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RECEIVED

MAY 28 1993

SAN JOAQUIN VALLEY UNIFIED
APCD—SOUTHERN REGION

ARY OF RESULTS

S-0172-0001-04

SUMMARY OF SOURCE TEST RESULTS

COMPANY: **DESTEC - LIVE OAK COGEN** APCD #: 4213001 (B)

TEST DATE: APRIL 22, 1993 UNIT #: TURBINE OUTLET

EMISSIONS	gr/scf	@12%CO2	ppm	ppm @15% O2	lb/ MMBtu	lb/hr	lb/day	Permit Limits
NH3			3.82 2.66 3.91	4.17 2.97 4.27		2.37 1.65 2.42		
Mean:			3.46	3.80		2.15	52	20 ppm
SULFUR								1/ 0.20 lb/hr as sulfur
Mean:			1.30			0.044	1.06	
NOx (dry) (RUNS 1-12)								0.0135 lb/MMBtu
Mean:			2.6	2.8	0.0105	4.3	103	6.16 lb/hr
CO (RUNS 1-12)								
Mean:			2.7	2.9		2.7	66	11.0 lb/hr
NMHC			0.06			0.037	0.9	5.37 lb/hr

RELATIVE ACCURACY	% RA Related to Referance Method	% RA Related to Applicable Standard		PERMIT LIMITS: Related to Referance Method	PERMIT LIMITS: Related to Applicable Standard
NOx	6.65	NA		20 %	10 %
CO	4.39	NA		10 %	5 %
O2	1.13	NA		20 %	10 %

For San Joaquin Unified APCD Use Only: 1/ Emission limit as sulfur = (lb/hr SO2/2) + (lb/hr SO4/3)

TRODUCTION

INTRODUCTION

On April 22, 1993, Petro Chem Environmental Services, Inc. (PCES) performed a series of emission source tests for Destec Operating Company at their Live Oak Limited Cogeneration Facility located in Bakersfield, California. The unit tested was one 48.5 MW GE LM-5000 gas fired turbine. Determination of concentrations (ppm) and emissions (lbs/hr) of ammonia, sulfur, NMHC, NOx, CO, O_2, from the exhaust of the turbine and relative accuracy testing was performed for NOx, CO, and O_2 using the following procedures:

PARAMETERS	METHOD	# TEST RUNS
Ammonia	BAAQMD ST-1B	3 - 30 minute
Sulfur	Fuel Analysis / Fuel Rates EAS Labs	1
NMHC	EPA Method 18; (modified) C_1 - C_{6+}	3
NOx	EPA Method 20; Chemiluminescent Analyzer equipped with Molydenum Convertor	12 - 30 minute
CO	EPA Method 10; Gas Filter Correlation Analyzer	12 - 30 minute
O_2	EPA Method 20; Fuel Cell Analyzer	12 - 30 minute
Molecular Weight O_2, CO_2, N_2	EPA Method 3; Orsat	2
Volume Flow DSCFM	EPA Method 2 & 4; Pitot Tube Traverse and Condensation Train	2
Relative Accuracy NOx/ CO / O_2	Title 40 CFR Performance Spec II, III, IV	9 - 30 minute

All sampling was performed by Doug Towne and Scott Davis of Petro Chem Environmental Services, Inc. The hydrocarbons and fuel gas analyses were performed by Terry Rowles of PCES. Scott Kicker of Destec Operating Company supervised the testing. Glenn Sliter of San Joaquin Valley Unified APCD, Southern Region, was present and witnessed the testing.

MONIA DATA

COMPANY : DESTEC
UNIT : LIVE OAK COGEN
DATE : 4-22-93
PROJECT : 027-488

METHOD 1-4
FIELD DATA @ 60° F

RUN #:	1	2	3	
TIME :	1400	1530	1728	AVERAGE
Vm (dry gas sampled)	28.931	30.695	28.826	
Y (meter calib. factor)	1.00976	1.00976	1.00976	
P bar (Barometric pressure)	29.5	29.5	29.5	
P static (stack pressure, " H2O)	-0.37	-0.37	-0.37	
Delta H (differential meter press, " H2O)	0.57	0.57	0.57	
Tm (meter temperature, R°)	535.3	532.3	534.1	
Vol H2O mls	107.7	122.1	118.9	
Vm(std),dscf	28.02	29.90	27.98	28.63
Bws-H2O vapor	0.1515	0.1595	0.1649	
MF-moisture factor	0.8485	0.8405	0.8351	
% CO2	3.1	3.0	3.1	
% O2	15.5	15.6	15.5	
% N2	81.4	81.4	81.4	
Md-MW stk gas,dry	29.12	29.10	29.12	29.11
Ms-MW stk gas,wet	27.43	27.33	27.28	27.35
Cp-pitot tube	0.831	0.831	0.831	
Avg sq rt ^p	1.06	0.98		
T stack, R°	731	730		
Stack area,ft2	94.315	94.315	94.315	
Vs-fps	71.81	65.98		
Qstd-dscfm	241599	220219		230909
Sample time	48	48	48	

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

AMMONIA (NH3)

EPA 350.3 / BAAQMD ST 1-B

	Run - 1	Run - 2	Run - 3	AVERAGE
NH3 (mg/L)	4.73	3.64	4.73	
Sample Volume (ml)	460	445	470	
Total NH3 (mg)	2.18	1.62	2.22	
Vm, acf (sampled)	28.931	30.695	28.826	
delta-H	0.57	0.57	0.57	
Meter Temp, °F	75.3	72.3	74.1	
% O2	15.5	15.6	15.5	
Vstd,dscf =	28.02	29.90	27.98	
DSCFM =	230909	230909	230909	
ppm NH3 =	3.82	2.66	3.91	**3.46**
ppm NH3 @ 15% 02 =	4.17	2.97	4.27	**3.80**
lbs/hr NH3 =	2.37	1.65	2.42	**2.15**

Calculations:

$$Vstd = \frac{(17.38 * Vm * (Pb + (H/13.6)) * MC)}{Tm}$$

Pbar..... 29.5
Meter Coeff..... 1.00976

$$ppm\ NH3 = \frac{mg * 836}{Vstd * MW}$$

Where:

Vstd = Corrected sample volume, SDCF @ 60°F & 29.92 in Hg
Vm = Uncorrectd meter volume, ft3
Tm = Absolute meter temperature in °R
Pb = Barometric pressure, in. Hg
17.38 = A constant correcting to 60°F & 29.92 in. Hg (520 R/29.92" Hg)
MC = Dry gas meter calibration coefficient
mg = Total wt. of NH3 in the impinger catch (in mg)
836 = A constant derived from the molar gas volume and correcting to 60F and 29.92 inches Hg.
delta-H = Pressure differential at meter orifice
MW = Molecular weight of ammonia, 17 gm/mole

OCARBON DATA

COMPANY : DESTEC
UNIT : LIVE OAK COGEN
DATE : 4-22-93
PROJECT : 027-488

HYDROCARBON RESULTS
CORRECTED FOR METHOD BLANK

RUN No.: 1
DSCFM: 230909 average of pitot tube velocity profiles

			BLANK	ppm - BLANK	lb/hr	ppm (as Methane)	lb/hr
Methane	(C1)	*ND	0.05	1.47	0.86	1.47	0.86
Ethane	(C2)	*ND	0.03	0.00	0.00	0.00	0.00
Propane	(C3)	*ND	0.02	0.00	0.00	0.00	0.00
Butane	(C4)	*ND	0.02	0.00	0.00	0.00	0.00
Pentane	(C5)	*ND	0.02	0.00	0.00	0.00	0.00
Hexane	(C6)		0.02	0.02	0.06	0.12	0.07
	Total			1.49	0.92	1.59	0.93
	Total (non methane)			0.02	0.06	0.12	0.07

RUN No.: 2
DSCFM: 230909 average of pitot tube velocity profiles

			BLANK	ppm - BLANK	lb/hr	ppm (as Methane)	lb/hr
Methane	(C1)	*ND	0.05	1.42	0.83	1.42	0.83
Ethane	(C2)	*ND	0.03	0.00	0.00	0.00	0.00
Propane	(C3)	*ND	0.02	0.00	0.00	0.00	0.00
Butane	(C4)	*ND	0.02	0.00	0.00	0.00	0.00
Pentane	(C5)	*ND	0.02	0.00	0.00	0.00	0.00
Hexane	(C6)		0.02	0.01	0.03	0.06	0.04
	Total			1.43	0.86	1.48	0.86
	Total (non methane)			0.01	0.03	0.06	0.04

RUN No.: 3
DSCFM: 230909 average of pitot tube velocity profiles

			BLANK	ppm - BLANK	lb/hr	ppm (as Methane)	lb/hr
Methane	(C1)	*ND	0.05	1.40	0.82	1.40	0.82
Ethane	(C2)	*ND	0.03	0.00	0.00	0.00	0.00
Propane	(C3)	*ND	0.02	0.00	0.00	0.00	0.00
Butane	(C4)	*ND	0.02	0.00	0.00	0.00	0.00
Pentane	(C5)	*ND	0.02	0.00	0.00	0.00	0.00
Hexane	(C6)		0.02	0.00	0.00	0.00	0.00
	Total			1.40	0.82	1.40	0.82
	Total (non methane)			0.00	0.00	0.00	0.00

*ND – Non detect in sample blank, used detection limit

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

HYDROCARBON RESULTS
UNCORRECTED

RUN No.: 1
DSCFM: 230909 average of pitot tube velocity profiles

		ppm	lb/hr	ppm (as Methane)	lb/hr (as Methane)
Methane	(C1)	1.52	0.89	1.52	0.89
Ethane	(C2)	0.00	0.00	0.00	0.00
Propane	(C3)	0.00	0.00	0.00	0.00
Butane	(C4)	0.00	0.00	0.00	0.00
Pentane	(C5)	0.00	0.00	0.00	0.00
Hexane	(C6)	0.04	0.13	0.24	0.14
	Total	1.56	1.01	1.76	1.03
	Total (non methane)	0.04	0.13	0.24	0.14

RUN No.: 2
DSCFM: 230909 average of pitot tube velocity profiles

		ppm	lb/hr	ppm (as Methane)	lb/hr (as Methane)
Methane	(C1)	1.47	0.86	1.47	0.86
Ethane	(C2)	0.00	0.00	0.00	0.00
Propane	(C3)	0.00	0.00	0.00	0.00
Butane	(C4)	0.00	0.00	0.00	0.00
Pentane	(C5)	0.00	0.00	0.00	0.00
Hexane	(C6)	0.03	0.09	0.18	0.11
	Total	1.50	0.95	1.65	0.96
	Total (non methane)	0.03	0.09	0.18	0.11

RUN No.: 3
DSCFM: 230909 average of pitot tube velocity profiles

		ppm	lb/hr	ppm (as Methane)	lb/hr (as Methane)
Methane	(C1)	1.45	0.85	1.45	0.85
Ethane	(C2)	0.00	0.00	0.00	0.00
Propane	(C3)	0.00	0.00	0.00	0.00
Butane	(C4)	0.00	0.00	0.00	0.00
Pentane	(C5)	0.00	0.00	0.00	0.00
Hexane	(C6)	0.00	0.00	0.00	0.00
	Total	1.45	0.85	1.45	0.85
	Total (non methane)	0.00	0.00	0.00	0.00

PETRO
CHEM
ENVIRONMENTAL
SERVICES, INC.

3207 Antonino Avenue
Bakersfield, California 93308
(805) 327-7300
FAX (805) 327-3459

COMPANY	: DESTEC OPERATING	DATE RECEIVED :	4-23-93
DATE	: 4-22-93	DATE ANALYZED :	4-24-93
PROJECT	: 027-488	DATE REPORTED:	4-28-93

EPA METHOD 18
HYDROCARBON ANALYSIS REPORT

UNIT : LIVE OAK COGEN

CONSTITUENT	RUN # 1 ppm(v/v)	RUN # 2 ppm(v/v)	RUN # 3 ppm(v/v)
METHANE	1.52	1.47	1.45
ETHANE	ND	ND	ND
PROPANE	ND	ND	ND
BUTANE	ND	ND	ND
PENTANE	ND	ND	ND
HEXANES+	0.04	0.03	ND
TOTAL	1.56	1.50	1.45
NON-METHANE	0.04	0.03	0.00

UNIT : HC SAMPLE BLANK

CONSTITUENT	ppm(v/v)
METHANE	ND
ETHANE	ND
PROPANE	ND
BUTANE	ND
PENTANE	ND
HEXANES+	0.02
TOTAL	0.02
NON-METHANE	0.02

COMPANY : DESTEC
UNIT : LIVE OAK COGEN
DATE : 4-22-93
PROJECT : 027-488

HYDROCARBON RESULTS @ 60°F

DETECTION LIMITS

		ppm	ppm (as Methane)
Methane	(C1)	0.05	0.05
Ethane	(C2)	0.03	0.06
Propane	(C3)	0.02	0.06
Butane	(C4)	0.02	0.08
Pentane	(C5)	0.02	0.10
Hexane	(C6)	0.02	0.12
Total		0.16	0.47
Total (non methane)		0.11	0.42

UR EMISSIO JS

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

SULFUR EMISSION RESULTS

TIME	TS, ppm	AVERAGE MSCFH	AVERAGE SCFH	FUEL SCFM	SULFUR	
					LBS/HR	LBS/DAY
1300-2145	1.30	403.55	403550	6726	0.044	1.06

EQUATION:

SCFM = SCFH (1/60)

SULFUR LBS/HR = TS ppm * 32 * SCFM * 1.581 * 10^-7

MW SULFUR = 32

ANALYSIS REPORT SHEET

Sulfur Compounds by GC/FPD

Client: Petro Chem
Site: 027-488
Can #: Tedlar

Lab #: 31460-1
Date Sampled: 4-22-93
Date Analyzed: 4-24-93

Compound	MDL ug/m3	Concentration ug/m3	Concentration ppbv
Hydrogen Sulfide	77.0	1300	960
Carbonyl Sulfide	77.0	2100	870
Methyl Mercaptan	77.0	not detected	not detected
Dimethyl Sulfide	77.0	not detected	not detected
Carbon Disulfide	38.5	not detected	not detected
Total Sulfur, H2S			1300

TIVE ACCURACY

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

ANALYZER NOx

RELATIVE ACCURACY RESULTS

PPMvd

RUN #	REFERENCE METHOD	CEM DATA	DIFFERENCE
1	2.44	2.63	-0.19
2	2.57	2.33	0.24
3	2.58	2.33	0.25
4	2.56	2.47	0.09
5	2.65	2.50	0.15
6	2.50	2.47	0.03
7	2.61	2.47	0.14
8	2.82	2.83	-0.01
9	2.77	2.53	0.24
10	2.35	2.37	-0.02
11	2.43	2.33	0.10
12	2.31	2.63	-0.32
AVERAGE	2.55	2.49	0.06

RELATIVE ACCURACY RELATED TO THE REFERENCE METHOD

$t_{.975}$ = 2.201

STANDARD DEVIATION = 0.18

CONFIDENCE COEFFICIENT = 0.11

REFERENCE METHOD = 2.55

RELATIVE ACCURACY = 6.65

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

ANALYZER CO

RELATIVE ACCURACY RESULTS

PPMvd

RUN #	REFERENCE METHOD	CEM DATA	DIFFERENCE
1 *	2.80	3.27	-0.47
2	2.63	2.66	-0.03
3	2.71	2.66	0.05
4	2.66	2.90	-0.24
5	2.54	2.60	-0.06
6	2.58	2.47	0.11
7	2.59	2.53	0.06
8 *	2.51	3.10	-0.59
9	2.67	2.50	0.17
10	2.75	2.63	0.12
11	2.80	2.70	0.10
12	2.76	3.07	-0.31
AVERAGE	2.669	2.672	-0.003

RELATIVE ACCURACY RELATED TO THE REFERENCE METHOD

$t_{.975}$ = 2.262

STANDARD DEVIATION = 0.16

CONFIDENCE COEFFICIENT = 0.11

REFERENCE METHOD = 2.67

RELATIVE ACCURACY = 4.39

* Runs 1 & 8 were excluded from all averages and calculations.

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

ANALYZER O2

RELATIVE ACCURACY RESULTS

PPMvd

RUN #	REFERENCE METHOD	CEM DATA	DIFFERENCE
1	15.46	15.50	-0.04
2	15.53	15.40	0.13
3	15.53	15.40	0.13
4	15.69	15.40	0.29
5	15.55	15.40	0.15
6	15.48	15.40	0.08
7	15.48	15.40	0.08
8	15.53	15.40	0.13
9	15.58	15.40	0.18
10	15.56	15.40	0.16
11	15.52	15.40	0.12
12	15.51	15.40	0.11
AVERAGE	15.54	15.41	0.13

RELATIVE ACCURACY RELATED TO THE REFERENCE METHOD

$t_{.975}$ = 2.201

STANDARD DEVIATION = 0.08

CONFIDENCE COEFFICIENT = 0.05

REFERENCE METHOD = 15.54

RELATIVE ACCURACY = 1.13

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

PCES REFERENCE METHOD SUMMARY

			NOx			CO		
RUN #	TIME	%O2	ppm	ppm @ 15% O2	lbs/hr	ppm	ppm @ 15% O2	lbs/hr
1	1300-1330	15.46	2.44	2.65	4.09	2.80	3.04	2.86
2	1345-1415	15.53	2.57	2.83	4.32	2.63	2.89	2.68
3	1430-1500	15.53	2.58	2.84	4.33	2.71	2.98	2.77
4	1515-1545	15.69	2.56	2.90	4.29	2.66	3.01	2.72
5	1600-1630	15.55	2.65	2.92	4.44	2.54	2.81	2.60
6	1645-1715	15.48	2.50	2.72	4.19	2.58	2.80	2.63
7	1730-1800	15.48	2.61	2.84	4.39	2.59	2.81	2.64
8	1815-1845	15.53	2.82	3.10	4.74	2.51	2.76	2.57
9	1900-1930	15.58	2.77	3.07	4.65	2.67	2.95	2.72
10	1945-2015	15.56	2.35	2.60	3.94	2.75	3.04	2.81
11	2030-2100	15.52	2.43	2.67	4.08	2.80	3.07	2.85
12	2115-2145	15.51	2.31	2.53	3.88	2.76	3.02	2.82
	AVERAGE	15.54	2.55	2.81	4.28	2.67	2.93	2.72

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

DESTEC CEM DATA SUMMARY

RUN #	TIME	%O2	NOx ppm	CO ppm
1	1300-1330	15.5	2.63	3.27
2	1345-1415	15.4	2.33	2.66
3	1430-1500	15.4	2.33	2.66
4	1515-1545	15.4	2.47	2.90
5	1600-1630	15.4	2.50	2.60
6	1645-1715	15.4	2.47	2.47
7	1730-1800	15.4	2.47	2.53
8	1815-1845	15.4	2.83	3.10
9	1900-1930	15.4	2.53	2.50
10	1945-2015	15.4	2.37	2.63
11	2030-2100	15.4	2.33	2.70
12	2115-2145	15.4	2.63	3.07
	AVERAGE	15.4	2.49	2.76

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

RUN #1

NOx/CO/O2 DATA

Stack Gas Measurement Data							
TIME INTERVAL			CONCENTRATIONS			% FULL SCALE	
BEGIN	-	END	O2:%	NOx:ppm	CO:ppm	O2%fs	NOx%fs	CO%fs
01:00 PM	-	01:10 PM	15.50	2.41	2.85	72.4	14.8	21.4
01:10 PM	-	01:20 PM	15.45	2.46	2.79	72.4	14.9	21.2
01:20 PM	-	01:30 PM	15.43	2.46	2.76	72.5	14.9	21.1
	Averages:		15.46	2.44	2.80	72.4	14.9	21.2

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	51.1	90.2
FINAL zero	10	10	10
FINAL span	94.6	51.1	90.3
ZERO DRIFT %/ppm	0.00	0.00	0.00
CALIB. DRIFT %/ppm	0.15	0.00	0.03
ZERO DRIFT %fs	0.00	0.00	0.00
CALIB.DRIFT %fs	0.60	0.00	0.10
CAL GAS value	20.9	20.6	20.1
FULL SCALE RANGE	25	50	25

DSCFM = 230730 (AVERAGE OF PITOT TUBE TRAVERSE)

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
NOx values:	15.46	2.44	8.03	2.65	4.09

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
CO values:	15.46	2.80	9.22	3.04	2.86

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

RUN #2

NOx/CO/O2 DATA

Stack Gas Measurement Data							
TIME INTERVAL			CONCENTRATIONS			% FULL SCALE	
BEGIN	-	END	O2:%	NOx:ppm	CO:ppm	O2%fs	NOx%fs	CO%fs
01:45 PM	-	01:55 PM	15.53	2.49	2.71	72.5	14.9	20.9
01:55 PM	-	02:05 PM	15.55	2.51	2.60	72.7	14.8	20.6
02:05 PM	-	02:15 PM	15.52	2.72	2.57	72.7	15.1	20.6
	Averages:		15.53	2.57	2.63	72.6	14.9	20.7

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	51.1	90.3
FINAL zero	10	9.9	10.1
FINAL span	94.4	50.8	90.6
ZERO DRIFT %/ppm	0.00	-0.05	0.03
CALIB. DRIFT %/ppm	0.10	-0.15	0.08
ZERO DRIFT %fs	0.00	-0.10	0.10
CALIB.DRIFT %fs	0.40	-0.30	0.30
CAL GAS value	20.9	20.6	20.1
FULL SCALE RANGE	25	50	25

DSCFM = 230730 (AVERAGE OF PITOT TUBE TRAVERSE)

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
NOx values:	15.53	2.57	8.58	2.83	4.32

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
CO values:	15.53	2.63	8.77	2.89	2.68

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

RUN #3

NOx/CO/O2 DATA

Stack Gas Measurement Data							
TIME INTERVAL			CONCENTRATIONS			% FULL SCALE	
BEGIN	-	END	O2:%	NOx:ppm	CO:ppm	O2%fs	NOx%fs	CO%fs
02:30 PM	-	02:40 PM	15.56	2.50	2.74	72.6	14.9	21.0
02:40 PM	-	02:50 PM	15.53	2.53	2.72	72.6	14.8	21.0
02:50 PM	-	03:00 PM	15.52	2.71	2.67	72.7	15.0	20.9
	Averages:		15.53	2.58	2.71	72.6	14.9	21.0

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	51.1	90.2
FINAL zero	10	10	9.9
FINAL span	94.4	50.6	90.6
ZERO DRIFT %/ppm	0.00	0.00	-0.03
CALIB. DRIFT %/ppm	0.10	-0.25	0.10
ZERO DRIFT %fs	0.00	0.00	-0.10
CALIB.DRIFT %fs	0.40	-0.50	0.40
CAL GAS value	20.9	20.6	20.1
FULL SCALE RANGE	25	50	25

DSCFM = 230730 (AVERAGE OF PITOT TUBE TRAVERSE)

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
NOx values:	15.53	2.58	8.61	2.84	4.33

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
CO values:	15.53	2.71	9.04	2.98	2.77

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

RUN #4

NOx/CO/O2 DATA

Stack Gas Measurement Data							
TIME INTERVAL			CONCENTRATIONS			% FULL SCALE	
BEGIN	-	END	O2:%	NOx:ppm	CO:ppm	O2%fs	NOx%fs	CO%fs
03:15 PM	-	03:25 PM	15.65	2.56	2.66	72.9	15.1	20.6
03:25 PM	-	03:35 PM	15.70	2.56	2.63	73.1	15.1	20.4
03:35 PM	-	03:45 PM	15.72	2.56	2.68	73.2	15.1	20.5
		Averages:	15.69	2.56	2.66	73.1	15.1	20.5

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	51.1	90.5
FINAL zero	10	10	9.9
FINAL span	94	51.1	90.3
ZERO DRIFT %/ppm	0.00	0.00	-0.02
CALIB. DRIFT %/ppm	0.00	0.00	-0.05
ZERO DRIFT %fs	0.00	0.00	-0.10
CALIB.DRIFT %fs	0.00	0.00	-0.20
CAL GAS value	20.9	20.6	20.1
FULL SCALE RANGE	25	50	25

DSCFM = 230730 (AVERAGE OF PITOT TUBE TRAVERSE)

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
NOx values:	15.69	2.56	8.79	2.90	4.29

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
CO values:	15.69	2.66	9.14	3.01	2.72

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

RUN #5

NOx/CO/O2 DATA

Stack Gas Measurement Data							
TIME INTERVAL			CONCENTRATIONS			% FULL SCALE	
BEGIN	-	END	O2:%	NOx:ppm	CO:ppm	O2%fs	NOx%fs	CO%fs
04:00 PM	-	04:10 PM	15.54	2.56	2.58	72.4	15.1	20.4
04:10 PM	-	04:20 PM	15.56	2.68	2.55	72.4	15.3	20.5
04:20 PM	-	04:30 PM	15.56	2.70	2.50	72.3	15.3	20.5
		Averages:	15.55	2.65	2.54	72.4	15.2	20.5

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	51.1	90.3
FINAL zero	10	10	10
FINAL span	93.7	51	90.9
ZERO DRIFT %/ppm	0.00	0.00	0.00
CALIB. DRIFT %/ppm	-0.07	-0.05	0.15
ZERO DRIFT %fs	0.00	0.00	0.00
CALIB.DRIFT %fs	-0.30	-0.10	0.60
CAL GAS value	20.9	20.6	20.1
FULL SCALE RANGE	25	50	25

DSCFM = 230730 (AVERAGE OF PITOT TUBE TRAVERSE)

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
NOx values:	15.55	2.65	8.87	2.92	4.44

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
CO values:	15.55	2.54	8.52	2.81	2.60

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

RUN #6

NOx/CO/O2 DATA

Stack Gas Measurement Data							
TIME INTERVAL			CONCENTRATIONS			% FULL SCALE	
BEGIN	-	END	O2:%	NOx:ppm	CO:ppm	O2%fs	NOx%fs	CO%fs
04:45 PM	-	04:55 PM	15.44	2.55	2.57	72.0	15.1	20.3
04:55 PM	-	05:05 PM	15.48	2.48	2.63	72.0	15.0	20.6
05:05 PM	-	05:15 PM	15.51	2.46	2.54	72.0	15.0	20.3
	Averages:		15.48	2.50	2.58	72.0	15.0	20.4

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	51.1	90.3
FINAL zero	10	10	10
FINAL span	93.6	51.2	90.5
ZERO DRIFT %/ppm	0.00	0.00	0.00
CALIB. DRIFT %/ppm	-0.10	0.05	0.05
ZERO DRIFT %fs	0.00	0.00	0.00
CALIB.DRIFT %fs	-0.40	0.10	0.20
CAL GAS value	20.9	20.6	20.1
FULL SCALE RANGE	25	50	25

DSCFM = 230730 (AVERAGE OF PITOT TUBE TRAVERSE)

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
NOx values:	15.48	2.50	8.24	2.72	4.19

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
CO values:	15.48	2.58	8.51	2.80	2.63

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

RUN #7

NOx/CO/O2 DATA

Stack Gas Measurement Data							
TIME INTERVAL			CONCENTRATIONS			% FULL SCALE	
BEGIN	-	END	O2:%	NOx:ppm	CO:ppm	O2%fs	NOx%fs	CO%fs
05:30 PM	-	05:40 PM	15.44	2.60	2.59	72.0	15.2	20.4
05:40 PM	-	05:50 PM	15.48	2.63	2.63	72.0	15.3	20.6
05:50 PM	-	06:00 PM	15.51	2.61	2.54	72.0	15.3	20.3
		Averages:	15.48	2.61	2.59	72.0	15.3	20.4

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	51.1	90.3
FINAL zero	10	10.3	10
FINAL span	93.6	50.9	90.5
ZERO DRIFT %/ppm	0.00	0.15	0.00
CALIB. DRIFT %/ppm	-0.10	-0.10	0.05
ZERO DRIFT %fs	0.00	0.30	0.00
CALIB.DRIFT %fs	-0.40	-0.20	0.20
CAL GAS value	20.9	20.6	20.1
FULL SCALE RANGE	25	50	25

DSCFM = 230730 (AVERAGE OF PITOT TUBE TRAVERSE)

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
NOx values:	15.48	2.61	8.63	2.84	4.39

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
CO values:	15.48	2.59	8.54	2.81	2.64

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

RUN #8

NOx/CO/O2 DATA

Stack Gas Measurement Data							
TIME INTERVAL			CONCENTRATIONS			% FULL SCALE	
BEGIN	-	END	O2:%	NOx:ppm	CO:ppm	O2%fs	NOx%fs	CO%fs
06:15 PM	-	06:25 PM	15.52	2.76	2.54	72.5	15.4	20.2
06:25 PM	-	06:35 PM	15.56	2.81	2.53	72.9	15.3	20.3
06:35 PM	-	06:45 PM	15.50	2.91	2.47	72.9	15.3	20.2
	Averages:		15.53	2.82	2.51	72.8	15.3	20.2

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	51.1	90.3
FINAL zero	10.2	9.9	10.1
FINAL span	94.5	50.6	90.6
ZERO DRIFT %/ppm	0.05	-0.05	0.03
CALIB. DRIFT %/ppm	0.12	-0.25	0.08
ZERO DRIFT %fs	0.20	-0.10	0.10
CALIB.DRIFT %fs	0.50	-0.50	0.30
CAL GAS value	20.9	20.6	20.1
FULL SCALE RANGE	25	50	25

DSCFM = 230730 (AVERAGE OF PITOT TUBE TRAVERSE)

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
NOx values:	15.53	2.82	9.41	3.10	4.74

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
CO values:	15.53	2.51	8.37	2.76	2.57

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

RUN #9

NOx/CO/O2 DATA

Stack Gas Measurement Data							
TIME INTERVAL			CONCENTRATIONS			% FULL SCALE	
BEGIN	-	END	O2:%	NOx:ppm	CO:ppm	O2%fs	NOx%fs	CO%fs
07:00 PM	-	07:10 PM	15.58	2.84	2.57	72.6	15.6	20.3
07:10 PM	-	07:20 PM	15.58	2.76	2.74	72.6	15.3	21.1
07:20 PM	-	07:30 PM	15.58	2.72	2.69	72.6	15.1	21.0
	Averages:		15.58	2.77	2.67	72.6	15.3	20.8

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	51.1	90.3
FINAL zero	10	9.9	10.1
FINAL span	94	50.8	90.5
ZERO DRIFT %/ppm	0.00	-0.05	0.03
CALIB. DRIFT %/ppm	0.00	-0.15	0.05
ZERO DRIFT %fs	0.00	-0.10	0.10
CALIB.DRIFT %fs	0.00	-0.30	0.20
CAL GAS value	20.9	20.6	20.1
FULL SCALE RANGE	25	50	25

DSCFM = 230730 (AVERAGE OF PITOT TUBE TRAVERSE)

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
NOx values:	15.58	2.77	9.32	3.07	4.65

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
CO values:	15.58	2.67	8.96	2.95	2.72

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

RUN #10

NOx/CO/O2 DATA

Stack Gas Measurement Data							
TIME INTERVAL			CONCENTRATIONS			% FULL SCALE	
BEGIN	-	END	O2:%	NOx:ppm	CO:ppm	O2%fs	NOx%fs	CO%fs
07:45 PM	-	07:55 PM	15.55	2.38	2.79	72.5	14.8	21.2
07:55 PM	-	08:05 PM	15.56	2.38	2.77	72.6	14.9	21.2
08:05 PM	-	08:15 PM	15.58	2.28	2.69	72.7	14.8	21.0
	Averages:		15.56	2.35	2.75	72.6	14.8	21.1

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	51.1	90.3
FINAL zero	10	9.9	10
FINAL span	94.1	51.5	90.6
ZERO DRIFT %/ppm	0.00	-0.05	0.00
CALIB. DRIFT %/ppm	0.02	0.20	0.08
ZERO DRIFT %fs	0.00	-0.10	0.00
CALIB.DRIFT %fs	0.10	0.40	0.30
CAL GAS value	20.9	20.6	20.1
FULL SCALE RANGE	25	50	25

DSCFM = 230730 (AVERAGE OF PITOT TUBE TRAVERSE)

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
NOx values:	15.56	2.35	7.87	2.60	3.94

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
CO values:	15.56	2.75	9.22	3.04	2.81

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

RUN #11

NOx/CO/O2 DATA

Stack Gas Measurement Data							
TIME INTERVAL			CONCENTRATIONS			% FULL SCALE	
BEGIN	-	END	O2:%	NOx:ppm	CO:ppm	O2%fs	NOx%fs	CO%fs
08:30 PM	-	08:40 PM	15.54	2.40	2.85	72.4	14.9	21.4
08:40 PM	-	08:50 PM	15.51	2.48	2.75	72.2	15.3	21.1
08:50 PM	-	09:00 PM	15.51	2.41	2.79	72.1	15.4	21.3
	Averages:		15.52	2.43	2.80	72.2	15.2	21.3

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	51.1	90.3
FINAL zero	10	10	10
FINAL span	93.7	51.8	90.5
ZERO DRIFT %/ppm	0.00	0.00	0.00
CALIB. DRIFT %/ppm	-0.07	0.35	0.05
ZERO DRIFT %fs	0.00	0.00	0.00
CALIB.DRIFT %fs	-0.30	0.70	0.20
CAL GAS value	20.9	20.6	20.1
FULL SCALE RANGE	25	50	25

DSCFM = 230730 (AVERAGE OF PITOT TUBE TRAVERSE)

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
NOx values:	15.52	2.43	8.09	2.67	4.08

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
CO values:	15.52	2.80	9.30	3.07	2.85

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

RUN #12

NOx/CO/O2 DATA

Stack Gas Measurement Data							
TIME INTERVAL			CONCENTRATIONS			% FULL SCALE	
BEGIN	-	END	O2:%	NOx:ppm	CO:ppm	O2%fs	NOx%fs	CO%fs
09:15 PM	-	09:25 PM	15.49	2.55	2.72	72.2	15.2	20.9
09:25 PM	-	09:35 PM	15.51	2.23	2.75	72.2	14.8	21.1
09:35 PM	-	09:45 PM	15.54	2.16	2.81	72.2	14.9	21.4
	Averages:		15.51	2.31	2.76	72.2	15.0	21.1

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	51.1	90.3
FINAL zero	10	10	10
FINAL span	93.7	51.8	90.5
ZERO DRIFT %/ppm	0.00	0.00	0.00
CALIB. DRIFT %/ppm	-0.07	0.35	0.05
ZERO DRIFT %fs	0.00	0.00	0.00
CALIB.DRIFT %fs	-0.30	0.70	0.20
CAL GAS value	20.9	20.6	20.1
FULL SCALE RANGE	25	50	25

DSCFM = 230730 (AVERAGE OF PITOT TUBE TRAVERSE)

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
NOx values:	15.51	2.31	7.69	2.53	3.88

	%O2	ppm	@ 3%O2	@15%O2	lb/hr
CO values:	15.51	2.76	9.18	3.02	2.82

SSION FACTORS
(lbs/MMBtu)

COMPANY : DESTEC
UNIT : LIVE OAK COGEN - TURBINE OUTLET
DATE : 4-22-93
PROJECT : 027-488

NOx, LBS/MMBTU & EPA F FACTOR @ 60°F

RUN	PPM	%O2	LBS/MMBTU
#1	2.44	15.46	0.00967
#2	2.57	15.53	0.01032
#3	2.58	15.53	0.01036
#4	2.56	15.69	0.01059
#5	2.65	15.55	0.01068
#6	2.50	15.48	0.00995
#7	2.61	15.48	0.01038
#8	2.82	15.53	0.01132
#9	2.77	15.58	0.01123
#10	2.35	15.56	0.00949
#11	2.43	15.52	0.00974
#12	2.31	15.51	0.00924
AVERAGE	2.61	15.54	0.01050

EPA F FACTOR @ 60°F 8511

L GAS ANALYSIS

PETRO CHEM ENVIRONMENTAL SERVICES, INC.

3207 Antonino Avenue
Bakersfield, California 93308
(805) 327-7300
FAX (805) 327-3459

COMPANY : DESTEC OPERATING COMPANY
UNIT : LIVE OAK COGEN
DATE : 4-22-93
PROJECT : 027-488

DATE RECEIVED : APRIL 23,1993
DATE ANALYZED : APRIL 23,1993
DATE REPORTED: APRIL 26,1993

FUEL GAS ANALYSIS

CONSTITUENT	MOLE %	WT. %
CARBON DIOXIDE	1.414	3.573
OXYGEN	0.009	0.016
NITROGEN	1.026	1.650
CARBON MONOXIDE	0.000	0.000
METHANE	92.485	85.175
ETHANE	4.220	7.284
PROPANE	0.698	1.767
ISOBUTANE	0.057	0.190
N-BUTANE	0.053	0.178
ISOPENTANE	0.013	0.054
N-PENTANE	0.009	0.036
HEXANES+	0.016	0.077
TOTALS :	100.000	100.000

CHONS Wt.%	
CARBON	72.45
HYDROGEN	23.29
OXYGEN	2.61
NITROGEN	1.65
SULFUR	0.00
H/C	0.321

SPECIFIC GRAVITY (AIR = 1)	0.6015
SPECIFIC VOLUME, cu.ft./lb.	21.79
GROSS CALORIFIC VALUE (DRY), BTU/cu.ft.	1033.87
GROSS CALORIFIC VALUE (WET), BTU/cu.ft.	1013.55
GROSS CALORIFIC VALUE (DRY), BTU/lb.	22524.78
NET CALORIFIC VALUE (DRY), BTU/cu.ft.	932.43
NET CALORIFIC VALUE (WET), BTU/cu.ft.	914.10
COMPRESSABILITY FACTOR "Z" @ 60° F, 1 ATM	0.9977
EXPANSION FACTOR (DSCF/CF)	8.80
EPA "F" FACTOR @ 68° F (DSCF/MM BTU)	8641
EPA "F" FACTOR @ 60° F (DSCF/MM BTU)	8511

ASTM METHODS D-1945-81 & D-3588-91

Terry Rowles
Laboratory Manager

S AND EQUATIONS

SAMPLING AND ANALYTIC PROCEDURES

REF: EPA Code of Federal Regulations, Title 40, Part 60, Appendix A. EPA Method 1, 2, 3, & 4

EPA Method 1: Sampling and Velocity Traverses for Stationary Sources

Prior to the source test a site assessment was performed in order to locate sample points for obtaining the best representative measurements of pollution concentrations and volumetric flow rates. EPA Method 1 takes into account duct area, straight run and cyclonic or stratified flow pattern.

EPA Method 2: Velocity and Volumetric Flow Rates

A computer was used in selection of suitable sample/traverse points. The calibrated pitot tube was connected to a magnehelic gauge and leak checked. A temperature and ΔP was recorded at each traverse point and a duct static pressure was measured and recorded. A volume flow rate was calculated from the measured required traverse points.

EPA Method 3: % CO_2, % O_2, Dry Molecular Weight

Concurrent with each particulate sampling, an integrated gas sample was withdrawn from the summation of the traverse points through the train and collected at the outlet of the meter into a sample bag. The contents of the sample bladder were analyzed by Orsat for fixed gas composition.

EPA Method 4: Percent Water

Tare weights of the charged individual impingers were recorded. After sampling, the final weights were recorded. Percent water was calculated from the weight of water collected and the dry gas volume sampled.

EPA METHOD 2
STACK GAS VELOCITY AND VOLUMETRIC FLOWRATE

Average Stack Gas Velocity
Eq. 2-6 & Eq. 2-9

$$P_g = \frac{Static\ Pressure,\ H_2O}{13.6}$$

$$P_s = P_{bar} + P_g$$

$$V_s = K_p\ C_p \left(\sqrt{\Delta P}\right) avg \sqrt{\frac{T_{s\,(avg)}}{P_s\ M_s}}$$

Average Stack Gas Dry Volumetric Flow Rate
Eq. 2-10

$$Q_{std} = 60\ (1 - B_{ws})\ v_s\ A \left[\frac{T_{std}}{T_{s\,(avg)}}\right] \left[\frac{P_s}{P_{std}}\right]$$

$$\frac{Q_{std}}{MF} = SCFM$$

EPA METHOD 3
DRY MOLECULAR WEIGHT OF STACK GAS
Eq. 3-2

$$M_d = 0.44\ (\%\,CO_2) + 0.320\ (\%\,O_2) + 0.280\ (\%\,N_2 + \%\,CO)$$

Wet Molecular Weight of Stack Gas

$$M_s = M_d\ (1 - B_{ws}) + 18\,(B_{ws})$$

EPA METHOD 4
DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Volume of Water Vapor Condensed
Eq. 4-1

$$V_{wc\,(std)} = \frac{(V_f - V_i)\rho_w \, RT_{std}}{P_{std} \, M_w} = K_1 \, (V_f - V_i)$$

Where: $K_1 = 0.04646 \ \frac{ft^3}{ml}$ @ 520° R

Volume of Water Vapor Collected in Silica Gel
Eq. 4-2

$$V_{wsg\,(std)} = \frac{(W_f - W_i) \ RT_{std}}{P_{std} \ M_w \ (453.6 \ g/lb)}$$

$$= K_2 \, (W_f - W_i)$$

Where: $K_2 = 0.04651 \ \frac{ft^3}{g}$ @ 520 ° R

Sample Gas Volume
Eq. 4-3

$$V_{m\,(std)} = V_m\ Y \left[\frac{(P_m)\ (T_{std})}{(P_{std})\ (T_m)} \right]$$

$$= K_3\ Y\ \frac{V_m\ \ P_m}{T_m}$$

Where: $K_3 = 17.38\ \frac{^\circ R}{in.\ Hg}$ @ $520\ ^\circ R$

Moisture Content
Eq. 4-4

$$B_{ws} = \frac{V_{wc\ (std)} + V_{wsg\ (std)}}{V_{wc\ (std)} + V_{wsg\ (std)} + V_{m\,(std)}}$$

$$B_{ws} \times 100 = \%\ H_2O\ \ in\ gas\ stream$$

$$MF = 1 - B_{ws}$$

NOMENCLATURE

A = Cross-sectional area of stack (ft^2)
A_n = Cross-sectional area of nozzle, (ft^2)
B_{ws} = Proportion of water vapor, by volume, in the gas stream
C_a = Acetone blank residue concentration, (mg/g)
C_p = Pitot tube coefficient, dimensionless
C_s = Concentration of particulate matter in stack gas, dry basis corrected to standard conditions, (gr/dscf)
C_{SO2} = Concentration of sulfur dioxide dry basis corrected to standard conditions, (lb/dscf)
C_{H2SO4} = Sulfuric acid (including SO3) concentration, corrected to standard conditions, (lb/dscf)
ΔH = Average pressure differential across the orifice meter, (in H_2O)
K_p = Pitot tube constant, $85.49 \frac{ft\ [(lb/lb\text{-}mole)(in\ Hg)]^{1/2}}{sec[\ (°R)\ (in\ H_2O)\ ]}$
L_p = Leakage rate observed during the post-test leak check, (cfm)
L_a = Maximum acceptable leakage rate, (0.02 cfm or 4% of average sampling rate, whichever is less)
L_i = Individual leakage rate observed during the leak check conducted prior to the "i^{nth}" component change, (cfm)
M_a = Mass of residue of acetone after evaporation, mg
M_d = Molecular weight of stack gas, dry basis, (lb/lb-mole)
M_n = Total weight of particulate matter collected, mg
M_s = Molecular weight of stack gas, wet basis, (lb/lb-mole)
M_w = Molecular weight of water, 18 lb/lb-mole
N = Normality of barium perchlorate titrant, (milliequivalents/ml)
ΔP = Velocity head of stack gas, (in H_2O)
P_{bar} = Barometric pressure at measurement site (in Hg)
P_g = Stack static pressure, (in Hg)
P_m = Absolute pressure at the dry gas meter, ($P_{bar} + \Delta H/13.6$)
P_s = Absolute stack gas pressure, (inches Hg)
$P_{(std)}$ = Standard absolute pressure, 29.92 in Hg
$Q_{(std)}$ = Dry volumetric stack gas flow rate, standard conditions, (dscfm)
R = Ideal gas constant, 21.85 (in Hg) (ft^3)/(lb-mole)(°R)
t_s = Stack temperature, (°F)
T_m = Absolute temperature at meter, (°R)
$T_{(std)}$ = Standard absolute temperature, (520°R)
T_s = Absolute stack temperature, (460° + t_s)
V_a = Volume of sample aliquot titrated, (ml)
V_{ab} = Volume of acetone blank, ml
V_m = Dry gas volume measured by dry gas meter, (dcf)
$V_{m(std)}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, (dscf)
$V_{wc(std)}$ = Volume of water vapor condensed corrected to standard conditions,(scf)
$V_{wsg(std)}$ = Volume of water vapor collected in silica gel corrected to standard conditions (scf)

NOMENCLATURE
(continued)

V_{ic} = Volume of water vapor condensed in impingers and silica gel, (ml)
V_f = Final volume of condensed water, ml
V_i = Initial volume of condensed water, ml
v_s = Average stack gas velocity, (ft/sec)
V_{soln} = Total volume of solution in which the sulfur dioxide sample is contained (ml)
V_t = Volume of barium perchlorate titrant used for the sample, (ml)
V_{tb} = Volume of barium perchlorate titrant used for the blank, (ml)
W_f = Final weight of silica gel or silica gel plus impinger, (g)
W_i = Initial weight of silica gel or silica gel plus impinger, (g)
Y = Dry gas meter calibration factor
ρ_w = Density of water, (0.002202 lb/ml @ 60°F)
ρa = Density of acetone, (g/ml)(see bottle label)
MF = Moisture factor
$\%CO_2$ = Percent CO_2 by volume (dry basis)
$\%O_2$ = Percent O_2 by volume (dry basis)
%CO = Percent CO by volume (dry basis)
$\%N_2$ = Percent N_2 by volume (dry basis)
0.264 = Ratio of O_2 to N_2 in air v/v
0.280 = Molecular weight of N_2 or CO, divided by 100
0.320 = Molecular weight of O_2, divided by 100
0.440 = Molecular weight of CO_2, divided by 100
60 = Conversion factor, (sec/min)
18.0 = Molecular weight of water, (lb/lb-mole)
32.03 = Equivalent weight of sulfur dioxide
θ = Total sampling time (min)
θ_i = Sampling time interval, between two successive component changes, beginning with the interval between the first and second changes, (min)
θ_1 = Sampling time interval, from the run beginning until first component change, (min)
θ_p = Sampling time interval, from the final (n^{th}) component change until the end of the sampling run, (min)

CONTINUOUS EMISSION MONITORING SYSTEM (CEMS)

Reference: Manual of Procedures; ST-13A, ST-19A, Jan 1982, State of California, Air Resources Board, Test Methods 1-100, June 1979.
EPA CFR Title 40, Pt. 60, Appendix A, Method 3A, 6C, 7E, & 10.

Instrument Summary

A constant sample of flue gas was extracted, dried, filtered and delivered to an instrument manifold system for distribution to one or more analyzers. Instrument results are recorded on an analog strip chart recorder. System calibration checks are performed as well as calibration checks at the beginning and end of each test run. Final data reduction includes zero and calibration drift corrections.

Sample Conditioning System

Consists of a borosilicate glass tube or 316 grade stainless steel probe fitted with a cindered stainless steel or pyrex glass wool particulate filter. The probe is fitted with a teflon (TFE) sample line which connects to a water condensation system located at the source. The condensation system consists of three 500-ml short stem glass impingers connected in a series, immersed in an ice bath. The gas is delivered to the instrument trailer with a teflon line (3/8" O.D.) through an in-line Balston particulate filter drawn by a teflon-coated diaphragm pump. The sample system is leak checked prior to sampling by plugging the end of the sample probe and adjusting the sample pump to its maximum rate (approximately 22" Hg). The manifold is by-passed and the leak rate monitored through a gas meter or low range flow meter.

Manifold System

Sample gas is delivered to each analyzer through a five way valve and regulated with a needle valve flow meter. Manifold pressure is controlled by a back pressure regulator which is typically set at three psi. Zero gas (N_2) and calibrated gases are delivered to the analyzers using the same five way valve and flow meter. All manifold parts are glass, stainless steel, or teflon materials.

Analog Strip Chart Data Reduction

Analog recordings consists of averaged time increments as shown on the data pages (typically 5,10, or 20 minute increments). Data for each increment was recorded at an average percent of full scale. The readings were then compared with the zero and calibration readings for calculation of the average concentration for each time increment. Any deviation of the zero and calibration readings from the start to the end of a test period was corrected by calculating apparent zero and calibration readings for the mid-point of each time increment. The average concentrations were then calculated from the sample readings and the apparent zero and span readings.

SOURCE TEST PROCEDURE BAAQMD ST-1B
AMMONIA, INTEGRATED SAMPLING

1. Applicability

   1.1 This method is used to quantify emissions of ammonia.

2. Principle

   2.1 Sample gas is drawn through a solution of 0.1 N hydrochloric acid which absorbs the ammonia. The ammonia is then analyzed according to Analytical Procedure EPA 350.3.

3. Range

   3.1 The minimum measurable concentration of ammonia is 1 ppm at the sample volume specified in this procedure.

   3.2 Elevated concentrations of ammonia may be determined by increasing the concentration of the absorbing reagent, hydrochloric acid solution. The concentration of reagent to be used may be determined by stoichiometry, allowing a 50% excess.

4. Interference

   4.1 See EPA Method 350.3.

5. Apparatus

   5.1 Probe - The probe is constructed of borosilicate glass tubing fitted with a glass wool filter in the nozzle.

   5.2 Condensers - Use three Greenberg-Smith impingers as absorber/condensers. The final impinger has a thermometer attached to the inlet stem.

   5.3 Cooling system - Use an ice bath to contain the impingers.

   5.4 Sample pump - Use a leak-free vacuum pump capable of maintaining a 14.3 liter/min (0.5 CFM) flow rate at 15 inches of mercury. The pump must have a flow control valve and vacuum gauge attached to the inlet.

   5.5 Silica gel tube - Use approximately 500cc of silica gel (with a Drierite indicator) to insure that the gas entering the dry test meter is dry.

   5.6 Dry test meter - Use a dry gas test meter accurate within + 2% of the true volume and equipped with a thermometer to measure the outlet temperature.

5.7 Connections - Use Teflon tubing in making all connections that come in contact with the sample. Vinyl tubing is acceptable for all other connections.

5.8 Barometer - Use a barometer that is accurate to within + 0.2 inches of mercury.

5.9 Rotameter - Use a calibrated rotameter to measure the sampling rate.

6. Reagents

6.1 Hydrochloric acid, 0.1N. Dissolve 7.30 ml concentrated HCl in sufficient water to make a 1.0 liter solution.

7. Pre-test Procedures

7.1 Add 100 ml of the HCl solution to each of two impingers.

7.2 Stopper the impingers.

7.3 Retain 100 ml of the HCl solution to analyze as a blank.

7.4 Assemble the sampling train as shown in Figure IV-4.

7.5 Leak-test the sampling train by starting the pump, plugging the probe, and adjusting the pump inlet vacuum to 10 inches Hg. The leak rate must not exceed 0.6 liter/min (0.02 CFM) through the dry test meter. Before stopping the pump, carefully release the plug in the sample probe to avoid back flow of the impinger solution.

7.6 Record the initial dry test meter reading and barometric pressure on the sampling data sheet.

7.7 If there is evidence of concentration stratification, select the sampling traverse points according to ST-18. Otherwise, sample at a single point.

8. Sampling

8.1 Each test run shall be of thirty minute duration when testing emissions from continuous operations. Each test run at batch process operation shall be for 90% of the batch time or thirty minutes, whichever is less.

8.2 Position the probe at the sampling point and start the pump.

8.3 Sample at a constant rate of 14.3 liter/min (0.5 CEM) during the test as determined by the rotameter. Use the rotameter only to establish the initial sampling rate. Then remove it from the system.

8.4 Record the following information at five minute intervals.

A. Dry test meter temperature
B. Impinger outlet temperature
C. Dry test meter volume

8.5 Add ice as necessary to maintain impinger temperatures at 7 °C (45 °F) or less.

8.6 At the conclusion of each run, stop the pump, remove the probe from the stack, record the final meter reading. Point the probe upward and purge the sample train with ambient air.

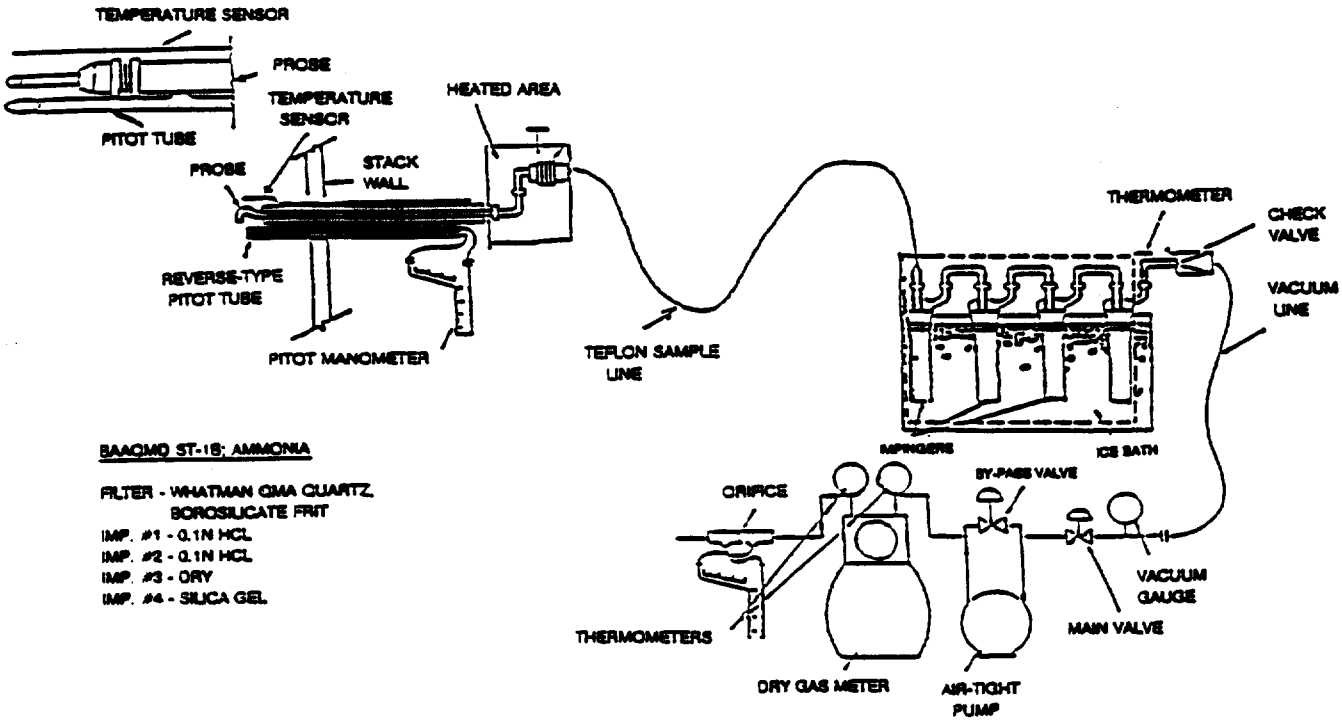
8.7 Take three consecutive samples.

9. Post-test Procedures

9.1 Stopper the impingers until they are analyzed.

9.2 Individually analyze the hydrochloric acid solutions and blank for total ammonia content according to analytical procedure Lab 1.

Sampling Diagram



NITROGEN, AMMONIA
Method 350.3
Potentiometric, Ion Selective Electrode

1. Scope and Application

   1.1 This method is applicable to the measurement of ammonia-nitrogen in drinking, surface and saline waters, domestic and industrial wastes.

   1.2 This method covers the range from 0.03 to 1400 mg NH_3-N/li. Color and turbidity have no effect on the measurements, thus, distillation may not be necessary.

2. Summary of Method

   2.1 The ammonia is determined potentiometrically using an ion selective ammonia electrode and a pH meter having an expanded millivolt scale or specific ion meter.

   2.2 The ammonia electrode uses a hydrophobic gas-permeable membrane to separate the sample solution from an ammonia chloride internal solution. Ammonia in the sample diffuses through the membrane and alters the pH of the internal solution, which is sensed by a pH electrode. The constant level of chloride in the internal solution is sensed by a chloride selective ion electrode which acts as the reference electrode.

3. Sample Handling and Preservation

   3.1 Samples may be preserved with 2 ml of conc. H_2SO_4 per liter and stored at 4°C.

4. Interferences

   4.1 Volatile amines act as a positive interference.

   4.2 Mercury interferes by forming a strong complex with ammonia. Thus the samples cannot be preserved with mercuric chloride.

5. Apparatus

   5.1 Electrometer (pH meter) with expanded mV scale or a specific ion meter.

   5.2 Ammonia selective electrode, such as Orion Model 95-10 or EIL Model 8002-2.

   5.3 Magnetic stirrer, thermally insulated, and Teflon-coated stirring bar.

6. Reagents

6.1 Distilled water: Special precautions must be taken to insure that the distilled water is free of ammonia. This is accomplished by passing distilled water through an ion exchange column containing a strongly acidic cation exchange resin mixed with a strongly basic anion exchange resin.

6.2 Sodium hydroxide, 10N: Dissolve 400 g of sodium hydroxide in 800 ml of distilled water. Cool and dilute to 1 liter with distilled water (6.1)

6.3 Ammonia chloride, stock solution: 1.0 ml = 1.0 mg NH_3-N. Dissolve 3.819 g NH_4Cl in water and bring to volume in a 1 liter volumetric flask using distilled water (6.1)

6.4 Ammonia chloride, standard solution: 1.0 ml = 0.01 mg NH_3-N. Dilute 10.0 ml of the stock solution (6.3) to 1 liter with distilled water (6.1) in a volumetric flask.

NOTE 1: When analyzing saline waters, standards must be made up in synthetic ocean water (SOW); found in Nitrogen, Ammonia: Calorimetric, Automated Phenate Method (350.1)

7. Procedures

7.1 Preparation of standards: Prepare a series of standard solutions covering the concentration range of the samples by diluting either the stock or standard solutions of ammonium chloride.

7.2 Calibration of electrometer: Place 100 ml of each standard solution in clean 150 ml beakers. Immerse electrode into standard of lowest concentration and add 1 ml of 10N sodium hydroxide solution while mixing. Keep electrode in the solution until a stable reading is obtained.

7.3 Repeat this procedure with the remaining standards, going from lowest to highest concentration. Using semilogarithmic graph paper, plot the concentration of ammonia in mg NH_3-N/li. on the log axis vs. the electrode potential developed in the standard on the linear axis, starting with the lowest concentration at the bottom of the scale.

7.4 Calibration of a specific ion meter: Follow the directions of the manufacturer for the operation of the instrument.

7.5 Sample measurement: Follow the procedure in (7.2) for 100 ml of sample in 150 ml beakers. Record the stabilized potential of each unknown sample and convert the potential reading to the ammonia concentration using the standard curve. If a specific ion meter is used, read the ammonia level directly in mg NH_3-N/li.

8. Precision and Accuracy

8.1 In a single laboratory (EMSL), using surface water samples at concentrations of 1.00, 0.77, 0.19 and 0.13 mg NH_3-N/1, standard deviations were +0.038, +0.017, +0.007 and +0.003 respectively.

8.2 In a single laboratory (EMSL), using surface water samples at concentrations of 0.19 and 0.13 mg NH_3-N/1, recoveries were 96% and 91%, respectively.

BIBLIOGRAPHY

1. Booth, R.L., and Thomas, R.F., "Selective Electrode Determination of Ammonia in Water and Wastes", Envir. Sci. Technology, 7, p. 523-526 (1973).

2. Banwart, W.L., Bremner, J.M., and Tabatabai, M.A., "Determination of Ammonia in Soil Extracts and Water Samples by an Ammonaia Electrode", Comm. Soil Sci. Plant., 3, p. 449 (1952).

3. Midgley, D., and Torrance, K., "The Determination of Ammonia in Condensed Steam and Boiler Feed-Water with a Potentiometric Ammonia Probe", Analyst 97, p. 626-633 (1972)

RELATIVE ACCURACY
Code of Federal Regualtions, 40 CFR, Pt. 60, App. B, Spec. 2

Arithmetic Mean of the Differences, d
Eq. 8.1

Where: n = Number of data points

$$\bar{d} = \frac{1}{n} \sum_{i=1}^{n} d_i$$

Standard deviation of the differences, S_d
Eq. 8.2

$$S_d = \left(\frac{\sum_{i=1}^{n} d_i^2 - \frac{\left(\sum_{i=1}^{n} d_i\right)^2}{n}}{n-1} \right)^{1/2}$$

Confidence Coefficient, CC
Eq. 8.3

$$CC = t_{0.975} \left(\frac{S_d}{\sqrt{n}} \right)$$

$t_{0.975}$ = t value Table (40 CFR, pg. 1043)

Relative Accuracy, RA
Eq. 8.4

$$RA = \frac{\left|\bar{d}\right| + \left|CC\right|}{\overline{RM}} \times 100$$

Where: |d| =Absolute value of the mean of differences (from Eq. 8.1)
RM = Average from reference method

HYDROCARBON EMISSIONS TESTING
EPA METHOD 18 - FID ANALYSIS

SAMPLING PROCEDURES

The sample was drawn via evacuated cannister through a stainless steel/teflon probe into a tedlar bag. Each sample bag was evacuated, and then filled.

ANALYTICAL PROCEDURES

The contents of the tedlar bag was analyzed by gas chromatography. The gas chromatograph was calibrated with an appropriate standard for each carbon #, before and after each set of samples are analyzed. The sample is speciated by carbon #-C_1, C_2, C_3, C_4, C_5, and C_{6+} backflush.

SYMBOL IDENTIFICATION

i = carbon #; i = 1 to 6+
s = refers to standard for that carbon #
Rx_i = response factor for C_i
MW = molecular weight - g/mole
DSCFM = Average volume flow rate of unit tested

EQUATIONS

$$Rx_i = \frac{Area\ std}{ppm\ std}$$

$$Sample\ ppm_i = \frac{1}{Rx_i} \times Area_i$$

$$Sample\ ppm\ (as\ C_1) = Sample\ ppm \times \#\ of\ Carbons$$

$$\frac{lbs}{hr_i} = ppm_i \times MW_i \times DSCFM \times 1.581 \times 10^{-7}$$

$$Total\ non\text{-}methane\ \frac{lbs}{hr} = \sum_{2}^{6+} \frac{lbs}{hr_i}$$

Note 1: If lbs/hr as methane is required, MW will equal 16.0 (MW of methane, CH_4)
Note 2: # of carbons: ethane = 2, propane = 3, etc...

APPENDIX I
RATIONAL DATA
plied by Destec)

FD 22APR93 22:11:52

LIVE OAK EMMISSIONS
MONITORING LOG

LOG #

1 NOX ACTUAL - STACK
2 NOX CORRECTED (15 O2) - STACK
3 CO ACTUAL - OUTLET
4 CO CORRECTED (15 O2) - OUTLET
5 O2 ACTUAL - OUTLET
6 CEM SYS IN CALIBRATION
7 CEM SYSTEM TROUBLE
8 AMMONIA (NH3) STACK GAS
9 FUEL GAS FLOW FROM CO
10

	HH:MM:SS	1 AI1425B PPMVD AVG NOx	2 AI1425D PPMVD AVG	3 AI1427B PPMVD AVG CO	4 AI1427D PPMVD AVG	5 AI1426B PCT VD AVG O2	6 XS1437 CALIB	7 XA1429 NORMAL	8 AT1424 PPMVD AVG	9 FI3714 MSCFH AVG	10
	10:15:00	1.7	1.8	1.9	2.0	12.0	NORMAL	NORMAL	1.4	409.0	
	10:30:00	2.8	3.1	3.6	3.9	15.6	NORMAL	NORMAL	2.2	408.1	
	10:45:00	2.1	2.4	2.2	2.5	15.7	NORMAL	NORMAL	2.2	408.8	
	11:00:00	2.0	2.2	2.1	2.3	14.5	NORMAL	ALARM	2.1	407.7	
	11:15:00	0.0	0.1	0.1	0.1	0.0	NORMAL	ALARM	0.1	408.4	
	11:30:00	0.1	0.1	0.1	0.1	0.0	NORMAL	ALARM	0.1	408.5	
	11:45:00	0.3	0.1	0.7	0.1	0.1	CALIB	NORMAL	0.2	407.1	
	12:00:00	38.0	0.1	40.9	0.1	3.9	CALIB	NORMAL	39.8	406.9	
	12:15:00	2.0	2.2	2.2	2.3	16.3	NORMAL	NORMAL	1.3	406.6	
	12:30:00	2.2	2.4	2.7	2.8	15.4	NORMAL	NORMAL	2.3	406.3	
	12:45:00	2.4	2.5	2.8	2.9	15.4	NORMAL	NORMAL	2.3	406.5	
	13:00:00	2.7	2.9	3.6	3.9	15.5	NORMAL	NORMAL	2.4	405.9	
#1	13:15:00	2.63	2.9	3.27	3.6	15.5	NORMAL	NORMAL	2.3	405.8	405.7
	13:30:00	2.5	2.6		2.8	15.4	NORMAL	NORMAL	2.1	405.5	
	13:45:00	2.3	2.4	2.7	2.8	15.4	NORMAL	NORMAL	2.4	405.1	
#2	14:00:00	2.33	2.5	2.66	2.7	15.4	NORMAL	NORMAL	2.2	404.7	404.7
	14:15:00	2.3	2.5		2.6	15.4	NORMAL	NORMAL	2.3	404.4	
	14:30:00	2.3	2.5	2.6	2.7	15.4	NORMAL	NORMAL	2.2	404.8	
#3	14:45:00	2.33	2.6	2.66	2.7	15.4	NORMAL	NORMAL	2.2	404.9	404.5
	15:00:00	2.3	2.5		2.7	15.4	NORMAL	NORMAL	2.1	403.8	
	15:15:00	2.4	2.6	2.7	2.9	15.4	NORMAL	NORMAL	2.1	403.8	
#4	15:30:00	2.47	2.5	2.90	3.2	15.4	NORMAL	NORMAL	2.1	403.4	403.6
	15:45:00	2.6	2.7		2.8	15.4	NORMAL	NORMAL	2.0	403.6	
	16:00:00	2.4	2.5	2.6	2.7	15.4	NORMAL	NORMAL	2.2	403.5	
#5	16:15:00	2.50	2.6	2.60	2.7	15.4	NORMAL	NORMAL	2.1	403.0	403.2
	16:30:00	2.6	2.7		2.5	15.4	NORMAL	NORMAL	1.9	403.2	
	16:45:00	2.5	2.6	2.5	2.6	15.4	NORMAL	NORMAL	1.9	403.0	
#6	17:00:00	2.47	2.6	2.47	2.4	15.4	NORMAL	NORMAL	2.0	402.5	402.6
	17:15:00	2.4	2.5		2.5	15.4	NORMAL	NORMAL	1.9	402.4	
	17:30:00	2.5	2.7	2.3	2.4	15.4	NORMAL	NORMAL	2.0	402.1	
#7	17:45:00	2.47	2.6	2.53	2.7	15.4	NORMAL	NORMAL	2.0	402.2	402.1
	18:00:00	2.4	2.6		2.6	15.4	NORMAL	NORMAL	2.0	402.1	
	18:15:00	2.5	2.7	2.8	2.9	15.4	NORMAL	NORMAL	2.1	402.6	
#8	18:30:00	2.83	2.7	3.10	2.5	15.4	NORMAL	NORMAL	1.9	401.8	402.1
	18:45:00	3.4	3.7		4.0	15.4	NORMAL	NORMAL	2.0	401.8	
	19:00:00	2.6	2.7	2.5	2.6	15.4	NORMAL	NORMAL	1.9	402.1	
#9	19:15:00	2.53	2.7	2.5	2.3	15.4	NORMAL	NORMAL	2.0	402.3	402.3
	19:30:00	2.4	2.5		2.7	15.4	NORMAL	NORMAL	2.0	402.6	
	19:45:00	2.3	2.5	2.7	2.7	15.4	NORMAL	NORMAL	1.9	403.5	
#10	20:00:00	2.37	2.5	2.63	2.6	15.4	NORMAL	NORMAL	2.1	403.7	403.6
	20:15:00	2.4	2.5		2.6	15.4	NORMAL	NORMAL	2.2	403.6	
	20:30:00	2.3	2.4	2.7	2.8	15.4	NORMAL	NORMAL	2.2	403.9	
#11	20:45:00	2.33	2.4	2.70	2.7	15.4	NORMAL	NORMAL	2.1	403.6	403.7
	21:00:00	2.4	2.6		2.7	15.4	NORMAL	NORMAL	2.1	403.5	
	21:15:00	2.4	2.6	2.6	2.7	15.4	NORMAL	NORMAL	2.1	403.8	
#12	21:30:00	2.63	3.4	3.07	3.9	15.4	NORMAL	NORMAL	2.0	404.2	404.5
	21:45:00	2.3	2.4		2.7	15.4	NORMAL	NORMAL	2.0	405.1	

403.55

APPENDIX II
RAW DATA

COMPANY: Desiec
UNIT : Live Oak Cogen
DATE : 4.22.93
PROJECT : 027.488

ON-SITE DATA

		RUN #1	RUN #2	RUN #3
	TIME:	1400 - 1454	1530-1626	1728-1816
Vm,	Dry sampled gas volume, dcf	28.931	30.695	28.826
Y,	Meter calibration factor (Met# 1.009760 1004)	1.009760	1.009760	1.009760
Pbar,	Barometric Pressure, "Hg	29.5	29.5	29.5
Pstatic	Stack static pressure, "Hg	-.37	-.37	-.37
▲H,	Differential meter pressure, "H2O	.57	.57	.57
Tm,	Meter temperature, °F	75.3	72.3	74.1

CONTENTS	RUN #1 FINAL	RUN #1 TARE	RUN #1 NET	RUN #2 FINAL	RUN #2 TARE	RUN #2 NET	RUN #3 FINAL	RUN #3 TARE	RUN #3 NET
0.1N HCl	692.2	553.7	138.5	711.6	555.8	155.8	705.6	555.8	149.8
0.1N HCl	593.2	591.5	1.7	626.1	623.4	2.7	600.0	597.6	2.4
DRY	497.3	496.5	.8	485.1	485.0	.1	497.3	496.5	.8
SG	842.3	835.8	6.5	793.2	786.6	6.6	848.3	842.3	6.0
(LW)	(0.1N HCl)		(39.8)			(43.1)			(40.1)
Vlc, volume of H2O, gms			107.7			122.1			118.9
	0.1N HCl rinse = 149.5			0.1N HCl rinse = 114.2			0.1N HCl rinse = 142.2		

		RUN #1	RUN #2	RUN #3
CO2,	% Dry Volume	3.1	3.0	3.1
O2,	% Dry Volume	15.5	15.6	15.5
N2,	% Dry Volume			
+ *Cp,*	Pitot Tube Coefficient (#)	.831	.831	.831
▲p,	Avg P, "H2O	1.130	0.952	/
Ts,	Stack temperature, °F	271	270	/
As,	Stack Area, sq.ft.	94.31	94.31	94.31
Ds,	Stack diameter, inches	131.5	131.5	131.5
Dn,	Nozzle diameter, inches	/	/	/
Dur,	Sampling time, min	48	48	48
% ISO	Mini iso			

Filter #			
Filter tare weights, gms			

Additional Comments:

METHOD 1-4/ST-1B RUN # 1

COMPANY: Destec
UNIT: Live OAIL
DATE: 4/22/93
PROJECT: 027-488
TECH: SAD
PUMP #:
METER BOX#: 1004
METER COEFF: 1.009760
PROBE #: 15' initial Cp:

PRE / POST TEST LEAK CHECK

LEAK RATE: <.02 cfm
VACUUM: 10 "Hg

AMBIENT TEMP, °F: 70
Pbar:
STATIC PRESSURE ("Hg):
ASSUMED MOISTURE,%:
NOZZLE ID#:
AVG. CALIB. NOZZLE DIAM.("):
PROBE LINER MATERIAL:
FILTER #:
DUCT DIAM ("): 131.5

TRAVERSE PT. NUMBER	TIME (e) min.	VACUUM "Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Δ Ps)in. H20	PRESSURE DIFFERENTIAL,"H20 RATE	PRESSURE DIFFERENTIAL,"H20 ΔH	GAS SAMPLE VOLUME (cu.ft)	GAS SAMPLE TEMP. AT DRY GAS METER INLET, °F	GAS SAMPLE TEMP. AT DRY GAS METER OUTLET,°F	FILTER HOLDER TEMP, °F PROBE	FILTER HOLDER TEMP, °F BOX	TEMP OF GAS EXIT CONDENSER OR LAST IMPINGER
8	1400	2	270	1.75	0.60	0.57	208.000	79	67			60
7	03	2	271	1.60	0.6	0.57	209.8	79	66			
6	06	2	270	1.25	0.6	0.57	211.6	81	68			61
5	09	2	274	1.0	0.6	0.57	213.4	82	68			
4	12	2	269	0.75	0.6	0.57	215.2	83	69			
3	15	2	267	0.90	0.6	0.57	217.0	83	70			61
2	18	2	267	0.90	0.6	0.57	218.8	85	70			
1	21	2	266	0.90	0.6	0.57	220.6	86	70			61
PC	14:24						222.481					
AVG								(75.4)				

METHOD 1-4 | ST-1B RUN # 1

COMPANY:	Destec
UNIT:	Live OAK
DATE:	4/22/93
PROJECT:	027-488
TECH:	SAO
PUMP #:	
METER BOX#:	1004
METER COEFF:	1.009760
PROBE #:	8' Initial Cp:

PRE / POST TEST LEAK CHECK

LEAK RATE: < 0.005 cfm

VACUUM: 5 "Hg

AMBIENT TEMP, °F:	
Pbar:	
STATIC PRESSURE ("Hg):	
ASSUMED MOISTURE,%:	
NOZZLE ID#:	
AVG. CALIB. NOZZLE DIAM.("):	
PROBE LINER MATERIAL:	
FILTER #:	
DUCT DIAM ("):	

TRAVERSE PT. NUMBER	TIME (θ) min.	VACUUM "Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Δ Ps)in. H20	PRESSURE DIFFERENTIAL,"H20 RATE	PRESSURE DIFFERENTIAL,"H20 ΔH	GAS SAMPLE VOLUME (cu.ft)	GAS SAMPLE TEMP. AT DRY GAS METER INLET, °F	GAS SAMPLE TEMP. AT DRY GAS METER OUTLET,°F	FILTER HOLDER TEMP, °F PROBE	FILTER HOLDER TEMP, °F BOX	TEMP OF GAS EXIT CONDENSER OR LAST IMPINGER
8	1430	2	272	1.30	0.6	0.57	222.481	78	70			61
7	33	2	273	1.15	0.6	0.57	224.2	80	70			
6	36	2	273	1.05	0.6	0.57	226.0	81	70			63
5	39	2	275	1.0	0.6	0.57	227.8	82	70			
4	42	2	273	1.0	0.6	0.57	229.6	82	70			63
3	45	2	273	1.25	0.6	0.57	231.4	81	69			
2	48	2	273	1.4	0.6	0.57	233.2	81	69			63
1	51	2	273	1.10	0.6	0.57	235.0	81	68			
EOT	14:54						236.931					
AVG	48 min		271	1.130		0.57	cuft = 28.931	(75.3)				

METHOD 1-4 / ST-1B RUN # 2

COMPANY: Destec
UNIT: Live OAK
DATE: 4/22/93
PROJECT: 027-488
TECH: SAO
PUMP #:
METER BOX#: 1004
METER COEFF: 1.009760
PROBE #: 15' Initial Cp:

PRE / POST TEST LEAK CHECK

LEAK RATE: < 0.02 cfm
VACUUM: 7 "Hg

AMBIENT TEMP, °F: 65
Pbar:
STATIC PRESSURE ("Hg):
ASSUMED MOISTURE,%:
NOZZLE ID#:
AVG. CALIB. NOZZLE DIAM.("):
PROBE LINER MATERIAL:
FILTER #:
DUCT DIAM ("):

TRAVERSE PT. NUMBER	TIME (θ) min.	VACUUM "Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Δ Ps)in. H20	PRESSURE DIFFERENTIAL,"H2O RATE	PRESSURE DIFFERENTIAL,"H2O ΔH	GAS SAMPLE VOLUME (cu.ft)	GAS SAMPLE TEMP. AT DRY GAS METER INLET, °F	GAS SAMPLE TEMP. AT DRY GAS METER OUTLET,°F	FILTER HOLDER TEMP, °F PROBE	FILTER HOLDER TEMP, °F BOX	TEMP OF GAS EXIT CONDENSER OR LAST IMPINGER
8	1530	2	270	1.25	0.6	0.57	237.505	68	66			61
7	33	2	273	1.0	0.6	0.57	239.3	78	66			
6	36	2	271	1.0	0.6	0.57	241.1	78	66			61
5	39	2	272	1.15	0.6	0.57	243.9	78	66			
4	42	2	271	0.9	0.6	0.57	245.7	78	66			64
3	45	2	271	1.0	0.6	0.57	247.5	78	67			
2	48	2	270	1.1	0.6	0.57	249.3	78	66			
1	51	2	268	1.05	0.6	0.57	251.1	78	66			64
PC	1554						253.917					
AVG									(71.4)			

METHOD 1-4 / ST-1B RUN # 2

COMPANY: Destec	PRE / POST TEST LEAK CHECK	AMBIENT TEMP, °F: 60°
UNIT: Live Oak		Pbar:
DATE: 4/22/93		STATIC PRESSURE ("Hg):
PROJECT: 027-488		ASSUMED MOISTURE,%:
TECH: SAD	LEAK RATE: <0.005 cfm	NOZZLE ID#:
PUMP #: 3	VACUUM: 6 "Hg	AVG. CALIB. NOZZLE DIAM.("):
METER BOX#: 1004		PROBE LINER MATERIAL:
METER COEFF: 1.009760		FILTER #:
PROBE #: 15' Initial Cp:		DUCT DIAM ("):

TRAVERSE PT. NUMBER	TIME (θ) min.	VACUUM "Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (▲Ps)in. H20	PRESSURE DIFFERENTIAL,"H2O RATE	PRESSURE DIFFERENTIAL,"H2O ▲H	GAS SAMPLE VOLUME (cu.ft)	GAS SAMPLE TEMP. AT DRY GAS METER INLET, °F	GAS SAMPLE TEMP. AT DRY GAS METER OUTLET,°F	FILTER HOLDER TEMP, °F PROBE	FILTER HOLDER TEMP, °F BOX	TEMP OF GAS EXIT CONDENSER OR LAST IMPINGER
8	1602	2	270	0.75	0.6	0.57	253.917	70	67			64
7	05	2	269	0.85	0.6	0.57	255.7	78	67			
6	08	2	271	0.90	0.6	0.57	257.5	79	67			64
5	11	2	270	0.90	0.6	0.57	259.3	81	68			
4	14	2	268	0.85	0.6	0.57	261.1	81	68			66
3	17	2	269	0.80	0.6	0.57	262.9	81	68			
2	20	2	268	0.95	0.6	0.57	264.7	80	68			66
1	23	2	268	0.85	0.6	0.57	266.5	80	67			
END	16:26						268.200					
								73.1				
AVG			270	.952		.57	30.695	72.3				

METHOD ST-1B RUN# 3

COMPANY:	Destec
UNIT:	Live Oak
DATE:	4/22/93
PROJECT:	027-488
TECH:	SAD
PUMP #:	
METER BOX#:	1004
METER COEFF:	1.009760
PROBE #:	Cp:

PRE / POST TEST LEAK CHECK

LEAK RATE:	<0.01	<0.005	cfm
VACUUM:	10	5	"Hg

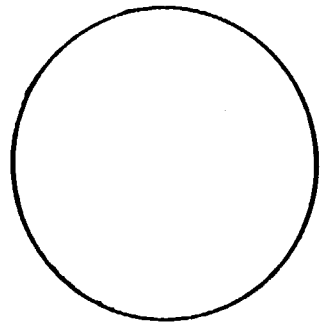
AMBIENT TEMP, °F:	60
Pbar:	
STATIC PRESSURE ("Hg):	
ASSUMED MOISTURE,%:	
NOZZLE ID#:	
AVG. CALIB. NOZZLE DIAM.("):	
PROBE LINER MATERIAL:	
FILTER #:	
DUCT DIAM ("):	

TRAVERSE PT. NUMBER	TIME (θ) min.	VACUUM "Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Δ Ps)in. H20	PRESSURE DIFFERENTIAL,"H20 RATE	PRESSURE DIFFERENTIAL,"H20 ΔH	GAS SAMPLE VOLUME (cu.ft)	GAS SAMPLE TEMP. AT DRY GAS METER INLET, °F	GAS SAMPLE TEMP. AT DRY GAS METER OUTLET,°F	FILTER HOLDER TEMP, °F PROBE	FILTER HOLDER TEMP, °F BOX	TEMP OF GAS EXIT CONDENSER OR LAST IMPINGER
Start	1728	2			0.6	0.57	269.8	70	66			61
	34	2			0.6	0.57	272.9	81	67			
	40	2			0.6	0.57	276.5	83	68			61
	46	2			0.6	0.57	280.1	83	68			
	52	2			0.6	0.57	283.7	83	68			65
	58	2			0.6	0.57	287.3	82	68			
	1804	2			0.6	0.57	290.9	82	68			63
	10	2			0.6	0.57	294.5	81	68			
Finish	18:16						298.154					
AVG						.57	28.826	74.1				

VELOCITY TRAVERSE

COMPANY:	Destec
UNIT:	Live Oak
DATE:	4/22/93
PROJECT:	027-488
TECH:	SAD
PUMP #:	
METER BOX#:	
METER COEFF:	
PROBE #:	Cp:

TOTAL	147.5
COUPLING	16.0
DIAMETER	131.5
AREA	94.31



TRAVERSE POINTS						
W/O	W/COUP	NO.	Ts, °F	Δp	Ts, °F	Δp
4.2	20.2	1				
13.8	29.8	2				
25.5	41.5	3				
42.5	58.5	4				
89.0	105.0	5				
106.0	122.0	6				
117.7	133.7	7				
127.3	143.3	8				

VELOCITY DATA

Rated Total MMBtu/HR

Δp	Vel
Ts	DSCFM
Static	MMBtu/hr
Pbar	% Thr
MW(wet)	
%H2O	
%O2	
°F, (@ 60°)	

Additional Data:

Diameters before disturb_____ After _____

# of points, total _____

VELOCITY TRAVERSE

EPA METHOD 20

COMPANY:	Dester
UNIT:	Live Oak
DATE:	4/22/93
PROJECT:	027-488
TECH:	SAD
PUMP #:	
METER BOX#:	
METER COEFF:	
PROBE #:	Cp:

TOTAL	162.5
COUPLING	31.0
DIAMETER	131.5
AREA	94.31

TRAVERSE POINTS						
W/O	W/COUP	NO.	Ts, °F	Δp	Ts, °F	Δp
	32.5	1		147.3	18	
	35.6	2		151.0	19	
	39.0	3		154.5	20	
	42.5	4		157.9	21	
	46.2	5		161.0	22	
	50.3	6				
	54.7	7				
	59.7	8				
	65.4	9				
	72.5	10				
	82.7	11				
	110.8	12				
	121.0	13				
	128.1	14				
	133.8	15				
	138.8	16				
	143.2	17				

VELOCITY DATA

Rated Total MMBtu/HR

Δp	Vel
Ts	DSCFM
Static	MMBtu/hr
Pbar	% Thr
MW(wet)	
%H2O	
%O2	
°F, (@ 60°)	

Additional Data:

Diameters before disturb _____ After _____

# of points, total _____

LABORATORY ANALYSIS

EPA METHOD 350.3 - AMMONIA ANALYSIS

COMPANY: Destec

LOCATION/UNIT: Live Oak Cogen

PROJECT: 027-488

DATE TESTED: 4/22/93

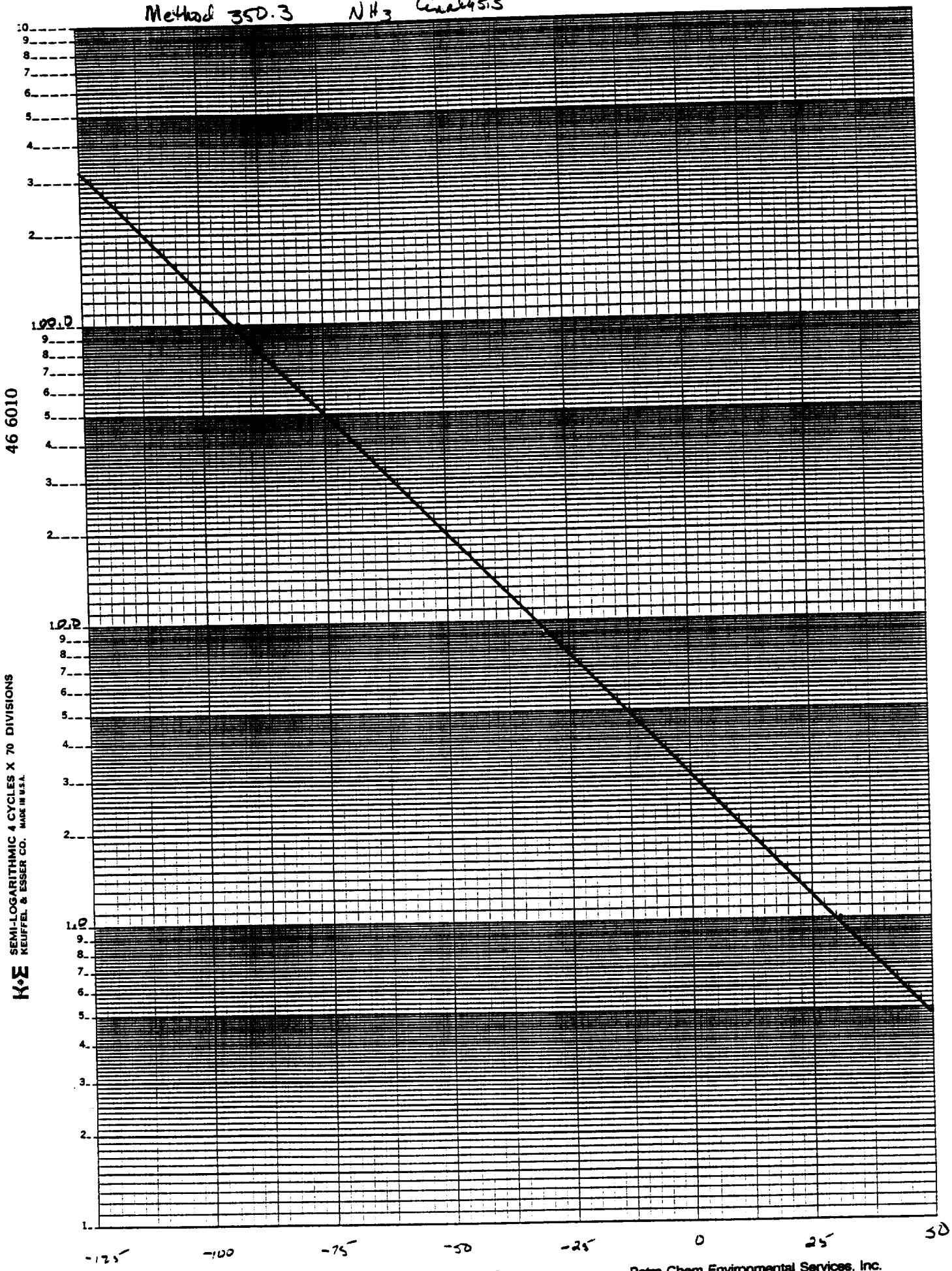
ANALYST: DGS

STANDARDIZATION:

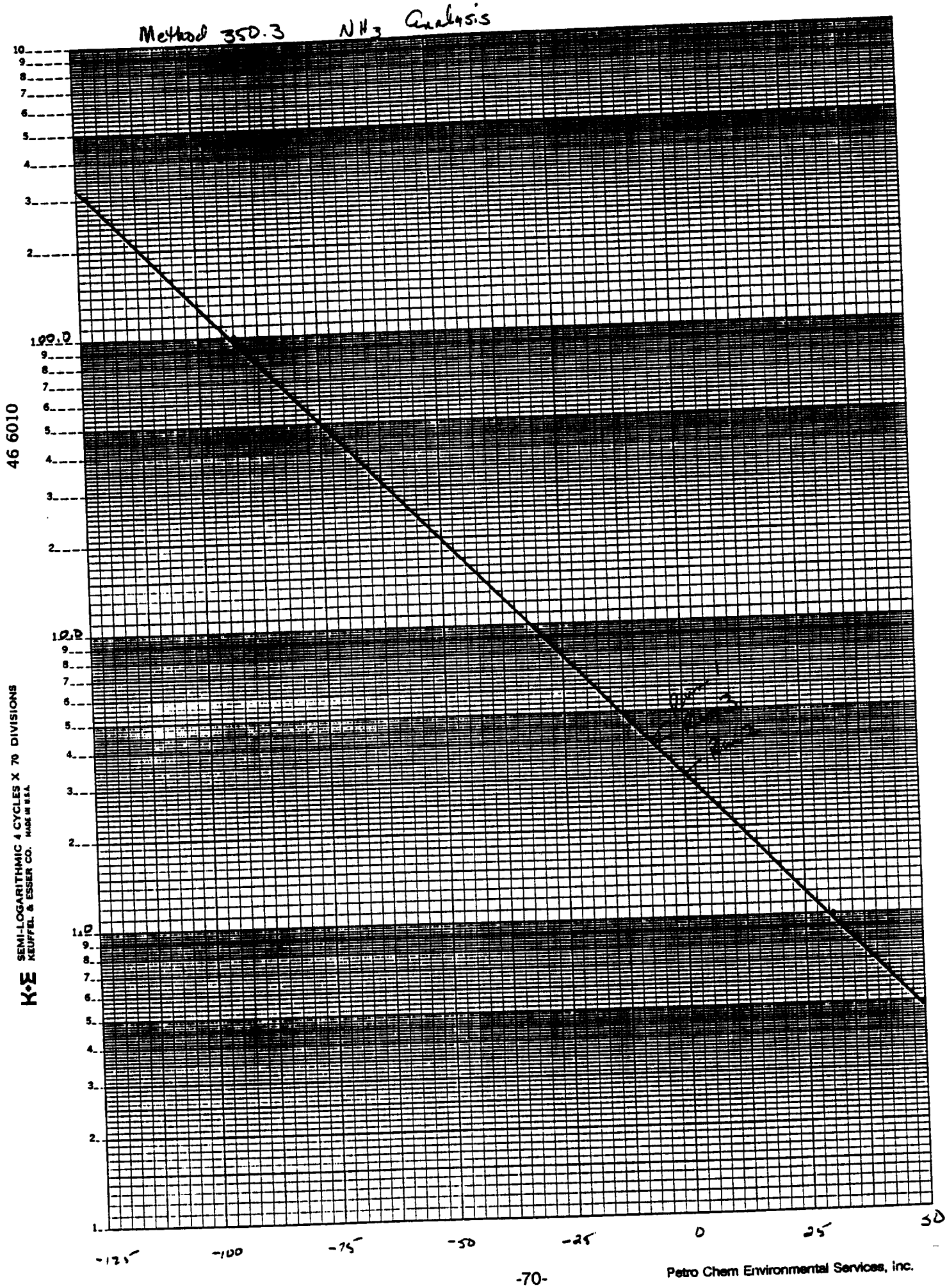
mg/L NH_4Cl	mV	SLOPE
0.1	96.8	
		65.6
1.0	31.2	
		61.6
10.0	-30.4	
		61.8
100.0	-92.2	

SAMPLE #	mV	N mg/L	df	N mg/L	NH3 mg/L	SAMPLE VOL.	T. mg
1	-6.9	3.9	—	3.9	4.73	460 ml	2.2 (2.17)
2	0	3.0	—	3.0	3.64	445 ml	1.6
3	-6.3	3.9	—	3.9	4.73	470 ml	2.2 (2.23)
Blank	126.6	*4.1				265 ml	

Method 350.3 NH_3 Analysis

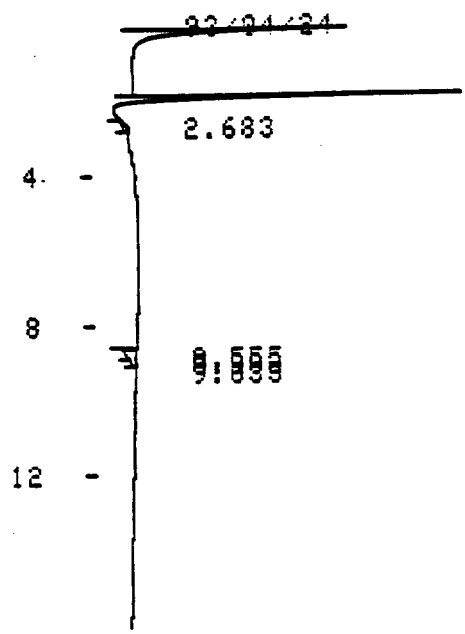


Method 350.3 NH_3 Analysis



DESTEC/WZI LIVE OAK COGEN
4-22-93 PROJECT # 027-488
HC SAMPLE BLANK

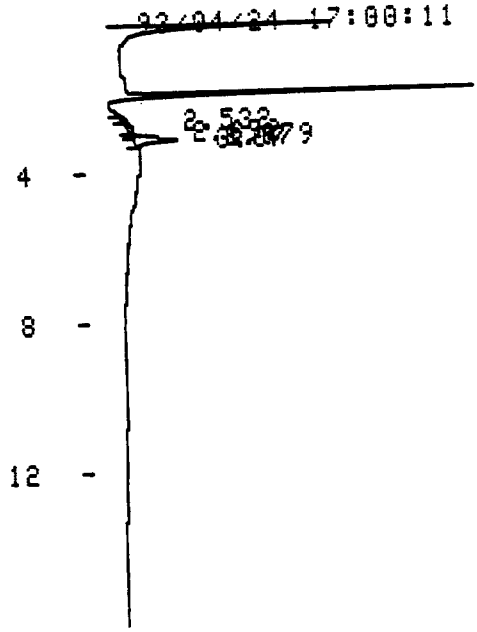
16:34:14



CHROMATOGRAM 8 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.683	218		6		C-6+
~~2~~	~~9.555~~	~~1244~~		~~1~~		~~C-5~~ } not a peak true
~~3~~	~~8.982~~	~~298~~	V	~~1~~		~~C-5~~
	TOTAL	1760			0	

DESTEC/WZI LIVE OAK COGEN
4-22-93 PROJECT # 027-488
HC SAMPLE # 1

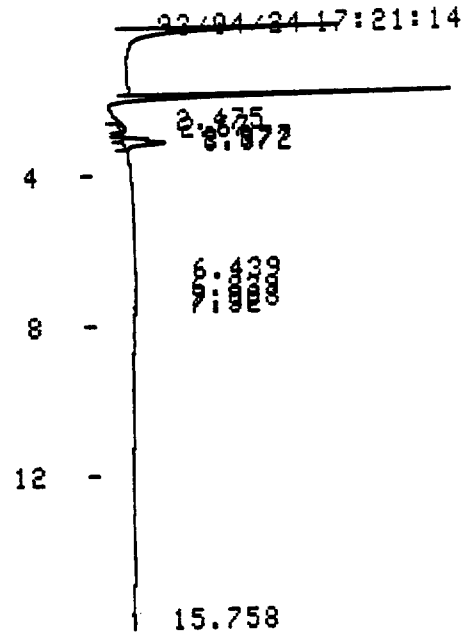


CHROMATOGRAM 9 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	~~2.533~~	~~302~~				
2	2.692	438	V	6		C-6+
3	2.979	738	V	1		C-1
4	3.07	1970	V	1		C-1
	TOTAL	3349			0	

2708

DESTEC/WZI LIVE OAK COGEN
4-22-93 PROJECT # 027-488
HC SAMPLE # 2

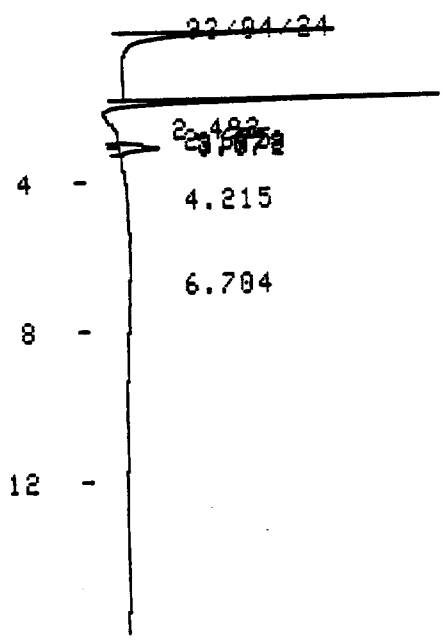


CHROMATOGRAM 10 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.67	356		6		C-6+
2	2.977	847	2606	1		C-1
3	3.072	1759	V	1		C-1
	TOTAL	2961			0	

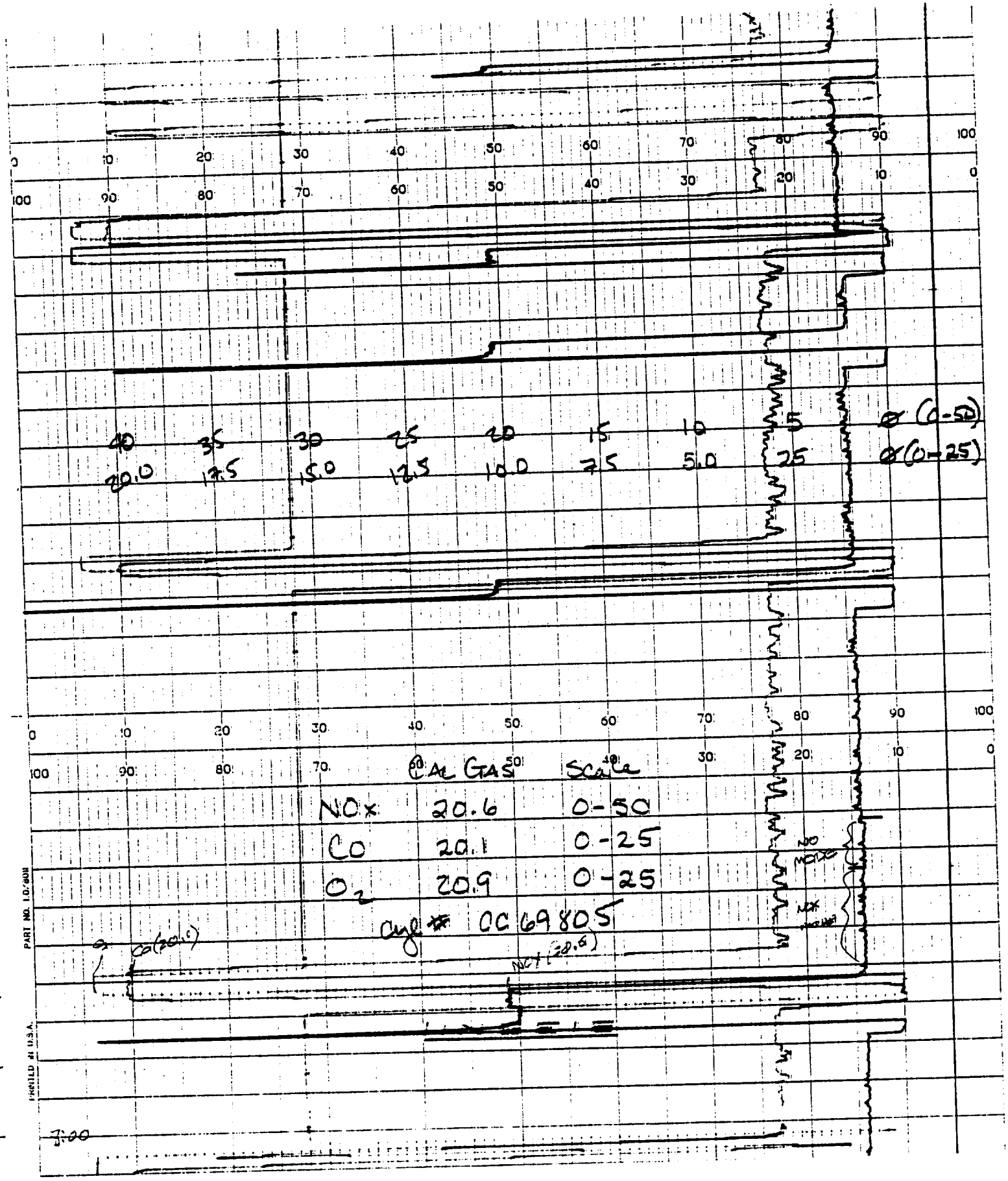
DESTEC/WZI LIVE OAK COGEN
4-22-93 PROJECT # 027-488
HC SAMPLE # 3

17:38:57

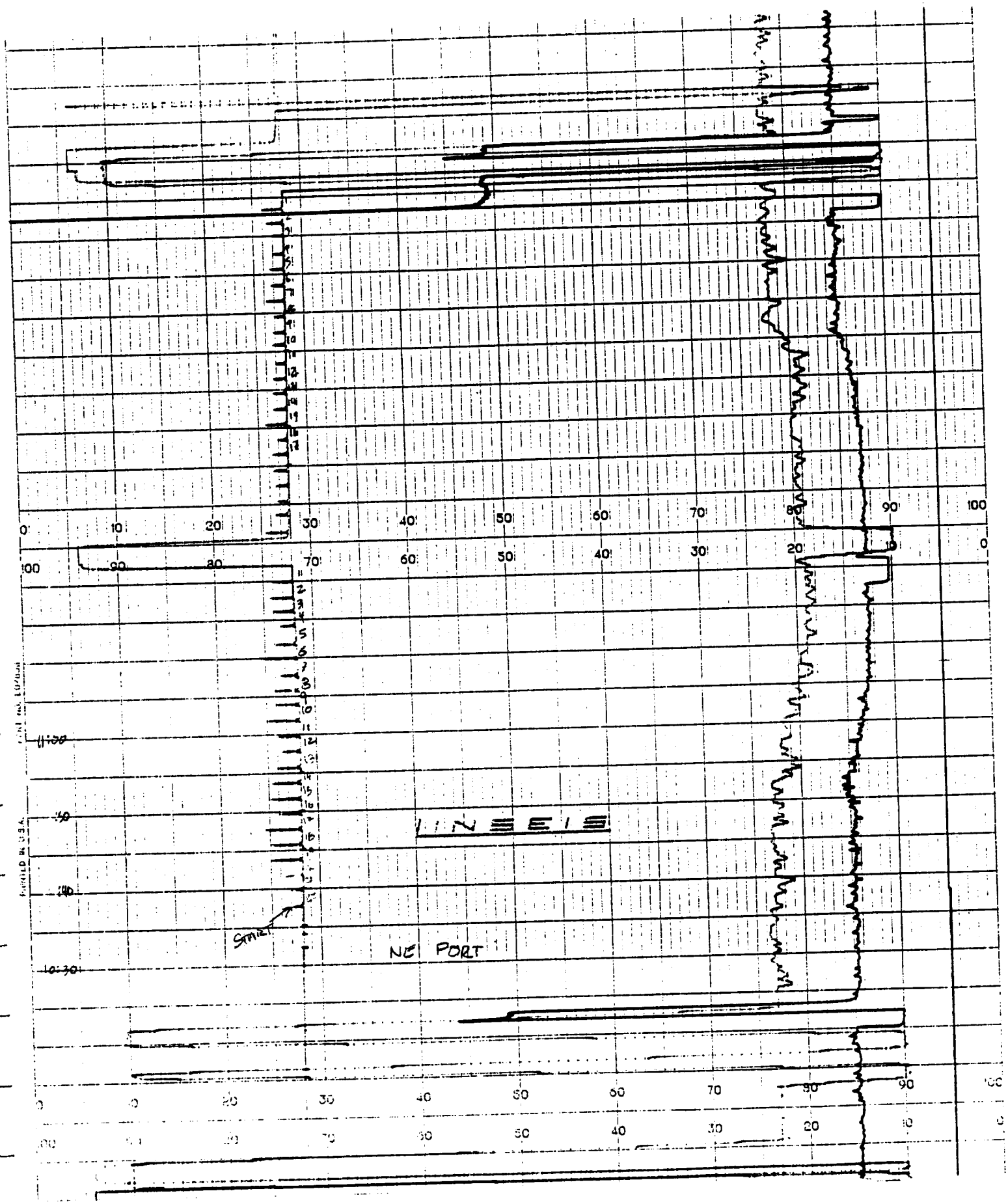


CHROMATOGRAM 11 MEMORIZED

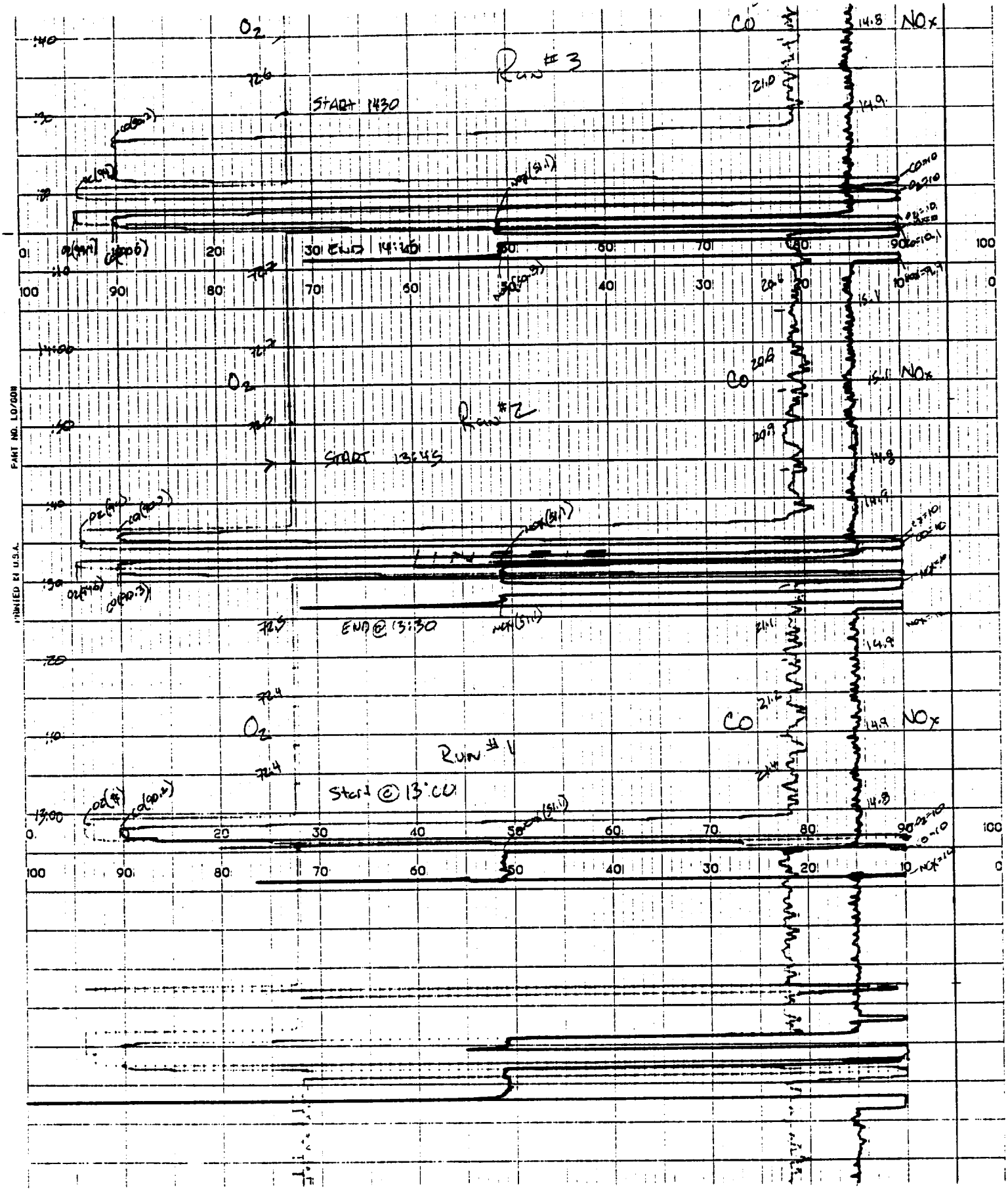
PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.978	849	V	1		C-1
2	3.072	1726		1		C-1
	TOTAL	2575			0	

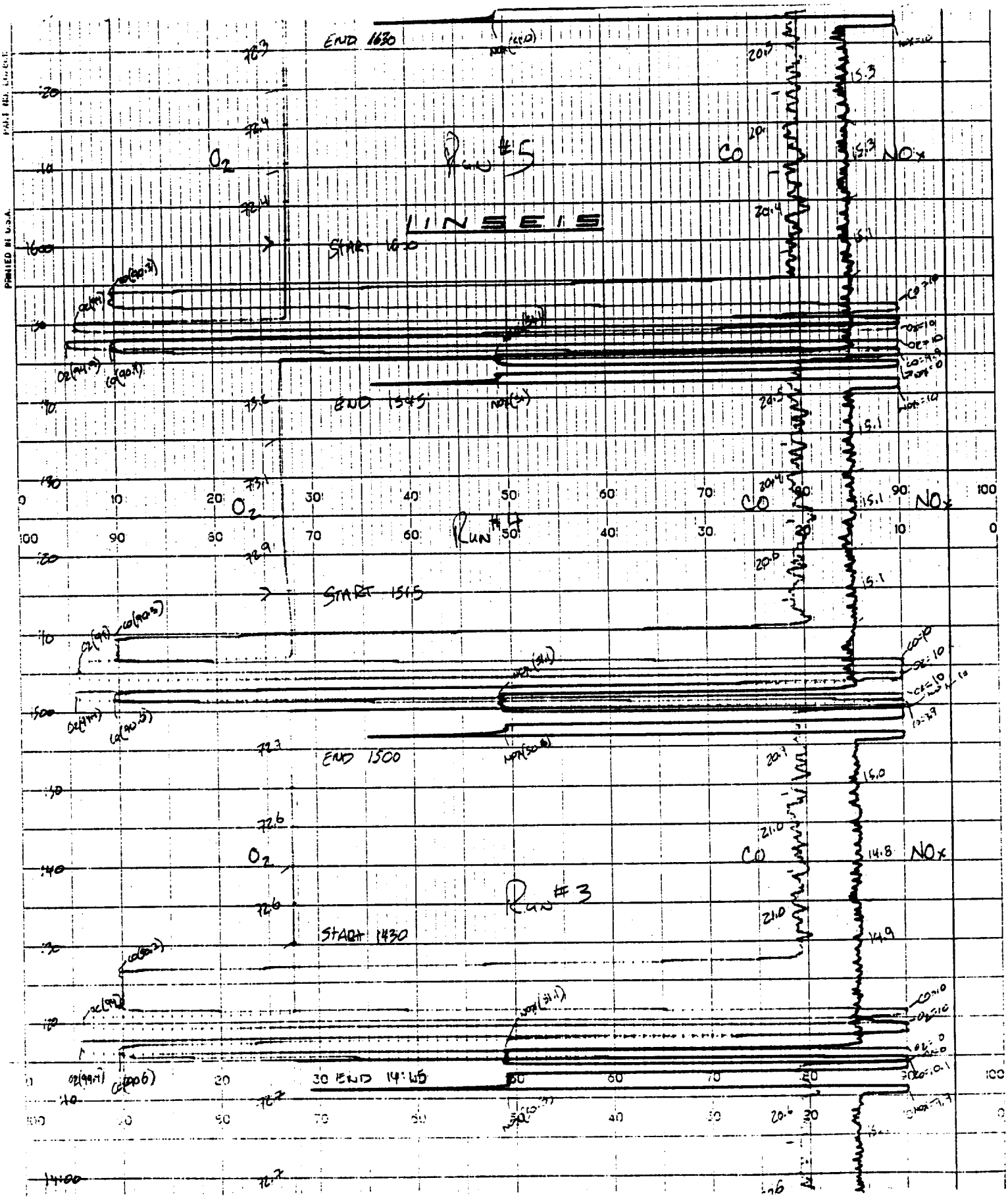


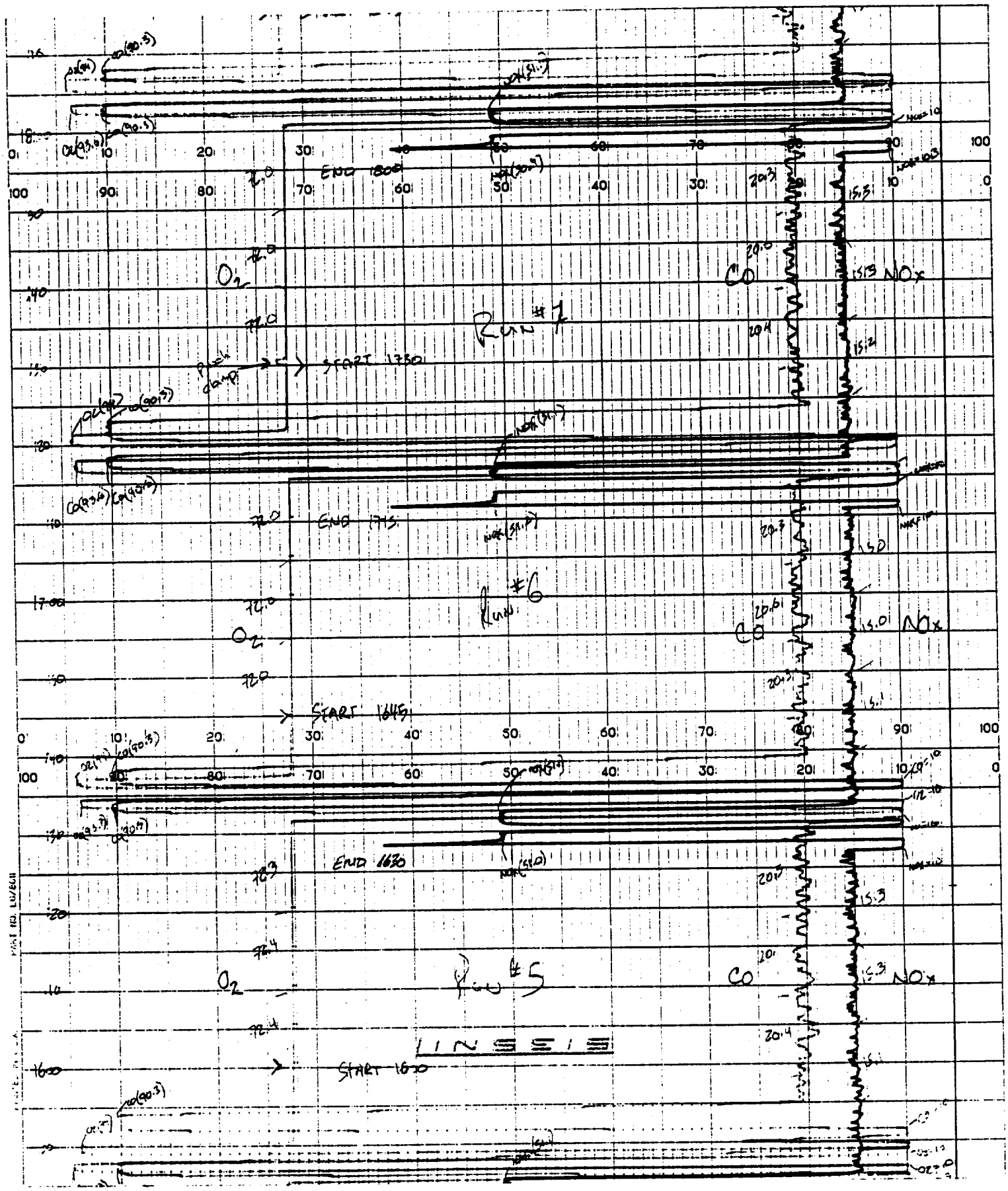
40 35 30 25 20 15 10 5 Ø (0-50)
20.0 17.5 15.0 12.5 10.0 7.5 5.0 25 Ø (0-25)
CAL GAS Scale
NOx 20.6 0-50
CO 20.1 0-25
O2 20.9 0-25
Cyl # CC 69805
NO MODE
NOx MODE
CO (20.1)
NOx (20.6)
3:00
PART NO. 1.0/80H
PRINTED IN U.S.A.

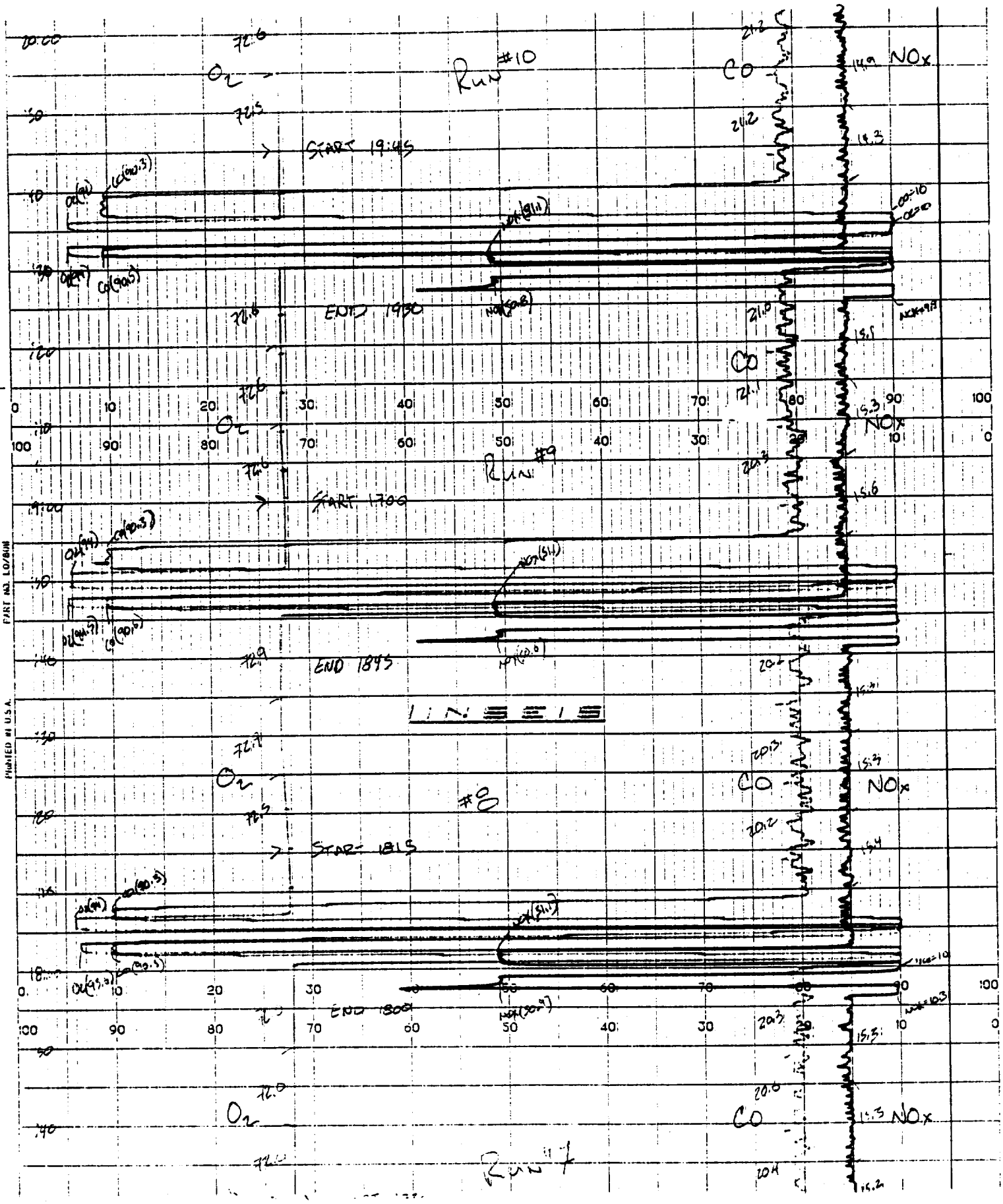


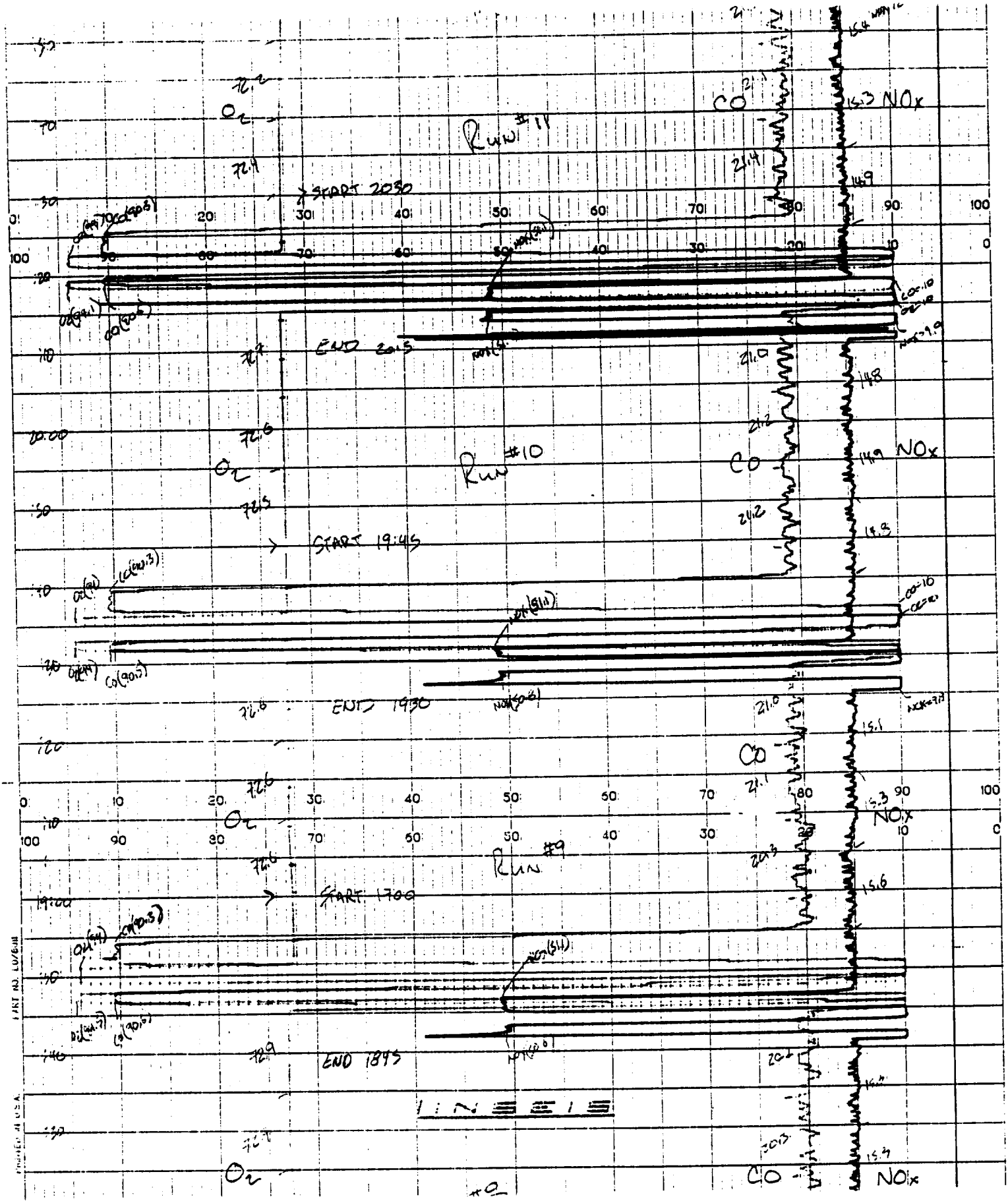
LINSEIS
NE PORT
START
11:00
10:30

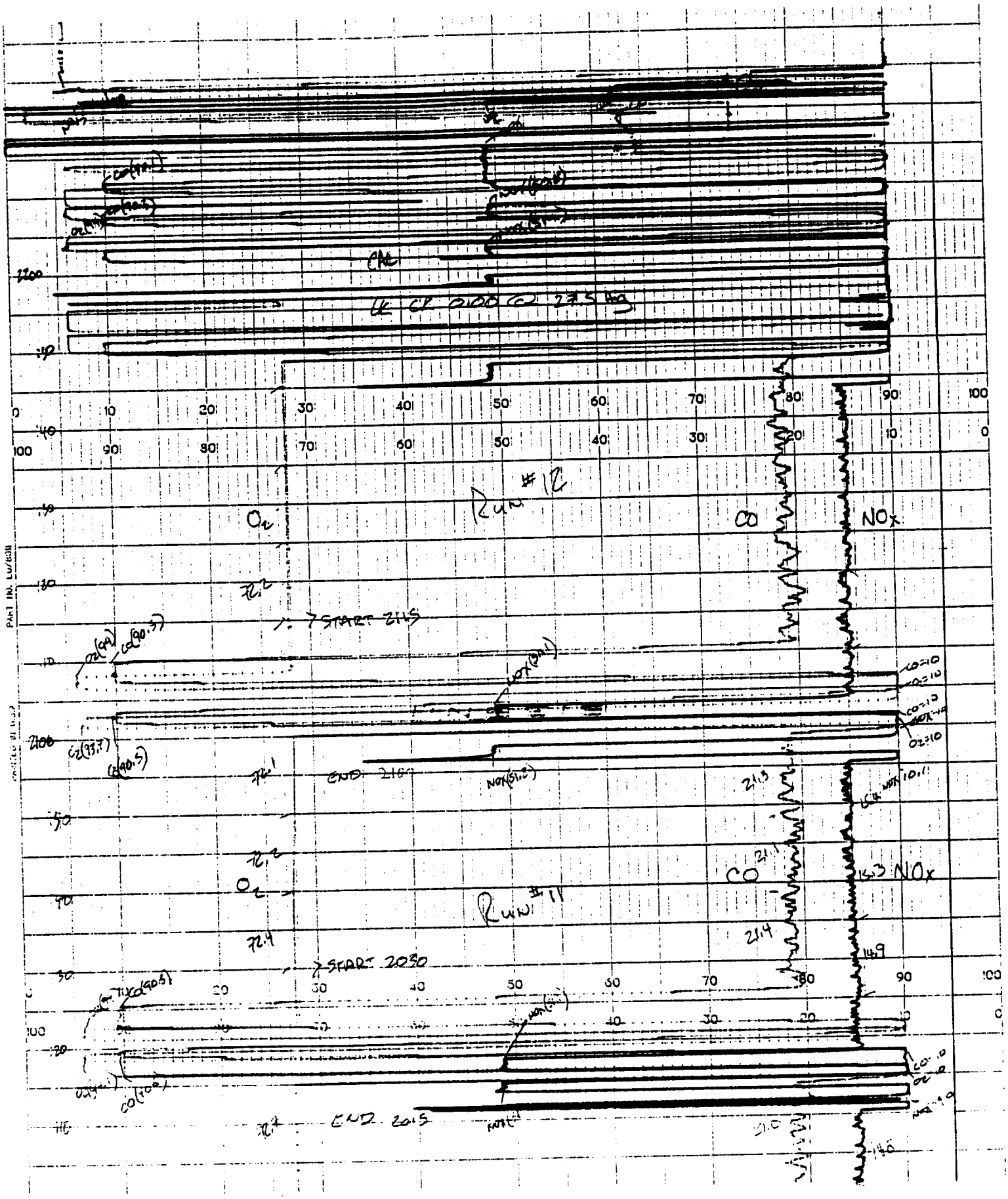

O2
CO
NOx
Run #3
START 1430
END 14:40
Run #2
START 13:45
END @ 13:30
Run #1
Start @ 13:00


END 1630
O2
Run #5
CO
NOx
LINES
START 1630
END 1545
O2
Run #4
CO
NOx
START 1515
END 1500
O2
CO
NOx
Run #3
START 1430
END 14:45


END 1800
START 1750
Run #7
O2
CO
NOx
END 1715
Run #6
START 1645
END 1630
Run #5
START 1600


Run #10
O2
CO
NOx
START 19:45
END 1930
Run #9
START 1700
END 1845
LINES
#8
START 1815
END 1800
Run #7


Run #11
START 2030
END 2015
Run #10
START 1945
END 1930
Run #9
START 1700
END 1845
O2
CO
NOx


Run #12
O2
CO
NOx
START 2145
END 2160
Run #11
O2
CO
NOx
START 2030
END 2045

PPENDIX III
TY ASSURANCE

PETRO CHEM ENVIRONMENTAL SERVICES, INC.

CHAIN OF CUSTODY RECORD

MAIN OFFICE
313 Daniels Lane
Bakersfield, CA 93307
(805) 327-7300 FAX (805) 327-3459

LAB OFFICE
3207 Antonino Avenue
Bakersfield, CA 93308
(805) 631-9332 FAX (805) 327-0860

ANALYSIS REQUEST

LABORATORY	LAB ID#
EAS	

COMPANY	LOCATION/UNIT
Dester	Live Oak Cogen

PROJECT	SAMPLED BY
027-488	DCT

METHOD	DELIVER REPORT TO:	PCES PO#
	Terry Rowles	3086

SAMPLE ID#	SAMPLE DESCRIPTION	SAMPLE DATE	Liq	Filter	Gas	Low Range Total Sulfur as H_2S				
Bag	Fuel Gas	4/22/93			X	X				

COMMENTS:

RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
D Smallwood	4/22/93		
RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
RELINQUISHED BY:	DATE	RECEIVED BY:	DATE

PETRO CHEM ENVIRONMENTAL SERVICES, INC.

DRY GAS METER CALIBRATION

DATE:	4-12-93	AMBIENT TEMP °F:	61
TECH:	BDM	BAROMETRIC Pbar:	30.06
METER I.D.#	1004	TEST METER ID#:	S5M104564
		TEST METER Mcf:	1.023

APPROXIMATE CFM		0.75	0.50	0.30
STD TEST METER VOLUME CF	INITIAL	0.00	0.00	0.00
	FINAL	7.44	10.01	10.01
	TOTAL	7.44	10.01	10.01
FIELD GAS METER VOLUME CF	INITIAL	165.40	185.40	197.40
	FINAL	172.82	185.40	207.79
	TOTAL	7.42	10.32	10.39
STD TEST METER TEMP (°F)		62.0	61.0	62.0
FIELD GAS METER TEMP (°F)	IN	71.0	75.0	74.0
	OUT	55.0	60.0	65.0
	AVERAGE	63.0	67.5	69.5
STD TEST METER PRESSURE ("H2O)		-0.60	-0.30	-0.15
FIELD GAS METER PRESSURE ("H2O)		0.73	0.32	0.09
FIELD GAS METER, Mcf		1.025891	1.003864	0.999526

FIELD AVERAGE Mcf:	1.009760	H@:	0.7246

PETRO CHEM ENVIRONMENTAL SERVICES, INC.
PITOT TUBE CALIBRATION

PITOT TUBE ID. # 13'IN
DATE: 4-30-93
CALIBRATED BY: RJK

	"A" SIDE CALIBRATION			
RUN #	Δ Pstd cm H2O (in.H2O)	Δ P(s) cm H2O (in. H2O)	Cp(s)	DEVIATION Cp(s) -Cp(A)
1	0.280	0.400	0.828	0.002
2	0.280	0.405	0.823	-0.003
3	0.285	0.410	0.825	-0.001
		Cp (SIDE A)	0.826	

	"B" SIDE CALIBRATION			
RUN #	Δ Pstd cm H2O (in.H2O)	Δ P(s) cm H2O (in. H2O)	Cp(s)	DEVIATION Cp(s) -Cp(B)
1	0.270	0.380	0.834	-0.001
2	0.270	0.385	0.829	-0.006
3	0.275	0.380	0.842	0.007
		Cp (SIDE B)	0.835	

Cp (SIDE A) - Cp (SIDE B) =	-0.009	0.831

Cp=.99 * Δ Pstd / Δ P(s)

AIRCO

542234

Airco Special Gases
Union Landing & River Roads
P.O. Drawer No. 272
Riverton
New Jersey 08077
Telephones: Marketing: 609-829-7878
Prod. & Admin.: 609-829-7914
International: 609-829-7917

CERTIFICATE OF ANALYSIS - EPA PROTOCOL GAS MIXTURE

CUSTOMER: Bakersfield Welding Supply Saugus CA

CYLINDER #: CC:69805
CYLINDER PRESSURE: 1000 psig
LABORATORY: Riverton NJ

CERTIFICATION DATE: 3/5/93
EXPIRATION DATE: 9/5/93
REFERENCE #: 30963

MIXTURE COMPONENT	ACTUAL MIXTURE CONCENTRATION	AIRCO INTERMEDIATE STANDARD CYLINDER #	CONC.	NIST SRM#
Carbon Monoxide	20.1 ppm	CC:62780	24.7 ppm	1678C

BALANCE GAS: Nitric Oxide, Sulfur Dioxide, Nitrogen

GAS ANALYZER:
MAKE: Beckman MODEL: 866 SERIAL#: 1000049
PRINCIPAL: Non-Dispersive Infrared
LAST MULTIPOINT CALIBRATION DATE: 11/3/92

R=REFERENCE STANDARD Z=ZERO GAS S=SAMPLE GAS

1ST ANALYSIS: DATE 2/26/93 ANALYST A.Lattanze

1) Z 000	R 243	S 197	CONC (1)	20.0 ppm
2) R 243	Z 000	S 197	CONC (2)	20.0 ppm
3) R 243	S 197	Z 000	CONC (3)	20.0 ppm
			AVE CONC	20.0 ppm

2ND ANALYSIS: DATE 3/5/93 ANALYST A.Lattanze

1) Z 000	R 240	S 195	CONC (1)	20.1 ppm
2) R 240	Z 000	S 195	CONC (2)	20.1 ppm
3) R 240	S 195	Z 000	CONC (3)	20.1 ppm
			AVE CONC	20.1 ppm

THIS CALIBRATION STANDARD HAS BEEN CERTIFIED VERSUS EPA TRACEABILITY PROTOCOL NO. 1, PROCEDURE G1, AND ANALYSES PERFORMED PER SECTION 3.0.4.

CERTIFIED CONCENTRATION: Carbon Monoxide==20.1ppm, Nitric Oxide=20.6ppm, Sulfur Dioxide=20.0 pp
Nitrogen=Balance

APPROVED BY [signature]
LABORATORY MANAGER

smd

AIRCO

542234

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CERTIFICATE OF ANALYSIS - EPA PROTOCOL GAS MIX

CUSTOMER: Bakersfield Welding Supply Saugus CA
CYLINDER #: CC:69805
CYLINDER PRESSURE: 1000 psig
LABORATORY: Riverton NJ

CERTIFICATION DATE: 3/5/93
EXPIRATION DATE: 9/5/93
REFERENCE #: 30963

MIXTURE COMPONENTS	ACTUAL MIXTURE CONCENTRATION	AIRCO INTERMEDIATE STANDARD CYLINDER #	CONC.	NIST SRM#
Nitric Oxide	20.6 ppm	CC:95054	18.7 ppm	2629A
Sulfur Dioxide	20.0 ppm	CC:15382	25.8 ppm	1693A

BALANCE GAS: Carbon Monoxide, Nitrogen

COMPONENT 1 GAS ANALYSIS PROCEDURE Chemiluminescence
MAKE/MODEL/SER#: Beckman, 952, 0100204
LAST MULTIPOINT CALIBRATION DATE: 2/2/93

COMPONENT 2 GAS ANALYSIS PROCEDURE Non-Dispersive Infrared
MAKE/MODEL/SER#: Beckman, 865, 0103986
LAST MULTIPOINT CALIBRATION DATE: 2/2/93
R=REFERENCE STANDARD Z=ZERO GAS S=SAMPLE GAS

1ST COMPONENT Nitric Oxide
1ST ANALYSIS: DATE 2/26/93 ANALYST A.Lattanze

1) Z 0000	R 1535	S 1680	CONC (1)	20.5 ppm
2) R 1535	Z 0000	S 1680	CONC (2)	20.5 ppm
3) R 1535	S 1680	Z 0000	CONC (3)	20.5 ppm
			AVE CONC	20.5 ppm

2ND ANALYSIS: DATE 3/5/93 ANALYST A.Lattanze

1) Z 0000	R 1500	S 1650	CONC (1)	20.6 ppm
2) R 1500	Z 0000	S 1650	CONC (2)	20.6 ppm
3) R 1500	S 1650	Z 0000	CONC (3)	20.6 ppm
			AVE CONC	20.6 ppm

2ND COMPONENT Sulfur Dioxide
1ST ANALYSIS: DATE 2/26/93 ANALYST A.Lattanze

1) Z 0000	R 2520	S 1950	CONC (1)	20.0 ppm
2) R 2520	Z 0000	S 1950	CONC (2)	20.0 ppm
3) R 2520	S 1950	Z 0000	CONC (3)	20.0 ppm
			AVE CONC	20.0 ppm

2ND ANALYSIS: DATE 3/5/93 ANALYST A.Lattanze

1) Z 0000	R 2410	S 1870	CONC (1)	20.0 ppm
2) R 2410	Z 0000	S 1870	CONC (2)	20.0 ppm
3) R 2410	S 1870	Z 0000	CONC (3)	20.0 ppm
			AVE CONC	20.0 ppm

THIS CALIBRATION STANDARD HAS BEEN CERTIFIED VERSUS EPA TRACEABILITY PROTOCOL NO. 1, PROCEDURE G1, AND ANALYSES PERFORMED PER SECTION 3.0.4.
CERTIFIED CONCENTRATION: Nitric Oxide=20.6ppm, Sulfur Dioxide=20.0ppm, Carbon Monoxide=20.1ppm Nitrogen=Balance

APPROVED BY [signature]
LABORATORY MANAGER

A member of The BOC Group
Petro Chem Environmental Services, Inc.

smd

PETRO
CHEM
ENVIRONMENTAL
SERVICES, INC.

3207 Antonino Avenue
Bakersfield, California 93308
(805) 327-7300
FAX (805) 327-3459

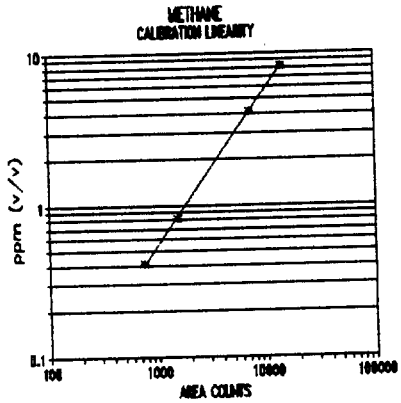
COMPANY : DESTEC OPERATING
DATE : 4-22-93
PROJECT : 027-488

DATE RECEIVED : 4-23-93
DATE ANALYZED : 4-24-93
DATE REPORTED: 4-28-93

EPA METHOD 18
LOW RANGE HYDROCARBON ANALYSIS
CALIBRATION DATA AND STATISTICS

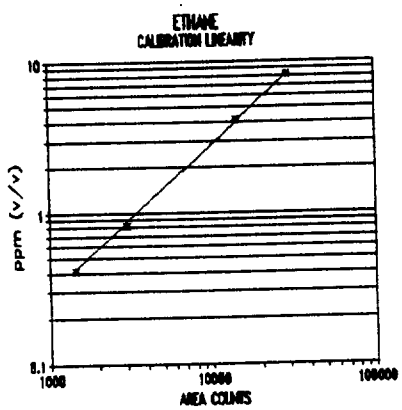
METHANE

CONC. (ppmv)	AREA COUNTS	RESPONSE FACTOR ppmv/AC
0.413	753	5.48E-04
0.825	1515	5.45E-04
4.125	7134	5.78E-04
8.25	14258	5.79E-04
	AVERAGE RF	5.62E-04
	STD. DEVIATION	1.60E-05
	RSD%	2.85%



ETHANE

CONC. (ppmv)	AREA COUNTS	RESPONSE FACTOR ppmv/AC
0.413	1433	2.88E-04
0.825	3018	2.73E-04
4.125	14282	2.89E-04
8.25	29337	2.81E-04
	AVERAGE RF	2.83E-04
	STD. DEVIATION	6.27E-06
	RSD%	2.22%



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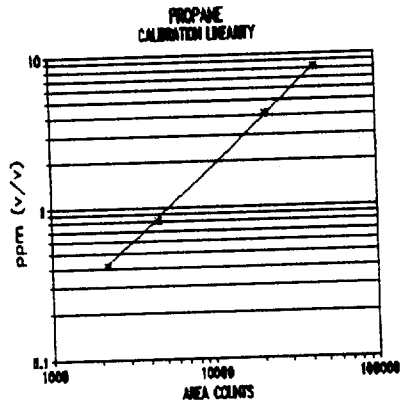
EPA METHOD 18
LOW RANGE HYDROCARBON ANALYSIS
CALIBRATION DATA AND STATISTICS

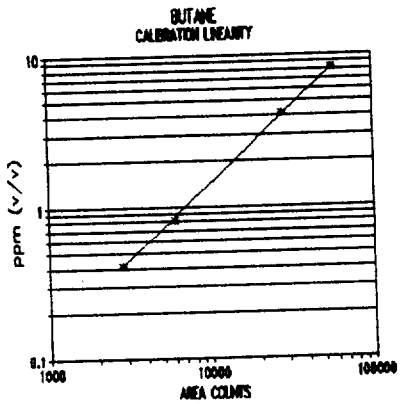
PROPANE

CONC. (ppmv)	AREA COUNTS	RESPONSE FACTOR ppmv/AC
0.413	2198	1.88E-04
0.825	4507	1.83E-04
4.125	21237	1.94E-04
8.25	43237	1.91E-04
	AVERAGE RF	1.89E-04
	STD. DEVIATION	4.10E-06
	RSD%	2.17%



BUTANE

CONC. (ppmv)	AREA COUNTS	RESPONSE FACTOR ppmv/AC
0.413	2826	1.46E-04
0.825	5953	1.39E-04
4.125	28314	1.46E-04
8.25	57502	1.43E-04
	AVERAGE RF	1.43E-04
	STD. DEVIATION	3.00E-06
	RSD%	2.09%



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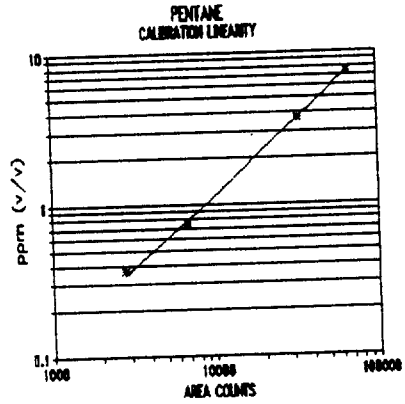
EPA METHOD 18
LOW RANGE HYDROCARBON ANALYSIS
CALIBRATION DATA AND STATISTICS

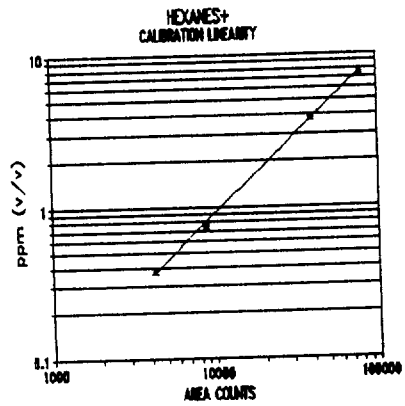
PENTANE

CONC. (ppmv)	AREA COUNTS	RESPONSE FACTOR ppmv/AC
0.37	2792	1.33E-04
0.74	6699	1.10E-04
3.7	32699	1.13E-04
7.4	66274	1.12E-04
	AVERAGE RF	1.17E-04
	STD. DEVIATION	9.04E-06
	RSD%	7.73%



HEXANE

CONC. (ppmv)	AREA COUNTS	RESPONSE FACTOR ppmv/AC
0.38	4233	8.98E-05
0.76	8763	8.67E-05
3.8	39423	9.64E-05
7.6	79851	9.52E-05
	AVERAGE RF	9.20E-05
	STD. DEVIATION	3.94E-06
	RSD%	4.28%



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COMPANY: DESTEC OPERATING
DATE : 4-22-93
PROJECT : 027-488

DATE RECEIVED : 4-23-93
DATE ANALYZED : 4-24-93
DATE REPORTED: 4-28-93

EPA METHOD 18
CALIBRATION DRIFT ANALYSIS

POST ANALYSIS CALIBRATION CHECK (0.4ppm STD.)

CONSTITUENT	INITIAL RF	POST RF	%DIFF.
METHANE	5.48E-04	5.30E-04	3.34%
ETHANE	2.88E-04	2.93E-04	-1.63%
PROPANE	1.88E-04	1.94E-04	-3.10%
BUTANE	1.46E-04	1.52E-04	-4.05%
PENTANE	1.33E-04	1.02E-04	23.21%
HEXANES+	8.98E-05	9.21E-05	-2.59%

POST ANALYSIS CALIBRATION CHECK (0.8ppm STD.)

CONSTITUENT	INITIAL RF	POST RF	%DIFF.
METHANE	5.45E-04	5.57E-04	-2.30%
ETHANE	2.73E-04	2.73E-04	0.20%
PROPANE	1.83E-04	1.87E-04	-1.90%
BUTANE	1.39E-04	1.42E-04	-2.48%
PENTANE	1.10E-04	1.09E-04	1.60%
HEXANES+	8.67E-05	9.07E-05	-4.57%

EPA METHOD 2
STACK GAS VELOCITY AND VOLUMETRIC FLOWRATE

Average Stack Gas Velocity
Eq. 2-6 & Eq. 2-9

$$P_g = \frac{Static\ Pressure,\ H_2O}{13.6}$$

$$P_s = P_{bar} + P_g$$

$$V_s = K_p\ C_p \left(\sqrt{\Delta P}\right) avg \sqrt{\frac{T_{s\,(avg)}}{P_s\ M_s}}$$

Average Stack Gas Dry Volumetric Flow Rate
Eq. 2-10

$$Q_{std} = 60\ (1 - B_{ws})\ v_s\ A \left[\frac{T_{std}}{T_{s\,(avg)}}\right] \left[\frac{P_s}{P_{std}}\right]$$

$$\frac{Q_{std}}{MF} = SCFM$$

EPA METHOD 3
DRY MOLECULAR WEIGHT OF STACK GAS
Eq. 3-2

$$M_d = 0.44\ (\%\,CO_2) + 0.320\ (\%\,O_2) + 0.280\ (\%\,N_2 + \%\,CO)$$

Wet Molecular Weight of Stack Gas

$$M_s = M_d\ (1 - B_{ws}) + 18\,(B_{ws})$$

SYSTEM BLANK
UHP NITROGEN

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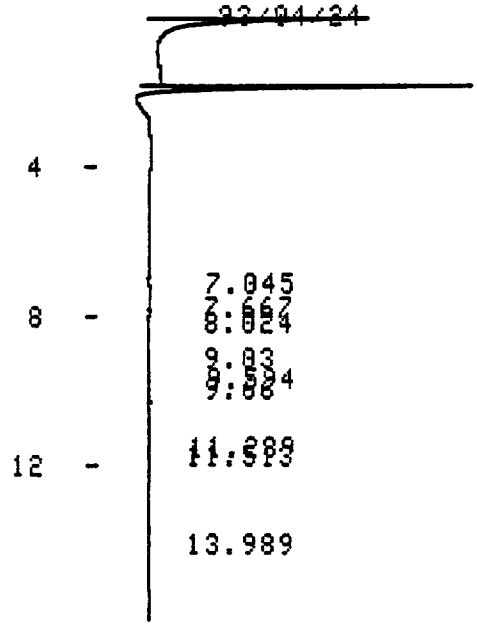
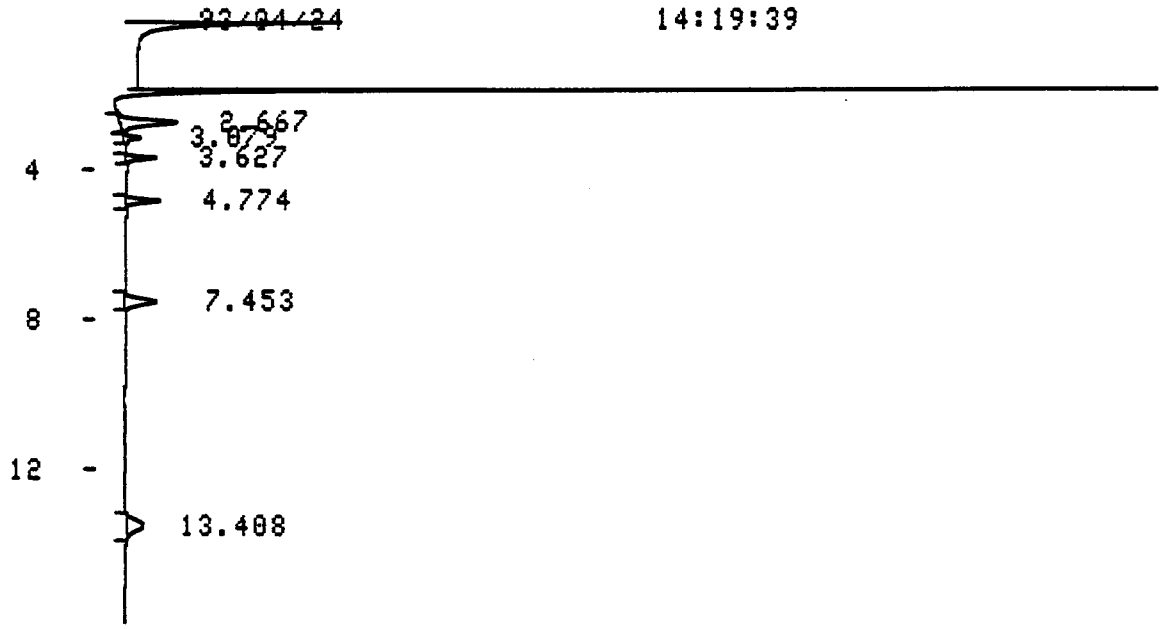


CHROMATOGRAM 3 MEMORIZED
WARNING NO PEAK

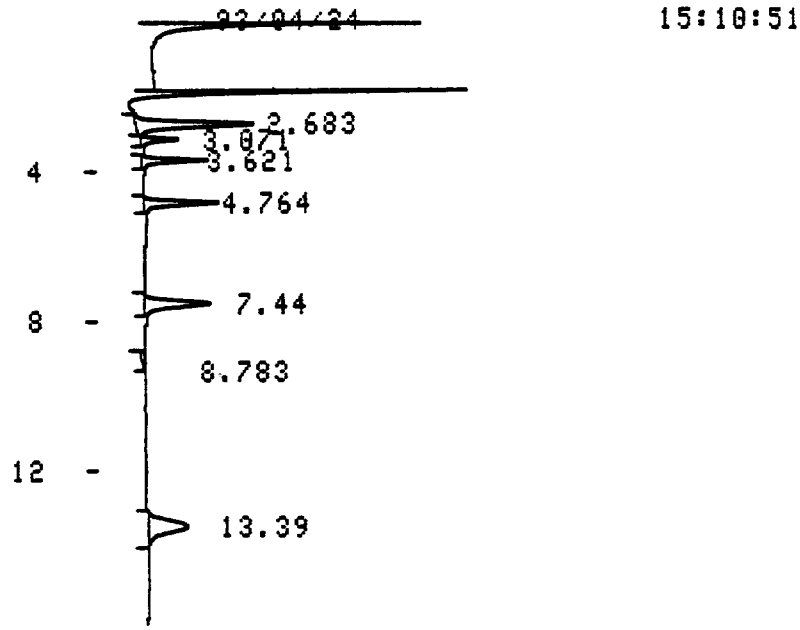
0.4PPm HYDROCARBON STANDARD
SCOTTY CAN MIX 1 DIL. 1:40



CHROMATOGRAM 18 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.667	4233		6		C-6+
2	3.079	753		1		C-1
3	3.627	1433		2		C-2
4	4.774	2198		3		C-3
5	7.453	2826		4		C-4
6	13.408	2792		5		C-5
	TOTAL	14235			0	

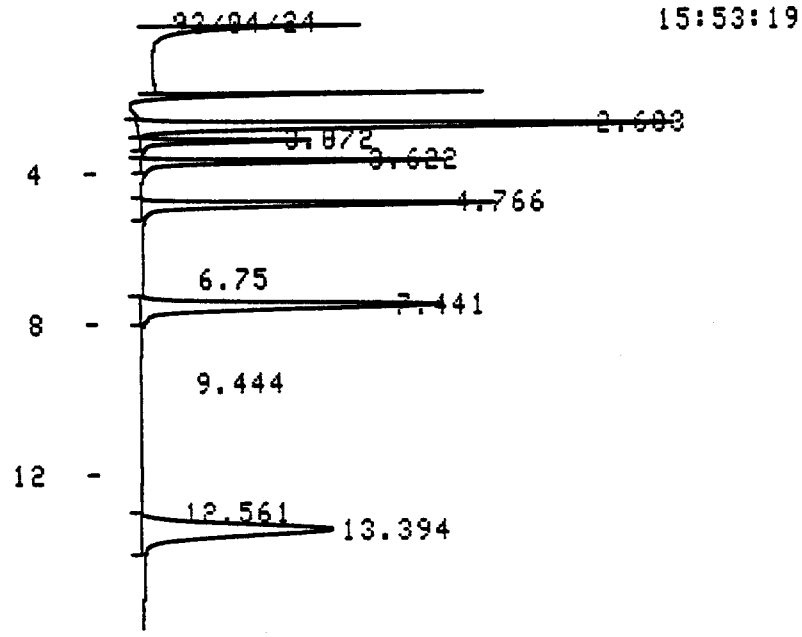
0.8PPm HYDROCARBON STANDARD
SCOTTY CAN MIX 1 DIL 1:20



CHROMATOGRAM 5 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.683	8763		6		C-6+
2	3.071	1515		1		C-1
3	3.621	3018		2		C-2
4	4.764	4507		3		C-3
5	7.44	5953		4		C-4
6	~~8.783~~	~~300~~		~~16~~		~~C-5~~
7	13.39	6699		5		C-5
	TOTAL	31263			0	

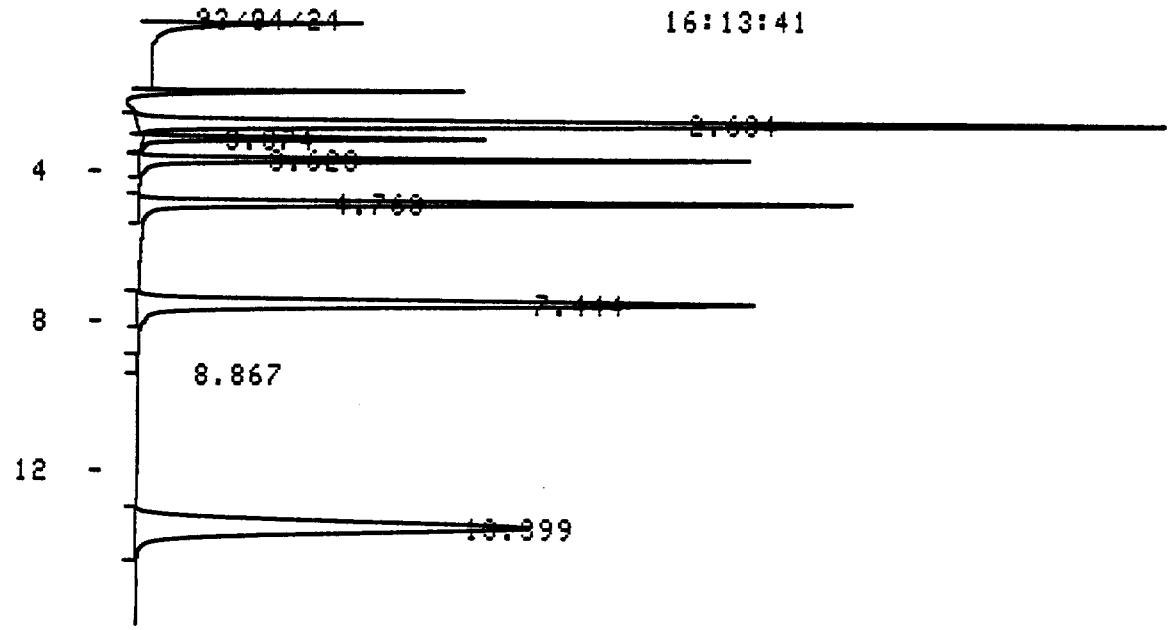
4PPm HYDROCARBON STANDARD
SCOTTY CAN MIX 1 DIL. 1:4



CHROMATOGRAM 6 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.683	39423		6		C-6+
2	3.072	7134		1		C-1
3	3.622	14282		2		C-2
4	4.766	21237		3		C-3
5	7.441	28314		4		C-4
6	13.394	32699		5		C-5
	TOTAL	143090			0	

8PPm HYDROCARBON STANDARD
SCOTTY CAN MIX 1 DIL. 1:1

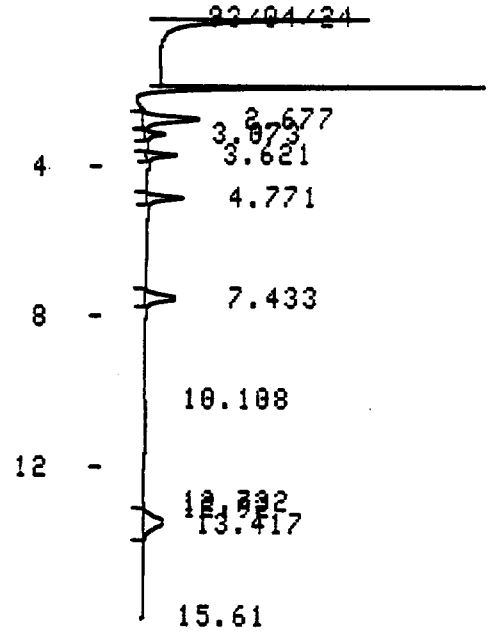


CHROMATOGRAM 7 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.684	79851		6		C-6+
2	3.074	14258		1		C-1
3	3.623	29337		2		C-2
4	4.768	43237		3		C-3
5	7.444	57502		4		C-4
6	~~8.867~~	~~216~~		~~16~~		~~C-5~~
7	13.399	66274		5		C-5
	TOTAL	290675			0	

POST ANALYSIS CALIBRATION CHECK
0.4PPm HYDROCARBON STANDARD
SCOTTY CAN MIX 1 DIL. 1:40

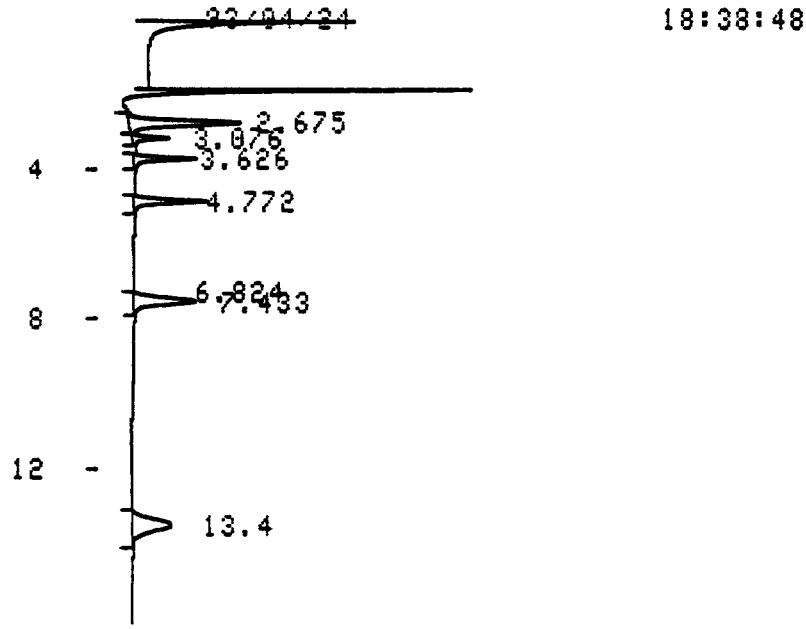
93/04/24 18:18:02



CHROMATOGRAM 16 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.677	4126		6		C-6+
2	3.073	779		1		C-1
3	3.621	1410		2		C-2
4	4.771	2132		3		C-3
5	7.433	2716		4		C-4
6	13.417	3636		5		C-5
	TOTAL	14797			0	

POST ANALYSIS CALIBRATION CHECK
0.8PPm HYDROCARBON STANDARD
SCOTTY CAN MIX 1 DIL. 1:20



CHROMATOGRAM 17 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.675	8380		6		C-6+
2	3.076	1481		1		C-1
3	3.626	3024		2		C-2
4	4.772	4423		3		C-3
5	7.433	5809		4		C-4
6	13.4	6808		5		C-5
	TOTAL	29924			0	

APPENDIX IV
CORRESPONDENCE

Gary Fuller
WZI, Inc.
March 31, 1993

Project: 027-488
Live Oak
Limited Cogen

SOURCE TEST PROTOCOL

I. Source Information

A. Unit

One 48.5 MW GE LM-5000
Gas Fired Turbine
PTO 4213001 B

B. Company

Destec Engineering , Inc.
Live Oak Limited Cogeneration Facility
Sec. 23, T28S, R27E
Kern County, California

C/O Gary Fuller (WZI, Inc.)
4700 Stockdale Highway
Bakersfield, California 93309

II. Testing Firm

Petro Chem Environmental Services, Inc.
313 Daniels Lane
Bakersfield, California 93307

Attention: Mark Ready

III. Regulatory Agency

San Joaquin Valley Unified APCD
Southern Region

IV. Summary

Determinations of concentrations (ppm) and emissions (lb/hr) of sulfur, NMHC, NOx, CO, NH_3 and Spec II, III, IV (NOx, O_2, CO) relative accuracy, from the exhaust of a gas fired Turbine/Generator.

V. Testing Date

April 22 - 23, 1993

Gary Fuller
WZI, Inc.
March 31, 1993

Project: 027-488
Live Oak
Limited Cogen

PROPOSAL FOR COMPLIANCE TESTING

Determination of concentrations (ppm) and emissions (lbs/hr) of sulfur, NMHC, NOx, CO, and NH_3 from the exhaust of one 48.5 MW gas fired Turbine/Generator. Relative Accuracy testing will be performed for NOx, O_2 and CO following Title 40 CFR performance Spec II, III and IV; a minimum of nine 30 minute runs will be performed. Fuel sulfur analysis will be performed by EPA Method 20 and 19; EAS Labs of San Luis Obispo will be used (example analysis enclosed). The following Methods will be used:

Parameters	Method	Test Runs Per Turbine	Permit Limit, lb/hr Per Turbine
Ammonia	BAAQMD ST-1B	3 - 30 minute	20 ppm
Sulfur	Fuel Analysis / Fuel Rates	1	*** .29 lb/hr as sulfur
NMHC	EPA Method 18; (modified) C_1-C_6+	3	** 5.37 lb/hr
* NOx	EPA Method 20; Chemiluminescent Analyzer	9 - 30 minute	6.16 lb/hr .0135 lb/MMBtu
* CO	EPA Method 10; GFC Analyzer	9 - 30 minute	11.00 lb/hr
* O_2	EPA Method 20; Fuel Cell Analyzer	9 - 30 minute	—
Molecular Weight $O_2/CO_2/N_2$	EPA Method 3; Orsat Analysis	2	—
Volume Flow DSCFM	EPA Method 2 & 4; Pitot Tube Traverse and Condensation Train	2	—
Relative Accuracy NOx/O_2/CO	Title 40 CFR Performance Spec II, III and IV	See above NOx/O_2/CO	20%/20%/10%

* An initial 48 point concentration traverse will be performed to document the point(s) of average concentration. All follow-up runs will be performed at the point(s) of average concentration.

** The Method 18 analysis will be modified to increase sensitivity to 0.2 ppm C_1-C_6+. Sample analysis is enclosed.

*** Emissions as sulfur = (lb/hr SO_2/s) + lb/hr SO_4/3.

SAN JOAQUIN VALLEY
UNIFIED AIR POLLUTION CONTROL DISTRICT
SOUTHERN REGION

Fresno Kern Kings Madera

Merced San Joaquin Stanislaus Tulare

PERMIT TO OPERATE

Number: 4213001(B)

PERMIT TO OPERATE IS HEREBY GRANTED TO: LIVE OAK LIMITED

FOR EQUIPMENT LOCATED AT: Sec. 18, T28S, R28E

EQUIPMENT OR PROCESS DESCRIPTION: One Cogeneration Unit

OPERATIONAL CONDITIONS LISTED BELOW.

THIS PERMIT BECOMES VOID UPON ANY CHANGE OF OWNERSHIP OR LOCATION, OR ANY ALTERATION.

NOTE: The permittee may be required to provide adequate sampling and testing facilities. Equipment modification requires a new permit.

REVOCABLE: This permit does not authorize the emission of air contaminants in excess of those allowed by the Rules and Regulations of the S.J.V.U.A.P.C.D.

DAVID L. CROW
EXECUTIVE DIRECTOR/APCO

By: Jon M. Adams

For Period: 04-30-92 TO 04-30-93

CONDITIONAL APPROVAL:
Compliance with all conditions of approval imposed by any applicable Authority to Construct is required for life of this equipment unless modified by application.

EQUIPMENT DESCRIPTION: Gas-Fired 48 Megawatt Cogeneration Facility, including the following equipment:

a. Stewart & Stevenson GE LM-5000 gas turbine generator system, 48 MW capacity.
b. Heat recovery boiler, 110,000 lb/hr 650 psig steam, 30,000 lbm/hr 200 psig steam.
c. Inlet air absorption chiller and heat exchanger.
d. Turbine combustor steam injection system for NOx control.
e. Selective catalytic reduction (SCR) system (for NOx control) utilizing ammonia as reducing agent.
f. Engelhard carbon monoxide reactor 236.4 in. wide x 375.5 in. high x 18.0 in. deep with 104 catalyst modules.
g. Continuously recording monitor for ammonia.
h. Continuously recording monitors for O and NOx.
i. Dollinger GP298-GTS-60 turbine lube oil mist eliminator.
j. Dollinger AE129-660 generator lube oil mist eliminator.

OPERATIONAL CONDITIONS:

1. Gas turbine engine shall be fired exclusively with PUC-regulated quality natural gas. (Rule 220.1-BACT)
2. Gas turbine engine steam injection rate shall be maintained at steam-to-fuel ratio documented to result in compliance with emission limits. (Rule 209)
3. Ammonia injection rate shall be controlled to maintain ammonia "breakthrough" to less than 20 ppmv. (Rule 419)
4. Fuel gas sulfur content shall not exceed 0.25 gr. H2S/100 scf without prior District approval. (Rule 220.1-BACT)

5. SO2 exhaust stack concentration shall not exceed 0.015% by volume and NO2 exhaust stack concentration shall not exceed 0.0108% by volume at 15% oxygen on dry basis. (Rule 422)
6. Live Oak Limited shall maintain accurate records of sulfur content in fuel gas and make such records readily available for District inspection upon request. (Rule 422)
7. If steam injection or SCR system is inoperative, gas turbine engine shall be shut down. (Rule 209)
8. Inlet gas temperature to catalyst bed shall be maintained within range recommended by catalyst manufacturer. (Rule 209)
9. Gas turbine engine shall not burn more than 10.28 MM scf/day of natural gas. (Rule 220.1)
10. Temperature of exhaust flow through carbon monoxide reactor shall be no less than 760 deg. F. (Rule 209)
11. All gas turbine engine exhaust shall flow through catalyst bed. (Rule 220.1)
12. Gas turbine engine shall be equipped to burn PUC-regulated natural gas only. (Rule 220.1)
13. Gas turbine engine shall be equipped with continuously recording fuel gas flowmeter. (Rule 209)
14. Gas turbine engine combustor steam injection system shall be equipped with continuously recording steam-to-fuel injection rate monitoring system accurate to within ±5%. (Rule 422)
15. Gas turbine exhaust shall be equipped with continuously recording O2, NOx and ammonia monitors. (Rule 209)
16. Circular cross section exhaust stack shall be equipped with permanent provisions to allow collection of stack gas samples consistent with EPA test methods and equipped with flow straighteners, if necessary, to minimize turbulence. (Rule 108.1)
17. Gas temperature at SCR catalyst section inlet shall be monitored by operational temperature indicator. (Rule 209)
18. Ammonia injection grid shall be equipped with operational ammonia flowmeter and injection pressure indicator. (Rule 209)
19. Installed SCR unit shall provide space for additional catalyst if source operation cannot achieve sampling limits. (Rule 209)
20. Gas turbine lube oil system atmospheric vent shall be equipped with aerosol/smoke control provisions. (Rule 209)
21. Live Oak Limited shall comply in full with Rule 422 (New Source Performance Standards) requirements including notification, recordkeeping and monitoring requirements. (Rule 422)
22. Continuous emission monitoring system for NOx (as NO2), NH3, and O2 serving exhaust gas steam shall conform to Rule 108 specifications. (Rule 108)
23. Continuous emission monitoring systems shall be calibrated and operated according to EPA guidelines as specified in CFR, Part 60, Appendix B. (Rule 108)
24. Audits of monitors shall be conducted semi-annually by independent laboratory in accordance with EPA guidelines, witnessed by District, and reports shall be submitted to District within 30 days of such audit. (Rule 108)
25. Live Oak continuous emission monitoring printouts shall be made readily available for District inspection upon request. (Rule 108)

26. Live Oak Limited shall keep accurate records of daily fuel consumption of gas turbine engine and shall make them readily available for District inspection upon request. (Rule 209)
27. Steam produced at this facility for use in oil-production operations shall be injected only into strata for which all wells are connected to District-authorized well vent vapor control system(s). (Rules 220.1 & 465.1)
28. Noncompliance with emission limit(s) requires immediate shutdown or curtailment to effect compliance. Installation of additional control provisions or increase in emission limit(s) requires modified Authority to Construct before continued operation at non-complying levels. Pursuant to Section 42350 of California Health and Safety Code, a variance from this condition cannot be obtained. (Rule 209)
29. Live Oak Limited shall monitor and records exhaust gas temperature at oxidation catalyst inlet, and if average temperature exceeds 800 deg. F., shall establish catalyst hydrocarbon control satisfies BACT requirement. (Rule 220.1)
30. This Authority to Construct cancels and replaces Authority to Construct #4213001. (Rule 220.1)

COMPLIANCE TESTING REQUIREMENTS:

Compliance with all emission sampling limits shall be demonstrated by District-witnessed sample collection by independent testing laboratory within 60 days after start-up of this equipment. Compliance with sulfur compounds emission sampling limits shall be demonstrated by fuel gas sulfur analysis, and compliance with oxides of nitrogen, VOC, carbon monoxide and ammonia emission sampling limits shall be demonstrated by District-witnessed sample collection by independent testing laboratory annually 60 days prior to permit anniversary date. Lube oil vent emission rate shall be tested if five percent opacity or greater visible emissions are exhibited. Official test results and field data shall be submitted to District within 30 days after collection. (Rule 108.1)

EMISSION SAMPLING LIMITS: Total for turbine exhaust plus lube oil vent

Particulates (PM-10):	2.76 lbm/hr (Rule 220.1)
Sulfur Compounds:	0.29 lbm/hr (of SO2) (Rule 220.1) 0.10 lbm/hr (of SO4) (Rule 220.1)
Oxides of Nitrogen:	5.78 lbm/hr (as NO2) (Rule 220.1) 0.0127 lbm/MM Btu (as NO2) (Rule 220.1-BACT req.)
Volatile Organic Compounds (VOC):	0.58 lbm/hr (including lube oil cooler (accumulating vent(s) (Rule 220.1) 0.576 ppmv dry at 15% O_2 (as CH_4) (Rule 220.1-BACT req.) (Only if catalyst inlet temperature exceeds 800 deg. F., see special cond. ii)
Carbon Monoxide:	10.90 lbm/hr (Rule 220.1)
Ammonia:	20.0 ppmv (Rule 419)

WARNING:

Failure of carbon monoxide reactor or SCR catalyst to perform as required because of catalyst poisoning or fouling shall not be recognized as basis for Rule 111 enforcement exemption. (Rule 111)

STATE OF CALIFORNIA AIR TOXICS HOT SPOTS REQUIREMENTS:

Facility shall comply with California Health and Safety Code Sections 44300 through 4384. (Rule 208.1)

STATIONARY SOURCE CURTAILMENT PLANS AND TRAFFIC ABATEMENT PLANS:

Facilities expected to emit 100 tons per year or more of carbon monoxide, hydrocarbons, PM-10 or oxides of nitrogen shall comply with SJVUAPCD Rule 613.

RULE 220.1 (NSR) ANALYSIS VALIDATION:

Maximum daily emission rate of all air contaminants from this permit unit shall not exceed the following daily emission limitations:

Particulates (PM-10):	68.29 lbm/day (Rule 220.1)
Sulfur Compounds:	6.90 lbm/day (of SO_2) (Rule 220.1) 2.30 lbm/day (of SO_4) (Rule 220.1)
Oxides of Nitrogen:	138.66 lbm/day (as NO_2) (Rule 220.1)
Volatile Organic Compounds (VOC):	14.00 lbm/day (Rule 220.1)
Carbon Monoxide:	261.56 lbm/day (Rule 220.1)

Compliance with these emission limits shall be verified by source operator on daily basis and written documentation made readily available to District for period of one year.

San Joaquin Valley
Unified Air Pollution Control District

PERMIT TO OPERATE

PERMIT NO.: 4213001C

EXPIRATION DATE: APRIL 30, 1993

LEGAL OWNER OR OPERATOR: LIVE OAK LIMITED
(Destec Energy Incorporated, Managing General Partner)

MAILING ADDRESS: 4800 Easton Drive, Suite 114
Bakersfield, California 93309

EQUIPMENT LOCATION: NW/4 Sec. 18, T28S, R28E
Kern River Oil Field

EQUIPMENT DESCRIPTION:
Gas-Fired 48 Megawatt Cogeneration Facility

CONDITIONS

1. Stewart & Stevenson GE LM-5000 gas turbine generator system shall have a capacity of no greater than 48 MW and a heat input rating of no greater than 453 MMBtu/hr. (Rule 2010)
2. Turbine shall be equipped with heat recovery boiler, 110,000 lb/hr 650 psig steam, 30,000 lb/hr 200 psig steam. (Rule 2010)
3. Turbine shall be equipped with inlet air absorption chiller and heat exchanger. (Rule 2010)
4. Turbine shall be equipped with turbine combustor steam injection system for NOx control. (Rule 2010)
5. Unfired heat recovery boiler shall be equipped with selective catalytic reduction (SCR) system (for NOx control) utilizing ammonia as reducing agent. (Rule 2010)
6. Unfired heat recovery boiler shall be equipped with Engelhard carbon monoxide reactor 236.4 in. wide x 375.5 in. high x 18.0 in. deep with 104 catalyst modules. (Rule 2010)

(CONDITIONS CONTINUE ON THE NEXT PAGE)

This Permit to Operate remains valid through the permit expiration date listed above, subject to payment of annual permit fees and compliance with permit conditions and all applicable local, state, and federal regulations. This permit is valid only at the location specified above, and becomes void upon any transfer of ownership or location. Any modification of the equipment or operation, as defined in District Rule 220.1, will require a new permit. This permit shall be posted as prescribed in District Rule 2010.

DAVID L. CROW

Executive Director / APCO

Southern Regional Office * 2700 M Street, Suite 275 * Bakersfield, California 93301 * (805) 861-3682 * FAX (805) 861-2060

Petro Chem Environmental Services, Inc.

7. Unfired heat recovery boiler exhaust shall be equipped with continuously recording monitor for ammonia. (Rule 2010)
8. Unfired heat recovery boiler exhaust shall be equipped with continuously recording monitors for 0_2 and NO_x. (Rule 2010)
9. Turbine lube oil vent shall be equipped with R. K. Chase turbine lube oil vent demister. (Rule 2010)
10. Turbine lube oil reservoir shall be equipped with R. K. Chase turbine lube oil reservoir demister. (Rule 2010)
11. Turbine generator shall be equipped with Dollinger AE129-660 generator lube oil mist eliminator. (Rule 2010)
12. No emission shall cause injury, detriment, nuisance or annoyance or endanger the comfort, repose, health or safety of any persons or have a natural tendency to cause injury or damage to business or property. (Rule 4002)
13. There shall be no odors detectable at or beyond property boundary. (Rule 4002)
14. Gas turbine engine shall be equipped to burn PUC-regulated quality natural gas only. (Rule 220.1)
15. Gas turbine engine shall be equipped with continuously recording fuel gas flowmeter. (Rule 220.1)
16. Gas turbine engine combustor steam injection system shall be equipped with continuously recording steam-to-fuel injection rate monitoring system accurate to within $\pm$ 5%. (Rule 422)
17. Gas turbine exhaust shall be equipped with continuously recording 02, NOx and ammonia monitors. (Rules 220.1 & 4002)
18. Circular cross section exhaust stack shall be equipped with permanent provisions to allow collection of stack gas samples consistent with EPA test methods and equipped with flow straighteners, if necessary, to minimize turbulence. (Rule 108.1)
19. Gas temperature at SCR catalyst section inlet shall be monitored by operational temperature indicator. (Rule 220.1)
20. Ammonia injection grid shall be equipped with operational ammonia flowmeter and injection pressure indicator. (Rule 220.1)
21. Installed SCR unit shall provide space for additional catalyst if source operation cannot achieve sampling limits. (Rule 220.1)
22. Gas turbine lube oil system atmospheric vent shall be equipped with aerosol/smoke control provisions. (Rule 4001)
23. Gas turbine engine shall be fired exclusively with PUC-regulated quality natural gas. (Rule 220.1 - BACT requirement)
24. Gas turbine engine steam injection rate shall be maintained at steam-to-fuel ratio documented to result in compliance with emission limits. (Rule 220.1)
25. Ammonia injection rate shall be controlled to maintain ammonia "breakthrough" to less than 20 ppmv. (Rule 4002)
26. Fuel gas sulfur content shall not exceed 0.25 gr. H2S/100 scf without prior District approval. (Rule 220.1 - BACT requirement)
27. SO2 exhaust stack concentration shall not exceed 0.015% by volume and NO2 exhaust stack concentration shall not exceed 0.0108% by volume at 15% oxygen on dry basis. (Rule 422)

28. Live Oak Limited shall maintain accurate records of sulfur content in fuel gas and make such records readily available for District inspection upon request. (Rule 422)
29. If steam injection or SCR system is inoperative, gas turbine engine shall be shut down. (Rule 220.1)
30. Inlet gas temperature to catalyst bed shall be maintained within range recommended by catalyst manufacturer. (Rule 220.1)
31. Gas turbine engine shall not burn more than 10.28 MM scf/day of natural gas. (Rule 220.1)
32. Temperature of exhaust flow through carbon monoxide reactor shall be not less than 760 deg. F. (Rule 220.1)
33. All gas turbine engine exhaust shall flow through catalyst bed. (Rule 220.1)
34. Live Oak Limited shall comply in full with Rule 422 (New Source Performance Standards) requirements including notification, recordkeeping and monitoring requirements. (Rule 422)
35. Continuous emission monitoring system for NOx (as NO2), NH3, and 02 serving exhaust gas stream shall conform to Rule 1080 specifications. (Rule 1080)
36. Continuous emission monitoring systems shall be calibrated and operated according to EPA guidelines as specified in CFR, Part 60, Appendix B. (Rule 1080)
37. Audits of monitors shall be conducted semiannually by independent laboratory in accordance with EPA guidelines, witnessed by District, and reports shall be submitted to District within 30 days of such audit. (Rule 1080)
38. Live Oak Limited continuous emission monitoring printouts shall be made readily available for District inspection upon request. (Rule 1080)
39. Live Oak Limited shall keep accurate records of daily fuel consumption of gas turbine engine and shall make them readily available for District inspection upon request. (Rule 220.1)
40. Steam produced at this facility for use in oil-production operations shall be injected only into strata for which all wells are connected to District-authorized well vent vapor control system(s). (Rules 220.1 & 465.1)
✓41. Noncompliance with emission limit(s) requires immediate shutdown or curtailment to effect compliance. Variance from this condition cannot be obtained. (C. H. & S. C. Section 42350)
42. Installation of additional control provisions or increase in emission limit(s) requires modified Authority to Construct before continued operation at non-complying levels. (Rule 220.1)
43. Live Oak Limited shall monitor and record exhaust gas temperature at oxidation catalyst inlet, and if average temperature exceeds 800 deg. F, shall establish catalyst hydrocarbon control satisfies BACT requirement. (Rule 220.1)
44. Failure of carbon monoxide reactor or SCR catalyst to perform as required because of catalyst poisoning or fouling shall not be recognized as basis for Rule 1100 enforcement exemption. (Rule 1100) MKB
45. Emission sampling limits of particulates (PM_{10}), total for turbine exhaust ~~plus lube oil vent,~~ shall not exceed 0.0061 lbm PM_{10}/MMBtu. (Rule 220.1) MKB
46. Emission sampling limits of sulfur compounds, total for turbine exhaust ~~plus lube oil vent,~~ shall not exceed 0.0006 lbm SO_2/MMBtu or 0.0002 lbm SO_4/MMBtu. (Rule 220.1) MKB
47. Emission sampling limits of oxides of nitrogen, total for turbine exhaust ~~plus lube oil vent,~~ shall not exceed 3.6 ppmv dry at 15% O_2 (as NO_2). (Rule 220.1)

48. Emission sampling limits of volatile organic compounds (VOC), total for turbine exhaust plus lube oil vent, shall not exceed 0.6 ppmv dry at 15% O_2 (as CH_4). (Rule 220.1-BACT req.) (Only if catalyst inlet temperature exceeds 800 deg. F, see condition 43)

49. Emission sampling limits of carbon monoxide, total for turbine exhaust ~~plus lube oil vent~~, shall not exceed 11 ppmv dry at 15% O_2. (Rule 220.1) MRB

50. Emission sampling limits of ammonia, total for turbine exhaust ~~plus lube oil vent~~, shall not exceed 20.0 ppmv. (Rule 4002) MRB

51. Emission of each air contaminant from this operation shall not exceed the following: (Rule 220.1)

Pounds Per Calendar Quarter

	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
PM_{10}	5,966	6,032	6,099	6,099
NO_x:	12,479	12,618	12,757	12,757
VOC:	1,260	1,274	1,288	1,288

52. Compliance with all emission sampling limits shall be demonstrated by District-witnessed sample collection by independent testing laboratory within 60 days after startup of this equipment. Compliance with sulfur compounds emission sampling limits shall be demonstrated by fuel gas sulfur analysis, and compliance with oxides of nitrogen, VOC, carbon monoxide and ammonia emission sampling limits shall be demonstrated by District-witnessed sample collection by independent testing laboratory annually 60 days prior to permit anniversary date. Lube oil vent emission rate shall be tested if five percent opacity or greater visible emissions are exhibited. Official test results and field data shall be submitted to District within 30 days after collection. (Rule 108.1)