4</u>
5				Final Initial Wt. gain
6				Final Initial Wt. gain
Flask				Final Initial Wt. gain

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 53.4

002647

Date _____

Signature _____

003407

BEST ANALYSIS RESULTS

003405

Gas Fractional Part

CO₂ _____
O₂ _____
CO _____
H₂ _____

003406

003404

Date _____

Signature _____

Signature _____



PARTICULATE TEST FIELD DATA SHEET

Plant MADEIRA ELI-ge To - 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 _____ Pilot Coefficient _____
Duct Dimensions in. x in. _____ Pilot Number _____
Start Time 1003 Meter Box Number D555
Operator TMH Orifice Coefficient 1.009/0.735

Nozzle Size & Number Q.178
Molecular Weight _____
BWO Q.05

IMPINGER VOLUMES	TIME	CO ₂	O ₂	CO
SILICA GEL				

FILTER DATA		
NUMBER	TARE	FINAL WT.

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT ³	TEMPERATURES °F							PUMP VACUUM in. Hg	√ΔP
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER			
										IN	OUT		
G4	1003	6.75	0.25	532.285	955	270	67	41	240	76	75	4.4	Pre-Leak check
G3	1008	6.75	0.25	531.8	945	285	67	41	252	77	77	1.0	0.015 @ 16"
G2	1013	2.0	0.6	533.5	951	301	66	41	271	78	77		
G1	1018	1.5	0.6	535	937	250	66	41	260	80	75	1.5	
				536.686									
F4	1036	1.0	0.36	536.686	946	270	66	40	274	81	81	3.5	
F3	1041	1.5	0.51	537.2	950	228	66	40	265	82	81	4.5	
F2	1046	2.5	0.85	541.5	948	228	66	40	274	86	84		
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													

Operator: T.M.H. Orifice Coefficient: 1.007/0.732 Date: 1/28/78

ACUREX
Corporation

ACUREX Corporation
 Plant Andover Irrigation D3r.
 Date 10/18/89
 Test Location Turbine #1
 Run Number #2
 Stack Diameter inches _____
 Duct Dimensions in. x in. _____
 Start Time 1003
 Operator Tmt
 Barometric Pressure _____
 Static Pressure -1.5
 Stack Pressure _____
 Probe Number _____
 Pitot Coefficient _____
 Pitot Number _____
 Meter Box Number 2555
 Orifice Coefficient 1.009 / 0.735

Nozzle Size & Number 0.178
Molecular Weight _____
BWO 0.05

FILTER DATA		
NUMBER	TARE	FINAL WT.

[illegible]

REFRIGER CATCH - PAHS

Sample No. 2A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)
1	<u>Blank</u>	<u>0 ml</u>		Final <u>494.1</u> Initial <u>441.6</u> Wt. gain <u>52.5</u>
2	<u>m:162 x H₂O</u>	<u>150</u>		Final <u>701.0</u> Initial <u>647.3</u> Wt. gain <u>53.7</u>
3	<u>Blank</u>	<u>0 ml</u>		Final <u>449.3</u> Initial <u>449.3</u> Wt. gain <u>0</u>
4	<u>Silica gel</u>	<u>721.6</u> <u>521.6</u>		Final <u>732.2</u> Initial <u>721.6</u> Wt. gain <u>10.6</u>
5				Final _____ Initial _____ Wt. gain _____
6				Final _____ Initial _____ Wt. gain _____
Flask				Final _____ Initial _____ Wt. gain _____

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 65.8 gm

003402

Date _____

Signature _____

003401

ORSAT ANALYSIS RESULTS

Gas Fractional Part

O₂ _____
CO₂ _____
CO _____
H₂ _____

Condensate 40ml

I-2 153ml

Date _____

Time _____

Signature _____

003399

003398

003409

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: MODESTO IRRIGATION
Date: 10/18/89

Performed by: TNH
Sample Location: TURBINE #1

Test No./Type: RUN #3a/PAH
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(wv) = 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, 87% O2(mg/dscm)	C(s std)= 0
Particulate Loading, dry 87% 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 Temp (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	1008.0	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

IMPINGER CATCH - PAHs

Sample No. 3A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)		
1		<u>Dist</u>		Final <u>406.8</u>	<u>33mL</u>	
				Initial <u>435.0</u>		
				Wt. gain <u>28.2</u>		
2	<u>Org. Free Water</u>	<u>145mL</u>		Final <u>590.7</u>	<u>146mL</u>	
				Initial <u>592.1</u>		
				Wt. gain <u>-1.4</u>		
3	<u>Blank</u>	<u>Dist</u>		Final <u>460.0</u>		
				Initial <u>468.0</u>		
				Wt. gain <u>-8.0</u>		
4	<u>Silica</u>	<u>Dist</u>		Final <u>728.6</u>		
				Initial <u>710.0</u>		
				Wt. gain <u>18.6</u>		
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

CO₂ _____
O₂ _____
CO _____
H₂ _____

003394
003395

Date _____

Time _____

Signature _____

003393

Field Blank PATHS

IMPINGER CATCH

Sample No. 4A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)
1	B1			Final <u>452.8</u> Initial <u>452.4</u> Wt. gain <u>0.4</u>
2	H ₂ O	10.2 ml		Final <u>579.2</u> Initial <u>599.2</u> Wt. gain <u>.0</u>
3	B2			Final <u>460.8</u> Initial <u>400.8</u> Wt. gain <u>0</u>
4	Silica Gel			Final <u>698.3</u> Initial <u>698.3</u> Wt. gain <u>.0</u>
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 _____

ORSTAT ANALYSIS RESULTS

Gas Fractional Part

CO₂ _____
O₂ _____
CO _____
H₂ _____

003390

Date _____

Time _____

Signature _____

688800

888800

*** 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 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)				Rotometer Setting	Pump Vacuum (in. Hg)	Leak Rate (PPH at Vacuum)	Comments
						ASH	Probe	Heated Line	Temper. Inlet				
A		Starting 14:35	0.0	39.1									
		Stop:											
B		Starting 14:40	1.0		0.89								0.89 L/min
		Stop:											
C		Starting 14:45	3.0	57.0									
		Stop:											
D		Starting 14:50	6.2	88.7									
		Stop:											
E		Starting 14:55	7.6	99.1									
		Stop:											
F		Starting 15:00	9.8	106									
		Stop:											
Summary			11.0	122.9									

Leak Check Final

Notes: Trap 1 - 10.4 DMPH
 2 - 15.4 DMPH
 3 - 0
 4 - 130 Silica gel 138.4

140 1467 *DR*

V. Wade
 10/17/89
 50-03

IMPINGER CATCH - Formaldehyde

Sample No. 1A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)
1	<u>DNPA / 2N HCl</u>	<u>10 ml</u>	<u>STD. needle</u>	Final <u>14 mL</u> Initial <u>10 mL</u> Wt. gain <u>4.0</u>
2	<u>DNPA / 2N HCl</u>	<u>15 ml</u>	<u>STD. needle</u>	Final <u>15 mL</u> Initial <u>15 mL</u> Wt. gain <u>0.02</u>
3	<u>Blank</u> <u>Silica gel</u>	<u>0 ml</u>	<u>STD. needle</u>	Final <u>100.7 gm</u> Initial <u>100.7 gm</u> Wt. gain <u>0.0</u>
4	<u>Silica Gel</u>	<u>100.7 gm</u>	<u>open shot</u>	Final <u>101.6</u> Initial <u>100.7 gm</u> Wt. gain <u>0.9</u>
5	_____	_____	_____	Final _____ Initial _____ Wt. gain _____
6	_____	_____	_____	Final _____ Initial _____ Wt. gain _____
Flask	_____	_____	_____	Final _____ Initial _____ Wt. gain _____

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 4.9 gms.

959200

Date 10/17/89

Signature [Signature]

W. H. B.

GAS ANALYSIS RESULTS

Gas Fractional Part

CO₂ _____
O₂ _____
CO _____
H₂ _____

Date _____

Time _____

Signature _____

Volatile Organic Sampling Train (VOST) Data Sheet

Plant MLP Project No. 65E
 Date 10/17/89 Operator BB
 Sample Location 604 TWINC Barometric Pressure (in. Hg) 29.78
 Run No. 2A 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)				Rotometer Setting	Pump Vacuum (in. Hg)	Leak Rate LPM at Vacuum	Comments
						GCN	Probe	Heated Line	Isobar Inlet				
A		Starts 1750	0.0	146.58									
		Stops		14									
B		Starts	1.0	148.36	0.8C								0.80 L/min
		Stops	2.0	149.16									0.71 L/min
C		Starts	13.0	157.31	0.74								
		Stops	14.0	158.01									
D		Starts	15.0	158.81	0.84								0.58 L/min
		Stops	16.0	159.77									
E		Starts	35.0	175.1	1.0								
		Stops	36.0	204.2									
F		Starts	37.0	219.45	0.87								
		Stops	38.0	219.45									
Summary													

Pre-Leak Check is fine!

Notes

IMPINGER CATCH - Formaldehyde

Sample No. 2A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)	
1	<u>DNPH</u>	<u>10 ml</u>	<u>Long Stem</u>	Final <u>98.0</u> Initial <u>95.9</u> Wt. gain <u>2.1</u>	11.7 ml
2	<u>DNPH</u>	<u>15 ml</u>	<u>Long Stem</u>	Final <u>98.8</u> Initial <u>98.8</u> Wt. gain <u>0</u>	15.0 ml 15.0 ml 98.8
3	<u>Blank</u>	<u>0 ml</u>	<u>Short Stem</u>	Final <u>79.9</u> Initial <u>70.0</u> Wt. gain <u>.9</u>	0
4	<u>Silica gel</u>	<u>98.2 g</u>	<u>open</u>	Final <u>99.1</u> Initial <u>98.2 g</u> Wt. gain <u>.9</u>	
5	_____	_____	_____	Final _____ Initial _____ Wt. gain _____	
6	_____	_____	_____	Final _____ Initial _____ Wt. gain _____	
Flask	_____	_____	_____	Final _____ Initial _____ Wt. gain _____	
TOTAL WEIGHT GAIN OF IMPINGERS (grams) <u>3.9</u>					

Date _____

Signature _____

003408

OBSERVATION ANALYSIS RESULTS

Gas Fractional Part

CO₂ _____
O₂ _____
CO _____
H₂ _____

Date _____

Time _____

Signature _____

Volatile Organic Sampling Train (VOST) Data Sheet

Plant MID
 Date 10/18/89
 Sample Location Gen Tubing 1
 Run No. 3A

VOS #2-
 $\alpha = 1.07$

Project No. 6581
 Operator BB, TH
 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)				Rotometer Setting	Pump Vacuum (in. Hg)	Leak Rate (PPM at Vacuum)	Comments
						DOH	Probe	Heated Line	Tenax Inlet				
A		Start: 1224	0.0	239.56	249.56								
		Stop: 1330	1.0	241.9									
B		Start:	3.0	244.6	0.7								
		Stop:	4.0	245.3									
C		Start:	6.0	247.1	1.8								
		Stop:	4.0	248.9									
D		Start:	3.1	270.9									
		Stop:	4.7	203.5									
E		Start:	100.2	334.5									
		Stop:		333.5									
F		Start:											
		Stop:											
Summary													

Notes: Leak check fine 333.5 } 1 min
 OK @ 5 Hg 335.6
 @ 1.002

EXPINGER CATCH

Farnellstyle
Method Blank

Sample No. 4A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)
1	<u>DAPH</u>	<u>100L</u>		Final <u>107.7 gm</u> 100L Initial <u>107.7 gm</u> Wt. gain <u> </u>
2	<u>DAPH</u>	<u>160L</u>		Final <u>117.8 gm</u> 160L Initial <u>111.8 gm</u> Wt. gain <u> </u>
3	<u>Blank</u>	<u>0</u>	<u>Short</u>	Final <u>82.2 gm</u> 80L Initial <u>82.1 gm</u> Wt. gain <u>.1 gm</u>
4	<u>Silica gel</u>		<u>Short</u>	Final <u>100.9 gm</u> Initial <u>100.8 gm</u> Wt. gain <u>.1 gm</u>
5				Final <u> </u> Initial <u> </u> Wt. gain <u> </u>
6				Final <u> </u> Initial <u> </u> Wt. gain <u> </u>
Flask				Final <u> </u> Initial <u> </u> Wt. gain <u> </u>

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 0.2 gm

Date

Signature

003055

ORSAT ANALYSIS RESULTS

Gas Fractional Part

CO₂
O₂
CO
H₂

Date

Signature

Signature

IMPINGER CATCH *-Formaldehyde*

Sample No. 3A

Impinger No.	Solution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)
1	<u>DMPH</u>	<u>10 ml</u>	<u>Long Stem</u>	Final <u>95.4 g</u> Initial <u>92.5 g</u> Wt. gain <u>2.9 g</u>
2	<u>DMPH</u>	<u>15 ml</u>	<u>Long Stem</u>	Final <u>97.8 g</u> Initial <u>97.8 g</u> Wt. gain <u>0.0 g</u>
3	<u>Blank</u>	<u>0 ml</u>	<u>Short</u>	Final <u>97.8 g</u> Initial <u>97.8 g</u> Wt. gain <u>0.0 g</u>
4	<u>Silica Gel</u>	<u>100.7 gm</u>	<u>Short</u>	Final <u>100.8 gm</u> Initial <u>100.7 gm</u> Wt. gain <u>0.1 gms.</u>
5	_____	_____	_____	Final _____ Initial _____ Wt. gain _____
6	_____	_____	_____	Final _____ Initial _____ Wt. gain _____
Flask	_____	_____	_____	Final _____ Initial _____ Wt. gain _____

after
12 ml
15 ml

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 3.1 gms

003403

Date 10/18/89
Signature [Signature]

ORSAT ANALYSIS RESULTS

Gas Fractional Part

O₂ _____
CO₂ _____
CO _____
H₂ _____

Date _____
Time _____
Signature _____



Re: Formaldehyde Tests

Energy & Environmental Division

Meter volume(std),

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

$$\alpha = 1.07$$

VOSTT CONSOLE #2

[illegible]

*** Laboratory Results**



Environmental Systems Division

Acurex - Building 2

November 22, 1989
Acurex ID: 8910135
Client PO: 6581
Page 1 of 3

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
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

	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
429 Compounds	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

Page 1 of 3

Acurex Proposal Number: _____

Company Name: <u>INAD</u>		Project Manager: <u>WJCHIN</u>		NO. OF CONTAINERS		ANALYSIS <u>CARZ 429 for PAH</u>		REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
Project Number: <u>00561</u>		Project Name: <u>Coastal Testing</u>						
Sampled by: (Printed and Written Signature) <u>[Signature]</u>								
SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION				
005617	10/16/09	1400	XAD	Gravel Turbine #1	1			RUN 1A
005618	10/16/09	1400	Org	Gravel Turbine #1	1			
005619	10/16/09	1400	Filter	Gravel Turbine #1	1			
005620	10/16/09	1400	Org	Gravel Turbine #1	1			
005621	10/16/09	1500	Filter	Gravel Turbine #1	1			
005622	10/16/09	1500	Org	Gravel Turbine #1	1			
005623	10/16/09	1500	Filter	Gravel Turbine #1	1			
005624	10/16/09	1500	Org	Gravel Turbine #1	1			
005625	10/16/09	1500	Filter	Gravel Turbine #1	1			
005626	10/16/09	1500	Org	Gravel Turbine #1	1			
005627	10/16/09	1500	Filter	Gravel Turbine #1	1			RUN 2A
005628	10/16/09	1500	Org	Gravel Turbine #1	1			
005629	10/16/09	1500	Filter	Gravel Turbine #1	1			
005630	10/16/09	1500	Org	Gravel Turbine #1	1			
005631	10/16/09	1500	Filter	Gravel Turbine #1	1			
005632	10/16/09	1500	Org	Gravel Turbine #1	1			
005633	10/16/09	1500	Filter	Gravel Turbine #1	1			
005634	10/16/09	1500	Org	Gravel Turbine #1	1			
005635	10/16/09	1500	Filter	Gravel Turbine #1	1			
005636	10/16/09	1500	Org	Gravel Turbine #1	1			
005637	10/16/09	1500	Filter	Gravel Turbine #1	1			
005638	10/16/09	1500	Org	Gravel Turbine #1	1			
005639	10/16/09	1500	Filter	Gravel Turbine #1	1			
Relinquished by: (Signature) <u>[Signature]</u>		Date/Time <u>10/16/09 1500</u>		Received by: (Signature)		Date/Time <u>10/16/09 1500</u>		REMARKS: <u>RECEIVED ALL SAMPLE VOLUMES</u>
Relinquished by: (Signature)		Date/Time		Received by: (Signature)		Date/Time		
Relinquished by: (Signature)		Date/Time		Received by: (Signature)		Date/Time		
Relinquished by: (Signature)		Date/Time		Received for Laboratory by: (Signature) <u>[Signature]</u>		Date/Time <u>10/20/09 1500</u>		ACUREX ANALYTICAL LABORATORY 405 Clyde Avenue, Bldg. 12 Mountain View, CA 94039 (415) 961-5700

ACUREX ANALYTICAL LABORATORY CHAIN OF CUSTODY

Acurex Proposal Number: _____

Company Name:		Project Manager:		NO. OF CONTAINERS		ANALYSIS	REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
Project Number:		Project Name:		SAMPLE LOCATION			
MID		BUCHANAN				CARE 429 fcl TH	
6561		Environ Test & MCLs Grounding Station					
Sampled by: (Printed and Written Signature)							
BUCCHANAN, JILL H. BCL							
SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION			
003396	10/16/89	1400	110	HCL T. Line #1		1	
003397	10/16/89	1400	110	HCL T. Line #1		1	
003398	10/16/89	1400	110	HCL T. Line #1		1	
003399	10/18/89	1400	XAD	HCL T. Line #1		1	
003400	10/16/89	1400	110	HCL T. Line #1		1	
003401	10/18/89	1430	XAD	Field Blank		1	
003402	10/18/89	1430	110	Field Blank		1	
003403	10/18/89	1430	110	Field Blank		1	
003404	10/18/89	1430	110	Field Blank		1	
003405	10/18/89	1430	110	Field Blank		1	
003406	10/18/89	1430	110	Field Blank		1	
003407	10/18/89	1430	110	Field Blank		1	
003408	10/18/89	1430	110	Field Blank		1	
003409	10/18/89	1430	110	Field Blank		1	
003410	10/18/89	1430	110	Field Blank		1	
Relinquished by: (Signature)		Date/Time		Received by: (Signature)		REMARKS:	
JILL H. BCL		10/24/89 1500				Received Volume	
Relinquished by: (Signature)		Date/Time		Received by: (Signature)			
Relinquished by: (Signature)		Date/Time		Received for Laboratory by: (Signature)		Date/Time	
				Jill H. BCL		10/24/89 1500	
ACUREX ANALYTICAL LABORATORY						(415) 961-5700	
405 Clyde Avenue, Bldg. 12						Mountain View, CA 94039	

Page 2 of 3

Page

Form 5192 10/87

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Acurex - Building 2

October 10, 1989
Acurex ID: 8910047
Client PO: 6581.030
Page 1 of 4

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.

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

Approved by: Robert DeRosier
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

	XAD & FILTER	Method Blank	Spike	Dup Spike
8270 Compounds	ug/train	ug/train	% Recov	% 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	Method Blank	Spike	Dup Spike
	ug/train	ug/train	% Recov	% 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

Page 1 of 1Page of Form 5192 10/87

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Yellow - Returned to Client with Report.

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Environmental Systems Division

Acurex
Building 2

November 1, 1989
Acurex ID: 8910119
Client PO: 6581
Page 1 of 3

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 Proposal Number:

Company Name:		Project Manager:		NO. OF CONTAINERS		ANALYSIS		REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
Project Number:	Project Name:	DATE	TIME	MATRIX	SAMPLE LOCATION	Carb 430		
6561	BUCHAN	10/17/89	1530	DNPH	Gas Turbine #1	1	RUN 1A	
	Emission Tests @ N.C. Core Generating Station	10/17/89	1900	DNPH	Gas Turbine #2	1	RUN 2A	
		10/18/89	1300	DNPH	Gas Turbine #1	1	RUN 3A	
		10/18/89	1600	DNPH	Field Blank	1	RUN 4A	
		10/18/89	1600	H ₂ O	Reagent Blank	1	organ Free water	
		10/18/89	1600	DNPH	Reagent Blank	1	DNPH Substia	
		10/18/89	1600	EtOH	Reagent Blank	1	Absolute Ethanol	
Relinquished by (Signature)		Date/Time		Received by: (Signature)		REMARKS:		
[Signature]		10/19 1100		[Signature]		* Run only if necessary RECORD ALL SAMPLE VOLUMES		
Relinquished by: (Signature)		Date/Time		Received by: (Signature)		Date/Time		
[Signature]				[Signature]		10/19/89 11:00		
Relinquished by: (Signature)		Date/Time		Received for Laboratory by: (Signature)		ACUREX ANALYTICAL LABORATORY 405 Clyde Avenue, Bldg. 12 Mountain View, CA 94039 (415) 961 5700		
[Signature]				[Signature]				

Acurex - ESD
Building 2

November 2, 1989
Acurex ID: 8910118
Client PO: 6581.030
Page 1 of 4

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

NO. 2
DIST OIL

Measurement

pCi/L

Gross alpha

11 ± 8

Gross beta

24 ± 10

Radian - 226

<2

Radium - 228

<3

Total Radium

<2

