...RONMENTAL
...ICES, INC.

...ANCE SOURCE TEST REPORT

... PETROLEUM OPERATIONS, INC.
28590 HIGHWAY 119
...UPMAN, CALIFORNIA 932..

...TENTION: DENNIS CHAMPION

UNIT TESTED:

K-71 ...
APCD #...1061 B

DATE TESTED:

MAY ..., 199.

DATE REPORTED:

JUNE ..., 199.

DETERMINATIONS:

...S OF PARTICULATE, NOx, CO, O_2,
...NMHC AND FUEL SULFUR

RECEIVED
JUN ...
ENVIRON...

PROJECT: 0.0-..2

TESTED BY: [signature]
JOHN ...

REVIEWED: [signature]

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ARY OF RESULTS

SUMMARY OF SOURCE TEST RESULTS

COMPANY: **BECHTEL PETROLEUM OPERATIONS, INC.** APCD #: 4091081 B

TEST DATE: MAY 26, 1993 UNIT #: K-71 30R

EMISSIONS	gr/scf	gr/dscf @12%CO2	ppm	ppm @ 15% O2	lb/hr	gr/ BHP-hr	Permit Limits
PARTICULATE	0.00459	0.00957			0.087		
	0.00395	0.00806			0.083		
	0.00350	0.00761			0.075		
Mean:	**0.00401**	**0.00841**			**0.082**		**0.15 lb/hr**
FUEL SULFUR			Total Sulfur as H2S =				
			< 1.0 ppm		**< .0011**		**0.0100 lb/hr**
NOx (dry)			111.0	59.1	1.52	0.74	
			97.5	52.9	1.35	0.66	
			94.5	51.5	1.32	0.64	
Mean:			**101.0**	**54.5**	**1.40**	**0.68**	**2.00 gr/BHP-hr 6.60 lb/hr**
CO			24.3	12.9	0.20	0.10	
			25.5	13.9	0.21	0.11	
			24.2	13.2	0.21	0.10	
Mean:			**24.7**	**13.3**	**0.21**	**0.10**	**8.00 lb/hr**
NMHC			344	182	1.63	0.79	
			362	196	1.74	0.86	
			340	185	1.65	0.80	
Mean:			**349**	**188**	**1.67**	**0.82**	**6.00 lb/hr**

Comments: _____

For San Joaquin Valley Unified APCD (Southern Region) Use Only: _____

INTRODUCTION

INTRODUCTION

On May 26, 1993, Petro Chem Environmental Services, Inc. (PCES) performed a series of emission source tests for Bechtel Petroleum Operations, Inc. located at the Elk Hills Naval Petroleum Reserve No. 1 in Tupman, California. The unit tested was K-71, a gas fired Waukesha IC engine. The unit is rated at 1500 HP and is equipped with PCC. Concentrations and emissions of particulate, NOx, CO, O_2, NMHC and fuel sulfur were determined using the following procedures:

PARAMETERS	METHOD	# TEST RUNS
Particulate	EPA Method 5; Gravimetric	3
NOx	EPA Method 7E; TECO 10 Chemiluminescent NO/NOx Analyzer	3 - 40 minute
CO	EPA Method 10; TECO 48 Gas Filter Correlation Analyzer	3 - 40 minute
O_2	EPA Method 3A; Teledyne 320 AX Fuel Cell Analyzer	3 - 40 minute
NMHC	EPA Method 18; Bag Sample, C_1-C_6+ FID Analysis	3 + blank
Fuel Sulfur	GC-FPD Tedlar Bag Total Sulfur referenced to an H_2S Standard	1
Volume Flow	EPA Method 19; Fuel Rates and Fuel Analysis	3
Fuel Analysis F-Factor Calorific Value	GC-TCD Stainless Steel Bomb C_1-C_6+, O_2, CO_2, N_2 and Btu/lb	1

All sampling was performed by John Hinkle and Bob Martin of Petro Chem Environmental Services, Inc. The hydrocarbons and fuel gas were performed by Terry Rowles of PCES. The fuel sulfur was analyzed by Zalco Laboratories, Inc. of Bakersfield, California. Mike Carr of Bechtel Petroleum Operations, Inc. supervised the operation of the test unit.

METHOD 5 DATA

COMPANY : BECHTEL PETROLEUM OPERATIONS, INC.
UNIT : K-71 30R
DATE : 5-26-93
PROJECT : 010-392

METHOD 1-5
FIELD DATA @ 60° F

	RUN #:	1	2	3
	TIME :	909	1049	1213
Vm (dry gas sampled)		46.8	51.59	52.28
Y (meter calib. factor)		0.983447	0.983447	0.983447
P bar (Barometric pressure)		28.62	28.62	28.62
P static (stack pressure, " H2O)		-0.03	-0.03	-0.03
Delta H (differential meter press, " H2O)		1.23	1.33	1.48
Tm (meter temperature, R°)		540	540	540
Vol H2O mls		87.2	88.5	126.5
Vm(std),dscf		**42.53**	**46.89**	**47.54**
Bws-H2O vapor		0.0870	0.0806	0.1100
MF-moisture factor		0.9130	0.9194	0.8900
% CO2		6.3	6.4	6.2
% O2		9.8	9.7	10
% N2		83.9	83.9	83.8
Md-MW stk gas,dry		**29.40**	**29.41**	**29.39**
Ms-MW stk gas,wet		**28.41**	**28.49**	**28.14**
Cp-pitot tube		0.84	0.84	0.84
Avg sq rt ^p		1.27	1.40	1.42
T stack, R°		1136	1147	1146
Stack area,ft2		0.785	0.785	0.785
Vs-fps		107.71	119.48	121.67
Qstd-dscfm		**2029**	**2245**	**2215**
Area noz,ft2		2.76E-04	2.76E-04	2.76E-04
Sample time		60	60	60
% Isokinetic		99.4	99.0	101.8

COMPANY : BECHTEL PETROLEUM OPERATIONS, INC.
UNIT : K-71 30R
DATE : 5-26-93

EPA METHOD 5 DATA
@ 60°F

RUN #1

PARTICULATE RESULTS:	net mg	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	3.30	0.00119	0.00109	0.00228	0.021
Filter:	3.10	0.00112	0.00102	0.00214	0.020
Condensables:	7.48	0.00271	0.00247	0.00516	0.047
Total:	13.88	0.00503	0.00459	0.00957	0.087

ADDITIONAL DATA:

TIME

start	finish	%O2	%CO2	%H2O	Vm(std)	DSCFM
909	1009	9.8	6.3	8.7	42.53	2029

RUN #2

PARTICULATE RESULTS:	net mg	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	5.00	0.00164	0.00151	0.00308	0.032
Filter:	2.60	0.00085	0.00079	0.00160	0.016
Condensables:	5.49	0.00180	0.00166	0.00338	0.035
Total:	13.09	0.00430	0.00395	0.00806	0.083

ADDITIONAL DATA:

TIME

start	finish	%O2	%CO2	%H2O	Vm(std)	DSCFM
1049	1149	9.7	6.4	8.06	46.89	2245

PARTICULATE RESULTS:	net mg	gr/dscf	gr/scf	gr/dscf @ 12% CO2	lbs/hr
Probe & Nozzle:	3.90	0.00126	0.00112	0.00245	0.024
Filter:	2.60	0.00084	0.00075	0.00163	0.016
Condensables:	5.64	0.00183	0.00163	0.00353	0.035
Total:	12.14	0.00393	0.00350	0.00761	0.075

ADDITIONAL DATA:

TIME

start	finish	%O2	%CO2	%H2O	Vm(std)	DSCFM
1213	1313	10	6.2	11	47.54	2215

US MONITORING DATA

COMPANY : BECHTEL PETROLEUM OPERATIONS, INC.
UNIT : K-71 30R
DATE : 5-26-93
PROJECT : 010-392

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
09:10 AM	-	09:20 AM	9.70	114	24.0	49.0	54.2	55.5
09:20 AM	-	09:30 AM	9.78	111	24.3	49.3	53.0	56.0
09:30 AM	-	09:40 AM	9.80	109	24.5	49.4	51.9	56.3
09:40 AM	-	09:50 AM	9.78	111	24.6	49.3	52.8	56.5
	Averages:		9.77	111	24.3	49.3	53.0	56.1

Calibration Data			
	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	92.8	48
FINAL zero	10	10	9.2
FINAL span	94	92.5	48.5
ZERO DRIFT %/ppm	0.00	0.00	-0.42
CALIB. DRIFT %/ppm	0.00	-0.78	0.26
ZERO DRIFT %fs	0.00	0.00	-0.80
CALIB.DRIFT %fs	0.00	-0.30	0.50
CAL GAS value	20.9	214	20
FULL SCALE RANGE	25	250	50

Meter Differential	7.35		
Meter Static	6.90		
Meter Coefficient	0.003	MCF/DAY	152
MMBtu/SCF	0.001108	DSCFM	1871
F-Factor @ 60°F	8521		
Operating BHP	931		
RPM	927		

	%O2	ppm	@ 3%O2	@15%O2	lb/hr	gr/BHP-hr
NOx values:	9.77	111	179	59.1	1.52	0.74

	%O2	ppm	@ 3%O2	@15%O2	lb/hr	gr/BHP-hr
CO values:	9.77	24.3	39.1	12.9	0.20	0.10

COMPANY : BECHTEL PETROLEUM OPERATIONS, INC.
UNIT : K-71 30R
DATE : 5-26-93
PROJECT : 010-392

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
10:00 AM	-	10:10 AM	9.93	99.1	25.0	49.8	48.2	58.0
10:10 AM	-	10:20 AM	10.01	98.6	25.4	49.9	48.0	58.5
10:20 AM	-	10:30 AM	10.04	96.5	25.8	49.8	47.2	59.0
10:30 AM	-	10:40 AM	10.12	95.7	25.9	49.9	46.9	59.0
	Averages:		**10.03**	**97.5**	**25.5**	**49.9**	**47.6**	**58.6**

Calibration Data	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	92.5	48.5
FINAL zero	10	10	10
FINAL span	93.1	92.5	47.5
ZERO DRIFT %/ppm	0.00	0.00	0.00
CALIB. DRIFT %/ppm	-0.22	0.00	-0.52
ZERO DRIFT %fs	0.00	0.00	0.00
CALIB.DRIFT %fs	-0.90	0.00	-1.00
CAL GAS value	20.9	214	20
FULL SCALE RANGE	25	250	50

Meter Differential	7.25		
Meter Static	6.95		
Meter Coefficient	0.003	MCF/DAY	151
MMBtu/SCF	0.001108	DSCFM	1903
F-Factor @ 60°F	8521		
Operating BHP	925		
RPM	925		

	%O2	ppm	@ 3%O2	@15%O2	lb/hr	gr/BHP-hr
NOx values:	**10.03**	**97.5**	**161**	**52.9**	**1.35**	**0.66**

	%O2	ppm	@ 3%O2	@15%O2	lb/hr	gr/BHP-hr
CO values:	**10.03**	**25.5**	**42.0**	**13.9**	**0.21**	**0.11**

COMPANY : BECHTEL PETROLEUM OPERATIONS, INC.
UNIT : K-71 30R
DATE : 5-26-93
PROJECT : 010-392

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
10:48 AM	-	10:58 AM	10.15	95.3	25.5	50.8	47.0	57.8
10:58 AM	-	11:08 AM	10.07	93.8	25.2	50.5	46.9	57.5
11:08 AM	-	11:18 AM	10.04	92.7	25.1	50.4	47.0	57.3
11:18 AM	-	11:28 AM	9.98	96.4	21.0	50.2	48.9	49.9
	Averages:		10.06	94.5	24.2	50.5	47.5	55.6

Calibration Data			
	O2	NOx	CO
INITIAL zero	10	10	10
INITIAL span	94	92.5	47.5
FINAL zero	10	10	10
FINAL span	94.1	94.5	48
ZERO DRIFT %/ppm	0.00	0.00	0.00
CALIB. DRIFT %/ppm	0.02	5.19	0.27
ZERO DRIFT %fs	0.00	0.00	0.00
CALIB.DRIFT %fs	0.10	2.00	0.50
CAL GAS value	20.9	214	20
FULL SCALE RANGE	25	250	50

Meter Differential	7.30		
Meter Static	6.95		
Meter Coefficient	0.003	MCF/DAY	152
MMBtu/SCF	0.001108	DSCFM	1921
F-Factor @ 60°F	8521		
Operating BHP	933		
RPM	927		

	%O2	ppm	@ 3%O2	@15%O2	lb/hr	gr/BHP-hr
NOx values:	10.06	94.5	156	51.5	1.32	0.64

	%O2	ppm	@ 3%O2	@15%O2	lb/hr	gr/BHP-hr
CO values:	10.06	24.2	40.0	13.2	0.21	0.10

CALCULATIONS

$$\frac{MCF}{DAY} = meter\ positive \times meter\ static \times meter\ coefficient$$

$$DSCFM = \frac{MCF}{DAY} \times .6944 \times \frac{MMBtu}{SCF} \times F\text{-}factor \times O_2 correction$$

$$ppm\ @\ 3\%\ O_2$$

$$ppm \times \frac{(20.9 - 3)}{(20.9 - actual\ O_2)}$$

$$ppm\ @\ 15\%\ O_2$$

$$ppm \times \frac{(20.9 - 15)}{(20.9 - actual\ O_2)}$$

$$\frac{LBS}{HR} = ppm \times MW \times 1.581 \times 10^{-7} \times DSCFM$$

$$\frac{GR}{BHP\text{-}hr} = \left[\frac{\left[\frac{lbs}{hr} \times 454 \right]}{Operating\ BHP} \right]$$

COMPANY : BECHTEL PETROLEUM OPERATIONS, INC.
UNIT : K-71 30R
DATE : 5-26-93
PROJECT : 010-392

HYDROCARBON RESULTS

RUN No.: 1							
DSCFM: 1871						OPERATING BHP	931
% O2: 9.77							
				ppm	ppm @15% O2	lb/hr	gr/BHP-hr
		ppm	lb/hr		(as methane)		
Methane	(C1)	1329	6.29	1329	705	12.19	5.94
Ethane	(C2)	125	1.11	250	133	1.18	0.58
Propane	(C3)	26	0.34	78	41	0.37	0.18
Butane	(C4)	4	0.07	16	8	0.08	0.04
Pentane	(C5)	0	0.00	0	0	0.00	0
Hexane	(C6)	0	0.00	0	0	0.00	0
		1484	7.81	1673	887	13.82	6.74
	Total						
(non methane)		155	1.52	344	182	1.63	0.79
RUN No.: 2							
DSCFM: 1903						OPERATING BHP	925
% O2: 10.03							
				ppm	ppm @15% O2	lb/hr	gr/BHP-hr
		ppm	lb/hr		(as methane)		
Methane	(C1)	1322	6.36	1322	718	6.36	3.12
Ethane	(C2)	134	1.21	268	145	1.29	0.63
Propane	(C3)	26	0.34	78	42	0.38	0.18
Butane	(C4)	4	0.07	16	9	0.08	0.04
Pentane	(C5)	0	0.00	0	0	0.00	0
Hexane	(C6)	0	0.00	0	0	0.00	0
	Total	1486	7.99	1684	914	8.11	3.98
	Total						
(non methane)		164	1.62	362	196	1.74	0.86
RUN No.: 3							
DSCFM: 1921						OPERATING BHP	933
% O2: 10.06							
				ppm	ppm @15% O2	lb/hr	gr/BHP-hr
		ppm	lb/hr		(as methane)		
Methane	(C1)	1355	6.58	1355	738	6.58	3.20
Ethane	(C2)	123	1.12	246	134	1.20	0.58
Propane	(C3)	26	0.35	78	42	0.38	0.18
Butane	(C4)	4	0.07	16	9	0.08	0.04
Pentane	(C5)	0	0.00	0	0	0.00	0
Hexane	(C6)	0	0.00	0	0	0.00	0
	Total	1508	8.12	1695	923	8.24	4.01
	Total						
(non methane)		153	1.54	340	185	1.65	0.80

SSION FACTORS

COMPANY : BECHTEL PETROLEUM OPERATIONS, INC.
UNIT : K-71 30R
DATE : 5-26-93
PROJECT : 010-392

SULFUR DIOXIDE EMISSION RESULTS

RUN	H2S, ppm	MCF/DAY	FUEL SCFM	SO2 LBS/HR
1	< 1.0	152	106	0.0011
2	< 1.0	151	105	0.0011
3	< 1.0	152	106	0.0011
			AVERAGE	0.0011

EQUATION:

SCFM = MCF/DAY * 1000/24 * 1/60

SO2 LBS/HR = H2S ppm * 64 * SCFM * 1.581 * 10^-7

MW SO2 = 64

COMPANY : BECHTEL PETROLEUM OPERATIONS, INC.
UNIT : K-71 30R
DATE : 5-26-93
PROJECT : 010-392

EMISSION FACTORS

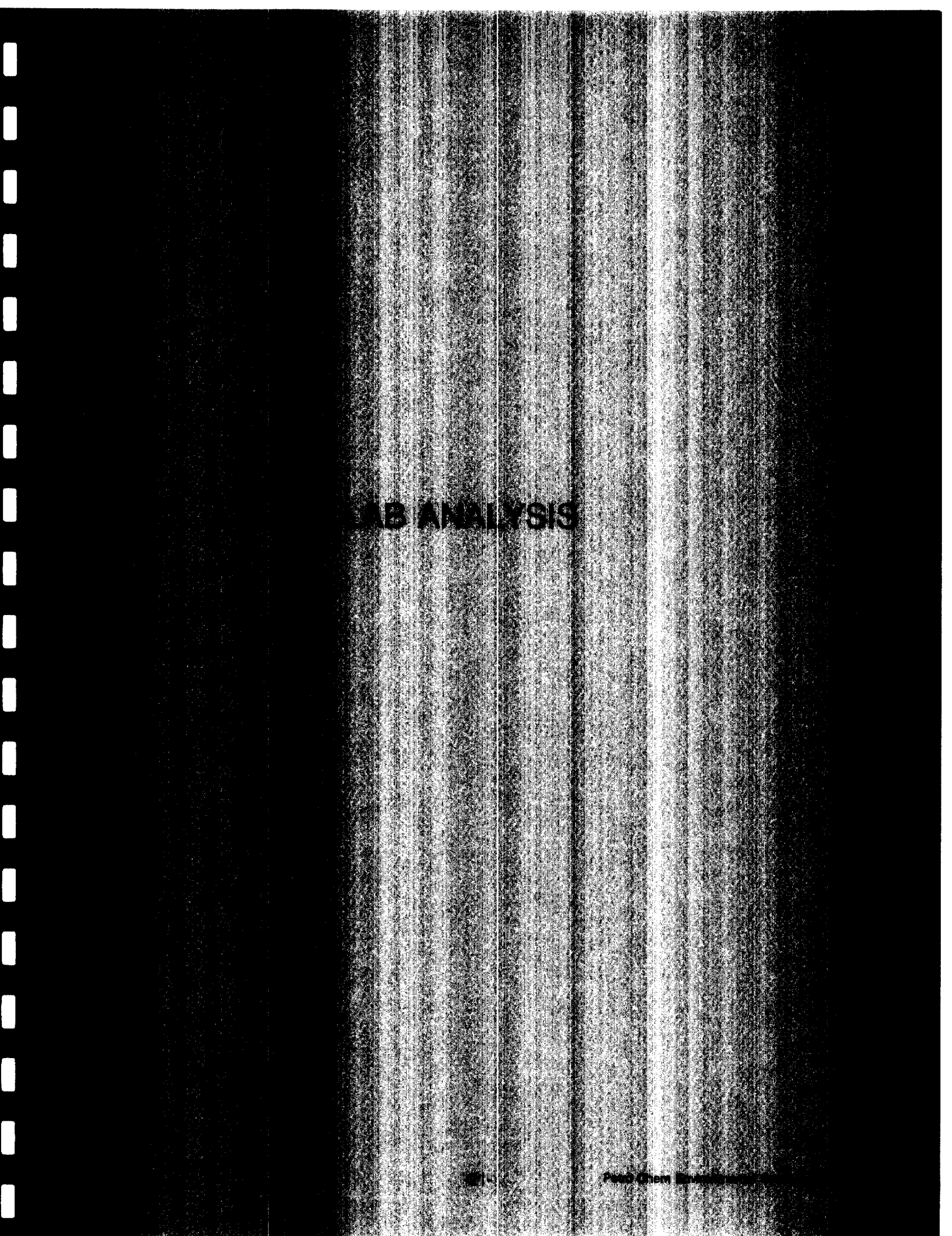
	LB/HR	MCF/DAY	MMCF/HR	LB/MMCF
NOx				
RUN 1	1.52	152	0.006	253
RUN 2	1.35	151	0.006	225
RUN 3	1.32	152	0.006	220
			AVERAGE	233

CO				
RUN 1	0.20	152	0.006	33.3
RUN 2	0.21	151	0.006	35.0
RUN 3	0.21	152	0.006	35.0
			AVERAGE	34.4

NMHC				
RUN 1	1.62	152	0.006	270
RUN 2	1.74	151	0.006	290
RUN 3	1.65	152	0.006	275
			AVERAGE	278

MMCF/HR = (MCF/DAY * 1/24) / 1000

LB/MMCF = (LB/HR) / (MMCF/HR)


AB ANALYSIS

PETRO
CHEM
ENVIRONMENTAL
SERVICES, INC.

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

COMPANY : BECHTEL PETROLEUM OPERATIONS, INC.
UNIT : K-71
DATE : 5-26-93
PROJECT : 010-392

DATE RECEIVED : MAY 27,1993
DATE ANALYZED : MAY 27,1993
DATE REPORTED: JUNE 4,1993

FUEL GAS ANALYSIS

CONSTITUENT	MOLE %	WT. %	CHONS Wt.%	
CARBON DIOXIDE	1.454	3.432	CARBON	73.90
OXYGEN	0.049	0.085	HYDROGEN	22.85
NITROGEN	0.446	0.669	OXYGEN	2.58
CARBON MONOXIDE	0.000	0.000	NITROGEN	0.67
			SULFUR	0.00
METHANE	87.094	74.947	H/C	0.309
ETHANE	7.524	12.135		
PROPANE	2.749	6.502		
ISOBUTANE	0.199	0.620		
N-BUTANE	0.382	1.192		
ISOPENTANE	0.045	0.174		
N-PENTANE	0.035	0.136		
HEXANES+	0.023	0.107		
TOTALS :	100.000	100.000		

SPECIFIC GRAVITY (AIR = 1)	0.6437
SPECIFIC VOLUME, cu.ft./lb.	20.36
GROSS CALORIFIC VALUE (DRY), BTU/cu.ft.	1108.18
GROSS CALORIFIC VALUE (WET), BTU/cu.ft.	1085.94
GROSS CALORIFIC VALUE (DRY), BTU/lb.	22559.36
NET CALORIFIC VALUE (DRY), BTU/cu.ft.	1001.60
NET CALORIFIC VALUE (WET), BTU/cu.ft.	981.50
COMPRESSABILITY FACTOR "Z" @ 60° F, 1 ATM	0.9973
EXPANSION FACTOR (DSCF/CF)	9.44
EPA "F" FACTOR @ 68° F (DSCF/MM BTU)	8650
EPA "F" FACTOR @ 60° F (DSCF/MM BTU)	8521

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

Terry Rowles
Laboratory Manager

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

Petro Chem Environmental Service
3207 Antonino Avenue
Bakersfield, CA 93308

Laboratory No: 36020
Date Received: 5-27-93
Date Reported: 6-2-93
P O #: 3109

Attention: Terry Rowles

Sample: Gas

Sample Description: Bechtel Unit #K-71 Fuel Gas, Job #010-392
Sampled by JKH on 5-26-93

Total Sulfur
(ASTM D 3246)

As H_2S, ppm (vol.)	< 1.0
As S, Grains/100 SCF*	< 0.06

* Standard cubic feet (60 °F, 14.7 psia)

John Zaleta
for Jim Etherton
Lab Operations Manager

JE/dla

4309 Armour Avenue Bakersfield, California 93308
(805) 395-0539 FAX (805) 395-3069

EPA METHOD 19
EPA F-FACTOR

EMISSION FACTOR CALCULATIONS

$$F = \frac{dscf}{MMBtu} = \left[\frac{10^6 \left[3.64\ \%H) + 1.53\ (\%C) + 0.57\ (\%S) + 0.14\ (\%N) - 0.46\ (\%O) \right]}{GCV} \right]$$

Where: GVC = *Gross calorific value of fuel combusted,* $\frac{Btu}{LB}$

$$F_{60^\circ F} = F_{68^\circ F} \times 0.985$$

GENERAL POLLUTANT LB/MMBtu EQUATION

$$E = ppmvd \times F_{60^\circ F} \times C \times \left[\frac{20.9}{20.9 - \%O_2} \right] \times MW$$

Where: $E = \frac{LB}{MMBtu}$

$F_{60^\circ F}$ = *F-FACTOR @* $60^\circ F$

$C = 2.635 \times 10^{-9}$

MW = NOx as 46; *CO as* 28; SO_2 *as* 64

METHODOLOGY

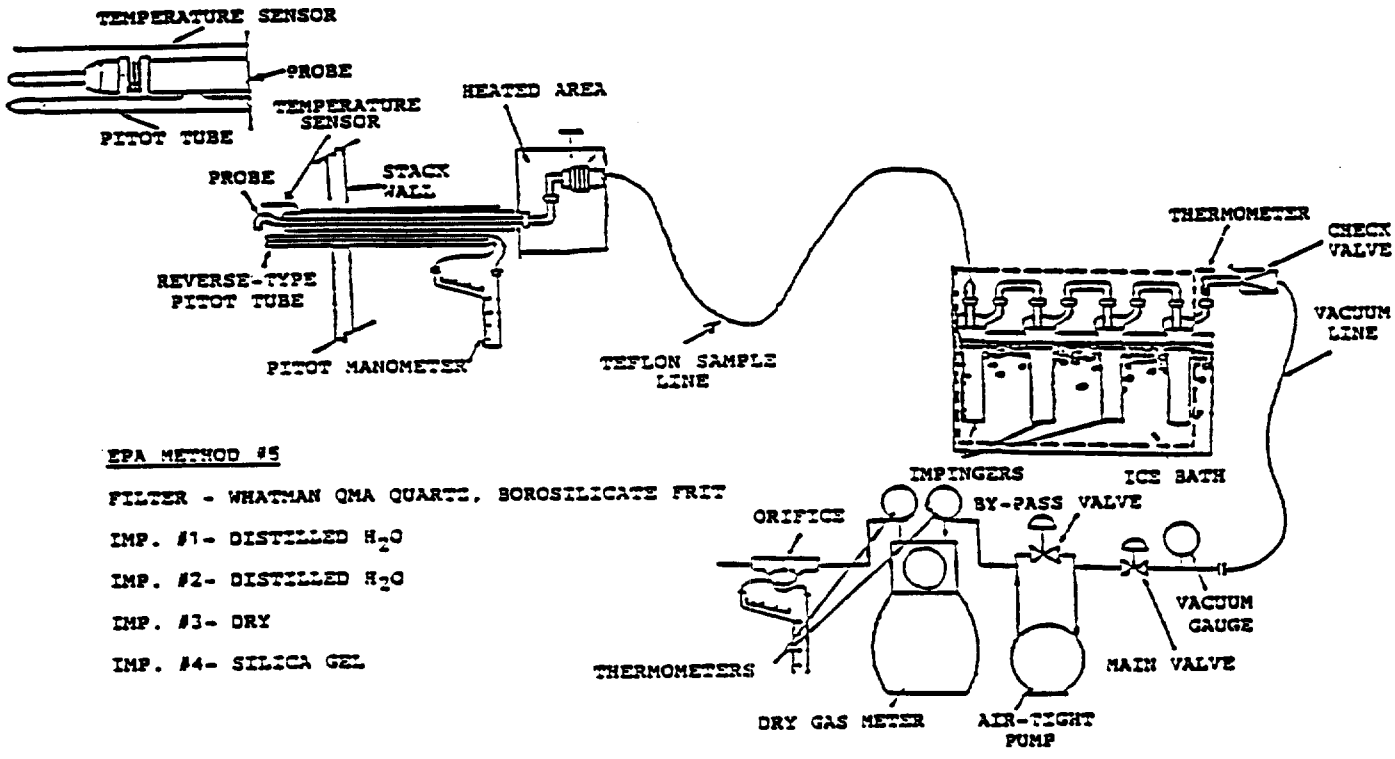
SAMPLING AND ANALYTIC PROCEDURES

REF: EPA Code of Federal Regulations, Title 40, Part 60, Appendix A. Method 1, 2, 3, 4, and 5

Sampling Apparatus

The sampling apparatus consisted of a nozzle, a heater wrapped probe, and a heated filter holder (see data sheets for type of nozzle, probe, and filter). The filter was connected to a heated teflon filter-to-impinger line. A series of impingers (see data sheet for type and contents) was connected in tandem and immersed in an ice bath. Following the absorption train was a gas pump, dry test meter, and a calibrated restriction orifice fitted with a magnehelic differential pressure gauge. A type 'S' pitot tube and temperature probe was then positioned alongside the probe terminating at the sample nozzle for the purpose of monitoring duct conditions throughout the test.

Sampling Diagram



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 patterns.

SAMPLING AND ANALYTIC PROCEDURES
(continued)

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 Δ-P was then recorded at each traverse point and a duct static pressure was also 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. Then 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 was recorded. After sampling, the final weights was then recorded. Percent water was calculated from the weight of water collected and the dry gas volume sampled.

EPA Method 5: Particulate Emissions

A series of preliminary measurements was made prior to conducting the particulate test. EPA Methods 1, 2, and 3 was performed to determine location and number of traverse points, average gas velocity, and pressure and gas molecular weight. Percent water was determined by a psychometric chart or from combustion analysis of the fixed gases. The results of these measurements were entered into the field computer for the purpose of determining an appropriate nozzle size for isokinetic sampling.

The Method 5 apparatus was then prepared on-site in the mobile laboratory. The absorption train was charged with freshly prepared chemicals, weighted on a calibrated digital balance to the nearest 0.1 grams, and assembled. The probe was brushed out and rinsed with distilled water and acetone, then the filter holder was charged. The sampling apparatus was sealed and transported to the sampling site were it was assembled and leak tested at 15 inches mercury vacuum.

The probe, filter and impinger line heaters were set at 250 °F and the probe was then positioned into the duct at the first traverse point with the nozzle out of the flow.

The nozzle was positioned into the gas flow and the vacuum pump was started immediately and adjusted to obtain an isokinetic sample rate. A complete traverse was performed while sampling at a minimum of two minutes per sample point. Upon completion of the traverse the vacuum pump was turned off and the probe was transferred into the next sample EPA port where an identical sample-traverse was then performed. Duct conditions (temperature, Δ-P) and sampling

conditions (meter temperature, volume and pressure, probe, filter, sample line, impinger temperatures, and absorption train vacuum) was monitored and recorded regularly for each sample point.

Upon completion of sampling, the apparatus was leak tested at a vacuum greater than the highest observed vacuum. The leak was recorded and the apparatus was then sealed and transported to the mobile laboratory. The heated filter-to-impinger line was rinsed with a known amount of distilled water into the first impinger.

The filter and any loose particulate was carefully removed from the filter holder with tweezers. It was then placed in a labeled petri dish and transported to the P.C.E.S. laboratory. The nozzle, probe, and filter top housing was rinsed and brushed three times with distilled water and acetone. The sample fractions were combined, bottled, labeled, and fluid level marked for transportation to the P.C.E.S. laboratory. Aliquots of distilled water and acetone were similarly treated for blank analysis.

The absorption train was inspected for abnormalities and disassembled. The impingers were weighed on a digital balance for a percent moisture determination. The contents of the impingers were quantitatively transferred into separate bottles, sealed, labeled, and fluid level marked for transportation to the P.C.E.S. laboratory for analysis, if required. Aliquots of the reagent grade impinger contents were saved for blank analysis.

The filter was transferred to an oven and heated at 105 °F for 2-3 hours and then placed in a desiccator for 24 hours. The filter was then weighed on a Mettler digital balance to the nearest 0.01 mg. Additional six hour desiccations and weighings were then performed until the difference between consecutive weighings were less than 0.5 mg or one percent of the total filtrate weight (weighed to a constant weight).

The nozzle/probe/filter top wash was then examined for any leakage during transportation and transferred to a tared evaporation dish. The wash was then evaporated at an elevated temperature, below the boiling point of the wash, with occasional swirling. The dish and wash residue was then desiccated and weighed to a constant weight.

If required by the regulatory agency, the contents of the first impinger were recovered and diluted volumetrically to a known volume. An aliquot of this sample was then evaporated, desiccated, and then weighed to a constant weight.

The net weight of particulate was calculated from the two fractions (three fractions including the impinger contents, if required). Concentrations (gr/DSCF) and emissions (lbs/hr) or other applicable units were then calculated and reported.

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

EPA METHOD 4
DETERMINATION OF MOISTURE CONTENT IN STACK GASES
(continued)

Sample Gas Volume
Eq. 4-3

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

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

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

Moisture Content
Eq. 4-4

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

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

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

EPA METHOD 5
DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES
Use in Method 5 and 8 combinations runs

Dry Gas Volume - Eq. 5-1

$$V_{m\,(std)} = V_m\, Y \left[\frac{T_{std}}{T_m}\right] \left[P_{bar} + \frac{\Delta H}{13.6}\right]$$

$$= K_1\, V_m\, Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right]$$

$$= K_1 = 17.38\ \frac{^\circ R}{in.Hg}\ @\ 520\ ^\circ R$$

*In case of leak rate beyond allowable limits, correct Eq. 5-1 as follows:
Case 1 - No component changes made during run.

$$V_m = V_m - (L_p - L_a)\theta$$

Case 2 - One or more component changes made during run.

$$V_m = \left[V_m - (L_1 - L_a)\,\theta_1 - \sum_{i=2}^{n} (L_i - L_a)\,\theta_i - (L_p - L_a)\,\theta_p\right]$$

Volume of Water Vapor - Eq. 5-2

$$V_{wc\,(std)} = V_{1\,c} \left[\frac{\rho_w}{M_w}\right] \left[\frac{RT_{std}}{P_{std}}\right]$$

$$= K_2\, V_{1\,c}$$

Where: $K_2 = 0.04646\ \frac{ft^3}{ml}\ @\ 60\ ^\circ F$

EPA METHOD 5
DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES
(continued)

Moisture Content - Eq. 5-3

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

Acetone Blank Concentration - Eq. 5-4

$$C_a = \frac{M_a}{V_a\ \rho_a}$$

Acetone Wash Blank - Eq. 5-5

$$W_a = C_a\ V_{aw}\ \ \rho_a$$

Particulate Concentration - Eq. 5-6

$$C_s = \frac{gr}{dscf} = \left[\ 0.001\ \frac{g}{mg}\right]\left[\ \frac{M_n}{V_{m\ (std)}}\right](15.432)$$

$$gr/dscf\ (MF) = \frac{gr}{scf}$$

Corrected to 12 % CO_2

$$\frac{gr}{dscf}\ @\ 12\%\ CO_2 = \frac{\frac{gr}{dscf} \times 12\ \%\ CO_2}{\%\ CO_2\ (dry)}$$

EPA METHOD 5
DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES
(continued)

Isokinetic Variation - Eq. 5-7 and 5-8

$$\%\ I = 100 \times \frac{T_s \left[V_{1c} K_3 + \frac{V_m}{T_m} \left[P_b + \frac{\Delta H}{13.6} \right] \right]}{60\ \theta\ A_n\ V_s\ P_s}$$

Where: $K_3 = 0.002669$

Mass Emission Rate

$$\frac{lbs}{hr} = \frac{gr}{dscf} \times dscfm \times 60\ \frac{m}{hr} \times \frac{1\ lb}{7000\ gr}$$

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 $\frac{ft\ [(lb/lb\text{-}mole)(in\ Hg)]\ ½}{sec[\ (°R)\ (in\ H_2O)\ ]}$
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.

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...

COMPANY : PETRO CHEM ENVIRONMENTAL SERVICES, INC.
UNIT : STEP VAN
DATE : 5-10-93

CONTINUOUS MONITORING INSTURMENT DATA

ANALIZER	MANUFACTURER & MODEL	SERIAL #
NOX ANALIZER	THERMO ELECTRON MODEL 10	SN 10A/R-17380-169
CO ANALIZER	CO-AUTOMATED CUSTOMS SYSTEMS 3300	SN N5C4134T
O2 ANALIZER	TELEDYNE MODEL 326RA	SN 49832

RAW DATA

I. C. ENGINE OBSERVATION REPORT
NAVAL PETROLEUM RESERVE NO. 1

LOCATION: SEC 30/T30S/R23E				DATE: 05-26-93		
APCD # S-0382-0072-02 K71				RELEASE # AFF 481		
REASON FOR TEST: ANNUAL SOURCE TEST				TEST COMPANY: PCES		
EQUIPMENT DESCRIPTION: 1500HP WAUKESHA				VEE PERFORMED: YES		
NOx CONTROL:	CAT.	PSC	PCC X	O2	OXIDIZING CAT. X	
POLLUTANTS:	PM X	NOx X	CO X	HC X	H2S X	SO2 X

EMISSIONS DATA

TIME	09:10	10:00	10:50			
NOX PPM	98	90	85			
CO	24.5	24.8	24			
% 02	9.75	9.85	10.10			

CALIBRATION GASES

POLLUTANT	SPAN GAS	RANGE	EXP DATE		INST. MFG	MODEL
NOX	214.0	0-250	05-93		TECO	10
CO	20.0	0-50	09-93		TECO	48
O2 %	20.9	0-25	AMBIENT		TELEDYNE	

ENGINE PARAMETERS

RPM'S	927	925	927			
TOTAL BHP LOAD	931	925	933			
PERCENT LOAD	67.0	67.0	67.0			
CATALYST TEMP.	711	712	711			
FUEL STATIC	6.90	6.95	6.95			
FUEL DIFF.	7.35	7.25	7.30			
COEF.	0.003	0.003	0.003			
RATE (MCF/DAY)	152.15	151.16	152.21			
SUCTION PSI	51	51	51			
DISCHARGE PSI	460	460	460			

COMMENTS:
NO VISIBLE EMISSIONS
SAN JOAQUIN VALLEY UNFIED AIR POLLUTION CONTROL DISTRICT REPRESENTATIVES WERE ON SITE TO WITNESS TEST.

OBSERVER: M. Carr

COMPRESSOR PERFORMANCE REPORT

Bechtel Petroleum Operations, Inc

Location : Elk Hills, California

Unit Mfr : Dresser Rand Model: 2HOS

Unit name: K71 Date: 26-May-93 08:22:22

CYL	SERVICE (stage)	CLR SET (%)	PRESSURES Ps (psi)	Pd (psi)	TEMPS SU DIS (dg F)	CALC CAPACITY (MMSCFD)	IHP (hp)	DIS T DELTA (dg F)	ROD LOAD (%)
1H	Stage2	10	158.7	503.7*	91 230	1.97	140.8	5	151C
1C	Stage2	10	158.5	484.9	91 230	4.42	252.8	11	161T
2H	Stage1	11	47.6	167.4	90 218	2.55	182.1	-1	149C
2C	Stage1	11	45.1	160.1	90 218	4.34	281.0	-1	147T

Total indicated horsepower (IHP) = 857 @ 927 RPM
Gas horsepower (GHP) = 931 @ 927 RPM
Compressor total horsepower (BHP) = 931 @ 927 RPM
Rated horsepower (BHP) = 1500 @1000 RPM
Derated horsepower (BHP) = 1391 for 927 RPM
Percent Load = 67%

* WARNING: Check the measured line pressures

Recommendations and Observations:
SJVUAPCD ANNUAL SOURCE TEST RUN 1

Analyst signature: Chuck Holman

COMPRESSOR PERFORMANCE REPORT

Bechtel Petroleum Operations, Inc

Location : Elk Hills, California

Unit Mfr : Dresser Rand Model: 2HOS

Unit name: K71 Date: 26-May-93 09:42:26

CYL	SERVICE (stage)	CLR SET (%)	PRESSURES Ps (psi)	Pd (psi)	TEMPS SU DIS (dg F)	CALC CAPACITY (MMSCFD)	IHP (hp)	DIS T DELTA (dg F)	ROD LOAD (%)
1H	Stage2	10	156.1	507.1*	92 230	1.96	140.7	1	151C
1C	Stage2	10	156.1	485.0	92 230	4.33	250.9	8	161T
2H	Stage1	11	48.5	165.7	97 225	2.66	181.3	1	145C
2C	Stage1	11	45.3	158.9	97 225	4.14	278.3	-1	148T

Total indicated horsepower (IHP) =	851	@ 925 RPM
Gas horsepower (GHP) =	925	@ 925 RPM
Compressor total horsepower (BHP) =	925	@ 925 RPM
Rated horsepower (BHP) =	1500	@1000 RPM
Derated horsepower (BHP) =	1387	for 925 RPM
Percent Load =	67%	

* WARNING: Check the measured line pressures

Recommendations and Observations:
SJVUAPCD ANNUAL SOURCE TEST RUN 2

Analyst signature: Chuck Holman

COMPRESSOR PERFORMANCE REPORT

Bechtel Petroleum Operations, Inc

Location : Elk Hills, California

Unit Mfr : Dresser Rand Model: 2HOS

Unit name: K71 Date: 26-May-93 10:27:40

CYL	SERVICE (stage)	CLR SET (%)	PRESSURES Ps (psi)	Pd (psi)	TEMPS SU DIS (dg F)	CALC CAPACITY (MMSCFD)	IHP (hp)	DIS T DELTA (dg F)	ROD LOAD (%)
1H	Stage2	10	157.0	482.9	95 235	2.13	144.1	11	149C
1C	Stage2	10	158.9	477.2	95 235	4.33	251.8	15	157T
2H	Stage1	11	47.6	166.8	100 230	2.68	183.4	1	147C
2C	Stage1	11	45.4	157.8	100 230	4.16	278.7	3	145T

Total indicated horsepower (IHP) = 858 @ 927 RPM
Gas horsepower (GHP) = 933 @ 927 RPM
Compressor total horsepower (BHP) = 933 @ 927 RPM
Rated horsepower (BHP) = 1500 @1000 RPM
Derated horsepower (BHP) = 1390 for 927 RPM
Percent Load = 67%

Recommendations and Observations:
SJVUAPCD ANNUAL SOURCE TEST RUN 3

Analyst signature: Chuck Holman

COMPANY : Bechtel

UNIT : K-71

DATE : 5/26/93

PROJECT : 010-392

Operational DATA

O_2	0-25	20.9	AMB			
NOx	0-250	214	CC93323	5/93		
CO	0-50	20	CC19071	9/93		
RUN #	Time	O_2	NOx	CO		
1	(S) 910	9.75	115	23		
1	AVG	9.75	115	24		
2	(S) 1000	9.75	98	24.5		
2	AVG	9.85	90	24.8		
3	(S) 1050	10.0	82	25		
3	AVG	10.1	85	24		

COMPANY: Bechtel
UNIT : K-71
DATE : 5-25-93
PROJECT : 016-392

ON-SITE DATA

		RUN #1	RUN #2	RUN #3
	TIME:	9:09-10:09	10:49-11:49	12:13-13:13
Vm,	Dry sampled gas volume, dcf	46.8	51.59	52.28
Y,	Meter calibration factor (Met# 1001 , 1001 , 1001)	.983447	.983477	.983437
Pbar,	Barometric Pressure, "Hg	28.62	28.62	28.62
Pstatic	Stack static pressure, "Hg	-.03	-.03	-.03
ΔH,	Differential meter pressure, "H2O	1.23	1.33	1.48
Tm,	Meter temperature, °F	80	80	80

	RUN #1			RUN #2			RUN #3		
CONTENTS	FINAL	TARE	NET	FINAL	TARE	NET	FINAL	TARE	NET
H2O	731.9	593.9	138.0	721.4	583.6	137.8	753.5	596.5	157.0
H2O	587.7	577.8	9.9	649.6	636.5	13.1	588.4	577.4	11.0
KO	493.7	489.6	4.1	497.9	495.0	2.9	492.9	489.4	3.5
Silica Gel	791.6	781.6	10.0	744.4	733.3	11.1	809.9	799.0	10.9
			<74.8>			<65.4>			<55.9>
Vlc, volume of H2O, gms			87.2			99.5			126.5

		RUN #1	RUN #2	RUN #3
CO2,	% Dry Volume	6.3	6.4	6.2
O2,	% Dry Volume	9.8	9.7	10.0
N2,	% Dry Volume	83.9	83.9	83.8
Cp,	Pitot Tube Coefficient (# PSS-1 , PSS-1 , PSS-1)	.840	.840	.840
Δp,	Avg P, "H2O	1.616	1.968	2.017
Ts,	Stack temperature, °F	676	687	686
As,	Stack Area, sq.ft.	.79	.79	.79
Ds,	Stack diameter, inches	12	12	12
Dn,	Nozzle diameter, inches	.225	.225	.225
Dur,	Sampling time, min	60	60	60
% ISO	Mini iso	100.01	100.10	100.28
	Filter #	586	588	587
	Filter tare weights, gms	.6003	.5969	.5994

Additional Comments:

METHOD 5 RUN # 1

COMPANY: BECHTEL
UNIT: K-71
DATE: 5-26-93
PROJECT: 010-392
TECH: RJX
PUMP #: GAST.
METER BOX#: MB1001 (0.88)
METER COEFF: 0.983447
PROBE #: PSS #1 Cp: 0.840

PRE / POST TEST LEAK CHECK
LEAK RATE: <0.006 / <0.003 cfm
VACUUM: 10 / 6 "Hg

AMBIENT TEMP, °F: 78 °F
Pbar: 28.62
STATIC PRESSURE ("Hg): -.03
ASSUMED MOISTURE,%: 10
NOZZLE ID#: -0.
AVG. CALIB. NOZZLE DIAM.("): 0.225
PROBE LINER MATERIAL: SS
FILTER #:
DUCT DIAM ("): 124

TRAVERSE PT. NUMBER	TIME (θ) min. 5 PT.	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
10	9:09	3	682	1.90	0.[illegible]	1.39	677.20	78	77	244	240	37
9	9:15	3	690	1.75	0.[illegible]	1.28	682.0	75	76	248	243	37
8	9:21	3	694	1.70	0.793	1.24	686.9	76	77	254	252	37
7	9:27	3	700	1.65	0.782	1.20	691.7	78	79	256	253	38
6	9:33	3	703	1.80	0.817	1.30	696.4	78	80	257	251	42
5	9:39	4	689	2.20	0.908	1.59	701.3	78	80	257	257	43
4	9:45	4	656	2.50	0.986	1.86	706.7	80	82	258	259	45
3	9:51	3	651	1.20	0.685	0.94	712.8	81	82	258	258	45
2	9:57	3	648	0.95	0.612	0.77	716.9	83	83	256	255	43
1	10:03	3	645	0.85	0.581	0.70	720.6	83	84	252	254	43
END	10:09						724.00					
							Vol = 46.80					
							Iso = 100.01					
							Vel Fps = 110.47					
AVG			676	1.610		1.23			80			

METHOD 5 RUN # 2

COMPANY:	BECHTEL	PRE / POST TEST LEAK CHECK	AMBIENT TEMP, °F:
UNIT:	K-71		Pbar: 28.62
DATE:	5-26-93		STATIC PRESSURE ("Hg): -.03
PROJECT:	010-392		ASSUMED MOISTURE,%: 10
TECH:	RJK	LEAK RATE: <0.006 / <0.006 cfm	NOZZLE ID#:
PUMP #:	GAST.	VACUUM: 12 / 7 "Hg	AVG. CALIB. NOZZLE DIAM.("): 0.225
METER BOX#:	MB1001 (0.88)		PROBE LINER MATERIAL: SS
METER COEFF:	0.983447		FILTER #:
PROBE #:	PSS-1 Cp: 0.840		DUCT DIAM ("): 12"

TRAVERSE PT. NUMBER	TIME (e) min. 6/PT.	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
10	10:49	4	669	2.00	0.879	1.48	731.40	82	82	245	243	43°
9	10:55	4	683	1.85	0.835	1.36	736.6	78	80	253	248	44°
8	11:01	4	689	1.75	0.808	1.28	741.7	76	79	256	258	44°
7	11:07	4	691	1.70	0.799	1.25	746.6	80	80	259	257	44°
6	11:13	4	692	1.70	0.797	1.25	751.4	77	80	259	258	44
5	11:19	4	696	2.30	0.927	1.65	756.2	78	81	261	251	44
4	11:25	4	695	2.50	0.965	1.79	761.6	77	80	259	250	45
3	11:31	4	689	2.70	1.010	1.95	767.4	80	82	256	251	46
2	11:37	4	688	2.50	0.974	1.81	773.5	81	83	257	253	47
1	11:43	4	673	1.00	0.621	0.79	779.4	84	82	254	249	48
END	11:49						782.99					
							Vol = 57.59					
							I.So = 100.10					
							Vel Fps = 122.70					
AVG			687	1.968		1.33			80			

METHOD 5 RUN # 3

COMPANY: BECHTEL	PRE / POST TEST LEAK CHECK	AMBIENT TEMP, °F:	
UNIT: K-71		Pbar: 28.62	
DATE: 5-26-93		STATIC PRESSURE ("Hg): -0.03	
PROJECT: 010-392		ASSUMED MOISTURE,%: 10	
TECH: RJK	LEAK RATE: <0.003 / <0.004 cfm	NOZZLE ID#:	
PUMP #: GAST.	VACUUM: 12 / 10 "Hg	AVG. CALIB. NOZZLE DIAM.("): 0.225	
METER BOX#: MB1001 (0.88)		PROBE LINER MATERIAL: SS	
METER COEFF: 0.983447		FILTER #:	
PROBE #: PSS-1 Cp: 0.840		DUCT DIAM ("): 12"	

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
10	12:13	4	674	2.10	0.903	1.56	784.00	84	85	248	245	53
9	12:19	4	680	1.85	0.843	1.37	789.3	83	83	249	248	44
8	12:25	4	682	1.80	0.827	1.33	794.5	80	82	251	252	45
7	12:31	4	688	1.70	0.801	1.25	799.5	79	82	252	257	45
6	12:37	4	693	1.70	0.799	1.25	804.2	79	81	254	256	46
5	12:43	4	695	2.40	0.946	1.72	809.1	77	81	253	255	46
4	12:49	4	693	2.60	0.985	1.86	814.8	77	80	254	252	47
3	12:55	4	688	2.50	0.965	1.80	820.7	75	79	251	255	47
2	13:01	4	685	2.30	0.925	1.66	826.4	73	79	253	258	47
1	13:07	4	680	1.40	0.725	1.05	831.9	75	80	251	250	47
End	13:13						836.28					
							V_{OL} = 52.28					
							T_{SO} = 100.28					
							V_{eTs} = 124.19					
AVG			686	2.017		1.48			80			

LABORATORY ANALYSIS
EPA METHOD 5 - PARTICULATE ANALYSIS

COMPANY: Bechtel
PROJECT: D10-392
LOCATION/UNIT: K-71
DATE TESTED: 5/26/93
ANALYST: DGS

RUN # 1

PROBE/NOZZLE/FILTER TOP VOL- 239ml

DISH # 37 #1	#2	#3	AVERAGE
FINAL (g) 80.6407	80.6411		80.6410
TARE (g) 80.6377			80.6377
NET (g)			0.0033

FILTER # 586

#1	#2	#3	AVERAGE
FINAL (g) 0.6035	0.6033		0.6034
TARE (g) 0.6003			0.6003
NET (g)			0.0031

CONDENSABLE (aliquot 250ml / 550ml)

DISH # 54 #1	#2	#3	AVERAGE
FINAL (g) 79.4070	79.4073		79.4072
TARE (g) 79.4038			79.4038
NET (g)			0.0034

LABORATORY ANALYSIS
EPA METHOD 5 - PARTICULATE ANALYSIS

COMPANY: Bechtel PROJECT: 010-392

LOCATION/UNIT: K-71 DATE TESTED: 5/24/93

ANALYST: DAS

RUN # 2

PROBE/NOZZLE/FILTER TOP VOL- 230 ml

DISH # 39	#1	#2	#3	AVERAGE
FINAL (g)	78.8822	78.8826		78.8824
TARE (g)	78.8774			78.8774
NET (g)				0.0050

FILTER # 588

	#1	#2	#3	AVERAGE
FINAL (g)	0.5994	0.5996		0.5995
TARE (g)	0.5969			0.5969
NET (g)				0.0026

CONDENSABLE (aliquot 250 ml / 549 ml)

DISH # 42	#1	#2	#3	AVERAGE
FINAL (g)	74.3551	74.3552		74.3552
TARE (g)	74.3527			74.3527
NET (g)				0.0025

LABORATORY ANALYSIS
EPA METHOD 5 - PARTICULATE ANALYSIS

COMPANY: Bechtel PROJECT: 010-392

LOCATION/UNIT: K-71 DATE TESTED: 5/26/93

ANALYST: DGS

RUN # 3

PROBE/NOZZLE/FILTER TOP VOL- 283 ml

DISH # 45	#1	#2	#3	AVERAGE
FINAL (g)	80.2130	80.2133		80.2132
TARE (g)	80.2093			80.2093
NET (g)				0.0039

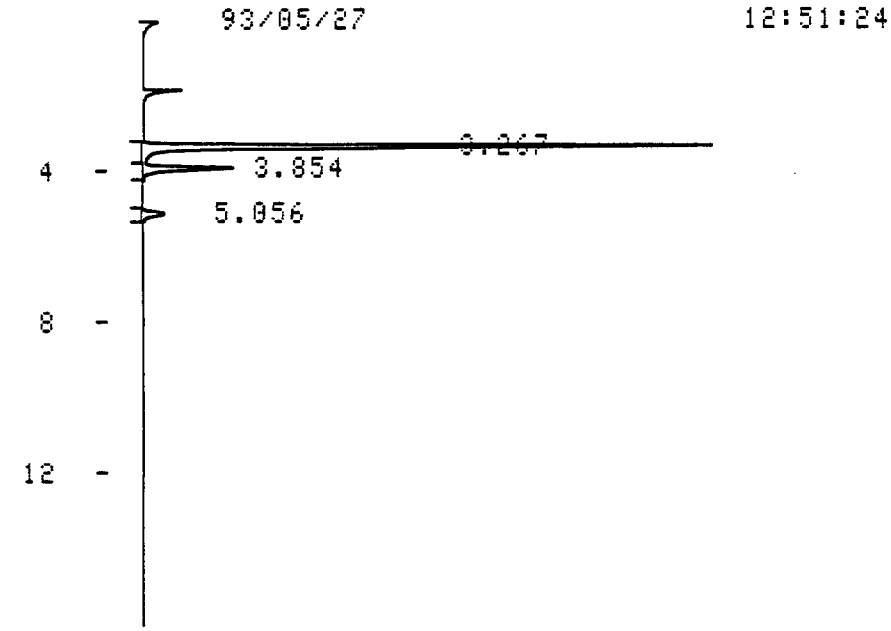
FILTER # 587

	#1	#2	#3	AVERAGE
FINAL (g)	0.6019	0.6020		0.6020
TARE (g)	0.5994			0.5994
NET (g)				0.0026

CONDENSABLE (aliquot 250ml / 542 ml)

DISH # 53	#1	#2	#3	AVERAGE
FINAL (g)	77.6710	77.6712		77.6711
TARE (g)	77.6685			77.6685
NET (g)				0.0026

BECHTEL UNIT: K-71
5-26-93 PROJECT: 010-392
HC SAMPLE BLANK

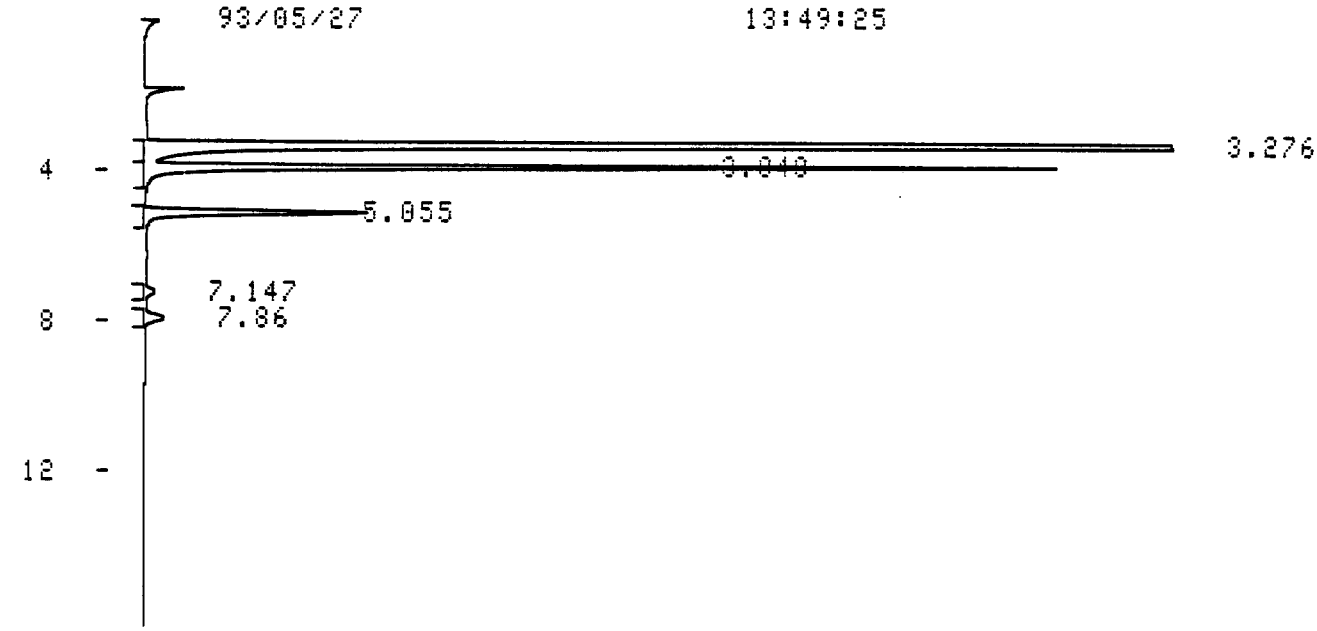


CHROMATOGRAM 8 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	3.267	25619		1	144.8581	C-1
2	3.854	4492		2	12.5381	C-2
3	5.056	1454		3	2.7005	C-3
	TOTAL	31565			160.0967	

GROUP(NAME)	CONC
C-1	144.8581
C-2	12.5381
C-3	2.7005
C-4	0
C-5	0
C-6+	0

BECHTEL UNIT: K-71
5-26-93 PROJECT: 010-392
HC SAMPLE # 1

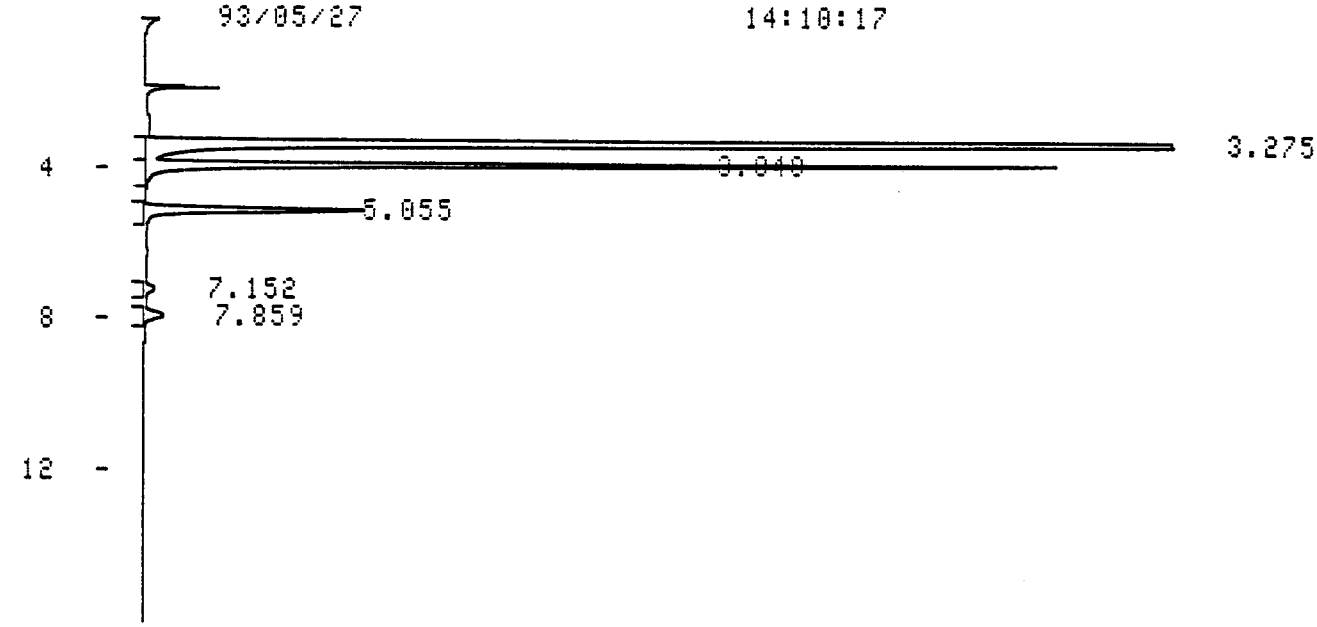


CHROMATOGRAM 11 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	3.276	235121		1	1329.4598	C-1
2	3.848	44637	V	2	124.5809	C-2
3	5.055	14254		3	26.4759	C-3
4	7.147	941		10	1.3321	C-4
5	7.86	1823		4	2.5805	C-4
	TOTAL	296776			1484.4289	

GROUP(NAME)	CONC
C-1	1329.4598
C-2	124.5809
C-3	26.4759
C-4	3.9125
C-5	0
C-6+	0

BECHTEL UNIT: K-71
5-26-93 PROJECT: 010-392
HC SAMPLE # 2

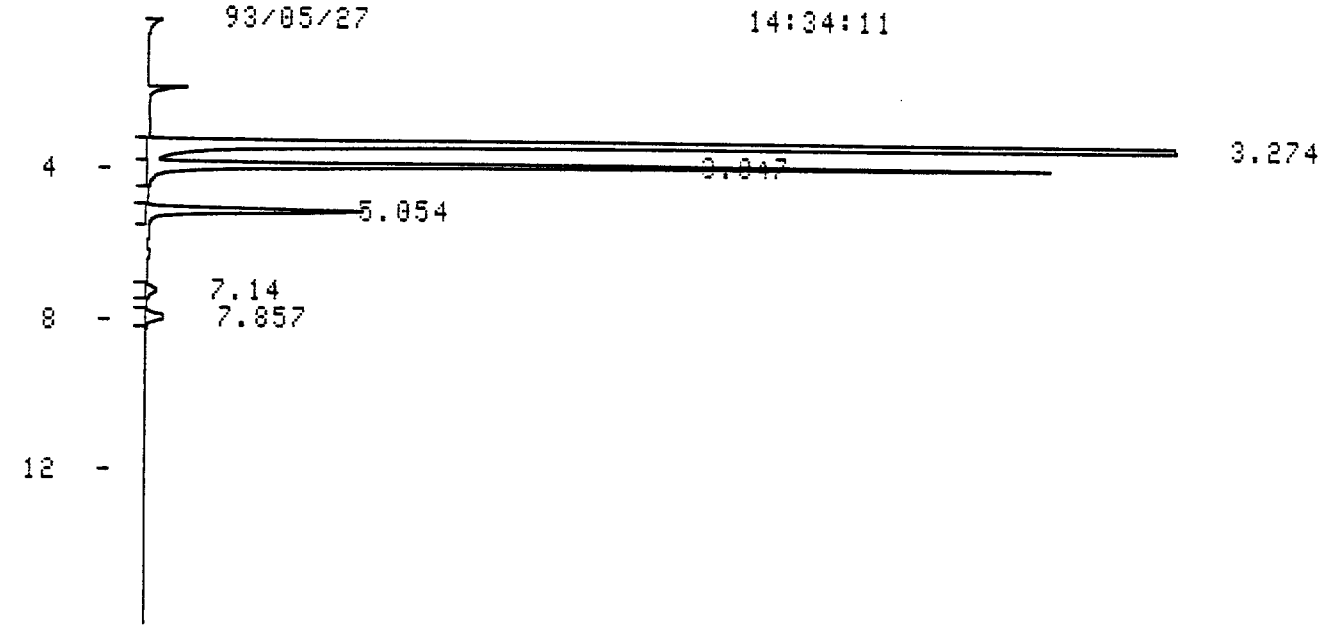


CHROMATOGRAM 12 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	3.275	233779		1	1321.8707	C-1
2	3.848	44318	V	2	123.6915	C-2
3	5.055	14107		3	26.2016	C-3
4	7.152	910		10	1.2882	C-4
5	7.859	1819		4	2.5749	C-4
	TOTAL	294932			1475.6268	

GROUP(NAME)	CONC
C-1	1321.8707
C-2	123.6915
C-3	26.2016
C-4	3.8631
C-5	0
C-6+	0

BECHTEL UNIT: K-71
5-26-93 PROJECT: 010-392
HC SAMPLE # 3



CHROMATOGRAM 13 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	3.274	239674		1	1355.2045	C-1
2	3.847	44127	V	2	123.1565	C-2
3	5.054	13872		3	25.7652	C-3
4	7.14	915		10	1.2955	C-4
5	7.857	1775		4	2.5125	C-4
	TOTAL	300362			1507.934	

GROUP(NAME)	CONC
C-1	1355.2045
C-2	123.1565
C-3	25.7652
C-4	3.808
C-5	0
C-6+	0

PETRO
CHEM
ENVIRONMENTAL
SERVICES, INC.

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

COMPANY : BECHTEL PETROLEUM
DATE : 5-25,26-93
PROJECT : 010-392

DATE RECEIVED : 5-26,27-9
DATE ANALYZED : 5-27-93
DATE REPORTED: 5-27-93

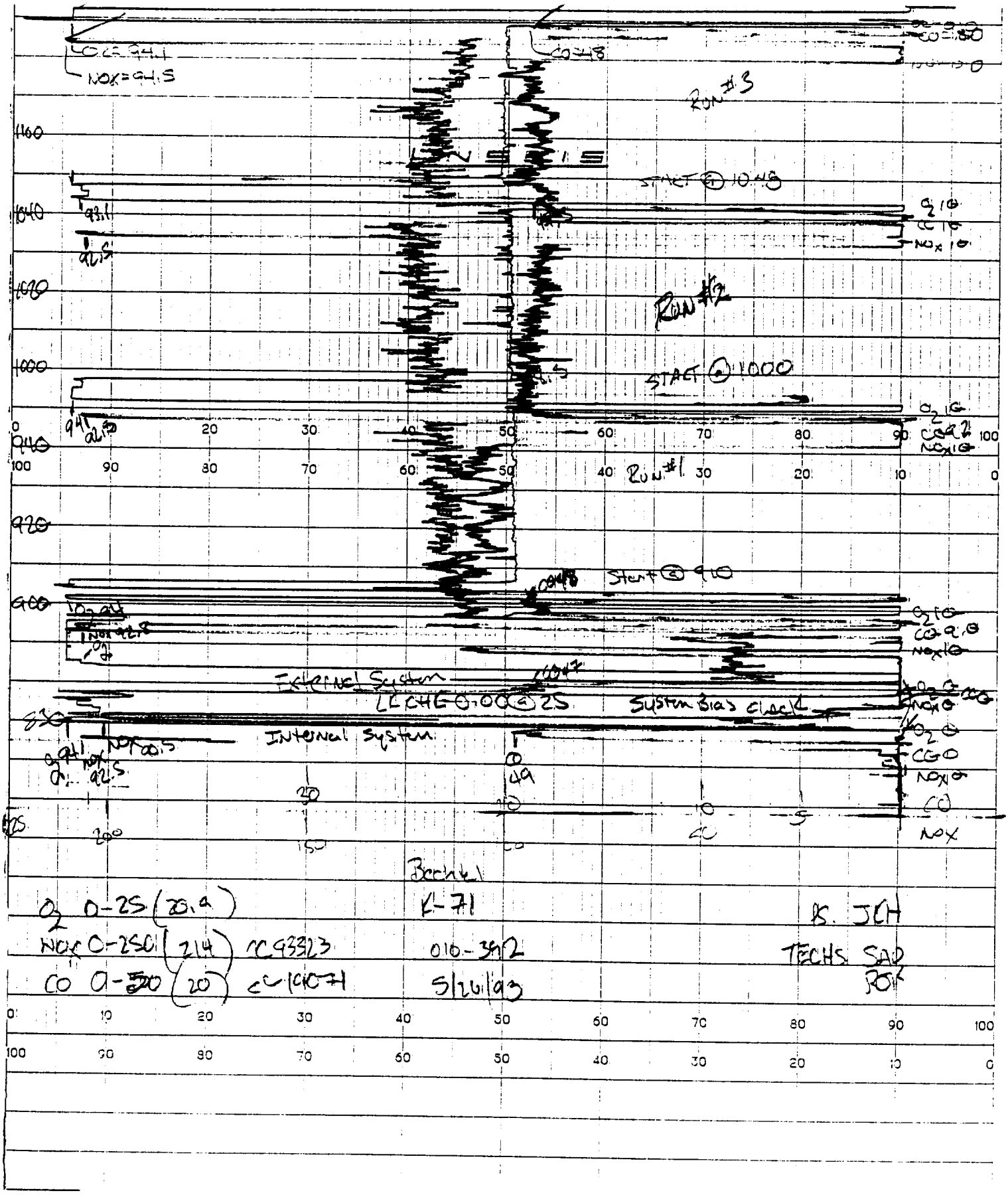
EPA METHOD 18
HYDROCARBON ANALYSIS REPORT

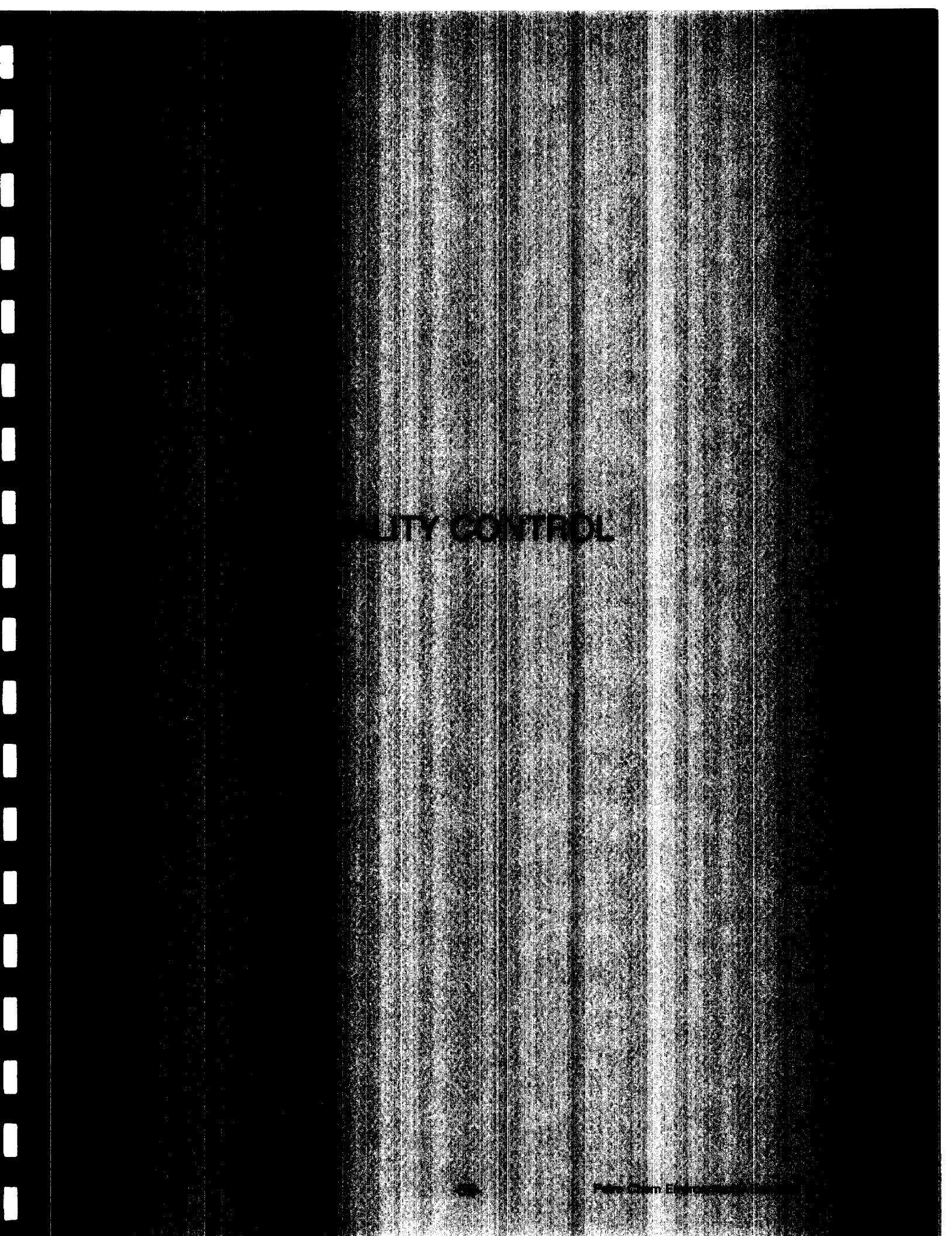
UNIT : K-71 (010-392 5-26-93)

CONSTITUENT	RUN # 1 ppm(v/v)	RUN # 2 ppm(v/v)	RUN # 3 ppm(v/v)
METHANE	1329.46	1321.87	1355.20
ETHANE	124.58	123.69	123.16
PROPANE	26.48	26.20	25.77
BUTANE	3.91	3.86	3.81
PENTANE	ND	ND	ND
HEXANES+	ND	ND	ND
TOTAL	1484.43	1475.62	1507.94
NON-METHANE	154.97	153.75	152.74

UNIT : HYDROCARBON SAMPLE BLANK 5-26-93

CONSTITUENT	ppm(v/v)
METHANE	144.86
ETHANE	12.54
PROPANE	2.70
BUTANE	ND
PENTANE	ND
HEXANES+	ND
TOTAL	160.10
NON-METHANE	15.24


CO=94.1
NOx=94.5
CO=48
RUN #3
LN 1.5
START @ 10:48
RUN #2
START @ 10:00
RUN #1
START @ 9:10
External System
LEAK 0.00 @ 25
System Bias check
Internal System
Bechtel
K-71
O2 0-25 (20.9)
NOx 0-250 (214) RC93323
CO 0-500 (20) CC191071
010-392
5/26/93
B. JCH
TECHS SAID OK


LITY CONTROL

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#								
ZALCO LABORATORIES		36020								
COMPANY	LOCATION/UNIT									
Bechtel	K-71									
PROJECT	SAMPLED BY									
010-392	JKH									
METHOD	DELIVER REPORT TO:	PCES PO#								
	TERRY ROWLES	3109								

SAMPLE ID#	SAMPLE DESCRIPTION	SAMPLE DATE	Liq	Filter	Gas	LOW RANGE TOTAL SULFUR as H2S				
BAG	FUEL GAS	5/26/93			X	X				

COMMENTS:

RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
D Smallwood	5/27/93	Danielle Quiroz	5-27-93
RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
RELINQUISHED BY:	DATE	RECEIVED BY:	DATE

PETRO CHEM ENVIRONMENTAL SERVICES, INC.

DRY GAS METER CALIBRATION

DATE:	4-6-93	AMBIENT TEMP °F:	64
TECH:	BDM	BAROMETRIC Pbar:	29.53
METER I.D.#	1001	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	7.33	10.01	10.01
	TOTAL	7.33	10.01	10.01
FIELD GAS METER VOLUME CF	INITIAL	383.10	392.30	403.00
	FINAL	390.56	402.73	413.50
	TOTAL	7.46	10.43	10.50
STD TEST METER TEMP (°F)		64.5	63.0	63.5
FIELD GAS METER TEMP (°F)	IN	59.0	59.5	59.5
	OUT	64.0	66.0	67.0
	AVERAGE	61.5	62.8	63.3
STD TEST METER PRESSURE ("H2O)		-0.60	-0.30	-0.15
FIELD GAS METER PRESSURE ("H2O)		1.41	0.53	0.18
FIELD GAS METER, Mcf		0.995939	0.980043	0.974358

FIELD AVERAGE Mcf:	0.983447	H@:	1.4808

PETRO CHEM ENVIRONMENTAL SERVICES, INC.
PITOT TUBE CALIBRATION

PITOT TUBE ID. # P5SS-1
DATE: 3-25-93
CALIBRATED BY: RJK

	"A" SIDE CALIBRATION			
RUN #	ΔPstd cm H2O (in.H2O)	ΔP(s) cm H2O (in. H2O)	Cp(s)	DEVIATION Cp(s) -Cp(A)
1	0.280	0.390	0.839	0.000
2	0.270	0.380	0.834	-0.005
3	0.290	0.400	0.843	0.004
		Cp (SIDE A)	0.839	

	"B" SIDE CALIBRATION			
RUN #	ΔPstd cm H2O (in.H2O)	ΔP(s) cm H2O (in. H2O)	Cp(s)	DEVIATION Cp(s) -Cp(B)
1	0.280	0.390	0.839	-0.001
2	0.290	0.400	0.843	0.003
3	0.280	0.390	0.839	-0.001
		Cp (SIDE B)	0.840	

Cp (SIDE A) - Cp (SIDE B) =	-0.001	0.840

$Cp = .99 * \Delta Pstd / \Delta P(s)$

AIRCO

521369

Airco Electronic 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 MIX

CUSTOMER: Bakersfield Welding Supply (Bakersfield, CA)
CYLINDER #: CC-93323 CERTIFICATION DATE: 11/17/92
CYLINDER PRESSURE: 1650 psig EXPIRATION DATE: 5/17/93
LABORATORY: Riverton, NJ REFERENCE #: 24593

MIXTURE COMPONENTS	ACTUAL MIXTURE CONCENTRATION	AIRCO INTERMEDIATE STANDARD CYLINDER #	CONC.	NIST SRM#
Nitric Oxide	214 ppm	CC-1528	225 ppm	1685B
Carbon Monoxide	220 ppm	CC-72904	206 ppm	2636A

BALANCE GAS: Nitrogen

COMPONENT 1 GAS ANALYSIS PROCEDURE Chemiluminescence
MAKE/MODEL/SER#: Beckman, 952, 0100204
LAST MULTIPOINT CALIBRATION DATE: 11/3/92

COMPONENT 2 GAS ANALYSIS PROCEDURE Non-Dispersive Infrared
MAKE/MODEL/SER#: Beckman, 866, 1000049
LAST MULTIPOINT CALIBRATION DATE: 11/3/92
R=REFERENCE STANDARD Z=ZERO GAS S=SAMPLE GAS

1ST COMPONENT Nitric Oxide

1ST ANALYSIS: DATE 11/10/92				ANALYST A. Lattanze	
1) Z 0000	R 7730	S 7330		CONC (1)	213 ppm
2) R 7730	Z 0000	S 7350		CONC (2)	214 ppm
3) R 7730	S 7350	Z 0000		CONC (3)	214 ppm
				AVE CONC	214 ppm

2ND ANALYSIS: DATE 11/17/92				ANALYST A. Lattanze	
1) Z 0000	R 7800	S 7410		CONC (1)	214 ppm
2) R 7815	Z 0000	S 7410		CONC (2)	213 ppm
3) R 7820	S 7420	Z 0000		CONC (3)	213 ppm
				AVE CONC	213 ppm

2ND COMPONENT Carbon Monoxide

1ST ANALYSIS: DATE 11/10/92				ANALYST A. Lattanze	
1) Z 000	R 420	S 447		CONC (1)	219 ppm
2) R 418	Z 000	S 446		CONC (2)	220 ppm
3) R 422	S 451	Z 000		CONC (3)	220 ppm
				AVE CONC	220 ppm

2ND ANALYSIS: DATE 11/17/92				ANALYST A. Lattanze	
1) Z 000	R 440	S 470		CONC (1)	220 ppm
2) R 440	Z 000	S 470		CONC (2)	220 ppm
3) R 440	S 470	Z 000		CONC (3)	220 ppm
				AVE CONC	220 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 = 214ppm; Carbon Monoxide = 220ppm; Balance = Nitrogen

APPROVED BY LABORATORY MANAGER

AIRCO

546242

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 Bakersfield, Ca

CYLINDER #: CC-19071
CYLINDER PRESSURE: 1000 psig
LABORATORY: Riverton, NJ

CERTIFICATION DATE: 3-29-93
EXPIRATION DATE: 9-29-93
REFERENCE #: 31381

MIXTURE COMPONENT	ACTUAL MIXTURE CONCENTRATION	AIRCO INTERMEDIATE STANDARD CYLINDER #	CONC.	NIST SRM#
Carbon Monoxide	20.0 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: 1-3-93

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

1ST ANALYSIS: DATE 3-22-93 ANALYST A. Lattanze

1) Z 000	R 245	S 199	CONC (1)	20.1 ppm
2) R 245	Z 000	S 199	CONC (2)	20.1 ppm
3) R 245	S 199	Z 000	CONC (3)	20.1 ppm
			AVE CONC	20.1 ppm

2ND ANALYSIS: DATE 3-29-93 ANALYST A. Lattanze

1) Z 000	R 243	S 196	CONC (1)	19.9 ppm
2) R 243	Z 000	S 196	CONC (2)	19.9 ppm
3) R 243	S 196	Z 000	CONC (3)	19.9 ppm
			AVE CONC	19.9 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 = 20.0 ppm, Nitric Oxide = 20.1 ppm, Sulfur Dioxide = 20.9 ppm, Nitrogen = Balance

APPROVED BY J. Lira
LABORATORY MANAGER

LABORATORY ANALYSIS
EPA METHOD 5 - PARTICULATE ANALYSIS

COMPANY: Bechtel PROJECT: 010-392

LOCATION/UNIT: K-71 DATE TESTED: 5/24/93

ANALYST: DGS

RUN # Blank

PROBE/NOZZLE/FILTER TOP VOL-

DISH #	#1	#2	#3	AVERAGE
FINAL (g)				
TARE (g)				
NET (g)				

FILTER # 589

	#1	#2	#3	AVERAGE
FINAL (g)	0.6028	0.6029		0.6029
TARE (g)	0.6029			0.6029
NET (g)				0

CONDENSABLE (aliquot /)

DISH #	#1	#2	#3	AVERAGE
FINAL (g)				
TARE (g)				
NET (g)				

PETRO CHEM ENVIRONMENTAL SERVICES LABORATORY

QUALITY CONTROL - METHOD 5 Q A BATCH #: 5-93-0028

DI H_2O FROM ANTONINO AVE VOLUME (ml): 250 ml

DISH #: 65	#2	#3	AVERAGE
FINAL WT. (g): 80.9372	80.9377	80.9379	80.9378
TARE WT. (g): 80.9376			80.9376
NET WT. (g):			0.0002

DI H_2O FROM DANIELS LN. VOLUME (ml): 250 ml

DISH #: 50	#2	#3	AVERAGE
FINAL WT. (g): 77.4968	77.4971		77.4970
TARE WT. (g): 77.4968			77.4968
NET WT. (g):			0.0002

EMPTY DISH

DISH #: 7	#2	#3	AVERAGE
FINAL WT. (g): 65.0497	65.0502		65.0500
TARE WT. (g): 65.0503			65.0503
NET WT. (g):			0

FILTER BLANK

FILTER #: 609	#2	#3	AVERAGE
FINAL WT. (g): 0.5896	0.5897		0.5897
TARE WT. (g): 0.5897			0.5897
NET WT. (g):			0

RECOVERY SAMPLE VOLUME (ml): 100 ml

DISH #: 51	#2	#3	AVERAGE
FINAL WT. (g): 80.0718	80.0721		80.0720
TARE WT. (g): 80.0502			80.0502
NET WT. (g):			0.0218

CONC (g/l): 0.2217 g/l Na_2SO_4	% RECOVERY: 98.3%
WT (g): 0.02217 g	(0.0218/0.02217) 100

PETRO
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ENVIRONMENTAL
SERVICES, INC.

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

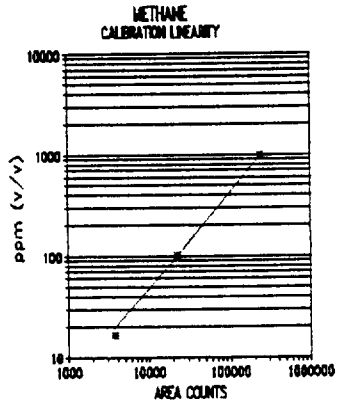
COMPANY : BECHTEL PETROLEUM
DATE : 5-25,26-93
PROJECT : 010-392

DATE RECEIVED : 5-26,27-93
DATE ANALYZED : 5-27-93
DATE REPORTED: 5-27-93

EPA METHOD 18
HYDROCARBON ANALYSIS
CALIBRATION DATA AND STATISTICS

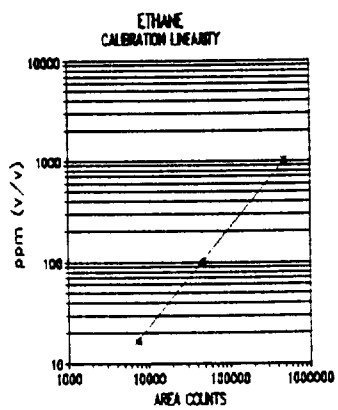
METHANE

CONC. (ppmv)	AREA COUNTS	RESPONSE FACTOR ppmv/AC
16.5	2859	5.77E-03
101	17862	5.65E-03
1000	177359	5.64E-03
	AVERAGE RF	5.69E-03
	STD. DEVIATION	5.92E-05
	RSD%	1.04%



ETHANE

CONC. (ppmv)	AREA COUNTS	RESPONSE FACTOR ppmv/AC
16.5	5652	2.92E-03
101	36188	2.79E-03
1030	350743	2.94E-03
	AVERAGE RF	2.88E-03
	STD. DEVIATION	6.50E-05
	RSD%	2.25%



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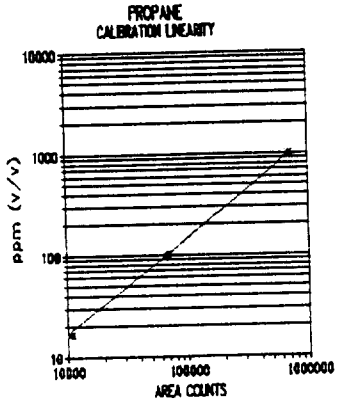
COMPANY: BECHTEL PETROLEUM
DATE : 5-25,26-93
PROJECT : 010-392

DATE RECEIVED : 5-26,27-93
DATE ANALYZED : 5-27-93
DATE REPORTED: 5-27-93

EPA METHOD 18
HYDROCARBON ANALYSIS
CALIBRATION DATA AND STATISTICS

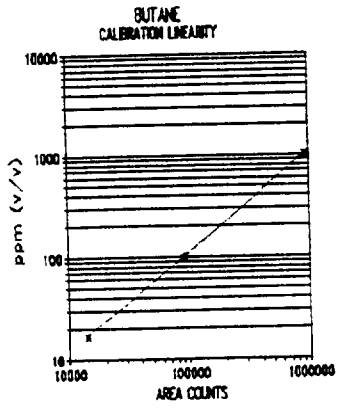
PROPANE

CONC. (ppmv)	AREA COUNTS	RESPONSE FACTOR ppmv/AC
16.5	8421	1.96E-03
100	53839	1.86E-03
1000	523992	1.91E-03
	AVERAGE RF	1.91E-03
	STD. DEVIATION	4.16E-05
	RSD%	2.18%



BUTANE

CONC. (ppmv)	AREA COUNTS	RESPONSE FACTOR ppmv/AC
16.5	11190	1.47E-03
101	71333	1.42E-03
1010	687704	1.47E-03
	AVERAGE RF	1.45E-03
	STD. DEVIATION	2.64E-05
	RSD%	1.81%



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3207 Antonino Avenue
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(805) 327-7300
FAX (805) 327-3459

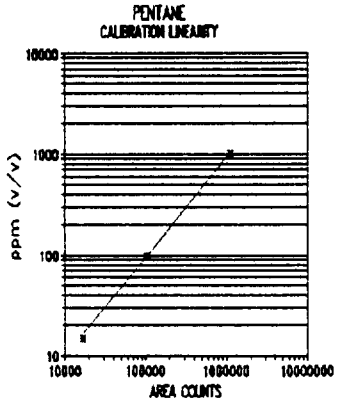
COMPANY: BECHTEL PETROLEUM
DATE : 5-25,26-93
PROJECT : 010-392

DATE RECEIVED : 5-26,27-93
DATE ANALYZED : 5-27-93
DATE REPORTED: 5-27-93

EPA METHOD 18
HYDROCARBON ANALYSIS
CALIBRATION DATA AND STATISTICS

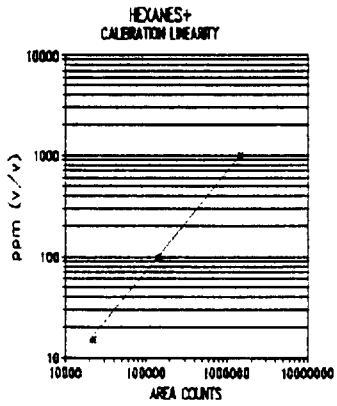
PENTANE

CONC. (ppmv)	AREA COUNTS	RESPONSE FACTOR ppmv/AC
14.8	12720	1.16E-03
99.1	85217	1.16E-03
1020	844962	1.21E-03
	AVERAGE RF	1.18E-03
	STD. DEVIATION	2.07E-05
	RSD%	1.76%



HEXANE

CONC. (ppmv)	AREA COUNTS	RESPONSE FACTOR ppmv/AC
15.2	16005	9.50E-04
100	107901	9.27E-04
1005	1066764	9.42E-04
	AVERAGE RF	9.40E-04
	STD. DEVIATION	9.54E-06
	RSD%	1.01%



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(805) 327-7300
FAX (805) 327-3459

COMPANY: BECHTEL PETROLEUM
DATE : 5-25,26-93
PROJECT : 010-392

DATE RECEIVED : 5-26,27-9
DATE ANALYZED : 5-27-93
DATE REPORTED: 5-27-93

EPA METHOD 18
CALIBRATION DRIFT ANALYSIS

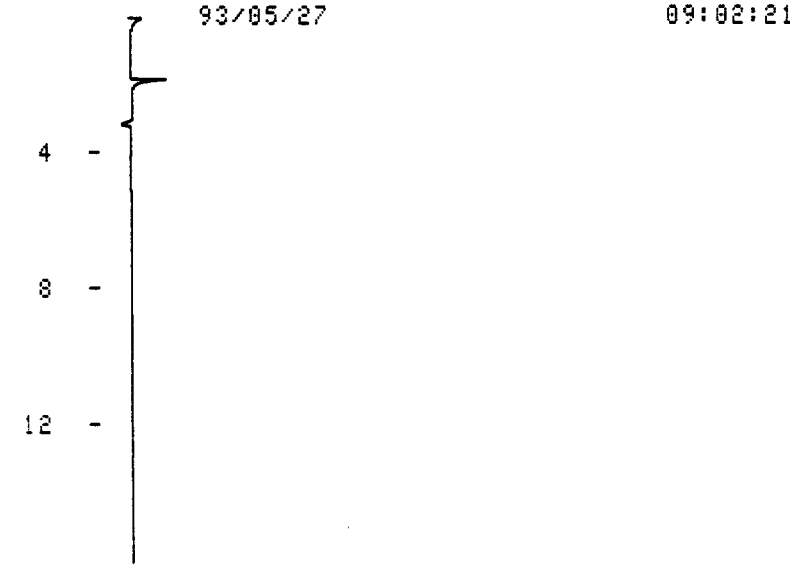
POST ANALYSIS CALIBRATION CHECK (15ppm STD.)

CONSTITUENT	INITIAL RF	POST RF	%DIFF.
METHANE	5.77E-03	5.77E-03	0.00%
ETHANE	2.92E-03	2.91E-03	0.44%
PROPANE	1.96E-03	1.96E-03	-0.13%
BUTANE	1.47E-03	1.46E-03	0.69%
PENTANE	1.16E-03	1.16E-03	0.59%
HEXANES+	9.50E-04	9.44E-04	0.57%

POST ANALYSIS CALIBRATION CHECK (100ppm STD.)

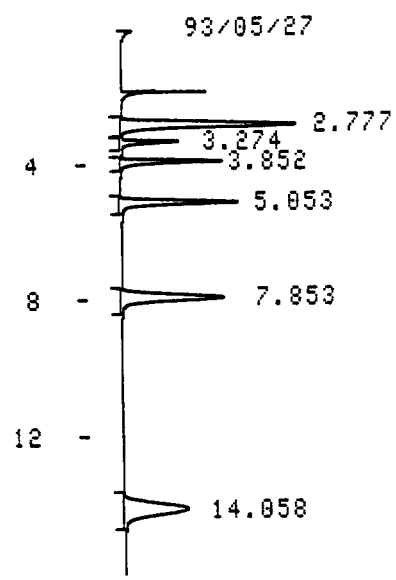
CONSTITUENT	INITIAL RF	POST RF	%DIFF.
METHANE	5.65E-03	5.60E-03	0.90%
ETHANE	2.79E-03	2.78E-03	0.35%
PROPANE	1.86E-03	1.85E-03	0.36%
BUTANE	1.42E-03	1.41E-03	0.45%
PENTANE	1.16E-03	1.16E-03	0.39%
HEXANES+	9.27E-04	9.23E-04	0.38%

SYSTEM BLANK
UHP HELIUM



CHROMATOGRAM 38 MEMORIZED
WARNING NO PEAK

15PPm HYDROCARBON STANDARD
SCOTTY CAN MIX 1



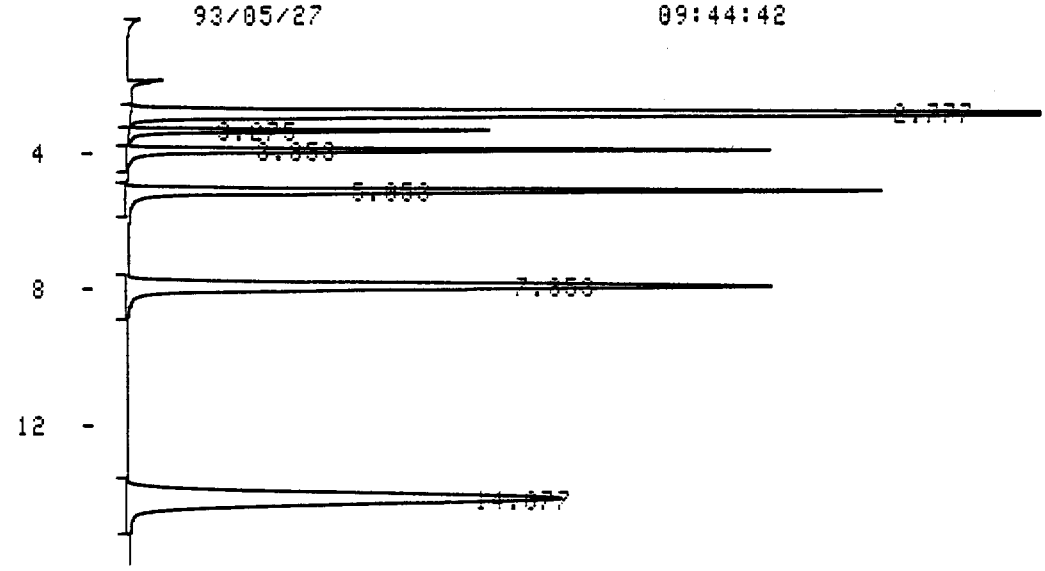
CHROMATOGRAM 1 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.777	16005		6		C-6+
2	3.274	2859		1		C-1
3	3.852	5652		2		C-2
4	5.053	8421		3		C-3
5	7.853	11190		4		C-4
6	14.058	12729		5		C-5
	TOTAL	56847				

IDENTIFICATION FILE 0
MODE$ 101 WINDOW 3

IDNO	NAME	TIME	FACTOR	CONC
1	C-1	3.26	0.00577104	16.5
2	C-2	3.85	0.00291927	16.5
3	C-3	5.04	0.00195939	16.5
4	C-4	7.83	0.00147453	16.5
5	C-5	14.04	0.00116356	14.8
6	C-6+	2.76	0.000949709	15.2
7	C-2	3.9	0.00291927	16.5
8	C-3	4.3	0.00195939	16.5
9	C-4	5.7	0.00147453	16.5
10	C-4	6.65	0.00147453	16.5
11	C-5	10.24	0.00116356	14.8
12	C-5	10.59	0.00116356	14.8
13	C-5	12.73	0.00116356	14.8
14	C-5	11.3	0.00116356	14.8
15	C-5	15.43	0.00116356	14.8
16	C-5	8.79	0.00116356	14.8
17	C-5	11.82	0.00116356	14.8

100PPm HYDROCARBON STANDARD
SCOTTY CAN MIX 220



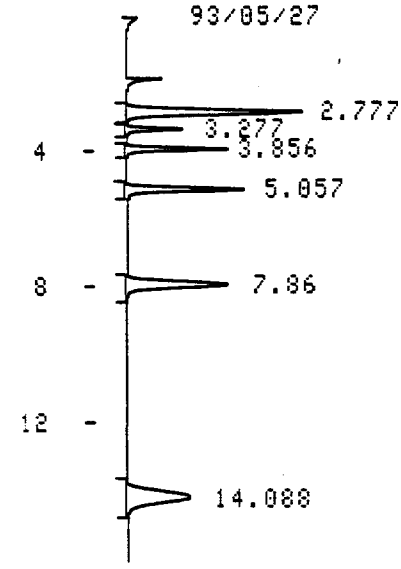
CHROMATOGRAM 2 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.777	107901		6		C-6+
2	3.275	17862		1		C-1
3	3.853	36188		2		C-2
4	5.053	53839		3		C-3
5	7.853	71333		4		C-4
6	14.077	85217		5		C-5
	TOTAL	372341				

IDENTIFICATION FILE 1
MODE# 101 WINDOW 3

IDNO	NAME	TIME	FACTOR	CONC
1	C-1	3.26	0.00565437	101
2	C-2	3.84	0.00279097	101
3	C-3	5.03	0.00185739	100
4	C-4	7.83	0.00141589	101
5	C-5	14.04	0.00116291	99.1
6	C-6+	2.77	0.000926775	100
7	C-2	4.18	0.00279097	101
8	C-3	4.58	0.00185739	100
9	C-4	6.05	0.00141589	101
10	C-4	7.04	0.00141589	101
11	C-5	10.21	0.00116291	99.1
12	C-5	10.59	0.00116291	99.1
13	C-5	12.71	0.00116291	99.1
14	C-5	11.3	0.00116291	99.1
15	C-5	15.27	0.00116291	99.1
16	C-5	12.19	0.00116291	99.1
17	C-5	11.61	0.00116291	99.1

POST ANALYSIS CALIBRATION CHECK
15PPm HYDROCARBON STANDARD
SCOTTY CAN MIX 1

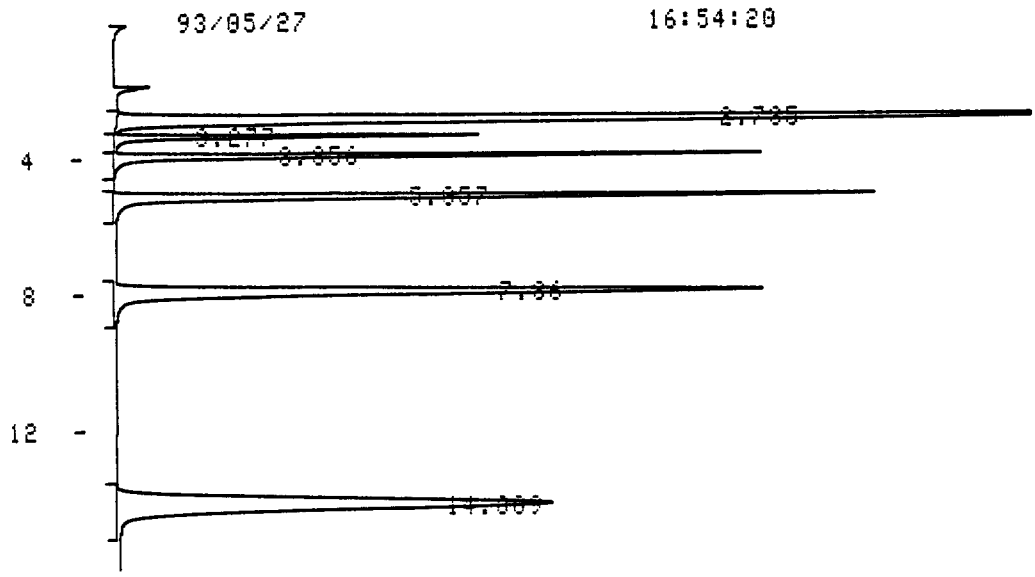


CHROMATOGRAM 14 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.777	16096		6	14.917	C-6+
2	3.277	2859		1	16.1639	C-1
3	3.856	5677		2	15.844	C-2
4	5.057	8410		3	15.6209	C-3
5	7.86	11268		4	15.9542	C-4
6	14.088	12795		5	14.88	C-5
	TOTAL	57105			93.3799	

GROUP(NAME)	CONC
C-1	16.1639
C-2	15.844
C-3	15.6209
C-4	15.9542
C-5	14.88
C-6+	14.917

POST ANALYSIS CALIBRATION CHECK
100PPm HYDROCARBON STANDARD
SCOTTY CAN MIX 220



CHROMATOGRAM 15 MEMORIZED

PKNO	TIME	AREA	MK	IDNO	CONC	NAME
1	2.785	108312		6	100.3812	C-6+
2	3.277	18025		1	101.9216	C-1
3	3.856	36314		2	101.3518	C-2
4	5.057	54036		3	100.3651	C-3
5	7.86	71656		4	101.4577	C-4
6	14.089	85553		5	99.4908	C-5
	TOTAL	373897			604.9681	

GROUP(NAME)	CONC
C-1	101.9216
C-2	101.3518
C-3	100.3651
C-4	101.4577
C-5	99.4908
C-6+	100.3812

COMPANY : PETRO CHEM ENVIRONMENTAL SERVICES, INC.
UNIT : STEP VAN
DATE : 5-10-93

ANALYZER : NOx THERMO ELECTRON MODEL 10
SERIAL # : SN 10A/R-17380-169

QUARTERLY LINEARITIES

CYL #	RANGE = 2500	VALUE %	VALUE%	DEVIATION
ALM23356	HIGH	1995	1967	1.12
CC2000	MID	799	799	0
	ZERO	0	0	0

CYL #	RANGE = 1000	ANALYZER VALUE %	ACTUAL VALUE%	%OF RANGE DEVIATION
CC2000	HIGH	784	799	-1.5
CC16755	MID	396	396	0
	ZERO	0	0	0

CYL #	RANGE = 250	ANALYZER VALUE %	ACTUAL VALUE%	%OF RANGE DEVIATION
CC93323	HIGH	211	214	-1.2
CC70292	MID	80.1	80.1	0
	ZERO	0	0	0

CYL #	RANGE = 100	ANALYZER VALUE %	ACTUAL VALUE%	%OF RANGE DEVIATION
CC70292	HIGH	81	80.1	0.9
CC14076	MID	40.6	40.6	0
	ZERO	0	0	0.3

CHECK LIST:	DUST
OIL CHANGE	OZONE SCRUBBER
DRIERITE	REACTION CHAMBER CLEANOUT
FILTER	CAPILLARIES

COMPANY : PETRO CHEM ENVIRONMENTAL SERVICES, INC.
UNIT : STEP VAN
DATE : 5-10-93

ANALYZER : CO - AUTOMATED CUSTOMS SYSTEMS 3300
SERIAL # : SN N5C4134T

QUARTERLY LINEARITIES

CYL #	RANGE = 2000	ANALYZER VALUE %	ACTUAL VALUE%	%OF RANGE DEVIATION
CC2000	HIGH	809	813	-0.2
CC16755	MID	435	435	0
	ZERO	20	0	1

CYL #	RANGE = 1000	ANALYZER VALUE %	ACTUAL VALUE%	%OF RANGE DEVIATION
CC2000	HIGH	825	813	1.2
CC16755	MID	435	435	0
	ZERO	0	0	0

CYL #	RANGE = 500	ANALYZER VALUE %	ACTUAL VALUE%	%OF RANGE DEVIATION
CC16755	HIGH	429	435	-1.2
CC93323	MID	220	220	0
	ZERO	0	0	0

CHECK LIST:

OPTICS CHECK AND CLEAN	
DUST	

COMPANY : PETRO CHEM ENVIRONMENTAL SERVICES, INC.
UNIT : STEP VAN
DATE : 5-10-93

ANALYZER : O2 TELEDYNE MODEL 326 RA
SERIAL # : SN 49832

QUARTERLY LINEARITIES

CYL #	RANGE = 25	ANALYZER VALUE %	ACTUAL VALUE%	%OF RANGE DEVIATION
AMBIENT	HIGH	21.25	20.9	1.4
N110964	MID	6.93	6.93	0
	ZERO	0.00	0	0

CYL #	RANGE = 10	ANALYZER VALUE %	ACTUAL VALUE%	%OF RANGE DEVIATION
N11964	HIGH	6.96	6.93	0.3
SA3291	MID	4	4	0
	ZERO	0.00	0	0

CHECK LIST:

DUST	
FUEL CELL	
ELECTRICAL CONNECTION	

CORRESPONDENCE

PETRO
CHEM
ENVIRONMENTAL
SERVICES, INC.

313 Daniels Lane
Bakersfield, California 93307
(805) 327-7300
FAX (805) 327-3459

Dennis Champion
Bechtel Petroleum Operations, Inc.
January 26, 1993

Unit: 52 IC Engines

SOURCE TEST PLAN

I. Source Information:

A. Unit: Various IC Engines/Compressors located at NPR-1 in Elk Hills, CA (See attachment)

B. Company: Bechtel Petroleum Operations, Inc.
28590 Highway 119
Tupman, CA 93276

Attention: Dennis Champion

II. Testing Firm: Petro Chem Environmental Services, Inc.
3207 Antonino Avenue
Bakersfield, CA 93308

Attention: Scott Davis

III. Regulatory Agency: San Joaquin Valley Unified APCD, Southern Zone and the Environmental Protection Agency.

IV. Summary: Annual Source Testing of 52 IC Engines. The engines will be tested for various pollutants; NOx, CO, NMHC, particulate and fuel sulfur. See attachments for each testing requirement and limits.

V. Testing Date: See Attachments

Dennis Champion
Bechtel Petroleum Operations, Inc.
January 26, 1993

Unit: 52 IC Engines

PROPOSAL FOR COMPLIANCE TESTING

Determination of concentrations (ppm, ppm @ 15% O_2 and gr/SCF) and emissions (lbs/hr, g/BHP-HR) of various pollutants from 52 Internal Combustion Engines located at NPR-1 in Kern County, California. See attachments for each engines' testing requirement and permit limits. All testing with be performed in accordance with San Joaquin Valley Unified APCD and EPA rules and regulations using the following methods.

Parameters	Method	# Test Runs
O_2	EPA Method 3A; Teledyne 320 AX Fuel Cell	3 - 40 min.
NOx	EPA Method 7E; Teco 10 Chemiluminescent	3 - 40 min.
CO	EPA Method 10; Teco 48 GFC	3 - 40 min.
NMHC	EPA Method 18; Tedlar Bag GC-FID	3
Particulate	EPA Method 5; Gravimetric	3
Volume Flow Particulate	EPA Method 2,3,4; Pitot Tube Traverse	3
Volume Flow Non-particulate	EPA Method 19; Fuel Rates and Fuel Analysis	3
Fuel Analysis F-Factor Calorific Value	GC-TCD Stainless Steel Bomb C_1-C_6+, O_2, CO_2, N_2 and Btu/lb	One day and/or One site
Fuel Analysis Fuel Sulfur	GC-FPD Tedlar Bag Total Sulfur referenced to and H_2S standard	One day and/or One site
Brake Horsepower	On site Beta measurement supplied by Bechtel Petroleum Operations, Inc.	3

APPENDIX
RITY TO CONSTRUCT

KERN COUNTY AIR POLLUTION CONTROL DISTRICT

RECEIVED
DEC 26 1989
ENVIRONMENTAL

AUTHORITY TO CONSTRUCT

2700 "M" Street, Suite 275
Bakersfield, CA 93301
(805) 861-3682

William J. Roddy
Air Pollution Control Officer

ISSUE DATE:	December 20, 1989	APPLICATION NO.	4091081B
EXPIRATION DATE:	December 20, 1991	DATE:	September 25, 1989

AUTHORITY TO CONSTRUCT IS HEREBY GRANTED TO:

ELK HILLS NAVAL PETROLEUM RESERVE #1

In the event an AUTHORITY TO CONSTRUCT is reissued to a new owner, any emissions increase assigned to this equipment during initial New Source Review Process remains with the initial bearer of this document.

AUTHORITY TO CONSTRUCT IS HEREBY GRANTED FOR:

Modification of Internal Combustion Engine:
Increase PM, SO2 and SO4 Emission Sampling Limits

(See attached sheets for equipment description and conditions)

S	T	R	Location:	Start-up Inspection Date:
30	30S	23E	2-30R Carneros Compressor Station	

Upon completion of construction and/or installation, please telephone the Manager of Engineering. This document serves as a TEMPORARY Permit to Operate only as provided by Rule 201 of the District's Rules and Regulations. For issuance of a Permit to Operate, Rule 208 requires that the equipment authorized by this AUTHORITY TO CONSTRUCT be installed and operated in accordance with the conditions of approval. Changes to these conditions must be made by application and must be approved before such changes are made. This document does not authorize the emission of air contaminants in excess of New Source Review limits (Rule 210.1) or Regulation IV emission limits. Emission testing requirements set forth in this document must be satisfied before a Permit to Operate can be granted.

Validation Signature:

Petro Chem Environmental Services, Inc.

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Continued

EQUIPMENT DESCRIPTION: Modification of Internal Combustion Engine: Increase PM, SO2 and SO4 Emission Sampling Limits, including the following equipment and design specifications:

A. Low pressure gas scrubber, V-503, (shared with 4091081,082)
B. Two suction scrubbers, (shared with 4091081,082)
C. Waukesha L7042GL, 1500 hp internal combustion engine,
D. Two intercoolers, (shared with 4091081,082)
E. Two interstage knockout vessels, (shared with 4091081,082)
F. Two after coolers, (shared with 4091081,082)
G. Compressor discharge knockout vessel, (shared with 4091081,082)
H. Piping to Stevens high pressure header. (shared with 4091081,082)

CONDITIONAL APPROVAL:

Pursuant to Rule 209, "conditional approval" is hereby granted. Please be aware that all conditions of approval remain in effect for life of project unless modifications are approved by District.

DESIGN CONDITION:

Engine shall be designed for fuel lean-burn. (Rule 209)

OPERATIONAL CONDITIONS:

a. Only natural gas with a sulfur compound concentration of 1.0 gr/100 scf or less shall be burned in this engine. (Rule 210.1)
b. Liquids from knockout vessels shall be directed to permit units 4091571-576 through closed piping. (Rule 209)

EMISSION SAMPLING LIMITS:

Particulates:	0.15 lbm/hr (Rule 210.1)
Sulfur Compounds:	0.03 lbm/hr (of SO_2) (Rule 210.1)
	0.03 lbm/hr (of SO_4) (Rule 210.1)
Oxides of Nitrogen:	6.60 lbm/hr (as NO2) (Rule 210.1)
Hydrocarbons:	6.00 lbm/hr (Rule 210.1)
Carbon Monoxide:	8.00 lbm/hr (Rule 210.1)

COMPLIANCE TESTING REQUIREMENTS:

Compliance with above IC engine emission sampling limits shall be demonstrated by District-witnessed sample collection by independent testing laboratory within 60 days after startup of this equipment and annually 60 days prior to permit anniversary date, and official test results and field data submitted within 30 days after collection. (Rule 108.1)

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STATE OF CALIFORNIA AIR TOXICS HOT SPOTS REQUIREMENTS:

Facility shall comply with California Health and Safety Code Sections 44300 through 44384. (Rule 208.1)

RULE 210.1 (NSR) ANALYSIS VALIDATION:

Maximum daily emission rate of each air contaminant from this permit unit shall not exceed daily amount shown as "proposed" on attached emission profile.

Maximum average monthly emission rate of each air contaminant from this permit unit shall not exceed number of days in month times daily amount shown as "proposed" on attached emission profile. Average monthly emission rate shall be determined at end of each month by averaging previous 12 months of operation (fewer than 12 if new or seasonal source).

Compliance with these emission limits shall be verified by source operator (with fuel consumption data, operational data, etc.) on daily basis (maximum daily emission rate) and on monthly basis (maximum average monthly emission rate) and written documentation made readily available to District for period of one year.

RULE 210.1 (NSR) SPECIFIC LIMITING CONDITIONS:
(see attached emission profile).

MW

EMISSION PROFILE
4091081B