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LA. DEPARTMENT OF
ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

EXXON COMPANY, U.S.A.
POST OFFICE BOX 61707 • NEW ORLEANS, LOUISIANA 70161-1707

PRODUCTION DEPARTMENT
SOUTHEASTERN DIVISION

January 11, 1993

Results of Engine Testing
Permit No. 2660-00077-01
St. Mary Parish, Louisiana

Mr. Gus Von Bodungen
Air Quality Division
Department of Environmental Quality
Post Office Box 82135
Baton Rouge, Louisiana 70884-2135

Dear Mr. Von Bodungen:

Attached is a copy of the complete report for the stack test performed on the 1550 HP compressor engine (ENG004) at Exxon's Bayou Sale Compressor Station. This test was required by Specific Condition No. 2 of the above referenced permit. The test was performed on October 28, 1992 by Emission Testing Services in accordance with 40 CFR 60, Appendix A, Method 7E and Method 10. A summary of the results was submitted to your office on December 10, 1992.

If you have any questions, please contact Karen Cox at 561-4391.

Yours very truly,

K. E. Killian, Supervisor
Regulatory Compliance - Inshore

KEC (BSALENG2)

xc: Mr. Ben Potier
Acadian Regional Office
Department of Environmental Quality
100 Asma Blvd., Suite 151
Lafayette, LA 70508

Bayou Sale Engine Report

File (w/ report): Air. 04.a.06.a

xc (w/ report): R. J. Marque
J. M. Popp (Garden City Gas Plant Office)

xc (cover letter only): R. G. Chamberlain
J. L. Highberger

VOS: I have 5 copies of the report in my office. KEC

EXXON COMPANY, U.S.A.
P.O. BOX 61706
NEW ORLEANS, LOUISIANA 70161

RECEIVED
JAN 14 1993
LA. DEPARTMENT OF
ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

EMISSION TESTING
on COMPRESSOR C.B. GMVA-12
EMISSION POINT ENG 004
at BAYOU SALE FIELD
OCTOBER 28, 1992

Testing conducted by :

E T S

EMISSION TESTING SERVICES, INC.

P.O. BOX 15075

BATON ROUGE, LOUISIANA 70895

(504) 925-8405

File : 92129B

EMISSION TEST REPORT CERTIFICATION

for

EXXON COMPANY, U.S.A

EMISSION TESTING

on COMPRESSOR C.B. GMVA-12

EMISSION POINT ENG 004

at BAYOU SALE FIELD

OCTOBER 28, 1992

Testing conducted by :

EMISSION TESTING SERVICES, INC.

I certify that I have personally examined and am familiar with the information submitted herein, and based on my inquiries of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete.

Richard Marque
Exxon Company, U.S.A.
Facility Representative

Troy LeSage
Emission Testing Services
Project Leader

Barry Gipson
Emission Testing Services
Manager

EXXON COMPANY, U.S.A.

EMISSION TESTING

on COMPRESSOR C.B. GMVA-12

EMISSION POINT ENG 004

at BAYOU SALE FIELD

OCTOBER 28, 1992

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I. INTRODUCTION

Emission Testing Services, Inc. was contracted by Exxon Company, U.S.A. to conduct emission testing on Compressor C.B. GMVA-12 (Emission Point ENG 004) located at Exxon's Bayou Sale Field. Oxides of nitrogen and carbon monoxide emissions were determined in order to demonstrate compliance with emissions permit #2660-00077-01 issued by the State of Louisiana, Department of Environmental Quality (Specific Condition #2).

EPA Method 7E was used to determine emissions of oxides of nitrogen and EPA Method 10 was used to determine carbon monoxide emissions. EPA Methods 1-4 were used to determine the number and location of sample points, and the velocity, molecular weight, moisture, and volumetric flow rate of the stack gas.

The test team consisted of Troy LeSage, James Gipson, and Robert Jones. Richard Marque represented Exxon and coordinated testing with facility operations. The Louisiana Department of Environmental Quality was represented by Ben Potier during the tests.

The Bayou Sale Compressor, C.B. GMVA-12, was tested on October 28, 1992. Three test runs were conducted while the compressor operated at a normal load rate of 80% of maximum.

II. SUMMARY

Results of emission testing on the Bayou Sale Compressor, C.B. GMVA-12, (Emission Point ENG 004) are presented in Table I.

EPA methods were used to determine stack gas parameters and pollutant emission rates. With the following exception, all testing was conducted without deviation from these methods and no unusual conditions were noted during the tests.

The Bayou Sale Field Compressor, C.B. GMVA-12, has a horizontal duct at the test point. A horizontal and vertical traverse were required; however, the vertical traverse was inaccessible. All testing was conducted across the horizontal traverse.

TABLE I
EMISSION TEST RESULTS SUMMARY

EXXON COMPANY, U.S.A.
BAYOU SALE FIELD

COMPRESSOR, C.B. GMVA-12
EMISSION POINT ENG 004

PARAMETER	PERMIT LIMIT MAX/AVG	RUN 1	RUN 2	RUN 3	AVG.
DATE		10-28-92	10-28-92	10-28-92	
TIME		1030-1129	1229-1328	1356-1455	
OXIDES of NITROGEN					
PPMv		685.1	653.0	699.3	679.1
lb/hr	43.23/37.59	36.305	34.243	37.044	35.864
CARBON MONOXIDE					
PPMv		94.6	92.2	92.5	93.1
lb/hr	43.23/37.59	3.051	2.943	2.981	2.992
OXYGEN, test analyzer, %		14.9	14.9	14.9	14.9
COMPRESSOR OPERATING DATA					
Fuel Rate, MSCFD		320	320	320	320
Engine Speed, rpm		285	285	285	285
Engine Timing, deg		9	9	9	9
Engine horsepower, hp		1240	1240	1240	1240
STACK GAS					
Temperature, F		641	644	644	643
Moisture, %		8.32	7.60	7.29	7.74
Velocity, ft/sec		125.12	125.43	125.18	125.24
Flow rate, acfm		16378	16419	16386	16394
dscfm		7314.4	7391.9	7389.2	7365.2

PROCESS DESCRIPTION

The Bayou Sale Compressor is used to compress and transfer natural gas into the sales pipeline. The compressor is driven by a natural gas fired engine.

FIGURE 1

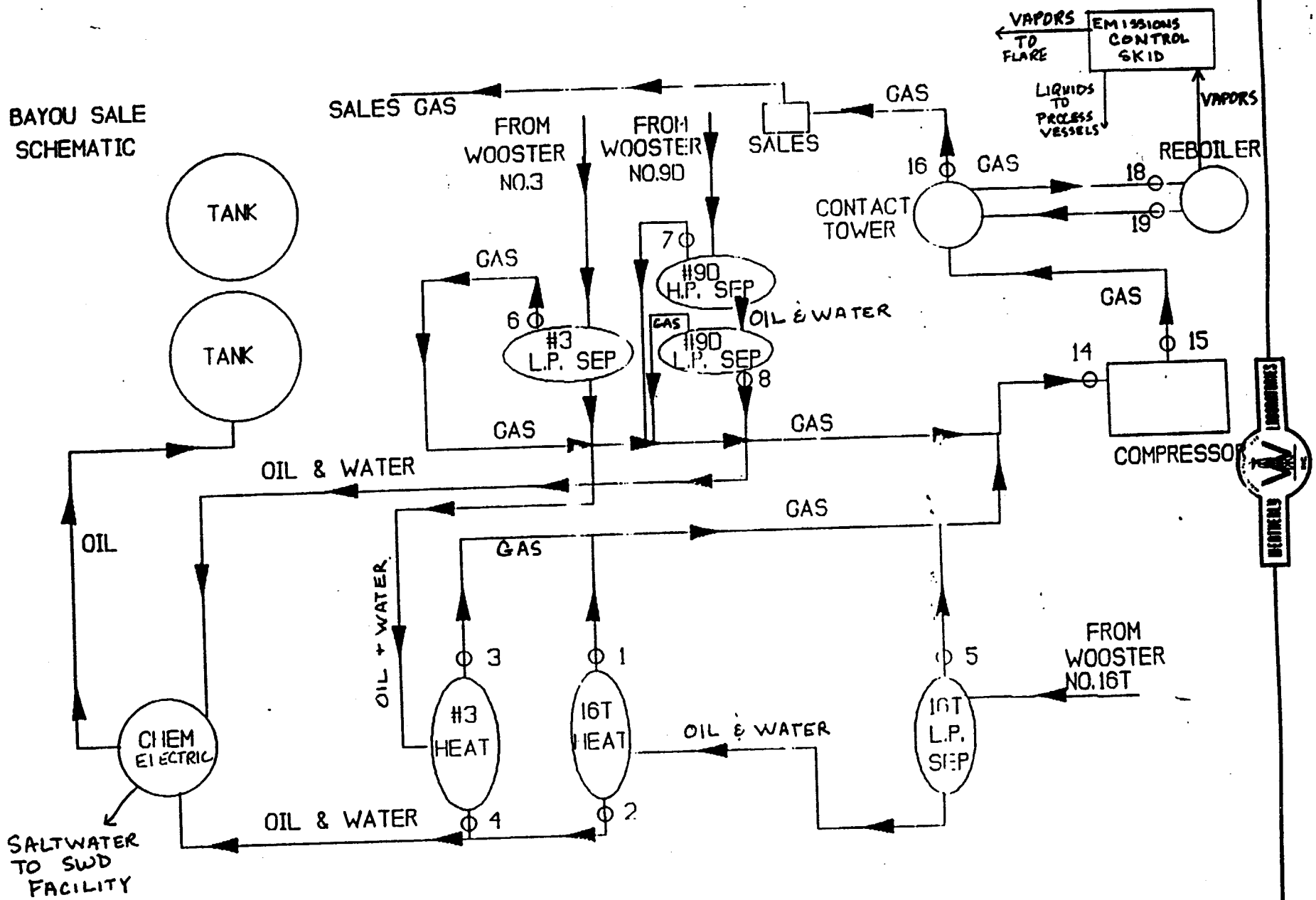
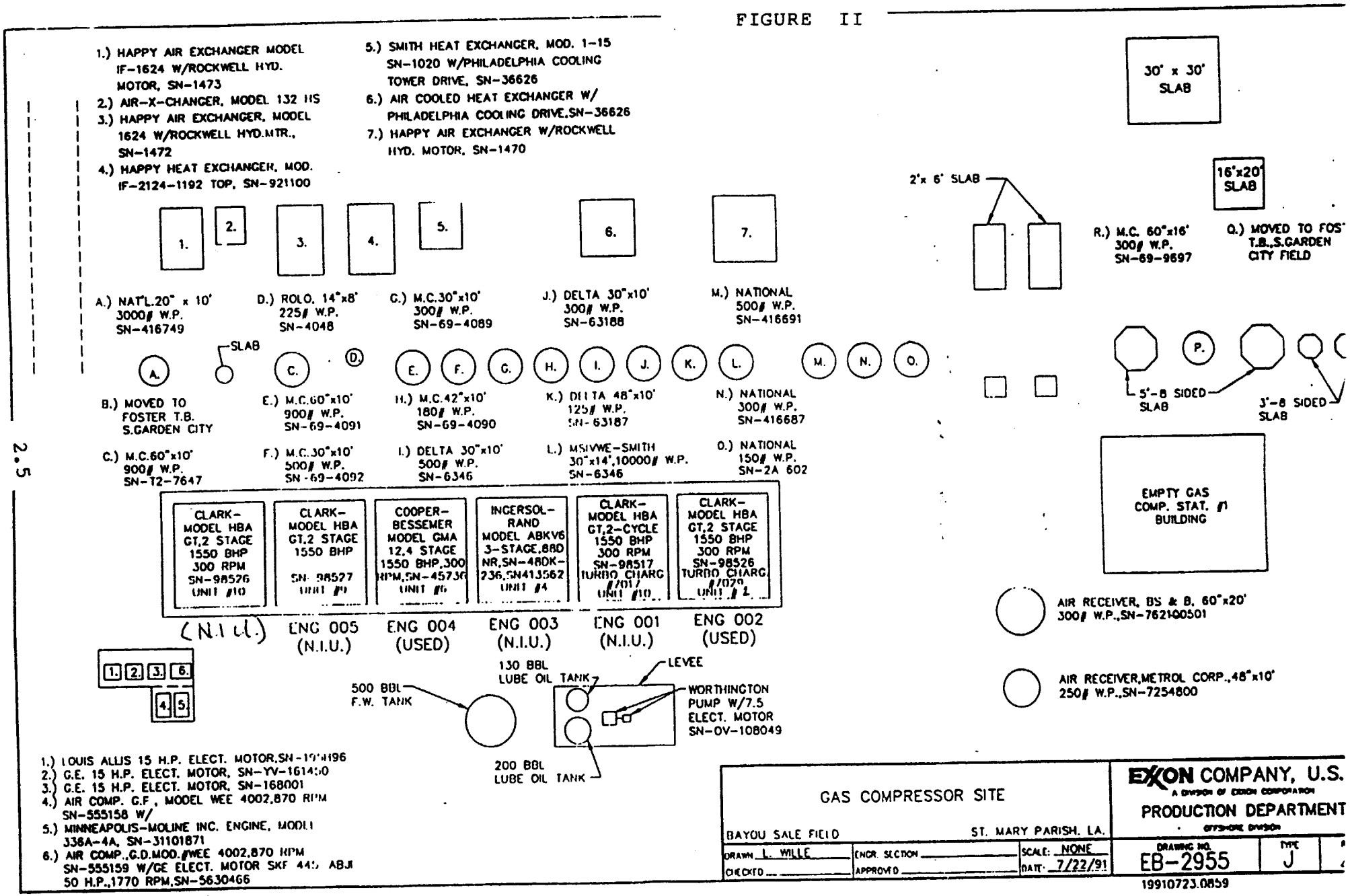

BAYOU SALE SCHEMATIC
TANK
TANK
SALES GAS
FROM WOOSTER NO.3
FROM WOOSTER NO.9D
SALES
GAS
VAPORS TO FLARE
EMISSIONS CONTROL SKID
LIQUIDS TO PROCESS VESSELS
VAPORS
REBOILER
16
GAS
18
19
CONTACT TOWER
7
#9D H.P. SEP
OIL & WATER
GAS
6
#3 L.P. SEP
GAS
#9D L.P. SEP
8
GAS
14
15
COMPRESSOR
GAS
GAS
OIL & WATER
GAS
OIL
GAS
OIL + WATER
3
1
5
FROM WOOSTER NO.16T
#3 HEAT
16T HEAT
OIL & WATER
16T L.P. SEP
CHEM ELECTRIC
OIL & WATER
4
2
SALTWATER TO SWD FACILITY

FIGURE II


1.) HAPPY AIR EXCHANGER MODEL IF-1624 W/ROCKWELL HYD. MOTOR, SN-1473
2.) AIR-X-CHANGER, MODEL 132 HS
3.) HAPPY AIR EXCHANGER, MODEL 1624 W/ROCKWELL HYD.MTR., SN-1472
4.) HAPPY HEAT EXCHANGER, MOD. IF-2124-1192 TOP, SN-921100
5.) SMITH HEAT EXCHANGER, MOD. 1-15 SN-1020 W/PHILADELPHIA COOLING TOWER DRIVE, SN-36626
6.) AIR COOLED HEAT EXCHANGER W/ PHILADELPHIA COOLING DRIVE,SN-36626
7.) HAPPY AIR EXCHANGER W/ROCKWELL HYD. MOTOR, SN-1470
30' x 30' SLAB
2'x 6' SLAB
16'x20' SLAB
R.) M.C. 60"x16' 300# W.P. SN-69-9697
Q.) MOVED TO FOS' T.B.,S.GARDEN CITY FIELD
A.) NAT'L.20" x 10' 3000# W.P. SN-416749
D.) ROLO. 14"x8' 225# W.P. SN-4048
G.) M.C.30"x10' 300# W.P. SN-69-4089
J.) DELTA 30"x10' 300# W.P. SN-63188
M.) NATIONAL 500# W.P. SN-416691
SLAB
B.) MOVED TO FOSTER T.B. S.GARDEN CITY
E.) M.C.60"x10' 900# W.P. SN-69-4091
H.) M.C.42"x10' 180# W.P. SN-69-4090
K.) DELTA 48"x10' 125# W.P. SN-63187
N.) NATIONAL 300# W.P. SN-416687
C.) M.C.60"x10' 900# W.P. SN-T2-7647
F.) M.C.30"x10' 500# W.P. SN-69-4092
I.) DELTA 30"x10' 500# W.P. SN-6346
L.) MSIVWE-SMITH 30"x14',10000# W.P. SN-6346
O.) NATIONAL 150# W.P. SN-2A 602
5'-8 SIDED SLAB
3'-8 SIDED SLAB
EMPTY GAS COMP. STAT. #1 BUILDING
CLARK- MODEL HBA GT,2 STAGE 1550 BHP 300 RPM SN-98526 UNIT #10
CLARK- MODEL HBA GT,2 STAGE 1550 BHP SN-98527 UNIT #9
COOPER-BESSEMER MODEL GMA 12,4 STAGE 1550 BHP,300 RPM,SN-45736 UNIT #6
INGERSOL-RAND MODEL ABKV6 3-STAGE,880 NR,SN-48DK-236,SN413562 UNIT #4
CLARK- MODEL HBA GT,2-CYCLE 1550 BHP 300 RPM SN-98517 TURBO CHARG #701 UNIT #10
CLARK- MODEL HBA GT,2 STAGE 1550 BHP 300 RPM SN-98526 TURBO CHARG #707 UNIT #2
(N.I.U.)
ENG 005 (N.I.U.)
ENG 004 (USED)
ENG 003 (N.I.U.)
ENG 001 (N.I.U.)
ENG 002 (USED)
AIR RECEIVER, BS & B, 60"x20' 300# W.P.,SN-762100501
AIR RECEIVER,METROL CORP.,48"x10' 250# W.P.,SN-7254800
130 BBL LUBE OIL TANK
LEVEE
500 BBL F.W. TANK
WORTHINGTON PUMP W/7.5 ELECT. MOTOR SN-OV-108049
200 BBL LUBE OIL TANK
1.) LOUIS ALLIS 15 H.P. ELECT. MOTOR,SN-19'N196
2.) G.E. 15 H.P. ELECT. MOTOR, SN-YV-161450
3.) G.E. 15 H.P. ELECT. MOTOR, SN-168001
4.) AIR COMP. G.F., MODEL WEE 4002,870 RPM SN-555158 W/
5.) MINNEAPOLIS-MOLINE INC. ENGINE, MODEL 336A-4A, SN-31101871
6.) AIR COMP.,G.D.MOD.#WEE 4002,870 RPM SN-555159 W/GE ELECT. MOTOR SKF 445 ABJI 50 H.P.,1770 RPM,SN-5630466
GAS COMPRESSOR SITE
BAYOU SALE FIELD
ST. MARY PARISH, LA.
DRAWN L. WILLE
CHECKED
ENGR. SECTION
APPROVED
SCALE: NONE
DATE: 7/22/91
EXXON COMPANY, U.S.
A DIVISION OF EXXON CORPORATION
PRODUCTION DEPARTMENT
OFFSHORE DIVISION
DRAWING NO. EB-2955
TYPE J
19910723.0859

III. PROCEDURE

Emissions were determined using EPA methods found in Appendix A, Part 60, Title 40 of the Code of Federal Regulations. A brief description of each method used follows.

METHOD 1: SAMPLE and VELOCITY TRAVERSES for STATIONARY SOURCES

Method 1 is applicable to stack having a diameter greater than 12 in. The method recommends that sampling points be located 8 diameters downstream and 2 diameters upstream from the nearest flow disturbances; however, any distances greater than the minimum 2 diameters downstream and 0.5 diameters upstream are acceptable. These distances help insure the collection of a representative sample in the absence of cyclonic flow. Cyclonic flow is detected by measuring the stack gas flow Yaw angle at each test point. The average yaw angle is required to be less than 20 degrees.

The Bayou Sale Field Compressor, C.B. GMVA-12 has a stack diameter of 20.0 in. The sampling point was located 3.75 stack diameters downstream and 1.25 stack diameters upstream from the nearest flow disturbances. During testing, 16 sample points were selected, divided into 8 traverse points located across 2 perpendicular diameters of the stack. NOTE : Only the horizontal traverse, 8 points, was used since the vertical traverse was inaccessible. Cyclonic flow was not detected.

METHOD 2: DETERMINATION of STACK GAS VELOCITY and VOLUMETRIC FLOW RATE (Type S pitot tube)

The average gas velocity in the stack was determined from the gas molecular weight, moisture content, and the average velocity head measured using a type S pitot tube. Volumetric flow rate was determined from the velocity and stack cross-sectional area.

METHOD 3: GAS ANALYSIS FOR CARBON DIOXIDE, OXYGEN, EXCESS AIR, and DRY MOLECULAR WEIGHT

The dry molecular weight of the stack gas was determined using an Orsat analyzer which measured the concentration of oxygen, carbon monoxide, and carbon dioxide. The remaining gas components were assumed to be nitrogen. A gas sample was removed from the centroid of the stack using a stainless steel probe fitted with a particulate filter. The probe, sample lines, and Orsat were purged sufficiently to obtain a representative grab sample for analysis.

METHOD 3A: DETERMINATION of OXYGEN CONCENTRATIONS in EMISSIONS from STATIONARY SOURCES (INSTRUMENTAL ANALYZER PROCEDURE)

A gas sample was continuously extracted from the stack using a heated probe and sample line. The sample was transferred to a oxygen analyzer for analysis of oxygen concentration. Analyzer output was continuously recorded by a computer data acquisition system. Results from the oxygen monitor were used for reference purposes and when required, for oxygen concentration corrections for all other parameters determined from the continuous gas sample stream. Oxygen data obtained from this method were not used to determine stack gas molecular weight.

METHOD 4: DETERMINATION of MOISTURE CONTENT in STACK GASES

A gas sample was extracted from the stack using a heated glass probe fitted with a particulate filter. Sample gas passed from the probe, through a series of four impingers immersed in an ice bath. The first two impingers contained known weights of water, the third was empty, and the fourth contained a known weight of silica gel. Any water vapor in the gas stream was condensed and trapped in the impingers.

METHOD 7E: DETERMINATION of NITROGEN OXIDES EMISSIONS from STATIONARY SOURCES

A gas sample was continuously extracted from the stack at a centroidal sampling point. The sample was transferred through a heated sample line to a continuous chemiluminescence analyzer.

METHOD 10: DETERMINATION of CARBON MONOXIDE EMISSIONS from STATIONARY SOURCES

A gas sample was continuously extracted from the stack at a centroidal sampling point. The sample was transferred through a heated sample line to a continuous nondispersive infrared analyzer.

IV. ANALYTICAL TECHNIQUE

All sample analyses were conducted following EPA methodology. Presented below are brief descriptions of each method used.

METHOD 7E: DETERMINATION of NITROGEN OXIDES EMISSIONS from STATIONARY SOURCES

All samples collected were analyzed in the field using a continuous chemiluminescence analyzer. The analyzer was calibrated using gas standards prepared by EPA protocol number 1, traceable to NBS standards.

METHOD 10: DETERMINATION of CARBON MONOXIDE EMISSIONS from STATIONARY SOURCES

All samples collected were analyzed in the field using a continuous nondispersive infrared analyzer. The analyzer was calibrated using gas standards prepared by EPA protocol number 1, traceable to NBS standards.

V. CHAIN of CUSTODY

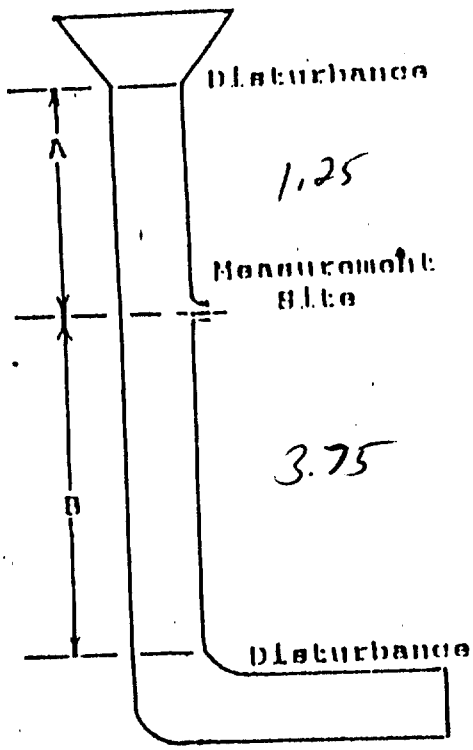
For all samples transported to the laboratory for analyses, a Chain of Custody form is prepared during the sample recovery process. Since all sample analysis were conducted in the field, no chain of custody was required.

VI. TEST DATA and CALCULATIONS

All emission test field data, unit operations data, and laboratory data are presented in this section along with the associated data reduction calculations.

Data from the field data forms were manually input into a computer for data processing and calculations. Integrity of data input is maintained by using a double entry system. The computer performed all calculations and produced the calculations and results summary pages. Input data accuracy were further verified by comparison of raw field data to the computer data printed on the summary pages. Computer program integrity and calculations verification are validated by processing a known set of data. Further controls on the computer program are conducted by comparison of manual spot calculations of the raw data input to computer calculations results.

Traverse Point Layout



Client EXXON

Date 10-28-92

Unit Tested EGN-004

Location Bayou Sale

Upstream Distance (A) 25"

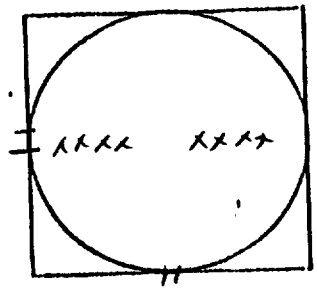
Downstream Distance (B) 75"

Inside Diameter 20"

Coupling Length 11.5"

Coupling Type 3" male screw on
(Need extension coupling for port)

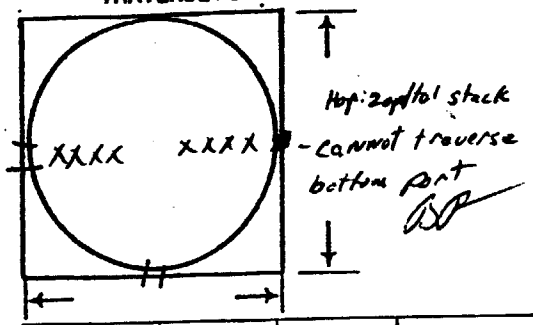
Cross Section Schematic of Stack



Horizontal stack
- cannot traverse bottom port

Traverse Point	Distance % of Diameter		Stack Diameter		Coupling Length		Traverse Points
1	.032	x	20	+	11.5	=	12.14
2	.105						13.6
3	.194						15.38
4	.323						17.96
5	.677						25.04
6	.806						27.62
7	.895						29.4
8	.968						30.86
9							
10							
11							
12							

CROSS SECTIONAL SCHEMATIC OF STACK TRAVERSE POINT LAYOUT



E T S FIELD DATA, METHOD(S) 1-4

PLANT Exxon
DATE 10-28-92
LOCATION Bayou Sale
OPERATOR Ris Jones
STACK NO. EG4-004
RUN NO. 1

SAMPLE BOX NO. KA
METER BOX NO. 442
AMBIENT TEMPERATURE 76
BAROMETRIC PRESSURE 30.02
FILTER TARE wt mg NA
NOZZLE DIAMETER, in. NA

STACK DIAMETER, in. 20"
PITOT TUBE NO. P-3-1
PITOT FACTOR .816
METER Δ Hø 1.7658
D.G.M.C. FACTOR .9978
K FACTOR NA

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in.H2O)	STACK TEMP (Ts), °F	VELOCITY HEAD (ΔPs)	(√ΔPs)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in., H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm), ft3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET (Tmin), °F	OUTLET (Tmout), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge
1 ONE	1031		648	2.80	1.67	1.5	1.5	758.689	84	81	262	70	2
2	1034		645	3.00	1.73				85	81	245	70	2
3	1037		647	2.90	1.70				87	82	255	70	2
4	1040		651	2.75	1.66				89	83	253	70	2
5	1043		648	2.15	1.47				91	85	248	70	2
6	1046		643	2.05	1.43				93	86	247	70	2
7	1049		638	2.15	1.47				95	88	248	70	2
8	1052		621	2.55	1.60				96	91	246	70	2
9	1055		621	2.45	1.57				96	91	246	70	2
10	1058		620	2.10	1.45				100	94	248	70	2
11	1101		635	1.95	1.40				101	96	251	70	2
12	1104		639	2.15	1.47				103	98	251	70	2
13	1107	+5.20	649	2.55	1.60				103	98	250	70	2
14	1110		652	2.85	1.69				106	102	260	70	2
15	1113		653	3.05	1.75				107	102	248	70	2
16 SIX	1116 1119		657	2.85	1.69			793.133	108	104	246	70	2
AVERAGE	48 min	+5.20	641.31		1.58	1.5		34.444		93.94			

VOLUME OF LIQUID WATER COLLECTED	IMPINGER WEIGHTS 63.5			
FINAL	521.7	515.7	426.4	628.7
INITIAL	556.6	531.1	430.1	628.2
WEIGHT COLLECTED	34.9	15.4	3.7	9.5
TOTAL WEIGHT				

ORSAT MEASUREMENT

	CO2	O2	CO	N2
1	3.2	15.4		
2				
3				
4				

COMMENTS: Traversed 8 points in + 8 points out

PRE-LEAK CHECK GOOD @ 10" Hg for .001 CFM
POST-LEAK CHECK GOOD @ 10" Hg for .005 CFM

6.1.2

E T S

Emission Testing Services, Inc.

Client : EXXON
Source : C.B. GMVA-12
Test Date : 10-28-92
Run No. : 1

DETERMINATION of STACK GAS MOISTURE, MOLECULAR WEIGHT, VELOCITY, and VOLUMETRIC FLOW RATE

A - Cross-sectional area of the stack, ft3
Acf - Stack gas flow rate, actual, acfm
Bws - Stack gas moisture fraction, %/100
Cp - Pitot tube coefficient
dH - Meter orific pressure differential, in. H2O
dP - Stack gas velocity head, in. H2O
F1 - Conversion factor, 13.6 in. H2O/ in. Hg
Kp - Pitot tube constant, 85.49
MCO2 - Molecular weight of CO2, 44.01 lb/ lb mole
Md - Stack gas molecular weight, dry lb/lb mole
MH2O - Molecular weight of water, 18.02 lb/lb mole
MN2 - Molecular weight of N2, 28.01 lb/lb mole
MO2 - Molecular weight of O2, 32.00 lb/lb mole
Ms - Stack gas molecular weight, wet lb/lb mole
Pbar - Barometric pressure, in. Hg
Pa - Stack gas static pressure, in. H2O
Ps - Stack gas absolute pressure, in. Hg
Pstd Standard absolute pressure, 29.92 in. Hg
Qsd - Stack gas volumetric flow rate, dry scfm
R - Ideal gas constant, 21.85
Tm - Meter temperature, R
Ts - Stack gas temperature, R
Tstd - Standard temperature, 528 R
Vi - Water vapor condensed, impinger 1, g
Vii - Water vapor condensed, impinger 2, g
Viii - Water vapor condensed, impinger 3, g
Viv - Water vapor condensed, impinger 4, g
Vm - Gas meter sample volume, dry ft3
Vmstd - Gas meter sample volume, dry std. ft3
Vs - Stack gas velocity, ft/sec
Vm - Total water vapor condensed, ft3
Y - Dry gas meter calibration factor
%CO2 - Stack gas CO concentration, %/100
%N2 Stack gas N2 concentration, %/100
O2 - Stack gas O2 concentration, %/100

$$Vw = \left\{ \frac{(Vi + Vii + Viii + Viv)\ R\ Tstd}{(453.6\ g/lb)\ Pstd\ MH2O} \right\} = \left\{ \frac{(34.9 + 15.4 + 3.7 + 9.5)(21.85)(528)}{(453.6)(29.92)(18.02)} \right\} = 2.99550$$

$$Vmstd = Vm\ Y \left\{ \frac{(Pb + dH/F1)\ Tstd}{Pstd\ Tm} \right\} = (34.444)(.9978) \left\{ \frac{(30.020 + 1.5000/13.6)(528)}{(29.92)(554)} \right\} = 32.98919$$

$$Bws = \left\{ \frac{Vw}{Vw + Vmstd} \right\} = \left\{ \frac{(2.99550)}{(2.99550 + 32.98919)} \right\} = .0832$$

$$Md = (MCO2)(\%CO2) + (MO2)(\%O2) + (MN2)(\%N2)$$
$$= (44.01)(.032) + (32.00)(.154) + (28.01)(.814) = 29.136$$

$$Ms = Md\ (1 - Bws) + (MH2O\ Bws) = (29.136)(1 - .0832) + (18.02)(.0832) = 28.211$$

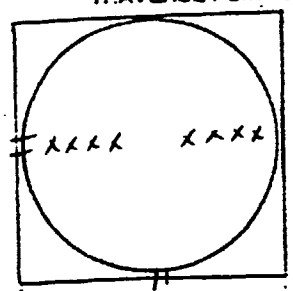
$$Vs = Kp\ Cp\ (dP)^{1/2} \left\{ \frac{Ts}{Ps\ Ms} \right\}^{1/2} = (85.49)(.8160)(1.5828) \left\{ \frac{(1101)}{(30.402)(28.211)} \right\}^{1/2} = 125.1182$$

$$Acf = (60\ sec/min)(Vs\ A) = (60)(125.1182)(2.1817) = 16377.9$$

$$Qsd = (3600\ sec/hr)(1 - Bws)(Vs\ A) \left\{ \frac{Tstd\ Ps}{Ts\ Pstd} \right\}$$

$$= (3600)(1 - .0832)(125.1182)(2.1817) \left\{ \frac{(528)(30.402)}{(1101)(29.92)} \right\} = 438866.9\ dscf/hr = 7314.4\ dscf/min$$

CROSS SECTIONAL SCHEMATIC OF STACK TRAVERSE POINT LAYOUT



Horizontal stack

could not traverse bottom port

ETS FIELD DATA, METHOD(S) 1-4

PLANT Exxon
DATE 10-27-92
LOCATION Bayou Sale
OPERATOR Rob Jones
STACK NO. EGN-004
RUN NO. 2

SAMPLE BOX NO. 1
METER BOX NO. 442
AMBIENT TEMPERATURE 76
BAROMETRIC PRESSURE 30.02
FILTER TARE wt mg NA
NOZZLE DIAMETER, in. NA

STACK DIAMETER, in. 20"
PITOT TUBE NO. P-3-1
PITOT FACTOR .816
METER Δ Hc 1.7658
D.G.M.C. FACTOR .9978
K FACTOR NA

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in.H2O)	STACK TEMP (Ts), °F	VELOCITY HEAD (ΔPs)	(√ΔPs)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm), ft3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET (Tmin), °F	OUTLET (Tmout), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge
1	1224		641	2.90	1.70	1.5	1.5	793.392	97	96	248	70	2
2	1228		650	2.95	1.72				100	97	249	70	2
3	1232		650	2.95	1.72				102	100	253	70	2
4	1236		651	2.60	1.61				104	99	255	70	2
5	1240		653	2.15	1.47				105	100	250	70	2
6	1244		641	2.05	1.43				107	102	252	70	2
7	1248		642	2.20	1.48				109	104	249	70	2
8	1252		624	2.60	1.61				110	105	257	70	2
9	1256		626	2.50	1.58				112	107	250	70	2
10	1300		622	2.15	1.47				113	109	242	70	2
11	1304		636	2.10	1.45				113	110	243	70	2
12	1308		648	2.15	1.47				113	111	249	70	2
13	1312		650	2.55	1.60				115	112	249	70	2
14	1316	+6.10	655	2.85	1.69				115	113	253	70	2
15	1320		655	2.90	1.70				117	113	252	70	2
16	1324		653	2.95	1.72			839.244	117	115	253	70	2
16 otHe	1328												
AVERAGE	64 min	+6.10	643.56		1.59	1.5		45.852		107.56			

COMMENTS: Traversed 8 points in & 8 points out

VOLUME OF LIQUID WATER COLLECTED	IMPINGER WEIGETS (74.7)			
FINAL	622.7	549.8	436.7	628.4
INITIAL	568.3	339.8	435.1	619.2
WEIGHT COLLECTED				

ORSAT MEASUREMENT

	CO2	O2	CO	N2
1	3.2	14.6		
2				
3				

PRE-LEAK CHECK GOOD @ 10" Hg for .001 CFM
POST-LEAK CHECK GOOD @ 10" Hg for .001 CFM

6.1.4

E T S

Emission Testing Services, Inc.

Client : EXXON
Source : C.B. GMVA-12
Test Date : 10-28-92
Run No. : 2

DETERMINATION of STACK GAS MOISTURE, MOLECULAR WEIGHT, VELOCITY, and VOLUMETRIC FLOW RATE

A - Cross-sectional area of the stack, ft3
Acf - Stack gas flow rate, actual, acfm
Bws - Stack gas moisture fraction, %/100
Cp - Pitot tube coefficient
dH - Meter orific pressure differential, in. H2O
dP - Stack gas velocity head, in. H2O
F1 - Conversion factor, 13.6 in. H2O/ in. Hg
Kp - Pitot tube constant, 85.49
MCO2 - Molecular weight of CO2, 44.01 lb/ lb mole
Md - Stack gas molecular weight, dry lb/lb mole
MH2O - Molecular weight of water, 18.02 lb/lb mole
MN2 - Molecular weight of N2, 28.01 lb/lb mole
MO2 - Molecular weight of O2, 32.00 lb/lb mole
Ms - Stack gas molecular weight, wet lb/lb mole
Pbar - Barometric pressure, in. Hg
Ps - Stack gas static pressure, in. H2O
Pt - Stack gas absolute pressure, in. Hg
Pstd Standard absolute pressure, 29.92 in. Hg
Qsd - Stack gas volumetric flow rate, dry scfm
R - Ideal gas constant, 21.85
Tm - Meter temperature, R
Ts - Stack gas temperature, R
Tstd - Standard temperature, 528 R
Vi - Water vapor condensed, impinger 1, g
Vii - Water vapor condensed, impinger 2, g
Viii - Water vapor condensed, impinger 3, g
Viv - Water vapor condensed, impinger 4, g
Vm - Gas meter sample volume, dry ft3
Vmstd - Gas meter sample volume, dry std. ft3
Vs - Stack gas velocity, ft/sec
Vm - Total water vapor condensed, ft3
Y - Dry gas meter calibration factor
%CO2 - Stack gas CO concentration, %/100
%N2 Stack gas N2 concentration, %/100
O2 - Stack gas O2 concentration, %/100

$$Vw = \left\{ \frac{(Vi + Vii + Viii + Viv)\ R\ Tstd}{(453.6\ g/lb)\ Pstd\ MH2O} \right\} = \left\{ \frac{(54.4 + 10.0 + 1.6 + 8.7)(21.85)(528)}{(453.6)(29.92)(18.02)} \right\} = 3.52384$$

$$Vmstd = Vm\ Y \left\{ \frac{(Pb + dH/F1)\ Tstd}{Pstd\ \ Tm} \right\} = (45.852)(.9978) \left\{ \frac{(30.020 + 1.5000/13.6)(528)}{(29.92)\ (568)} \right\} = 42.86114$$

$$Bws = \left\{ \frac{Vw}{Vw + Vmstd} \right\} = \left\{ \frac{(3.52384)}{(3.52384 + 42.86114)} \right\} = .0760$$

$$Md = (MCO2)(\%CO2) + (MO2)(\%O2) + (MN2)(\%N2)$$
$$= (44.01)(.032) + (32.00)(.146) + (28.01)(.822) = 29.105$$

$$Ms = Md\ (1 - Bws) + (MH2O\ Bws) = (29.105)(1 - .0760) + (18.02)(.0760) = 28.262$$

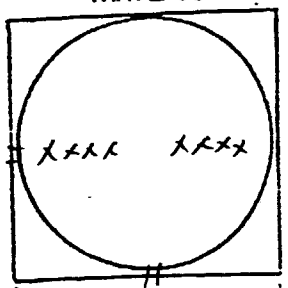
$$Vs = Kp\ Cp\ (dP)^{1/2} \left\{ \frac{Ts}{Ps\ Ms} \right\}^{1/2} = (85.49)(.8160)(1.5883) \left\{ \frac{(1104)}{(30.469)(28.262)} \right\}^{1/2} = 125.4307$$

$$Acf = (60\ sec/min)(Vs\ \ A) = (60)(125.4307)(\ \ 2.1817) = 16418.8$$

$$Qsd = (3600\ sec/hr)(1 - Bws)(Vs\ A) \left\{ \frac{Tstd\ Ps}{Ts\ Pstd} \right\}$$

$$= (3600)(1 - .0760)(125.4307)(\ \ 2.1817) \left\{ \frac{(528)(30.469)}{(1104\ \ )(29.92)} \right\} = 443513.0\ dscf/hr = 7391.9\ dscf/min$$

CROSS SECTIONAL SCHEMATIC OF STACK
TRAVERSE POINT LAYOUT



Horizontal stack

could not sample bottom port

ETS FIELD DATA, METHOD(S) 1-4

PLANT Exxon
DATE 10-27-92
LOCATION Bayou Sale
OPERATOR Rob Jones
STACK NO. EGN-004
RUN NO. 3

SAMPLE BOX NO. KA
METER BOX NO. 442
AMBIENT TEMPERATURE 83
BAROMETRIC PRESSURE 30.02
FILTER TARE wt mg NA
NOZZLE DIAMETER in. NA

STACK DIAMETER in. 20"
PITOT TUBE NO. P-3-1
PITOT FACTOR .816
METER Δ Hₐ 1.2658
D.G.M.C. FACTOR .9978
K FACTOR NA

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in.H2O)	STACK TEMP (Ts), °F	VELOCITY HEAD (ΔPs)	√ΔPs	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET (Tmin), °F	OUTLET (Tmout), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg (mm)
1 on@	1356		644	2.60	1.61	1.5	1.5	839.701	109	109	250	70	2
2	1400		649	2.90	1.70				113	110	252	70	2
3	1404		650	2.90	1.70				114	111	255	70	2
4	1408		652	2.55	1.60				115	113	248	70	2
5	1412		652	2.10	1.45				116	114	262	70	2
6	1416		646	2.05	1.43				117	114	244	70	2
7	1420		631	2.10	1.45				118	115	258	70	2
8	1424		626	2.10	1.45				119	116	245	70	2
9	1428		627	2.40	1.55				120	118	247	70	2
10	1432		625	2.10	1.45				121	119	245	70	2
11	1436		627	2.10	1.45				120	119	249	70	2
12	1440		649	2.55	1.60				122	121	251	70	2
13	1444		652	3.05	1.75				123	120	259	70	2
14	1448	+5.40	653	3.10	1.76				124	121	259	70	2
15	1452		650	3.00	1.73				123	122	254	70	2
16 off	1456 1500		653	2.85	1.69			886.700	125	122	254	70	2
AVERAGE	64 min	+5.40	643.5		1.59	1.5		46.999		117.59			

COMMENTS: Traversed 8 points in 4 8 points out

PRE-LEAK CHECK GOOD @ 10" Hg for .005 CFM
POST-LEAK CHECK GOOD @ 10" Hg for .005 CFM

VOLUME OF LIQUID WATER COLLECTED	IMPINGER WEIGETS 720			
FINAL	556.1	531.1	430.1	628.2
INITIAL	604.1	547.7	431.7	634.5
WEIGHT COLLECTED	47.5	16.6	1.6	6.3

ORSAT MEASUREMENT

	CO2	O2	CO	N2
1	3.2	15.2		
2				
3				

6.1.6

E T S

Emission Testing Services, Inc.

Client : EXXON
Source : C.B. GMVA-12
Test Date : 10-28-92
Run No. : 3

DETERMINATION of STACK GAS MOISTURE, MOLECULAR WEIGHT, VELOCITY, and VOLUMETRIC FLOW RATE

A - Cross-sectional area of the stack, ft3
Acf - Stack gas flow rate, actual, acfm
Bws - Stack gas moisture fraction, %/100
Cp - Pitot tube coefficient
dH - Meter orific pressure differential, in. H2O
dP - Stack gas velocity head, in. H2O
F1 - Conversion factor, 13.6 in. H2O/ in. Hg
Kp - Pitot tube constant, 85.49
MCO2 - Molecular weight of CO2, 44.01 lb/ lb mole
Md - Stack gas molecular weight, dry lb/lb mole
MH2O - Molecular weight of water, 18.02 lb/lb mole
MN2 - Molecular weight of N2, 28.01 lb/lb mole
MO2 - Molecular weight of O2, 32.00 lb/lb mole
Ms - Stack gas molecular weight, wet lb/lb mole
Pbar - Barometric pressure, in. Hg
Pa - Stack gas static pressure, in. H2O
Ps - Stack gas absolute pressure, in. Hg
Pstd Standard absolute pressure, 29.92 in. Hg
Qsd - Stack gas volumetric flow rate, dry scfm
R - Ideal gas constant, 21.85
Tm - Meter temperature, R
Ts - Stack gas temperature, R
Tstd - Standard temperature, 528 R
Vi - Water vapor condensed, impinger 1, g
Vii - Water vapor condensed, impinger 2, g
Viii - Water vapor condensed, impinger 3, g
Viv - Water vapor condensed, impinger 4, g
Vm - Gas meter sample volume, dry ft3
Vmstd - Gas meter sample volume, dry std. ft3
Vs - Stack gas velocity, ft/sec
Vm - Total water vapor condensed, ft3
Y - Dry gas meter calibration factor
%CO2 - Stack gas CO concentration, %/100
%N2 Stack gas N2 concentration, %/100
O2 - Stack gas O2 concentration, %/100

$$Vw = \left\{ \frac{(Vi + Vii + Viii + Viv)\ R\ Tstd}{(453.6\ g/lb)\ Pstd\ MH2O} \right\} = \left\{ \frac{(47.5 + 16.6 + 1.6 + 6.3)(21.85)(528)}{(453.6)(29.92)(18.02)} \right\} = 3.39648$$

$$Vmstd = Vm\ Y \left\{ \frac{(Pb + dH/F1)\ Tstd}{Pstd\ Tm} \right\} = (46.999)(.9978) \left\{ \frac{(30.020 + 1.5000/13.6)(528)}{(29.92)(578)} \right\} = 43.17035$$

$$Bws = \left\{ \frac{Vw}{Vw + Vmstd} \right\} = \left\{ \frac{(3.39648)}{(3.39648 + 43.17035)} \right\} = .0729$$

$$Md = (MCO2)(\%CO2) + (MO2)(\%O2) + (MN2)(\%N2)$$
$$= (44.01)(.032) + (32.00)(.152) + (28.01)(.816) = 29.128$$

$$Ms = Md\ (1 - Bws) + (MH2O\ Bws) = (29.128)(1 - .0729) + (18.02)(.0729) = 28.318$$

$$Vs = Kp\ Cp\ (dP)^{1/2} \left\{ \frac{Ts}{Ps\ Ms} \right\}^{1/2} = (85.49)(.8160)(1.5854) \left\{ \frac{(1104)}{(30.417)(28.318)} \right\}^{1/2} = 125.1795$$

$$Acf = (60\ sec/min)(Vs\ A) = (60)(125.1795)(2.1817) = 16385.9$$

$$Qsd = (3600\ sec/hr)(1 - Bws)(Vs\ A) \left\{ \frac{Tstd\ Ps}{Ts\ Pstd} \right\}$$

$$= (3600)(1 - .0729)(125.1795)(2.1817) \left\{ \frac{(528)(30.417)}{(1104)(29.92)} \right\} = 443352.3\ dscf/hr = 7389.2\ dscf/min$$

Emission Testing Services, Inc.
P.O. Box 15075
Baton Rouge, LA 70895
504-925-8405

Client : EXXON
Source : C.B. GMVA-12
Testing Date : 10-28-92
Run : 1 - 3

OXIDES OF NITROGEN EMISSION RATE

ENOX - NOX emission rate as NO2, lb/hr
F - NO2 factor, 1.1948 X 10-7 (lb/ft3)/ PPM
NOXmsc - NOX concentration as measured, PPM
Qsd - Dry volumetric stack gas flow rate, DSCF/hr

ENOX = (NOXmsc)(F)(Qsd)

-------- RUN 1 --------

ENOX = (653.04)(1.1948 X 10-7)(438866.9) = 34.243

-------- RUN 2 --------

ENOX = (685.11)(1.1948 X 10-7)(443513.0) = 36.305

-------- RUN 3 --------

ENOX = (699.31)(1.1948 X 10-7)(443352.3) = 37.044

Emission Testing Services, Inc.
P.O. Box 15075
Baton Rouge, LA 70895
504-925-8405

Client : EXXON
Source : C.B. GMVA-12
Testing Date : 10-28-92
Run : 1 - 3

CARBON MONOXIDE EMISSION RATE

ECO - Carbon Monoxide Emission Rate - Lb/Hr
F - CO conv. factor, 7.2727 X 10-8 (lb/ft3)/(PPM)
COms - Concentration of carbon monoxide - PPM
Qsd - Dry volumetric stack gas flow rate, DSCF/Hr

ECO = (COms)(F)(Qsd)

-------- RUN 1 --------

ECO = (92.21)(7.2727 X 10-8)(438866.9) = 2.943

-------- RUN 2 --------

ECO = (94.58)(7.2727 X 10-8)(443513.0) = 3.051

-------- RUN 3 --------

ECO = (92.45)(7.2727 X 10-8)(443352.3) = 2.981

Test analyzer response, Methods 3A, 7E, and 10 was recorded by a computer data acquisition system. One minute average data were printed as recorded and served as a hardcopy record of the test data. Presented on the following pages are the computer print outs of the test data.

Each test analyzer is calibrated before and after each test run by challenging the analyzer with a set of certified calibration gases. Analyzer response is recorded by a computer data acquisition system. Calibration data sheets are manually completed as the calibrations are performed serving as hardcopy records of the calibration. Calibration results are taken from the computer system to avoid any data acquisition bias. Analyzer calibration data sheets are presented following the test data.

E T S
EMISSION TESTING SERVICES, INC.

EXXON CO USA

ENGINE SOURCE ID CB GMVA-12

EMISSION POINT ENG 004

DATE: 10/28/1992

RUN NO: 1

TIME	CO-PPM	NOX-PPM	O2-%
10:30:02	92.67	606.10	15.01
10:31:02	93.18	636.91	14.96
10:32:02	92.84	640.72	14.96
10:33:02	94.72	652.16	14.96
10:34:03	93.70	633.10	14.96
10:35:03	92.67	637.55	14.96
10:36:03	94.55	647.71	14.96
10:37:03	91.64	660.10	15.05
10:38:03	92.84	669.95	14.93
10:39:03	93.70	643.58	14.96
10:40:03	91.47	611.50	14.96
10:41:03	92.15	649.62	14.96
10:42:03	94.55	611.18	14.87
10:43:03	95.24	660.42	14.96
10:44:03	92.15	667.72	14.87
10:45:03	92.33	628.65	14.96
10:46:03	90.78	640.41	14.96
10:47:03	89.93	633.74	14.96
10:48:03	92.67	643.90	14.96
10:49:03	91.64	650.89	14.96
10:50:03	93.52	660.74	14.96
10:51:03	91.47	658.19	14.88
10:52:03	92.15	668.68	14.95
10:53:03	91.13	637.87	15.05
10:54:03	88.90	657.24	15.00
10:55:03	89.07	626.75	15.00
10:56:03	90.10	621.98	14.96
10:57:03	91.98	654.70	14.95
10:58:03	91.98	636.28	14.97
10:59:03	90.44	669.63	14.96

TIME	CO-PPM	NOX-PPM	O2-%
11:00:03	92.84	648.98	14.95
11:01:04	91.98	627.07	14.96
11:02:04	89.76	681.70	14.87
11:03:04	92.50	651.21	14.89
11:04:04	91.81	711.56	14.87
11:05:04	90.61	636.91	14.96
11:06:04	89.76	621.98	14.87
11:07:04	91.30	668.68	14.87
11:08:05	91.13	695.36	14.95
11:09:05	94.72	665.50	14.88
11:10:05	94.04	636.28	14.87
11:11:06	94.04	712.83	14.90
11:12:06	92.84	690.28	14.85
11:13:06	93.87	660.74	14.87
11:14:06	89.93	618.17	14.87
11:15:07	91.47	632.15	15.00
11:16:07	92.84	668.04	14.87
11:17:07	94.55	713.46	14.96
11:18:07	93.01	670.90	14.87
11:19:07	94.21	673.12	14.87
11:20:07	90.95	663.91	14.87
11:21:07	92.15	669.63	14.87
11:22:07	92.50	640.72	14.88
11:23:07	91.13	620.40	14.87
11:24:07	90.27	694.72	14.87
11:25:07	93.52	647.39	14.96
11:26:07	93.35	650.57	14.88
11:27:07	90.44	627.07	14.87
11:28:07	92.84	669.63	14.87
11:29:07	92.15	695.36	14.95
AVG CONC	92.21	653.04	14.93

E T S

EMISSION TESTING SERVICES, INC.

EXXON CO USA

ENGINE SOURCE ID CB GMVA-12

EMISSION POINT ENG 004

DATE: 10/28/1992

RUN NO: 2

TIME	CO-PPM	NOX-PPM	O2-%
12:29:19	97.05	652.56	15.06
12:30:19	95.50	709.39	15.00
12:31:19	93.27	627.79	14.87
12:32:20	97.39	687.48	14.87
12:33:20	95.67	668.12	14.96
12:34:20	94.99	711.62	14.97
12:35:20	94.82	693.52	14.96
12:36:20	93.79	724.00	14.96
12:37:20	95.50	724.63	15.02
12:38:20	97.73	635.09	15.07
12:39:20	93.27	623.03	15.06
12:40:20	89.33	661.45	14.97
12:41:20	93.62	662.72	14.96
12:42:20	94.65	725.90	14.96
12:43:20	96.53	681.45	14.95
12:44:20	93.45	648.11	14.87
12:45:20	96.02	641.44	14.96
12:46:20	94.13	673.20	14.96
12:47:20	97.22	681.45	14.88
12:48:20	99.10	750.99	14.87
12:49:20	93.27	694.47	14.87
12:50:20	96.53	706.22	15.00
12:51:20	93.27	656.37	14.96
12:52:21	97.73	725.90	14.95
12:53:21	94.13	648.11	14.87
12:54:21	95.50	704.00	14.97
12:55:21	95.33	703.04	14.97
12:56:21	93.45	736.38	15.00
12:57:21	94.47	634.46	14.90
12:58:21	95.16	654.78	14.94
12:59:21	90.70	677.32	14.96
13:00:21	89.84	666.21	14.96
13:01:21	94.65	721.14	14.87
13:02:21	92.76	708.76	14.87
13:03:21	92.24	691.61	14.87
13:04:21	97.39	742.73	14.88
13:05:21	93.45	687.48	14.88
13:06:21	94.65	754.80	14.96
13:07:21	94.82	672.56	14.96
13:08:21	93.79	659.86	14.87
13:09:21	91.56	723.36	14.87
13:10:21	96.02	665.26	14.89
13:11:21	93.45	674.15	14.87
13:12:22	94.47	636.68	14.96
13:13:22	95.16	668.12	14.87
13:14:22	92.07	756.07	14.85
13:15:22	94.99	675.74	14.87
13:16:22	94.30	638.59	14.87
13:17:22	94.82	674.78	14.85
13:18:22	92.59	691.93	14.87
13:19:22	93.45	696.06	14.88
13:20:22	92.07	701.14	14.96
13:21:22	92.76	664.94	14.87
13:22:22	96.88	692.25	14.87
13:23:22	94.13	682.40	14.87
13:24:22	99.45	673.20	14.88
13:25:22	96.19	682.40	14.87
13:26:22	95.67	669.07	14.87
13:27:22	95.67	726.22	14.88
13:28:23	92.76	684.31	14.87
AVG CONC	94.58	685.11	14.92

E T S
EMISSION TESTING SERVICES, INC.

EXXON CO USA

ENGINE SOURCE ID CB GMVA-12

EMISSION POINT ENGINE 004

DATE: 10/28/1992

RUN NO: 3

TIME	CO-PPM	NOX-PPM	O2-%
13:56:53	93.79	671.05	14.96
13:57:53	93.96	681.24	14.89
13:58:53	96.39	707.99	14.88
13:59:54	92.05	723.91	14.87
14:00:54	93.79	690.16	14.87
14:01:54	96.56	722.64	14.87
14:02:54	92.92	740.47	14.87
14:03:54	96.73	683.79	14.87
14:04:54	95.52	683.79	14.87
14:05:54	94.13	705.12	14.87
14:06:54	95.35	716.91	14.87
14:07:55	93.96	718.50	14.87
14:08:55	97.25	714.68	14.87
14:09:55	93.09	657.04	14.87
14:10:55	92.92	694.30	14.87
14:11:55	92.05	718.82	14.87
14:12:55	94.83	762.12	14.87
14:13:55	90.84	683.79	14.84
14:14:55	93.44	607.37	14.87
14:15:55	91.01	699.71	14.87
14:16:55	92.92	757.03	14.87
14:17:55	93.44	714.68	14.87
14:18:55	91.01	710.22	14.85
14:19:55	92.40	723.59	14.87
14:20:55	94.65	676.15	14.87
14:21:56	94.31	686.66	14.87
14:22:56	92.23	747.79	14.88
14:23:56	89.80	691.75	14.88
14:24:56	90.49	715.63	14.88
14:25:56	90.84	712.77	14.88
14:26:56	89.11	680.93	14.87
14:27:56	91.19	700.03	14.88
14:28:56	92.40	706.40	14.88
14:29:56	88.07	681.88	14.87
14:30:56	92.23	742.70	14.88
14:31:56	92.57	671.05	14.87
14:32:56	92.05	639.53	14.87
14:33:56	94.83	719.13	14.87
14:34:56	88.07	654.18	14.87
14:35:56	88.93	689.52	14.87
14:36:56	90.15	723.91	14.87
14:37:56	89.28	647.49	14.85
14:38:56	93.27	681.24	14.87
14:39:57	89.28	699.71	14.87
14:40:57	89.11	658.95	14.88
14:41:57	88.76	653.22	14.87
14:42:57	90.67	707.35	14.88
14:43:57	92.92	672.33	14.83
14:44:57	93.79	748.11	14.87
14:45:57	93.27	713.40	14.87
14:46:57	92.40	793.01	14.87
14:47:57	91.53	711.49	14.88
14:48:57	92.40	693.34	14.87
14:49:57	93.09	699.39	14.88
14:50:57	88.41	664.69	14.87
14:51:57	96.04	693.02	14.88
14:52:57	90.67	705.12	14.87
14:53:57	92.23	721.68	14.87
14:54:57	94.83	688.25	14.87
14:55:57	92.57	678.06	14.88
AVG CONC	92.45	699.31	14.87

EXXON CO USA

NOX CONVERTER EFFICIENCY TEST

OCTOBER 27, 1992

TIME	NOX-VTS	NOX-PPM
13:07:39	1.07	267.31
13:08:39	1.03	263.17
13:09:39	1.03	262.85
13:10:39	1.08	267.63
13:11:39	1.10	265.72
13:12:39	1.04	265.40
13:13:39	1.03	262.85
13:14:39	1.03	262.53
13:15:39	1.07	264.12
13:16:39	1.07	263.49
13:17:39	1.03	260.62
13:18:39	1.03	261.89
13:19:39	1.01	255.84
13:20:39	1.00	258.07
13:21:39	1.05	256.16
13:22:39	1.00	253.30
13:23:39	1.00	254.25
13:24:39	1.03	260.62
13:25:39	1.01	255.84
13:26:39	1.00	253.30
13:27:39	1.00	248.20
13:28:39	1.03	260.62
13:29:39	1.03	262.85
13:30:39	1.00	258.07
13:31:40	1.03	262.53
13:32:40	1.05	256.16
13:33:40	1.07	264.12
13:34:40	1.00	253.30
13:35:40	1.05	256.16
13:36:40	1.07	263.49
AVG.	1.03	260.02

ETS

EMISSION TESTING SERVICES, INC.

METHOD 3A DATA SHEET

CLIENT Exxon Production CO USA DATE 10-28-92

SOURCE ID EGN-004 PARAMETER O_2

OPERATOR Troy LeSage RUN # 1 LOAD% 80%

CALIBRATION STATISTICS

Cylinder Value		Analyzer Response volt	percent	Absolute Difference volt	percent	% Drift ±3%
Zero	N/2	0.04	-0.06	0.03	-0.09	0.01
Mid	8.63	3.84	8.93	3.72	8.50	-1.88
High	15.63	6.75	15.54	6.64	15.27	-1.091

Calibration curve: ppm = (response volt)(slope) + intercept

Slope 2.326 Intercept -0.1567 Span Range 23.108

Analyzer Cal		Init volt	Analyzer percent	Resp Bias ±5	Final volt	Analyzer percent	Resp Bias ±5	Span Drift ±3%
Conc.	N/2	0.11	0.1	0.7	0.14	0.17	1.1	0.3

$$\text{Sys. Cal. Bias} = \frac{\text{Sys. cal. (ppm)} - \text{analyzer cal. (ppm)}}{\text{Span (ppm)}} \times 100$$

$$\%\text{Drift} = \frac{\text{Final sys. resp. (ppm)} - \text{Initial sys. resp. (ppm)}}{\text{span (ppm)}} \times 100$$

TEST DATA

Start Time: _____ Finish Time: _____ Minutes per point: _____

Sample Port _____

Test Point Volt

1 ____	4 ____	7 ____	10 ____	13 ____	16 ____	19 ____	22 ____	25 ____	28 ____
2 ____	5 ____	8 ____	11 ____	14 ____	17 ____	20 ____	23 ____	26 ____	29 ____
3 ____	6 ____	9 ____	12 ____	15 ____	18 ____	21 ____	24 ____	27 ____	30 ____

AVG VOLT _____ AVG CONC _____%

CORRELATION COEFFICIENT: 0.9999

COMMENTS: _____

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ETS
EMISSION TESTING SERVICES, INC.

METHOD 7E DATA SHEET

CLIENT Exxon Production CO USA DATE 10-28-92

SOURCE ID EGN-004 PARAMETER NOx

OPERATOR Troy LeSage RUN # 1 LOAD % 80%

CALIBRATION STATISTICS

Cylinder Value		Analyzer Response volt	ppm	Absolute Difference volt	ppm	% Drift ±3%
Zero	N2	0.00	-10.42	0.05	-7.12	0.05
Mid	433.9	1.76	441.4	1.74	442.23	-0.20
High	1985.37	7.66	1982.3	7.66	1982.3	0.0

Calibration curve: ppm = (response volt)(slope) + intercept

Slope 260.14 Intercept -10.420 Span Range 2570.99

Analyzer Cal	Init volt	Analyzer ppm	Resp Bias ±5	Final volt	Analyzer ppm	Resp Bias ±5	Span Drift ±3%
Conc. 1985.37	7.60	1966.7	-0.6	7.57	1958.8	-0.91	-0.30

$$\text{Sys. Cal. Bias} = \frac{\text{Sys. cal. (ppm)} - \text{analyzer cal. (ppm)}}{\text{Span (ppm)}} \times 100$$

$$\%\text{Drift} = \frac{\text{Final sys. resp. (ppm)} - \text{Initial sys. resp. (ppm)}}{\text{span (ppm)}} \times 100$$

TEST DATA

Start Time: _____ Finish Time: _____ Minutes per point: _____

Sample Port _____

Test Point Volt

1 ____	4 ____	7 ____	10 ____	13 ____	16 ____	19 ____	22 ____	25 ____	28 ____
2 ____	5 ____	8 ____	11 ____	14 ____	17 ____	20 ____	23 ____	26 ____	29 ____
3 ____	6 ____	9 ____	12 ____	15 ____	18 ____	21 ____	24 ____	27 ____	30 ____

AVG VOLT _____ AVG CONC _____ ppm

CORRELATION COEFFICIENT: 0.9999

COMMENTS: _____

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ETS

EMISSION TESTING SERVICES, INC.

METHOD 10 DATA SHEET

CLIENT Exxon ~~Production~~ CO USA DATE 10-28-92

SOURCE ID EGN-004 PARAMETER CO

OPERATOR Troy LeSage RUN # 1 LOAD% 80%

CALIBRATION STATISTICS

Cylinder Value		Initial Analyzer Response volt	Initial Analyzer Response ppm	Final Analyzer Response volt	Final Analyzer Response ppm	% Drift ±3%
Zero	N_2	0.005	-2.9	0.005	-2.9	0.0
Low	56.69	0.86	82.06	0.85	86.01	-0.1
Mid	290.1	2.84	295.4	2.83	294.3	-0.10
High	584.3	5.56	581.5	5.55	580.5	-0.1

Calibration curve: ppm = (response volt)(slope) + intercept

Slope 105.21 Intercept -3.422 Span Range 1048.69

$$\%\text{Drift} = \frac{\text{Final sys. resp. (ppm)} - \text{Initial sys. resp. (ppm)}}{\text{span (ppm)}} \times 100$$

TEST DATA

Start Time: _____ Finish Time: _____ Minutes per point: _____

Sample Port _____

Test Point Volt

1 ____	4 ____	7 ____	10 ____	13 ____	16 ____	19 ____	22 ____	25 ____	28 ____
2 ____	5 ____	8 ____	11 ____	14 ____	17 ____	20 ____	23 ____	26 ____	29 ____
3 ____	6 ____	9 ____	12 ____	15 ____	18 ____	21 ____	24 ____	27 ____	30 ____

AVG VOLT _____ AVG CONC _____ ppm

CORRELATION COEFFICIENT: 0.9999

COMMENTS: _____

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ETS
EMISSION TESTING SERVICES, INC.

METHOD 3A DATA SHEET

CLIENT Exxon ~~Production~~ CO USA DATE 10-23-92

SOURCE ID ENG-004 Bayou Sale PARAMETER O_2

OPERATOR Troy LeSage RUN # 2 LOAD % 80%

CALIBRATION STATISTICS

Cylinder Value		Analyzer Response volt	Analyzer Response percent	Absolute Difference volt	Absolute Difference percent	% Drift ±3%
Zero	N_2	0.03	-0.03	0.04	-0.004	0.2
Mid	8.63	3.72	8.69	3.76	8.79	0.42
High	15.63	6.64	15.59	6.59	15.48	-0.48

Calibration curve: ppm = (response volt)(slope) + intercept

Slope 2.3635 Intercept -0.0959 Span Range 23.5360

Analyzer Cal		Init volt	Analyzer percent	Resp Bias ±5	Final volt	Analyzer percent	Resp Bias ±5	Span Drift ±3%
Conc.	N_2	0.13	0.21	1.02	0.16	0.28	1.20	0.30

$$\text{Sys. Cal. Bias} = \frac{\text{Sys. cal. (ppm)} - \text{analyzer cal. (ppm)}}{\text{Span (ppm)}} \times 100$$

$$\%\text{Drift} = \frac{\text{Final sys. resp. (ppm)} - \text{Initial sys. resp. (ppm)}}{\text{span (ppm)}} \times 100$$

TEST DATA

Start Time: _____ Finish Time: _____ Minutes per point: _____

Sample Port _____

Test Point Volt

1 ____	4 ____	7 ____	10 ____	13 ____	16 ____	19 ____	22 ____	25 ____	28 ____
2 ____	5 ____	8 ____	11 ____	14 ____	17 ____	20 ____	23 ____	26 ____	29 ____
3 ____	6 ____	9 ____	12 ____	15 ____	18 ____	21 ____	24 ____	27 ____	30 ____

AVG VOLT _____ AVG CONC _____%

CORRELATION COEFFICIENT: 0.9999

COMMENTS: _____

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ETS

EMISSION TESTING SERVICES, INC.

METHOD 7E DATA SHEET

CLIENT Exxon Production CO USA DATE 10-28-92

SOURCE ID ENG-001 Bayou Sale PARAMETER Nox

OPERATOR Troy LeSage RUN # 2 LOAD % 80%

CALIBRATION STATISTICS

Cylinder Value		Analyzer Response volt	Analyzer Response ppm	Absolute Difference volt	Absolute Difference ppm	% Drift ±3%
Zero	N2	0.005	-7.54	0.00	-8.84	-0.05
Mid	433.9	1.74	443.6	1.74	443.6	0.0
High	1985.37	7.66	1983.1	7.64	1977.9	-0.2

Calibration curve: ppm = (response volt)(slope) + intercept

Slope 260.05 Intercept -8.8407 Span Range 2591.68

Analyzer Cal		Init volt	Analyzer ppm	Resp Bias ±5	Final volt	Analyzer ppm	Resp Bias ±5	Span Drift ±3%
Conc.	1985.4	7.63	1975.3	-0.3	7.63	1975.3	-0.10	0.0

$$\text{Sys. Cal. Bias} = \frac{\text{Sys. cal. (ppm)} - \text{analyzer cal. (ppm)}}{\text{Span (ppm)}} \times 100$$

$$\%\text{Drift} = \frac{\text{Final sys. resp. (ppm)} - \text{Initial sys. resp. (ppm)}}{\text{span (ppm)}} \times 100$$

TEST DATA

Start Time: _____ Finish Time: _____ Minutes per point: _____

Sample Port _____

Test Point Volt

1 ____	4 ____	7 ____	10 ____	13 ____	16 ____	19 ____	22 ____	25 ____	28 ____
2 ____	5 ____	8 ____	11 ____	14 ____	17 ____	20 ____	23 ____	26 ____	29 ____
3 ____	6 ____	9 ____	12 ____	15 ____	18 ____	21 ____	24 ____	27 ____	30 ____

AVG VOLT _____ AVG CONC _____ ppm

CORRELATION COEFFICIENT: 0.9999

COMMENTS: _____

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ETS

EMISSION TESTING SERVICES, INC.

METHOD 10 DATA SHEET

CLIENT Exxon Production CO USA DATE 10-28-92

SOURCE ID Eng. - 004 Bayou Salle PARAMETER CO

OPERATOR Troy LeSage RUN # 2 LOAD% 80%

CALIBRATION STATISTICS

Cylinder Value		Initial Analyzer Response volt	Initial Analyzer Response ppm	Final Analyzer Response volt	Final Analyzer Response ppm	% Drift ±3%
Zero	N2	0.005	-2.42	0.020	-2.94	-0.05
Low	86.69	0.85	86.60	0.35	86.60	0.0
Mid	290.1	2.83	295.2	2.81	293.1	-0.2
High	584.3	5.55	581.7	5.49	575.4	-0.6

Calibration curve: ppm = (response volt)(slope) + intercept

Slope 105.35 Intercept -2.9440 Span Range 1050.51

$$\%Drift = \frac{\text{Final sys. resp. (ppm)} - \text{Initial sys. resp. (ppm)}}{\text{span (ppm)}} \times 100$$

TEST DATA

Start Time: _____ Finish Time: _____ Minutes per point: _____

Sample Port _____

Test Point Volt

1 ____	4 ____	7 ____	10 ____	13 ____	16 ____	19 ____	22 ____	25 ____	28 ____
2 ____	5 ____	8 ____	11 ____	14 ____	17 ____	20 ____	23 ____	26 ____	29 ____
3 ____	6 ____	9 ____	12 ____	15 ____	18 ____	21 ____	24 ____	27 ____	30 ____

AVG VOLT _____ AVG CONC _____ ppm

CORRELATION COEFFICIENT: 0.9999

COMMENTS: _____

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ETS

EMISSION TESTING SERVICES, INC.

METHOD 3A DATA SHEET

CLIENT Exxon ~~Production~~ CO USA DATE 10-23-92

SOURCE ID Eng. 004 Bayou Sallie PARAMETER O2

OPERATOR Troy LeSage RUN # 3 LOAD % 80%

CALIBRATION STATISTICS

Cylinder Value		Analyzer Response volt	Analyzer Response percent	Absolute Difference volt	Absolute Difference percent	% Drift ±3%
Zero	N2	0.04	-0.07	0.04	-0.07	0.0
Mid	8.63	3.76	8.79	3.72	8.82	0.13
High	15.63	6.59	15.51	6.55	15.44	-0.42

Calibration curve: ppm = (response volt)(slope) + intercept

Slope 2.383 Intercept -0.1660 Span Range 23.663

Analyzer Cal		Init volt	Analyzer percent	Resp Bias ±5	Final volt	Analyzer percent	Resp Bias ±5	Span Drift ±3%
Conc.	N2	0.11	0.1	0.72	0.10	0.07	0.59	-0.13

$$\text{Sys. Cal. Bias} = \frac{\text{Sys. cal. (ppm)} - \text{analyzer cal. (ppm)}}{\text{Span (ppm)}} \times 100$$

$$\%\text{Drift} = \frac{\text{Final sys. resp. (ppm)} - \text{Initial sys. resp. (ppm)}}{\text{span (ppm)}} \times 100$$

TEST DATA

Start Time: _____ Finish Time: _____ Minutes per point: _____

Sample Port _____

Test Point Volt

1 ____	4 ____	7 ____	10 ____	13 ____	16 ____	19 ____	22 ____	25 ____	28 ____
2 ____	5 ____	8 ____	11 ____	14 ____	17 ____	20 ____	23 ____	26 ____	29 ____
3 ____	6 ____	9 ____	12 ____	15 ____	18 ____	21 ____	24 ____	27 ____	30 ____

AVG VOLT _____ AVG CONC _____%

CORRELATION COEFFICIENT: 0.9998

COMMENTS: _____

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ETS

EMISSION TESTING SERVICES, INC.

METHOD 7E DATA SHEET

CLIENT Exxon Production CO USA DATE 10-28-92

SOURCE ID ENG-004 Bayou Salle PARAMETER Nox

OPERATOR Troy LeSage RUN # 3 LOAD % 80%

CALIBRATION STATISTICS

Cylinder Value		Analyzer Response volt	Analyzer Response ppm	Absolute Difference volt	Absolute Difference ppm	% Drift ±3%
Zero	N2	0.005	-8.09	0.00	-9.39	-0.05
Mid	433.9	1.74	444.4	1.73	441.8	-0.10
High	1985.37	7.64	1982.99	7.64	1982.99	0.0

Calibration curve: ppm = (response volt)(slope) + intercept

Slope 260.78 Intercept -9.3940 Span Range 2598.44

Analyzer Cal		Init volt	Analyzer ppm	Resp Bias ±5	Final volt	Analyzer ppm	Resp Bias ±5	Span Drift ±3%
Conc.	1985.4	7.61	1975.17	-0.30	7.61	1975.17	-0.30	0.0

Sys. Cal. Bias = $\frac{\text{Sys. cal. (ppm) - analyzer cal. (ppm)}}{\text{Span (ppm)}}$ X 100

%Drift = $\frac{\text{Final sys. resp. (ppm) - Initial sys. resp. (ppm)}}{\text{span (ppm)}}$ X 100

TEST DATA

Start Time: _____ Finish Time: _____ Minutes per point: _____

Sample Port _____

Test Point Volt

1 ____	4 ____	7 ____	10 ____	13 ____	16 ____	19 ____	22 ____	25 ____	28 ____
2 ____	5 ____	8 ____	11 ____	14 ____	17 ____	20 ____	23 ____	26 ____	29 ____
3 ____	6 ____	9 ____	12 ____	15 ____	18 ____	21 ____	24 ____	27 ____	30 ____

AVG VOLT _____ AVG CONC _____ ppm

CORRELATION COEFFICIENT: 0.9999

COMMENTS: _____

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ETS

EMISSION TESTING SERVICES, INC.

METHOD 10 DATA SHEET

CLIENT Exxon Production CO USA DATE 10-25-92

SOURCE ID Eng.-004 Bayou Sale PARAMETER CO

OPERATOR Troy LeSage RUN # 3 LOAD% 80%

CALIBRATION STATISTICS

Cylinder Value		Initial Analyzer Response volt	Initial Analyzer Response ppm	Final Analyzer Response volt	Final Analyzer Response ppm	% Drift ±3%
Zero	N_2	0.00	-3.28	0.00	-3.28	0.0
Low	86.69	0.85	87.22	0.85	87.22	0.0
Mid	290.1	2.81	295.9	2.83	298.03	0.20
High	584.3	5.49	581.2	5.51	583.4	0.21

Calibration curve: ppm = (response volt)(slope) + intercept

Slope 106.47 Intercept -3.2810 Span Range 1061.43

$$\%Drift = \frac{\text{Final sys. resp. (ppm)} - \text{Initial sys. resp. (ppm)}}{\text{span (ppm)}} \times 100$$

TEST DATA

Start Time: _____ Finish Time: _____ Minutes per point: _____

Sample Port _____

Test Point Volt

1 ____	4 ____	7 ____	10 ____	13 ____	16 ____	19 ____	22 ____	25 ____	28 ____
2 ____	5 ____	8 ____	11 ____	14 ____	17 ____	20 ____	23 ____	26 ____	29 ____
3 ____	6 ____	9 ____	12 ____	15 ____	18 ____	21 ____	24 ____	27 ____	30 ____

AVG VOLT ____ AVG PPM ____ ppm

CORRELATION COEFFICIENT: 0.9999

COMMENTS: _____

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Presented on the following pages are compressor operating data collected during the emissions test. Also included is a fuel gas analysis report.

ETS
EMISSION TESTING SERVICES, INC.

INTERNAL COMBUSTION ENGINE
OPERATIONAL RECORD

Company Name Exxon Co U.S.A

Company Location Bayou Sale

Engine Name Cooper

Engine Source I. D. No. _____

Design Specifications

Manufacturer's Name _____

Model No. _____ Serial No. _____

Parameter Specifications

A. Fuel Type nat. gas B. Fuel Supplier Exxon

C. Fuel Flow Units 320 KCF Meas. Method meter (Barton)

D. Is unit equipped for waste heat recovery? no

Describe _____

E. Does unit use water or steam injection? no

If so, describe measurement method (continuous flow, start-finish volumes, etc) _____

F. Manifold Pressure units (psia, kpa, etc.) PSIA

G. Manifold Temp. (°F, °C, etc.) 80°F

Ultimate Fuel Analysis

C _____ S _____ H _____ Ash _____

O _____ H_2O _____ N _____

Trace Metals: Na _____ Va _____ K _____

Fuel elements added _____

Fuel elements added for smoke suppression _____

FORM COMPLETED BY:

NAME: Russell Collins TITLE: Opr.

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INTERNAL COMBUSTION ENGINE

TEST RUN LOG

(GAS ENGINES)

Company ~~Engine~~ EXXON

Engine C.B. GMVA-12

Operator R. Collins

Date: 10-28-92 Test Time: Start 10:30 AM End 11:30 A.M

Ambient Temperature, at time of test 80°

Engine Load Condition % 80

DATA LOG TIME (15 minute intervals)	10:30	10:45	11:00	11:15
Fuel Feed (flow)	320 KCF	320 KCF	320 KCF	320 KCF
Intake Manifold Temp.	amb. 80°	80°	80°	80°
Intake Manifold Pressure	4"	4"	4"	4"
Fuel Header Pressure	51 psi	51 psi	51 psi	51 psi
Engine Speed (rpm)	285	285	285	285
Spark Ignition Timing	9°	9°	9°	9°
Horse Power	1240 HP	1240	1240	1240

Run Conditions:

Remarks:

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INTERNAL COMBUSTION ENGINE

TEST RUN LOG

(GAS ENGINES)

Company Exxon

Engine C.B. GMVA 12

Operator Russell Collins

Date: 10 28 92 Test Time: Start 12:30 P.M End 1:30 P.M

Ambient Temperature, at time of test 82°

Engine Load Condition % 50

DATA LOG TIME (15 minute intervals)	12:30		1:00 P.M	1:15 P.M.
Fuel Feed (flow)	320 KCF	320 KCF	320 KCF	320 KCF
Intake Manifold Temp.	82°	82°	82°	82°
Intake Manifold Pressure	4"	4"	4"	4"
Fuel Header Pressure	51	51	51	51
Engine Speed (rpm)	285	285	285	285
Spark Ignition Timing	9°	9°	9°	9°
Horse Power	1240	1240	1240	1240

Run Conditions:

Remarks:

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INTERNAL COMBUSTION ENGINE

TEST RUN LOG

(GAS ENGINES)

Company EXXON

Engine C.B. GMVA 12

Operator K. Collins

Date: 10-28-92 Test Time: Start 1:55 P.M. End 2:55 P.M.

Ambient Temperature, at time of test 82°

Engine Load Condition % 80

DATA LOG TIME (15 minute intervals)	1:55 PM	2:10 PM	2:25 PM	2:40 PM
Fuel Feed (flow)	320 KCF	320 KCF	320 KCF	320 KCF
Intake Manifold Temp.	82°	82°	82°	82°
Intake Manifold Pressure	4"	4"	4"	4"
Fuel Header Pressure	51 psi	51 PSI	51 PSI	51 PSI
Engine Speed (rpm)	285	285	285	285
Spark Ignition Timing	9°	9°	9°	9°
Horse Power	1240 HP	1240 HP	1240 HP	1240 HP

Run Conditions:

Remarks:

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EXXON COMPANY, USA
FIELD: BAYOU SALE
WELL NAME: FUEL GAS OUTLET
W. L. LOG NO.: 9125
SAMPLE TYPE: GAS

(17)

#17

SAMPLE POINT: FUEL GAS OUTLET
SAMPLE DATE : 9-12-91
CYLINDER NO.: C295
SAMPLING CONDITIONS: 80 PSIG & 80°F

HYDROCARBON ANALYSIS OF SEPARATOR GAS

COMPONENT	MOLE%	SEPARATOR GAS GPM @ 15.025 PSIA	WT %
NITROGEN	0.2999		0.4620
METHANE	91.6391		80.8440
CARBON DIOXIDE	1.7398		4.2104
ETHANE	3.5092	0.9573	5.8026
HYDROGEN SULFIDE	0.0000	0.0000	0.0000
PROPANE	1.4597	0.4103	3.5397
ISO-BUTANE	0.4299	0.1435	1.3741
N-BUTANE 0.7698	0.3599	0.1157	1.1504
ISO-PENTANE	0.1500	0.0560	0.5951
N-PENTANE 0.250	0.1000	0.0369	0.3967
ISO-HEXANES	0.1106	0.0449	0.5212
N-HEXANE	0.0379	0.0159	0.1794
BENZENE	0.0177	0.0051	0.0762
HEPTANES	0.0894	0.2893	0.4930
TOLUENE	0.0119	0.0535	0.0604
OCTANES	0.0253	0.0744	0.1592
ETHYL BENZENE	0.0010	0.0039	0.0057
XYLENES	0.0047	0.0183	0.0272
NONANES	0.0089	0.0239	0.0626
DECANES PLUS	0.0051	0.0125	0.0401
TOTALS	100.0000	2.2614	100.0000

CALCULATED PROPERTIES OF SEPARATOR GAS

SEP. GAS SPECIFIC GRAVITY (AIR=1.00) = 0.6292
SEP. GAS HEAT OF COMB. (BTU/CU.FT. @ 15.025 PSIA & 60 F) DRY = 1103.1 REAL
SEP. GAS HEAT OF COMB. (BTU/CU.FT. @ 15.025 PSIA & 60 F) WET = 1083.8 WATER SAT.
SEP. GAS COMPRESSIBILITY (@ 1 ATM. & 60 F) Z = 0.9974

DETECTION LIMITS: 0.0001 WT%

REPORT NO. 5367-9125

INTERNATIONAL LABORATORIES

VI. APPENDIX

The following appendices are presented as supporting documentation to the emission test report.

7.1.1 Resumes of Test Personnel

7.2.1 Equipment Calibrations

7.3.1 Gas Standard Certifications

7.4.1 Continuous Analyzer descriptions and specifications

7.5.1 Permit Information

Troy W. LeSage
Sampling Specialist
Emission Testing Services, Incorporated
Baton Rouge, Louisiana

EDUCATION

High School Graduate

U. S. EPA Round Robin sample integrity audits

Completed Emission Testing Services Air Sampling Techniques Seminar

Participates in on going Air-Pollution Training Institute Courses (APTI)

EPA - Sampling and evaluation of Airborne Asbestos, Temple University

NIOSH - Supervision of Asbestos Abatement Projects, Texas A & M

EPA certified smoke reader (Method 9)

EXPERIENCE

1987 to Present - Emission testing specialist for ETS. Performs EPA reference methods for compliance testing as well as other non-routine source evaluations. Responsibilities also include job preparation, equipment calibration, and equipment maintenance.

1985 to 1987 - Industrial Hygiene Technician for an environmental firm, performing metal analysis with atomic adsorption spectrophotometer, fiber analysis for asbestos and overseeing asbestos abatement projects.

James R. Gipson, Jr.
Sampling Technician Trainee
Emission Testing Services, Incorporated
Baton Rouge, Louisiana

EDUCATION

High School Graduate

NLU - Physical Therapy

EXPERIENCE

1992 to Present - Emission testing trainee technician for ETS.
Supports in performing EPA Reference methods for compliance testing as-well-as other nonroutine source evaluations. Responsibilities also include equipment calibrations and maintenance of analytical instruments.

1989 to 1991-----Worked for C-B Enterprises of West Monroe, Louisiana.
Responsibilities included automotive frame, body, mechanical and electrical repair as-well-as painting.

1987 to 1989 ------- Worked for Tri-Metals Fabrication of Baton Rouge, Louisiana. Responsibilities included layout, fitting and welding of structural steel and routine maintenance on equipment.

MILITARY

U.S. NAVY
Served 8 months active duty and currently inactive reserve.

Robert S. Jones
Sampling Specialist
Emission Testing Services, Incorporated
Baton Rouge, Louisiana

EDUCATION

High School Graduate

LSU - Drafting

EPA certified opacity reader (Method 9)

EXPERIENCE

1990 to Present - Emission testing specialist for ETS. Performs EPA Reference methods for compliance testing as well as other non-routine source evaluations. Responsibilities also include equipment calibrations and maintenance of analytical instruments.

1987 to 1989 - Worked for Cintas Corporation of Baton Rouge, Louisiana. Responsibilities included plant start-up, lighting and heating boiler to pressure.

1984 to 1987 - Worked for Hi/Lo Auto Supply. Responsibilities included providing mechanical advise to customers and warehouse management.

ETS
EMISSION TESTING SERVICES, INC.

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English Units)

I.D.O.M.R. 615.020

Leak Check Good @ 0.00002

Date 9-2-92

Meter box number 442

Barometric pressure, P_b 30.09 in. Hg

Calibrated by B. Magee Jr.

Orifice manometer setting (ΔH), in. H_2O	Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter (t_w), °F	Dry gas meter Inlet (t_{d_i}), °F	Dry gas meter Outlet (t_{d_o}), °F	Dry gas meter Avg (t_d), °F	Time (θ), min.
0.5	5	5.041 / 620.061	77°	84 / 90	80 / 86	85.0	12.65
1.0	5	5.119 / 625.180	77°	90 / 95	87 / 91	90.75	8.90
1.5	10	10.328 / 635.508	77°	93 / 99	91 / 95	94.50	14.57
2.0	10	10.395 / 645.903	77°	97 / 103	94 / 98	98.50	12.75
3.0	10	10.446 / 656.349	77°	101 / 107	97 / 99	101.0	10.48
4.0	10						

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@_i = \frac{0.0317\,\Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$
0.5	0.0368	1.0054	1.7840
1.0	0.0737	0.9993	1.7477
1.5	0.110	0.9961	1.7445
2.0	0.147	0.9956	1.7685
3.0	0.221	0.9928	1.7842
4.0	0.294		
Average		0.9978	1.7658

Y = Ratio of reading of wet test meter to dry test meter; tolerance for individual values ± 0.02 from average.

$H@$ = Orifice pressure differential that equates to 0.75 cfm of air @ 68 F and 29.92 inches of mercury, in. H_2O; tolerance for individual values ± 0.20 from average.

Calibrated by Billy Magee Jr.

ETS

PITOT TUBE CALIBRATION

Pitot Tube Number P-3-1. Cp (std) 0.99

Calibrated By Ron Duguay. Date Aug 14 92.

Point Number	Standard Pitot Δ p (in. H_2O)	"S" Type Pitot Δ p (in. H_2O) "A" Side	"B" Side
H 1	1.3	1.9	1.9
M 2	0.84	1.2	1.2
L 3	0.31	0.48	0.47

Calculations:

$$Cp_{(s)} = Cp_{(std)} \times \sqrt{\frac{\Delta p\ (std)}{\Delta p\ (s)}}$$

Deviation $= Cp_{(s)} - \overline{Cp}$ (Side A or B)

Avg. Dev. $= \dfrac{\sum_{1}^{3} \left| Cp_{(s)} - \overline{Cp} \right|}{3}$ (Side A or B)

"A" Side $Cp_{(s)}$	Deviation	"B" Side $Cp_{(s)}$	Deviation
0.819	-0.005	0.819	-0.002
0.828	-0.014	0.828	-0.011
0.796	0.018	0.804	0.013

$\overline{Cp}$ = 0.814 = 0.817

$\left| \overline{Cp}\ (\text{Side A}) - \overline{Cp}\ (\text{Side B}) \right|$ = 0.003 (must be ≤ 0.01)

Avg. Dev. (Side A) = 0.012 (must be ≤ 0.01)

(Side B) = 0.009 (must be ≤ 0.01)

$Cp = \dfrac{\overline{Cp}\ (\text{Side A}) + \overline{Cp}\ (\text{Side B})}{2}$ (should be $0.80 \leq Cp \leq 0.85$) = 0.816

ETS

EMISSION TESTING SERVICES, INC.

OXYGEN CYLINDER CERTIFICATION

Company: QUALITY GAS PRODUCTS

Cylinder Number: CC83900

Analyst: RAM DURGUM

Date: AUGUST 25, 1992

Instrument: ORSAT

Trial	O_2	CO_2
1	8.7	0.00
2	8.6	0.00
3	8.6	0.00
4	8.6	0.00
5	8.6	0.00
6	8.6	0.00
7	8.6	0.00
8	8.6	0.00
9	8.7	0.00
10	8.6	0.00
11	8.6	0.00
12	8.6	0.00

TOTALS: 103.4

Mean O_2 % avg.= 8.62

D:\FORM\02CERT

ETS
EMISSION TESTING SERVICES, INC.

OXYGEN CYLINDER CERTIFICATION

Company: QUALITY GAS PRODUCTS

Cylinder Number: CC83885

Analyst: RAM DURGUM

Date: AUGUST 25, 1992

Instrument: ORSAT

Trial	O_2	CO_2
1	15.8	0.00
2	15.7	0.00
3	15.6	0.00
4	15.6	0.00
5	15.6	0.00
6	15.6	0.00
7	15.6	0.00
8	15.7	0.00
9	15.6	0.00
10	15.6	0.00
11	15.6	0.00
12	15.6	0.00
TOTALS:	103.4	

Mean O_2 % avg.= 15.63

D:\FORM\02CERT

EPA PROTOCOL
UN1956 BAL NITROGEN
NOX
NITRIC OXIDE 433.9ppm
NITROGEN DIOXIDE 433.9ppm
0.00ppm

NON FLAMMABLE

Date 7-9-92
CYL AAL9996
PROJECT NO. 37662
EXPIRATION DATE 12-22-93
P.O. 1205FD

P03610

Scott Specialty Gases
MIDWEST 313-589-2350
EAST 215-766-8861
SOUTHWEST 713-944-4820
WEST 714-887-2571
DO NOT REMOVE THIS LABEL

Shipped From : Scott Michigan
Our Project # : 537662
Your P.O. # : 1205FD
Expiration Date : 12-22-93
Cylinder Number : AAL-9996
Cylinder Pressure : 1900 psig
Certification Date : 6-22-92
1 of 1 Component(s)

Customer :
EMISSION TESTING
10389 MAMMOTH DRIVE
BATON ROUGE, LA. 70895

**** CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES ****

PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Protocol # 1 — Procedure # G1

LAB # 3610

Certified Accuracy 1 % NBS Traceable

ANALYZED CYLINDER		REFERENCE STANDARDS			INSTRUMENTATION		
COMPONENT	CERTIFIED CONCENTRATION	SRM # (CRM #)	CYLINDER NUMBER	CONCENTRATION	INSTRUMENT/ MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
NITRIC OXIDE	433.9 PPM	1687	ALM-014665	965.5 PPM	BECKMAN 951A 270-0828993	4-3-92	CHEMILUMINESCENCE
		1685	ALM-008700	250.3 PPM			

BALANCE GAS : NITROGEN

NITROGEN DIOXIDE 0.00 PPM (FROM SECOND ANALYSIS)

FIRST ANALYSIS — DATE : 6-11-92

ZERO GAS (mV)	TEST GAS (mV)	CURVE RESULTS PPM	REFERENCE GAS CONCENTR.	(mV)	CURVE RESULTS PPM
0.00	43.20	431.9	965.5 PPM	96.50	965.5
0.00	43.20	431.9		96.50	965.5
0.00	43.20	431.9		96.50	965.5

CALCULATED RESULTS 431.9, 431.9, 431.9

AVERAGE : 431.9 PPM

SECOND ANALYSIS — DATE : 6-22-92

ZERO GAS (mV)	TEST GAS (mV)	CURVE RESULTS PPM	REFERENCE GAS CONCENTR.	(mV)	CURVE RESULTS PPM
0.00	43.60	435.9	965.5 PPM	96.50	965.5
0.00	43.60	435.9		96.50	965.5
0.00	43.60	435.9		96.50	965.5
0.00	43.60 NOX	435.9			

CALCULATED RESULTS 435.9, 435.9, 435.9

435.9 PPM NOX

AVERAGE : 435.9 PPM

CALIBRATION CURVE 1 st DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
1687	965.5	100	96.50	965.5	0.00
GMIS	748.0	77	75.00	750.3	0.30
GMIS	395.0	41	39.60	395.9	0.22
1685	250.3	26	25.10	250.7	0.16
	0.0000	0	0.0000	0.0000	0.00
		0		0.00	0.00
		0		0.00	0.00
1685	250.3	LOW	25.10	250.7	0.16
1687	965.5	HIGH	96.50	965.5	0.00

* GMIS - GAS MANUACTURER'S INTERNAL STANDARD

DATA ACQ CYL : 0 FILE # : 87

Analyst : Ron Eichler Jr

Approved By : [signature]

Revised : 3/31/92 RML

7.3.3

Scott Specialty Gases

a division of Scott Environmental Technology, Inc.

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Shipped From : Scott Michigan

Our Project # : 523578

Your P.O. # : 91053-1

Expiration Date : 11-29-92

Cylinder Number : AAL-4530

Cylinder Pressure 1500 psig

Customer :
EMISSION TESTING SERVICES
10127 MAMMOTH DRIVE
BATON ROUGE, LA. 70895

* * * * CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES * * * *
PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Protocol # 1 — Procedure # G1

File # PC-0362

Certified Accuracy 1 % NBS Traceable

ANALYZED CYLINDER		REFERENCE STD			INSTRUMENTATION		
COMPONENT	CERTIFIED CONC.	SRM # (CRM #)	CYLINDER NUMBER	CONC.	INSTR/MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
NITRIC OXIDE	1965 PPM	2631	FF-16175	2854 PPM	BECKMAN 951A	3-8-91	CHEMILUMINESCENCE
1985.37 NOX		GMIS‡	HA-6840	971.6 PPM	CTO		
BALANCE GAS : NITROGEN							

NITROGEN DIOXIDE 20.37 PPM (FROM SECOND ANALYSIS)

FIRST ANALYSIS DATE : 5-23-91

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	67.50	1966	2854 PPM	98.00	2854
0.00	67.50	1966		98.00	2854
0.00	67.50	1966		98.00	2854
CALCULATED RESULTS		1966			
		1966			
		1966			
AVERAGE :		1966 PPM			

SECOND ANALYSIS DATE : 5-29-91

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	67.40	1963	2854 PPM	98.00	2854
0.00	67.40	1963		98.00	2854
0.00	67.40	1963		98.00	2854
0.00	65.10 NOX	1954			
CALCULATED RESULTS		1963			
		1963			
		1963	1954 PPM NOX		
AVERAGE :		1963 PPM			

CALIBRATION CURVE 1 st DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
2631	2854	100	98.00	2854	0.00
	1428	50	49.00	1428	-0.00
	971.6	34	33.10	965.2	-0.66
	489.0	17	16.80	470.8	0.38
	0.0000	0	0.00	0.0000	0.00
		0		0.0000	0.00
		0		0.00	0.00
	489.0	LOW	16.80	470.8	0.38
2631	2854.0	HIGH	98.00	2854.0	0.00

‡ GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

Approved By : S. Shapiro

The sole liability of this Company for gas which fail to comply with this analysis shall be replacement thereof by the Company without charge.

7.3.4

Scott Specialty Gases

a division of Scott Environmental Technology, Inc.

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Shipped From : Scott Michigan

Our Project # : 537662

Your P.O. # : 1205FD

Expiration Date : 12-22-93

Cylinder Number : AAL20994

Cylinder Pressure 1900 psig

1 of 1 Component(s)

Customer :

EMISSION TESTING SERVICES
10329 [illegible] DRIVE
BATON ROUGE LA 70815

: : : : CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES : : : :

PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Protocol # 1 — Procedure # G1

File # - PO-3600

Certified Accuracy 1 % NBS Traceable

ANALYZED CYLINDER		REFERENCE STD			INSTRUMENTATION		
COMPONENT	CERTIFIED CONC.	SRM # (CRM #)	CYLINDER NUMBER	CONC.	INSTR/MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
CARBON MONOXIDE	86.69 PPM	1697	AAL1355	96.67 PPM	HORIBA	6-22-92	NON-DISPERSIVE INFRARED
		1677C	AAL9235	9.90 PPM	OPE 144E		

BALANCE GAS : NITROGEN

FIRST ANALYSIS — DATE : 6-15-92

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	152.50	86.75	96.67 PPM	170.00	96.67
0.00	152.50	86.75		170.00	96.67
0.00	152.50	86.75		170.00	96.67
CALCULATED RESULTS		86.75			
		86.75			
		86.75			
AVERAGE :		86.75 PPM			

SECOND ANALYSIS — DATE : 6-22-92

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	152.60	86.63	96.67 PPM	170.00	96.67
0.00	152.60	86.63		170.00	96.67
0.00	152.60	86.63		170.00	96.67
CALCULATED RESULTS		86.63			
		86.63			
		86.63			
AVERAGE :		86.63 PPM			

CALIBRATION CURVE — 2 nd DEGREE

SRM # (CRM #)	CONC. %	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
1697	96.67	100	170.00	96.67	-0.00
SMIS	50.55	52	89.70	50.61	0.12
1678A	47.20	49	83.60	47.14	-0.12
SMIS	20.57	21	36.60	20.53	-0.17
1677C	9.90	10	17.80	9.96	0.58
	0.00	0	0.00	0.0000	0.00
		0		0.00	0.00
1677C	9.90	LOW	17.80	9.96	0.58
1697	96.67	HIGH	170.00	96.67	-0.00

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

* SMIS - GAS MANUFACTURER'S INTERNAL STANDARD

Analyst : [illegible]

Approved By : J. Shapiro

7.3.5

Scott Specialty Gases

a division of Scott Environmental Technology, Inc.

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Shipped From : Scott Michigan
Our Project # : 537662
Your P.O. # : 1205FD
Expiration Date : 12-22-93
Cylinder Number : AAL12825
Cylinder Pressure 1900 psig
1 of 1 Component(s)

Customer :
EMISSION TESTING SERVICES
10369 MAMMOTH DRIVE
BATON ROUGE LA 70895

! ! ! ! CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES ! ! ! !
PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Protocol # 1
Procedure # G1
File # PO 3602
Certified Accuracy 1 % NBS Traceable

ANALYZED CYLINDER		REFERENCE STD			INSTRUMENTATION		
COMPONENT	CERTIFIED CONC.	SRM # (CRM #)	CYLINDER NUMBER	CONC.	INSTR/MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
CARBON MONOXIDE	290.1 PPM	1680	AAL16199	475.00 PPM	BECKMAN 951A 270-0828998	6-3-92	NON-DISPERSIVE INFRARED
		2636	ALM013383	243.40 PPM			

BALANCE GAS : NITROGEN

FIRST ANALYSIS DATE : 6-16-92

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	109.30	289.72	475.00 PPM	175.00	475.00
0.00	109.30	289.72		175.00	475.00
0.00	109.30	289.72		175.00	475.00
CALCULATED RESULTS		289.72			
		289.72			
		289.72			
AVERAGE :		289.72 PPM			

SECOND ANALYSIS DATE : 6-22-92

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	109.60	290.54	475.00 PPM	175.00	475.00
0.00	109.60	290.54		175.00	475.00
0.00	109.60	290.54		175.00	475.00
CALCULATED RESULTS		290.54			
		290.54			
		290.54			
AVERAGE :		290.54 PPM			

CALIBRATION CURVE 2 nd DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
1680	475.00	100	175.00	475.00	0.00
2636	243.40	51	91.60	244.14	0.30
GMIS	240.40	51	89.90	239.52	-0.37
1679	96.67	20	36.80	96.86	0.19
	0.00	0	0.00	0.00	0.00
		0		0.0000	0.00
		0		0.00	0.00
2636	243.4	LOW	91.60	244.14	0.00
1680	475.00	HIGH	175.00	475.00	0.00

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

! GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

Analyst : Don Eckler Jr

Approved By : J. Shapiro

7.3.6

Scott Specialty Gases

a division of Scott Environmental Technology, Inc.

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Shipped From : Scott Michigan
Our Project # : 537662
Your P.O. # : 1205FD
Expiration Date : 12-22-93
Cylinder Number : AAL12828
Cylinder Pressure 1900 psig
1 of 1 Component(s)

Customer :
EMISSION TESTING SERVICES
10389 MAMMOTH DRIVE
BATON ROUGE LA 70895

* * * * CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES * * * *
PERFORMED ACCORDING TO SECTION 3.0.4
Certified Per Traceability Procedure # G1
Protocol # 1
File # PO-3604
Certified Accuracy 1 % NBS Traceable

ANALYZED CYLINDER		REFERENCE STD			INSTRUMENTATION		
COMPONENT	CERTIFIED CONC.	SRM # (CRM #)	CYLINDER NUMBER	CONC.	INSTR/MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
CARBON MONOXIDE	584.3 PPM	1681	ALM-010502	967.1 PPM	HORIBA OPE-144E 560172153	6-16-92	NON-DISPERSIVE INFRARED
		1680	AAL-16179	475.0 PPM			

BALANCE GAS : NITROGEN

FIRST ANALYSIS DATE : 6-16-92

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	61.90	584.8	967.1 PPM	100.00	967.1
0.00	61.90	584.8		100.00	967.1
0.00	61.90	584.8		100.00	967.1

CALCULATED RESULTS 584.8, 584.8, 584.8

AVERAGE : 584.8 PPM

SECOND ANALYSIS DATE : 6-22-92

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	61.80	583.8	967.1 PPM	100.00	967.1
0.00	61.80	583.8		100.00	967.1
0.00	61.80	583.8		100.00	967.1

CALCULATED RESULTS 583.8, 583.8, 583.8

AVERAGE : 583.8 PPM

CALIBRATION CURVE 2 nd DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
1681	967.1	100	100.00	967.1	0.00
1680	475.0	49	50.60	474.6	-0.08
2636	243.4	25	26.40	243.3	0.16
1679	96.67	10	10.60	96.77	0.11
	0.0000	0	0.00	0.0000	0.00
		0		0.0000	0.00
		0		0.00	0.00
1680	475.0	LOW	50.60	474.62	-0.08
1681	967.1	HIGH	100.00	967.1	0.00

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

1 SMIS - BA3 MANUFACTURER'S INTERNAL STANDARD

Analyst : [signature]

Approved By : J. Shapiro

7.3.7

OXYGEN ANALYZER
PRINCIPLE OF OPERATION and SPECIFICATIONS

THERMOX

Model Number : 254

I. PRINCIPLES of OPERATION

The THERMOX oxygen analyzer consists of two units, a sensor and a control-readout unit. The sensor assembly incorporates an electrochemical cell, furnace, resistance temperature detector (RTD), flow block, and associated plumbing. The control-readout unit contains the electronics necessary for control of the cell furnace temperature, detector signal conditioning, and multiple range functions.

The electrochemical cell consists of a closed-end tube made of zirconium oxide (zirconia) with electrodes of porous platinum coated onto the inside and outside. When heated, the zirconia cell becomes a conductor of electricity due to the mobility of oxygen ions in its crystal structure. When the electrodes are in contact with gases of equal pressure having different oxygen concentrations, a voltage is produced that is logarithmically proportional to the ratio of the oxygen concentration on the reference side of the cell, ambient air, and the oxygen concentration on the other side of the cell, the sample gas.

Since the electrochemical cell voltage is also dependent on the cell temperature, the cell temperature is maintained at a constant level using an electrically heated furnace. Furnace temperature is sensed using a platinum RTD and controlled using a proportional temperature controller located in the control unit.

II. SPECIFICATIONS

Ranges	:	0 to 10%
	:	0 to 25%
Detection Limits		
minimum	:	0.01%
maximum	:	25%
Response Time	:	3 sec
Zero Drift, 24 hr	:	+/- 0.2%
Span Drift, 24 hr	:	+/- 0.2%
Precision	:	+/- 0.1%
Linearity	:	+/- 1%
Noise	:	0.05 RMS
Sample flow rate	:	0.5 - 2 l/min
Interferences	:	None

OXIDES OF NITROGEN ANALYZER
PRINCIPLE OF OPERATION and SPECIFICATIONS

THERMO ENVIRONMENTAL INSTRUMENTS

Model Number : 14A

I. PRINCIPLES of OPERATION

The model 14A NO-NO2-NOX analyzer utilizes the principle of chemiluminescence for the detection of nitrogen oxides. The analyzer consists of a photomultiplier, ozone generator, reaction chamber, NO2 to NO converter, and associated plumbing and electronics.

Sample gas is blended with O3 in a reaction chamber. The gas-phase reaction of NO and O3 produce a characteristic luminescence with an intensity linearly proportional to the concentration of NO. Chemiluminescence from the reaction is monitored through an optical filter using a highly sensitive photomutiplier. The filter photomultiplier combination responds to light in a narrow wavelength band unique to the NO and O3 reaction. In order to measure NOX, NO plus NO2, the sample gas is diverted through a NO2 to NO converter before entering the reaction chamber. The resulting chemiluminescent response is linearly proportional to the NOX concentration of the sample gas.

Ozone for the reaction is produced using an ozone generator. The generator uses a high energy electric arc discharge and dry ambient air to produce ozone.

II. SPECIFICATIONS

Ranges	:	0 to 0.01 PPM	Detection Limit		
		0 to 0.025 PPM	Minimum	:	0.001 PPM
		0 to 0.1 PPM	Maximum	:	2500 PPM
		0 to 0.25 PPM			
		0 to 1.0 PPM	Response Time	:	1 sec
		0 to 10 PPM			
		0 to 100 PPM	Linearity	:	+/- 1%
		0 to 1000 PPM			
		0 to 2500 PPM	Noise	:	0.05 RMS
12 hr Zero Drift :		< 12%	Precision	:	+/- 1.0 PPM
12 hr Span Drift :		< 12%			
			Sample flow rate	:	0.5 - 2 l/min

Interferences : Negligible interference from H2O, carbon and sulfur compounds

CARBON MONOXIDE ANALYZER
PRINCIPLE OF OPERATION and SPECIFICATIONS

THERMO ENVIRONMENTAL INSTRUMENTS

Model Number : 48

I. PRINCIPLES of OPERATION

The model 48 CO analyzer utilizes non-dispersive infrared (NDIR) detection of CO enhanced by gas filter correlation (GFC). The analyzer consists of an optical bench, Gas filter chopper, infrared (IR) source, IR detector, and associated electronics.

Sample gas is passed through an optical White Cell in which a beam of IR radiation passes. The White Cell provides a long beam path length in a relatively small cell by utilizing optical mirrors to produce multiple passes of the IR beam through the cell. IR radiation is produced using a wire wound resistor that is heated by passing a regulated DC voltage through the resistor causing it to radiate in the IR range. The radiation is passed through a gas filter chopper and a narrow bandpass interference filter before entering the White cell. As the IR beam passes through the cell, CO molecules absorb the IR proportional to the concentration of CO in the sample. The remaining IR exits the cell and is measured by an IR detector.

Interference from gases in the sample that absorb IR at the same wavelengths as CO are eliminated using GFC. GFC utilizes a correlation wheel consisting of two optical cells, one filled with CO and the other filled with N2. The wheel, positioned in the IR beam path before it enters the White Cell, is rotated by a synchronous motor. The IR beam passes alternately through the CO and N2 cells of the wheel. The CO filter acts to produce a reference beam which can not be further absorbed by CO in the sample cell. The N2 filter is transparent to IR radiation and produces a measure beam which can be absorbed by CO in the sample cell. The chopped detector signal is modulated by the alternation between the two gas filters with an amplitude related to the concentration of CO in the sample cell. Other gases do not cause detector signal modulation since they absorb the reference and measure beams equally.

II. SPECIFICATIONS

Ranges	:	0 to 1 PPM	Detection Limit		
		0 to 2 PPM	Minimum	:	0.10 PPM
		0 to 5 PPM	Maximum	:	1000 PPM
		0 to 10 PPM			
		0 to 20 PPM	Response Time	:	1 min
		0 to 50 PPM			
		0 to 100 PPM	Linearity	:	+/- 1%
		0 to 200 PPM			
		0 to 500 PPM	Noise	:	0.05 RMS
		0 to 1000 PPM			
24 hr Zero Drift :		+/- 0.2 PPM	Precision	:	+/- 0.1 PPM
24 hr Span Drift :		+/- 1% full scale			
			Sample flow rate	:	0.5 - 2 l/min
Interferences	:	Negligible interference from H2O and CO2			

Permit No. 2660-00077-01

SPECIFIC CONDITIONS

BAYOU SALE COMPRESSOR STATION
EXXON COMPANY, U.S.A.
CENTERVILLE, ST. MARY PARISH, LOUISIANA

1. Permittee shall maintain the reliability of Flare Industries device that assures the pilot light function of the flare, Emission Point 001. Any failure of this device could require notification under LAC 33:111.927 of the Louisiana Air Quality Regulations.

2. Permittee shall demonstrate compliance with the CO and NOx emission limits of this permit by performing a stack test on one compressor engine (Emission Points ENG 002 or ENG 004). Test methods and procedures shall be in accordance with 40 CFR 60, Appendix A, Method 7E - Determination of Nitrogen Oxides from Stationary Sources and Method 10 - Determination of Carbon Monoxide Emissions from Stationary Sources.

3. Permittee shall test the compressor engines (Emission Points ENG 002 or ENG 004) every 90 days for NOx, CO, and O_2 emissions utilizing portable analyzers that are calibrated before each test using a known reference gas sample. Records of these tests shall be kept on site and available for inspection by the Air Quality Compliance Division.

11/25/92 Per Mr. Banerjee, we only need to test one of the engines quarterly.

AIR QUALITY DATA SHEET
PAGE 2

BAYOU SALE COMPRESSOR STATION
EXXON COMPANY, U.S.A.
CENTERVILLE, ST. MARY PARISH, LOUISIANA

MAXIMUM/AVERAGE EMISSION RATES ARE LISTED IN LB/HR

Emission Point No.	Permitted Emissions PM_{10}	SO_2	NO_X	VOC	CO	OTHER	HEIGHT Feet	TEMP. °F	FLOW RATE CFM
DHY 001	-	-	0.08/0.08	-	0.02/0.02	-	24	700	319
* ENG 002	-	-	43.23/37.59	1.37/1.19	43.23/37.59	-	29	700	5179
* ENG 004	-	-	43.23/37.59	1.37/1.19	43.23/37.59	-	37	700	5179
TNK 003	-	-	-	1.15/1.15	-	-	NA	NA	NA
TNK 004	-	-	-	0.02/0.02	-	-	NA	NA	NA
TNK 005	-	-	-	0.02/0.02	-	-	NA	NA	NA
HTR 001	0.01/0.01	-	0.10/0.10	0.01/0.01	0.02/0.02	-	30	700	399
HTR 002	0.01/0.01	-	0.10/0.10	0.01/0.01	0.02/0.02	-	30	700	399
HTR 003	0.01/0.01	-	0.10/0.10	0.01/0.01	0.02/0.02	-	30	700	399
HTR 004	0.01/0.01	-	0.10/0.10	0.01/0.01	0.02/0.02	-	30	700	399
HTR 005	0.01/0.01	-	0.10/0.10	0.01/0.01	0.02/0.02	-	30	700	399
HTR 006	-	-	0.08/0.08	-	0.02/0.02	-	25	700	299
HTR 007	0.01/0.01	-	0.10/0.10	0.01/0.01	0.02/0.02	-	30	700	399
HTR 008	0.01/0.01	-	0.10/0.10	0.01/0.01	0.02/0.02	-	30	700	399
FLHTR 01	0.01/0.01	-	0.10/0.10	0.01/0.01	0.02/0.02	-	15	700	399
GDP 001	-	-	-	0.01/0.01	0.02/0.02	-	NA	NA	NA
GDP 002	-	-	-	0.09/0.09	-	-	NA	NA	NA
GDP 003	-	-	-	0.09/0.09	-	-	NA	NA	NA
FUG 001	-	-	-	5.95/5.95	-	-	NA	NA	NA
FLR 001	1.31/0.01	-	43.75/0.32	13.94/0.16	8.75/0.06	-	50	-	7560
DHY 002	-	-	-	7.07/6.15	-	-	NA	NA	NA

AIR QUALITY DATA SHEET
PAGE 3

BAYOU SALE COMPRESSOR STATION
EXXON COMPANY, U.S.A.
CENTERVILLE, ST. MARY PARISH, LOUISIANA

Emission Point No.	TONS PER YEAR PM_{10}	SO_2	NO_X	VOC	CO	OTHER
DHY 001	-	-	0.35	-	0.09	-
E 002	-	-	41.6	1.30.52	41.16	-
ENG 004	-	-	164.64	5.21	164.64	-
T 003	-	-	-	5.04	-	-
TNK 004	-	-	-	0.10	-	-
TNK 005	-	-	-	0.10	-	-
H 001	0.04	-	0.44	0.04	0.09	-
HTR 002	0.04	-	0.44	0.04	0.09	-
H 003	0.04	-	0.44	0.04	0.09	-
HTR 004	0.04	-	0.44	0.04	0.09	-
H 005	0.04	-	0.44	0.04	0.09	-
006	-	-	0.35	-	0.09	-
HTR 007	0.04	-	0.44	0.44	0.09	-
008	0.04	-	0.44	0.04	0.09	-
FLHTR 01	0.04	-	0.44	0.04	0.09	-
001	-	-	-	0.20	-	-
DP 002	-	-	-	0.20	-	-
003	-	-	-	0.20	-	-
001	-	-	-	26.06	-	-
LR 001	0.04	-	1.40	0.68	0.28	-
002	-	-	-	0.54	-	-
otal	0.36	-	211.42	39.95	206.98	-

[illegible] as many times as there are individual emission points, and use one page for each point. Note that the subscripted numbers indicate explanatory notes on pages 4 and 5.

Point source ID number[1]	Descriptive name of the equipment served by this stack	Height of stack above grade[2]	Stack diameter[3]	Stack gas exit temperature
ENG002	1550 BHP Compressor Engine Exhaust	29 ft	1.67 ft	700 °F

Stack gas flow rate at process conditions, not at standard	Stack gas exit velocity	If this stack serves a "boiler"[4], give the type(s) of fuel used and the heat input (i.e., fuel rate x heating value)	% of annual throughput of pollutants through this emission point (totals 100%)				Normal operating time of this point		
			Dec-Feb	Mar-May	June-Aug	Sept-Nov	hrs/day	days/week	wks/yr
5179 ft^3/min	39 ft/sec	NA type(s) of fuel ____ 10^6 BTU/hr 1st fuel ____ 10^6 BTU/hr 2nd fuel, if any	25 %	25 %	25 %	25 %	24	7	13

25%

Name of pollutant	Pollution control equipment code[5]	Control equipment efficiency[6]	Average emission rate lbs/hr	Maximum emission rate lbs/hr	Annual emission rate tons/yr	Emission estimation method[7]	Add, change or delete code[8]	Concentration in gases exiting the stack[9]
particulate matter								gr/std ft^3
sulfur dioxide	000	0	Neg	Neg	Neg	3	Change	PPM (VOL)
nitrogen dioxide	000	0	37.59	43.23	41.16	3	Change	Fill in this column only as required by note 9.
hydrocarbons								
carbon monoxide	000	0	37.59	43.23	41.16	4	Change	
VOC Hydrocarbons	000	0	1.19	1.37	1.30	3	Change	

7.5.4

If this stack is from equipment which burns fuel, give the % of the total fuel used by the equipment which is used, either directly or indirectly, for space heating (or cooling) at the plant. (i.e., to heat or cool the air in a room) If this stack is not from a fuel burning equipment, or if fuel is burned but none of the heat is intended to heat or cool air in a room, enter a zero below:

0 % "space heat"

Give below the fuel or process materials charging rate to the unit served by this stack.[11]

Name of fuel/ process material	Annual rate	Maximum hourly rate
Fuel: Natural Gas	28.3 MMcf/yr	12.9 Mscf/hr
	/yr	/hr
	/yr	/hr
	/yr	/hr
	/yr	/hr
	/yr	/hr

In g td us to rd da rod e s ((the nis pd) o , I ocol I ge as many times as there are individual emission points, and use one page for each point. Note that the subscripted numbers indicate explanatory notes on pages 4 and 5.

Point source ID number[1]	Descriptive name of the equipment served by this stack	Height of stack above grade[2]	Stack diameter[3]	Stack gas exit temperature
ENG004	1550 BHP Compressor Engine Exhaust	37 ft	2.33 ft	700 °F

Stack gas flow rate at process conditions, not at standard	Stack gas exit velocity	If this stack serves a "boiler"[4], give the type(s) of fuel used and the heat input (i.e., fuel rate x heating value)	% of annual throughput of pollutants through this emission point (totals 100%)				Normal operating time of this point		
			Dec-Feb	Mar-May	June-Aug	Sept-Nov	hrs/day	days/week	wks/yr
5179 ft^3/min	20 ft/sec	NA type(s) of fuel 10^6 BTU/hr 1st fuel 10^6 BTU/hr 2nd fuel, if any	25 %	25 %	25 %	25 %	24	7	52

Name of pollutant	Pollution control equipment code[5]	Control equipment efficiency[6]	Average emission rate lbs/hr	Maximum emission rate lbs/hr	Annual emission rate tons/yr	Emission estimation method[7]	Add, change or delete code[8]	Concentration in gases exiting the stack[9]
particulate matter								gr/std ft^3
sulfur dioxide	000	0	Neg	Neg	Neg	3	Change	PPM (VOL)
nitrogen dioxide	000	0	37.59	43.23	164.64	3	Change	
hydrocarbons								
carbon monoxide	000	0	37.59	43.23	164.64	4	Change	
VOC Hydrocarbons	000	0	1.19	1.37	5.21	3	Change	

Fill in this column only as required by note 9.

7.5.5

If this stack is from equipment which burns fuel, give the % of the total fuel used by the equipment which is used, either directly or indirectly, for space heating (or cooling) at the plant. (i.e., to heat or cool the air in a room) If this stack is not from a fuel burning equipment, or if fuel is burned but none of the heat is intended to heat or cool air in a room, enter a zero below:

0 % "space heat"

Give below the fuel or process materials charging rate to the unit served by this stack.[11]

Name of fuel/ process material	Annual rate	Maximum hourly rate
Fuel: Natural Gas	113 MMscf/yr	12.9 Mscf/hr
	/yr	/hr
	/yr	/hr
	/yr	/hr
	/yr	/hr
	/yr	/hr