Montana Refining Company, Inc.
Great Falls, Montana

Diesel Hydrotreater Heater (HTU) H1701 & Hydrogen Plant Reformer Heater H1810 Stacks

NO_x/CO Compliance Emission Test Report

10/08/08

By:

Ed Wadington

Energy & Environmental Measurement Corporation (EEMC)
1744 Mullowney Lane, Billings, Montana 59101
Phone: (406) 252-4450 Fax: (406) 252-6350

3730 N. Pellegrino Drive, Tucson, Arizona 85749
Phone: (520) 749-2167 Fax: (520) 749-3582

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FIELD OBSERVATION CHECKLIST

Test Date:	**10/08/08**
Plant Name:	**Montana Refining Company, Inc.**
Plant Address:	**1900 10th Street N.E.** **Great Falls, Montana 59404**
Sources Tested:	**HTU (Diesel Hydrotreater Heater) H1701 &** **Hydrogen Plant Reformer Heater H1810 Stacks**
Plant Contact:	**Ray Martinich / Environmental Engineer**
Phone: **Fax:**	**(406) 761-4100 refinery; (406) 454-9862 direct line** **(406) 761-0174**
Observers & Affiliation:	**Ray Martinich - Montana Refining Company** **No State Observers**
EEMC Field Team:	
Team Leader:	**Dave Wang**
Other Members:	**Jason Wiggs** **John Adams**

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INTRODUCTION

Montana Refining Company, Inc., Great Falls, Montana contracted with Energy & Environmental Measurement Corporation (EEMC) to conduct a series of NO_x/CO compliance emission tests on their Hydrogen Plant Reformer Heater (H1810) and Diesel Hydrotreater Heater (H1701) Stacks located at Great Falls, Montana. This report contains all field data, calculations and results.

Test Chronolog
10/08/08

Time	Run #	Source	Test Description
07:45-08:44	1-NO_x/CO	Hydrogen Plant	EPA Methods #7E, #10 & #19
08:52-09:51	2-NO_x/CO	Hydrogen Plant	EPA Methods #7E, #10 & #19
09:59-10:58	3-NO_x/CO	Hydrogen Plant	EPA Methods #7E, #10 & #19
07:45-08:45	1-GF/H_2O	Hydrogen Plant	EPA Methods #1-4
08:52-09:52	2-GF/H_2O	Hydrogen Plant	EPA Methods #1-4
09:59-10:59	3-GF/H_2O	Hydrogen Plant	EPA Methods #1-4
11:35-12:34	4-NO_x/CO	Hydrotreater (HTU)	EPA Methods #7E, #10 & #19
12:42-13:41	5-NO_x/CO	Hydrotreater (HTU)	EPA Methods #7E, #10 & #19
13:49-14:48	6-NO_x/CO	Hydrotreater (HTU)	EPA Methods #7E, #10 & #19
11:35-12:35	4-GF/H_2O	Hydrotreater (HTU)	EPA Methods #1-4
12:42-13:42	5-GF/H_2O	Hydrotreater (HTU)	EPA Methods #1-4
13:49-14:49	6-GF/H_2O	Hydrotreater (HTU)	EPA Methods #1-4

TEST METHODS/PROCEDURES

Gas Flow / Moisture Sampling

EPA Methods #1-4[1] were utilized for determination of stack gas velocity, density and moisture. Note section tabulated - Stack Parameters for a description of the sampling locations, etc.

The sample train consisted of a SS pitobe assembly (S-type pitot tube and a Type K thermocouple) leading to a set of four Greenburg-Smith impingers where flue gas moisture was condensed (1&2-150 ml H_2O_2 , 3-empty, and 4-silica gel). The dried gases were then pulled, via an umbilical cord, to a RAC type meter box for gas volume metering. A meter box orifice slip stream was utilized for collection of an integrated bag sample and analyzed via orsat and a Servomex oxygen analyzer. A total of three one-hour tests were conducted concurrent with the NO_x/CO testing.

TEST METHODS/PROCEDURES - continued

Upon completion of the test run, CO_2 / O_2 concentrations were determined by triplicate orsat analysis (integrated bag), and moisture determination was via gravimetric analysis of the impinger liquid gain.

NO_x Emissions

EPA Method #7E[1] was utilized for determination of stack gas NO_x concentration. The stack gases were extracted from the stream, and conveyed to an CAI (Model 400) Chemiluminescent analyzer. EPA Protocol 1 calibration gases were utilized for instrument span checks. Zero was checked with zero N_2 gas. Results were recorded via an integrating logger on a one-minute basis.

CO Emissions

EPA Method #10[1] was utilized for determination of gas stream carbon monoxide concentration. A CAI (Model 100) NDIR analyzer was utilized. Span gases were EPA Protocol 1 CO in N_2. Calibration results are included with each test run as per the method.

Fuel Analysis

In order to develop an Fd factor a fuel analysis was conducted by Montana Refining. The results and subsequent calculations (Fd) are included the this report (lbs/MMBtu).

Units of Reporting

The data is reported with the following units:

1) NO_x/CO
   ppm v/v Dry - parts per million on a volume basis with and without water
   PPH - pounds per hour
   TPY - tons per year
   lb/MMBtu - pounds per million British Thermal Units
2) Gas Flow
   Flow - FPS - feet per second
   Volume - AWCFM - actual wet cubic feet per minute
   SDCFH - dry standard* cubic feet per hour,
   (* @ 68 °F and 29.92 Hg)
3) CO_2/O_2 - % v/v - percent on a volume basis

RESULTS

The Data Summaries Section contains pertinent results. Field data & calculations are included as tabulated.

REFERENCES

[1] Federal Register, Pt. 60, App. A. Methods #1-4, #7E, #10 & #19, 7/1/07.

COMPLIANCE STATEMENT

Montana Refining Company, Inc.
Diesel Hydrotreater Heater (HTU) H1701 &
Hydrogen Plant Reformer Heater H1810 Stacks
Great Falls, Montana

Emission Limits:

Hydrogen Plant Heater

NO_x	@	1.9 lb/hr, 8.3 TPY & 0.08 lbs/MMBtu
CO	@	0.93 lb/hr, 4.1 TPY

Hydrotreater Heater

NO_x	@	1.42 lb/hr, 6.2 TPY & 0.0716 lbs/MMBtu
CO	@	0.79 lb/hr, 6.2 TPY

Measured Emissions (10/08/08):

Hydrogen Plant ReformerHeater H1810

NO_x	@	0.88 lb/hr, 3.85 TPY & 0.037 lbs/MMBtu	**PASS**
CO	@	0.03 lb/hr, 0.1 TPY	**PASS**

Diesel Hydrotreater Heater (HTU) H1701

NO_x	@	0.76 lb/hr, 2.85 TPY & 0.053 lbs/MMBtu	**PASS**
CO	@	0.01 lb/hr, 0.04 TPY	**PASS**

Example: lbs/hr → tons/year
(0.88 lbs/hr) (24hrs/day) (365days/year) / (2000lbs/ton) = 3.85 tons/year

Summary of Montana Refining Company, Inc.
Hydrogen Plant Reformer Heater H1810
Great Falls, Montana
NO_x/CO Emission Data
10/8/2008

Time	Run#	EPA Method #7E - NO_x Emissions			EPA Method #10 - CO Emissions		
		ppm v/v D	PPH	lbs/MMBtu	ppm v/v D	PPH	lbs/MMBtu
07:45-08:44	1-NOx/CO	27.2	0.87	0.036	1.4	0.03	0.001
08:52-09:51	2-NOx/CO	27.8	0.88	0.037	1.9	0.04	0.002
09:59-10:58	3-NOx/CO	27.7	0.88	0.037	1.8	0.03	0.001
Mean 1-3		27.6	0.88	0.037	1.7	0.03	0.001

Time	Run#	EPA Methods #1-4 Gas Stream Characteristics						
		AWCFM	ADCFM	DSCFH	T(s) °F	$\%H_2O$ v/v	$\%CO_2$ v/v Dry	O_2
07:45-08:45	1-GF/H2O	8,845.6	7,632.0	267,678.6	334	13.72	13.0	5.2
08:52-09:52	2-GF/H2O	8,821.6	7,565.4	265,341.7	334	14.24	13.1	5.3
09:59-10:59	3-GF/H2O	8,829.6	7,567.0	265,063.2	335	14.30	13.2	5.2
Mean 1-3		8,832.3	7,588.1	266,027.8	334	14.09	13.1	5.2

Summary of Montana Refining Company, Inc.
Diesel Hydrotreater Heater (HTU) H1701
Great Falls, Montana
NO_x/CO Emission Data
10/8/2008

Time	Run#	EPA Method #7E - NO_x Emissions			EPA Method #10 - CO Emissions		
		ppm v/v D	PPH	lbs/MMBtu	ppm v/v D	PPH	lbs/MMBtu
11:35-12:34	4-NOx/CO	43.5	0.74	0.053	1.4	0.01	0.001
12:42-13:41	5-NOx/CO	44.6	0.78	0.054	1.4	0.01	0.001
13:49-14:48	6-NOx/CO	44.0	0.77	0.053	1.6	0.02	0.001
Mean 4-6		44.0	0.76	0.053	1.5	0.01	0.001

		EPA Methods #1-4 Gas Stream Characteristics						
		AWCFM	ADCFM	DSCFH	T(s)	$\%H_2O$	$\%CO_2$	$\%O_2$
					°F	v/v	v/v Dry	
11:35-12:35	4-GF/H2O	5,998.2	5,518.9	142,423.5	619	7.99	9.4	2.9
12:42-13:42	5-GF/H2O	6,080.2	5,645.5	145,553.0	620	7.15	9.5	2.8
13:49-14:49	6-GF/H2O	6,115.8	5,658.9	145,901.6	620	7.47	9.5	2.8
Mean 4-6		6,064.7	5,607.8	144,626.0	620	7.54	9.5	2.8

Review and Certification

All work, calculations, and other activities and tasks performed and documented in this report were carried out under my direction and supervision. This test project conforms to EEMC's Quality Manual and to the requirements of ASTM D-7036.

David Wang
Division Manager, EEMC

10 - 19 - 08
Date

I have reviewed all testing details, calculations, results, conclusions and other appropriate written materials contained herein, and hereby certify that the presented material is authentic and accurate.

Ed Wadington
President, EEMC

11 | 11 | 08
Date

I have reviewed, and accept, the production and test data contained in this report, and hereby certify that it is authentic.

Signature

Date

Name (Printed)

Title

Company

STACK PARAMETERS

Montana Refining Company, Inc.
Great Falls, Montana

Hydrogen Plant Reformer Heater Stack

Diameter of Stack	@	35 inches (2.917 ft.)
Area of Stack	@	6.683 sq. ft.

Distance to upstream flow disturbance	@	~6 ft. (toward process)
Distance to downstream flow disturbance	@	3.0 ft. (toward stack exit)

Number of diameters upstream	@	~6 ft. / 3 ft. = -2 d
Number of diameters downstream	@	3.0 ft. / 3 ft. = 1.0 d

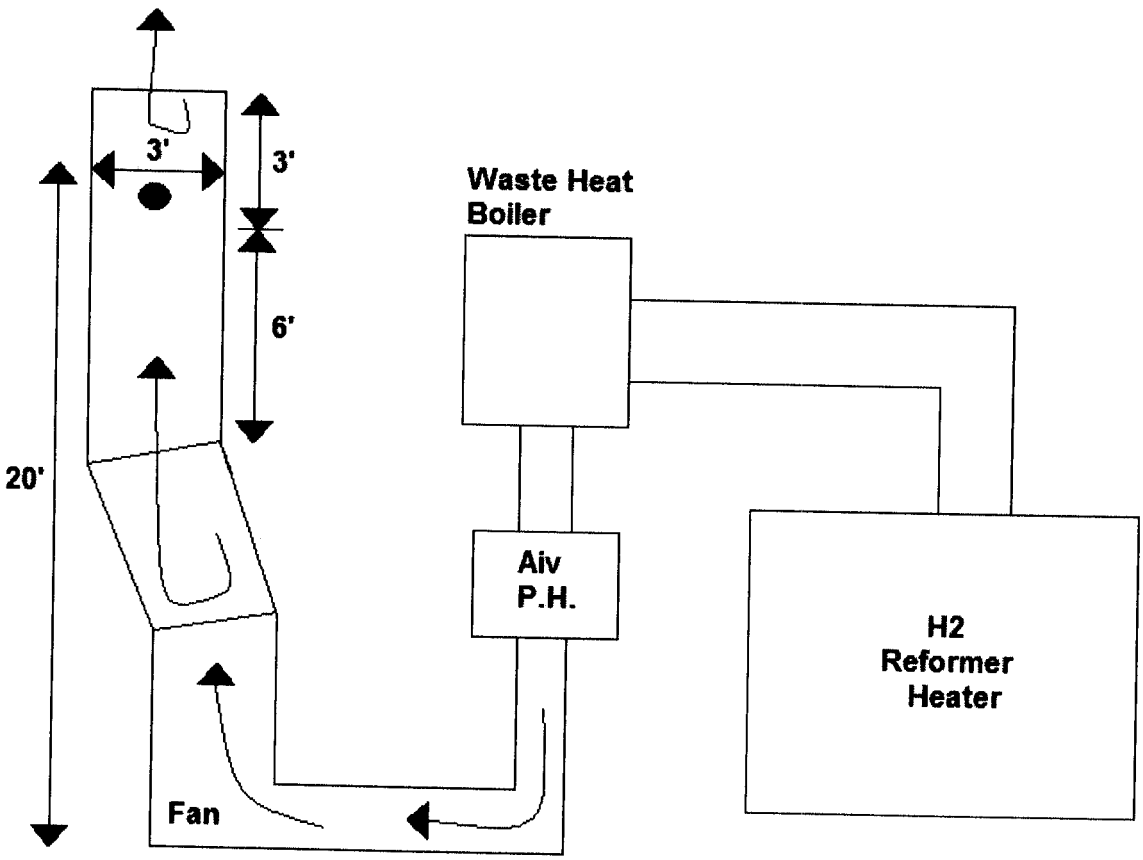
Number of sample ports = 2 @ 90°
Number of NO_x/CO/Gas Flow sample (traverse) points: 24(12/traverse)

Location of traverse points: (from inside wall)

1) 0.735 (1.0) inches
2) 2.35 inches
3) 4.13 inches
4) 6.20 inches
5) 9.00 inches
6) 12.82 inches
7) 23.18 inches
8) 27.00 inches
9) 29.63 inches
10) 31.75 inches
11) 33.59 inches
12) 35.24(35.0) inches

The NO_x/CO sample probe was located at the center of the gas stream after a three point stratification test validated this strategy.

Hydrogen Plant Reformer Heater Stack
Montana Refining Company



STACK PARAMETERS

Montana Refining Company, Inc.
Great Falls, Montana

Diesel Hydrotreater Heater Stack (HTU)

Diameter of Stack	@	33 inches (2.75 ft.)
Area of Stack	@	5.94 sq. ft.

Distance to upstream flow disturbance	@	~6 ft. (toward process)
Distance to downstream flow disturbance	@	15 ft. (toward stack exit)

Number of diameters upstream	@	~6 ft. / 3 ft. = 17.5 d
Number of diameters downstream	@	15 ft. / 3 ft. = 6.5 d

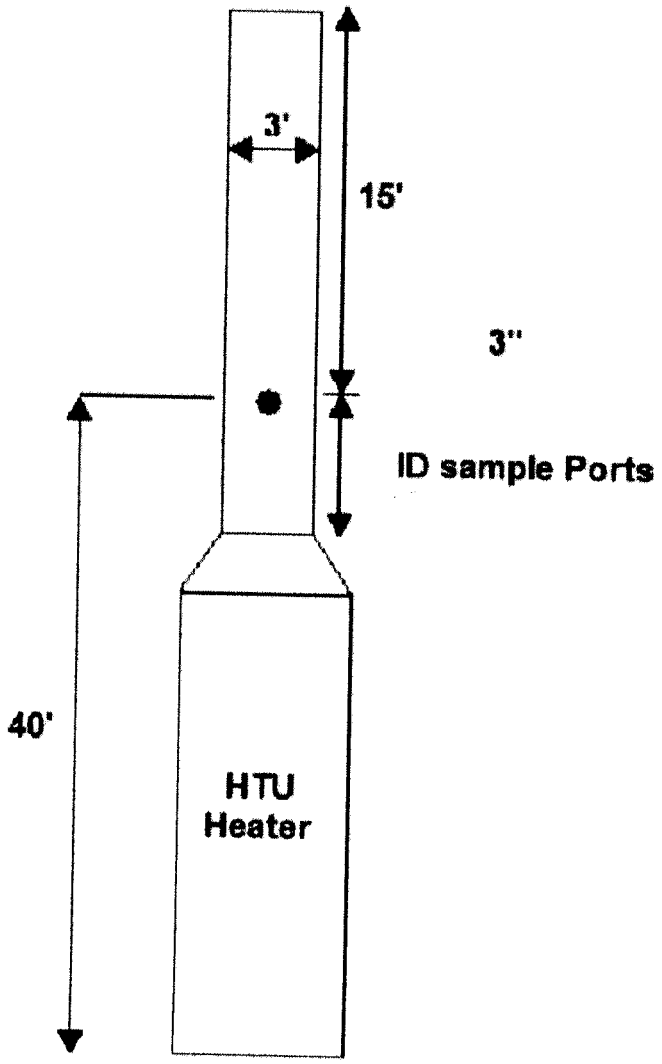
Number of sample ports = 2 @ 90°
Number of NO_x/CO/Gas Flow sample (traverse) points: 24(12/traverse)

Location of traverse points: (from inside wall)

1) 0.69 (1.0) inches
2) 2.21 inches
3) 3.89 inches
4) 5.84 inches
5) 8.25 inches
6) 11.75 inches
7) 21.25 inches
8) 24.75 inches
9) 27.16 inches
10) 29.11 inches
11) 30.79 inches
12) 32.31(32.0) inches

The NO_x/CO sample probe was located at the center of the gas stream after a three point stratification test validated this strategy.

Diesel Hydrotreater Heater Stack (HTU)
Montana Refining Company



NO_x EXAMPLE CALCULATIONS

COMPANY NAME: Montana Refining Co.
PLANT LOCATION: Great Falls, Montana
SOURCE TESTED: #1 & #2 Plant Reformer H1810
SPECIES: NOX
TEST DATE: 10/8/08

Run #1

Calculate the "Calibration Corrected NO_x Value", C_{GAS} - EPA Reference Method #7E

C_{GAS} = $(C_{Mean} - C_O)[C_{MA}/(C_M - C_O)]$
C_{GAS} = corrected gas concentration, ppm v/v dry

C_{Mean} = average gas ppm from analyzer
C_{Mean} = 27.12

C_O = average of initial and final (post) system bias calibration check for zero calibration gas, ppm
C_O = 0.15

C_{MA} = actual concentration of upscale calibration gas, ppm
C_{MA} = 50.2

C_M = average of initial and final (post) system bias calibration check for upscale calibration gas, ppm
C_M = 49.95

C_{GAS} = (27.12 C_{Mean} - 0.15 C_O)[50.2 C_{MA}/(49.95 C_M - 0.15 C_O)]
= 27.2

F_d Calculations - EPA Reference Method #19

Oxygen based F factor dry basis.

$E = C_dF_d[20.9 / (20.9 - \%O_2)]$

Where:

E = emission rate in lbs/mmBtu
C_d = concentration in lbs/scf
To convert from ppm v/v dry to lbs/scf multiply ppm by 1.194×10^{-7}

F_d = fuel factor on a dry basis
= _____ scf/mmBtu for **natural / fuel** gas as **supplied / calculated.**

NO_x Example:

E = (27.2 ppm v/v dry)(1.194x10^{-7})(8,258 scf/mmBtu)[20.9 / (20.9 - 5.2 $\%O_2$)]
= 0.036 lbs/mmBtu

CO EXAMPLE CALCULATIONS

COMPANY NAME: Montana Refining
PLANT LOCATION: Great Falls, Montana
SOURCE TESTED: H2 Plant Reformer H1810
SPECIES: CO
TEST DATE: 10/8/08

Calculate the "Calibration Corrected CO Value", C_{GAS} - EPA Reference Method #10

C_{GAS} = $(C_{Mean} - C_O)[C_{MA}/(C_M - C_O)]$
C_{GAS} = corrected gas concentration, ppm v/v dry

C_{Mean} = average gas ppm from analyzer
C_{Mean} = 1.59

C_O = average of initial and final (post) system bias calibration check for zero calibration gas, ppm
C_O = 0.2
C_{MA} = actual concentration of upscale calibration gas, ppm
C_{MA} = 43.8
C_M = average of initial and final (post) system bias calibration check for upscale calibration gas, ppm
C_M = 43.355

C_{GAS} = (1.59 C_{Mean} - 0.2 C_O)[43.8 C_{MA}/(43.355 C_M - 0.2 C_O)]
= 1.41

F_d Calculations - EPA Reference Method #19

Oxygen based F factor dry basis.

$E = C_d F_d[20.9 / (20.9 - \%O_2)]$

Where:

E = emission rate in lbs/mmBtu
C_d = concentration in lb/scf
To convert from ppm v/v dry to lb/scf multiply ppm by 7.27×10^{-8}

F_d = fuel factor on a dry basis
= 8,258 scf/mmBtu for **natural / fuel** gas as **supplied / calculated.**

CO Example:

E = (1.4 ppm v/v dry)(7.27×10^{-8})(8,258)[20.9 / (20.9 - 5.2 $\%O_2$)]
= 0.001 lb/mmBtu

EEMC

MASS FLOW EXAMPLE CALCULATIONS

COMPANY NAME: Montana Refining Co.
PLANT LOCATION: Great Falls Montana
SOURCE TESTED: H2 Plant Reformer H1810

SPECIES: NOx/Co
TEST DATE: 10/8/08

Definitions:

PPH based on MW, Molecular Weight, MW = 46/28 for species NOx/CO

Gas Flow (GF) units are awcfm, sdcfh, or what is compatible to concentration.

Concentration units are ppm v/v dry or wet, compatible to gas flow.

Volume/Mole, V/M = (359 cu.ft./lb-mole @ STP) $\left(\frac{Ts\ °A}{492°A}\right)\left(\frac{29.92Hg}{Ps"Hg}\right)$

Ts °A = Temperature Stack, degrees Absolute

Ps "Hg = Pressure Stack, inches mercury

pph = (60×10^{-6})(MW/(V/M))(Gas Flow)(Concentration)

Run # **PPH Basis (Species=** 46/28 **, MW=** NOx/ **)** **PPH**

1 NOx =(60×10^{-6})((46 MW)/(659.082 **V/M**))(7,632 GF)(27.2 ppmv/v)= 0.87

V/M = (359 cu.ft./lb-mole @ STP) $\left(\frac{794\ Ts\ °A}{492°A}\right)\left(\frac{29.92Hg}{26.301\ Ps"Hg}\right)$ = 659.082

1 Co =(60×10^{-6})((28 MW)/(659.082 **V/M**))(7,632 GF)(1.4 ppmv/v)= 0.03

V/M = (359 cu.ft./lb-mole @ STP) $\left(\frac{\_\_\_\ Ts\ °A}{492°A}\right)\left(\frac{29.92Hg}{\_\_\_\ Ps"Hg}\right)$ = ____

____ =(60×10^{-6})((___ MW)/(___ **V/M**))(___ GF)(___ ppmv/v)= ____

V/M = (359 cu.ft./lb-mole @ STP) $\left(\frac{\_\_\_\ Ts\ °A}{492°A}\right)\left(\frac{29.92Hg}{\_\_\_\ Ps"Hg}\right)$ = ____

____ =(60×10^{-6})((___ MW)/(___ V/M))(___ GF)(___ ppmv/v)= ____

V/M = (359 cu.ft./lb-mole @ STP) $\left(\frac{\_\_\_\ Ts\ °A}{492°A}\right)\left(\frac{29.92Hg}{\_\_\_\ Ps"Hg}\right)$ = ____

____ =(60×10^{-6})((___ MW)/(___ **V/M**))(___ GF)(___ ppmv/v)= ____

V/M = (359 cu.ft./lb-mole @ STP) $\left(\frac{\_\_\_\ Ts\ °A}{492°A}\right)\left(\frac{29.92Hg}{\_\_\_\ Ps"Hg}\right)$ = ____

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Compliance Data
EPA Methods #7E & 10

Client:	**Montana Refining Company, Inc.**	**Run #:**	**1-NO_x/CO**
Location:	**Great Falls, Montana**	**Time:**	**07:45-08:44**
Source:	**Hydrogen Plant Reformer Heater H1810**	**Date:**	**10/08/08**

#	Time	NO_x - ppm v/v Dry	CO - ppm v/v Dry	#	Time	NO_x - ppm v/v Dry	CO - ppm v/v Dry
1	7:45	27.5	1.5	31	8:15	26.9	1.8
2	7:46	26.0	1.4	32	8:16	26.5	1.7
3	7:47	26.8	1.5	33	8:17	26.3	1.6
4	7:48	27.7	1.5	34	8:18	26.9	1.5
5	7:49	27.5	1.5	35	8:19	25.9	1.9
6	7:50	26.8	1.6	36	8:20	26.9	1.7
7	7:51	27.3	1.4	37	8:21	27.7	1.6
8	7:52	26.2	1.5	38	8:22	28.7	1.7
9	7:53	26.7	1.5	39	8:23	29.3	1.8
10	7:54	27.9	1.4	40	8:24	25.1	1.5
11	7:55	26.5	1.6	41	8:25	24.3	1.6
12	7:56	27.1	1.2	42	8:26	26.3	1.5
13	7:57	26.4	1.4	43	8:27	28.1	1.9
14	7:58	26.4	1.4	44	8:28	29.4	1.8
15	7:59	27.6	1.5	45	8:29	30.8	1.7
16	8:00	26.8	1.4	46	8:30	29.3	1.8
17	8:01	27.8	1.3	47	8:31	24.5	1.6
18	8:02	27.4	1.5	48	8:32	25.0	1.7
19	8:03	27.0	1.3	49	8:33	27.5	1.5
20	8:04	27.2	1.3	50	8:34	28.9	1.9
21	8:05	27.4	1.3	51	8:35	30.1	1.8
22	8:06	27.0	1.4	52	8:36	30.7	1.8
23	8:07	26.9	1.6	53	8:37	25.7	1.7
24	8:08	26.7	1.5	54	8:38	24.0	1.5
25	8:09	26.4	1.2	55	8:39	25.6	1.7
26	8:10	27.7	1.6	56	8:40	27.4	1.8
27	8:11	27.3	1.6	57	8:41	28.2	2.0
28	8:12	27.6	1.8	58	8:42	28.8	1.9
29	8:13	27.8	1.7	59	8:43	25.2	1.8
30	8:14	27.5	1.7	60	8:44	24.3	1.6
				Averages:		**27.12**	**1.59**

Client: Montana Refining Company, Inc. **Test #:** 1-NOx/CO
Source: Hydrogen Plant Reformer Heater H1810 **Date:** 10/8/2008

Instrument Calibration Checks

NO_X Instrument

Calibration Span, CS: 100.7 ppm v/v Dry

NO_X Calibration Error Tests

Time	Tank Value C_v	Instrument Resp., C_{Dir}	System CE, SCE (< 2% of span)
7:16	0.0	0.0	0.0
7:20	50.2	50.1	-0.1
7:24	100.7	100.3	-0.4

Initial System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_i (< 5% of span)
7:33	0.0	0.1	0.1
7:31	50.2	50.0	-0.2

Post System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_f (< 5% of span)	Drift, D (SB_f - SB_i) (< 3% of span)
8:46	0.0	0.2	0.2	0.1
8:48	50.2	49.9	-0.3	-0.1

CO Instrument

Calibration Span, CS: 93.5 ppm v/v Dry

CO Calibration Error Tests

Time	Tank Value C_v	Instrument Resp., C_{Dir}	System CE, SCE (< 2% of span)
7:16	0	0.1	0.1
7:18	43.8	43.6	-0.2
7:22	93.5	93.1	-0.4

Initial System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_i (< 5% of span)
7:29	0	0.2	0.2
7:27	43.8	43.5	-0.3

Post System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_f (< 5% of span)	Drift, D (SB_f - SB_i) (< 3% of span)
8:46	0	0.2	0.2	0.0
8:50	43.8	43.5	-0.3	0.0

Instrument Response Times:

	Zero	High
NO_X	27	25 seconds
CO	27	29 seconds

Client:	**Montana Refining Company, Inc.**	**Test #:**	**1-NOx/CO**
Source:	**Hydrogen Plant Reformer Heater H1810**	**Date:**	**10/8/2008**

Data From Concurrent Run:

Ps	26.301	IN Hg
Gas Flow	7,632.0	adcfm
Avg. Temp	334	Deg. F
	794	Deg. A (R)
NOx Molecular Wt.	46	
CO Molecular Wt.	28	
Oxygen	5.2	% v/v dry
cu.ft/lb-mole Act Conditions	659.082	ft^3/#mole
Fd Factor (O_2 Basis)	8,258	dscf/mmBtu

Calculations:

Averages:

NO_X	27.12 ppm v/v Dry
CO	1.59 ppm v/v Dry

Calibration Corrected Values:

NO_X	27.2 ppm v/v Dry
CO	1.4 ppm v/v Dry

Mass Flow:

NO_X	0.87 PPH
CO	0.03 PPH
NO_x	0.036 lb/mmBTU
CO	0.001 lb/mmBTU

Compliance Data
EPA Methods #7E & 10

Client:	**Montana Refining Company, Inc.**	**Run #:**	**2-NO_x/CO**
Location:	**Great Falls, Montana**	**Time:**	**08:52-09:51**
Source:	**Hydrogen Plant Reformer Heater H181**	**Date:**	**10/08/08**

#	Time	NO_X - ppm v/v Dry	CO - ppm v/v Dry	#	Time	NO_X - ppm v/v Dry	CO - ppm v/v Dry
1	8:52	26.1	1.7	31	9:22	30.7	2.3
2	8:53	28.2	1.7	32	9:23	31.4	2.4
3	8:54	29.2	1.7	33	9:24	25.1	2.6
4	8:55	30.6	1.6	34	9:25	24.4	2.6
5	8:56	30.6	1.7	35	9:26	26.8	2.7
6	8:57	24.8	1.6	36	9:27	28.7	2.9
7	8:58	24.3	1.8	37	9:28	30.0	3.0
8	8:59	26.7	1.6	38	9:29	31.3	3.1
9	9:00	28.3	1.8	39	9:30	27.2	3.1
10	9:01	29.5	1.5	40	9:31	24.2	2.4
11	9:02	30.9	1.3	41	9:32	25.1	2.5
12	9:03	27.7	1.6	42	9:33	27.3	2.3
13	9:04	24.4	1.7	43	9:34	28.3	2.4
14	9:05	24.9	1.5	44	9:35	29.2	2.3
15	9:06	27.1	1.7	45	9:36	28.1	2.6
16	9:07	28.1	1.7	46	9:37	25.1	2.5
17	9:08	29.4	1.8	47	9:38	25.5	2.2
18	9:09	28.9	1.4	48	9:39	27.3	2.7
19	9:10	25.0	1.7	49	9:40	28.1	2.5
20	9:11	24.6	1.3	50	9:41	29.0	2.4
21	9:12	26.4	1.4	51	9:42	30.0	2.5
22	9:13	27.1	1.5	52	9:43	29.8	2.2
23	9:14	28.0	1.6	53	9:44	25.6	2.7
24	9:15	29.3	1.7	54	9:45	25.3	2.7
25	9:16	30.0	1.8	55	9:46	27.3	2.2
26	9:17	25.3	1.9	56	9:47	29.0	2.5
27	9:18	24.2	1.9	57	9:48	30.3	2.3
28	9:19	26.2	2.0	58	9:49	32.0	2.4
29	9:20	28.1	1.9	59	9:50	31.3	2.7
30	9:21	29.0	2.0	60	9:51	25.2	2.5
					Averages:	**27.69**	**2.11**

Client: Montana Refining Company, Inc. **Test #:** 2-NOx/CO
Source: Hydrogen Plant Reformer Heater H1810 **Date:** 10/8/2008

Instrument Calibration Checks

NO_X Instrument

Calibration Span, CS: 100.7 ppm v/v Dry

NO_X Calibration Error Tests

Time	Tank Value C_v	Instrument Resp., C_{Dir}	System CE, SCE (< 2% of span)
7:16	0.0	0.0	0.0
7:20	50.2	50.1	-0.1
7:24	100.7	100.3	-0.4

Initial System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_i (< 5% of span)
8:46	0.0	0.2	0.2
8:48	50.2	49.9	-0.3

Post System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_f (< 5% of span)	Drift, D (SB_f - SB_i) (< 3% of span)
9:53	0.0	0.2	0.2	0.0
9:55	50.2	49.9	-0.3	0.0

CO Instrument

Calibration Span, CS: 93.5 ppm v/v Dry

CO Calibration Error Tests

Time	Tank Value C_v	Instrument Resp., C_{Dir}	System CE, SCE (< 2% of span)
7:16	0	0.1	0.1
7:18	43.8	43.6	-0.2
7:22	93.5	93.1	-0.4

Initial System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_i (< 5% of span)
8:46	0	0.2	0.2
8:50	43.8	43.5	-0.3

Post System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_f (< 5% of span)	Drift, D (SB_f - SB_i) (< 3% of span)
9:53	0	0.2	0.2	0.0
9:57	43.8	43.5	-0.3	0.0

Instrument Response Times:

	Zero	High
NO_X	27	25 seconds
CO	27	29 seconds

Client:	**Montana Refining Company, Inc.**	**Test #:**	**2-NOx/CO**
Source:	**Hydrogen Plant Reformer Heater H1810**	**Date:**	**10/8/2008**

Data From Concurrent Run:

Ps	26.301	IN Hg
Gas Flow	7,565.4	adcfm
Avg. Temp	334	Deg. F
	794	Deg. A (R)
NOx Molecular Wt.	46	
CO Molecular Wt.	28	
Oxygen	5.3	% v/v dry
cu.ft/lb-mole Act Conditions	659.082	ft^3/#mole
Fd Factor (O_2 Basis)	8,258	dscf/mmBtu

Calculations:

Averages:

NO_X	27.69 ppm v/v Dry
CO	2.11 ppm v/v Dry

Calibration Corrected Values:

NO_X	27.8 ppm v/v Dry
CO	1.9 ppm v/v Dry

Mass Flow:

NO_X	0.88 PPH
CO	0.04 PPH
NO_X	0.037 lb/mmBTU
CO	0.002 lb/mmBTU

Compliance Data
EPA Methods #7E & 10

Client: Montana Refining Company, Inc.
Location: Great Falls, Montana
Source: Hydrogen Plant Reformer Heater H18

Run #: 3-NO_x/CO
Time: 09:59-10:58
Date: 10/08/08

#	Time	NO_x - ppm v/v Dry	CO - ppm v/v Dry	#	Time	NO_x - ppm v/v Dry	CO - ppm v/v Dry
1	9:59	24.9	2.3	31	10:29	29.4	1.9
2	10:00	27.1	2.4	32	10:30	27.8	1.7
3	10:01	28.2	2.6	33	10:31	25.3	1.8
4	10:02	29.5	2.5	34	10:32	25.7	2.0
5	10:03	28.4	2.2	35	10:33	27.4	1.9
6	10:04	24.6	2.3	36	10:34	27.8	1.3
7	10:05	25.1	2.5	37	10:35	28.9	1.4
8	10:06	26.7	2.3	38	10:36	29.9	1.4
9	10:07	27.6	2.6	39	10:37	29.3	1.5
10	10:08	28.4	2.4	40	10:38	25.1	1.6
11	10:09	29.3	2.7	41	10:39	25.0	1.6
12	10:10	30.0	2.5	42	10:40	27.3	1.5
13	10:11	25.8	1.7	43	10:41	29.0	1.6
14	10:12	24.8	1.8	44	10:42	30.1	1.6
15	10:13	27.0	1.8	45	10:43	31.3	1.6
16	10:14	29.0	2.1	46	10:44	28.8	1.9
17	10:15	29.9	2.0	47	10:45	24.7	1.8
18	10:16	31.2	1.9	48	10:46	25.6	1.7
19	10:17	30.8	2.1	49	10:47	28.2	1.7
20	10:18	25.2	1.9	50	10:48	29.3	1.7
21	10:19	25.2	1.7	51	10:49	30.7	1.8
22	10:20	27.7	2.1	52	10:50	30.3	1.8
23	10:21	29.1	2.1	53	10:51	25.6	1.9
24	10:22	30.2	1.9	54	10:52	24.4	1.9
25	10:23	31.1	1.8	55	10:53	26.2	2.0
26	10:24	26.6	1.9	56	10:54	27.6	1.8
27	10:25	24.6	1.8	57	10:55	28.7	2.0
28	10:26	25.8	1.8	58	10:56	26.8	2.0
29	10:27	27.5	1.9	59	10:57	27.0	2.5
30	10:28	28.5	1.7	60	10:58	26.6	2.8
					Averages:	**27.66**	**1.95**

Client: Montana Refining Company, Inc. **Test #:** 3-NOx/CO
Source: Hydrogen Plant Reformer Heater H1810 **Date:** 10/8/2008

Instrument Calibration Checks

NO_X Instrument

Calibration Span, CS: 100.7 ppm v/v Dry

NO_X Calibration Error Tests

Time	Tank Value C_v	Instrument Resp., C_{Dir}	System CE, SCE (< 2% of span)
7:16	0.0	0.0	0.0
7:20	50.2	50.1	-0.1
7:24	100.7	100.3	-0.4

Initial System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_i (< 5% of span)
9:53	0.0	0.2	0.2
9:55	50.2	49.9	-0.3

Post System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_f (< 5% of span)	Drift, D (SB_f - SB_i) (< 3% of span)
11:00	0.0	0.2	0.2	0.0
11:02	50.2	50.0	-0.2	0.1

CO Instrument

Calibration Span, CS: 93.5 ppm v/v Dry

CO Calibration Error Tests

Time	Tank Value C_v	Instrument Resp., C_{Dir}	System CE, SCE (< 2% of span)
7:16	0	0.1	0.1
7:18	43.8	43.6	-0.2
7:22	93.5	93.1	-0.4

Initial System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_i (< 5% of span)
9:53	0	0.2	0.2
9:57	43.8	43.5	-0.3

Post System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_f (< 5% of span)	Drift, D (SB_f - SB_i) (< 3% of span)
11:00	0	0.2	0.2	0.0
11:04	43.8	43.6	-0.2	0.1

Instrument Response Times:

	Zero	High
NO_X	27	25 seconds
CO	27	29 seconds

Client:	**Montana Refining Company, Inc.**	**Test #:**	**3-NOx/CO**
Source:	**Hydrogen Plant Reformer Heater H1810**	**Date:**	**10/8/2008**

Data From Concurrent Run:

Ps	26.301	IN Hg
Gas Flow	7,567.0	adcfm
Avg. Temp	335	Deg. F
	795	Deg. A (R)
NOx Molecular Wt.	46	
CO Molecular Wt.	28	
Oxygen	5.3	% v/v dry
cu.ft/lb-mole Act Conditions	659.912	ft^3/#mole
Fd Factor (O_2 Basis)	8,258	dscf/mmBtu

Calculations:

Averages:

NO_X	27.66 ppm v/v Dry
CO	1.95 ppm v/v Dry

Calibration Corrected Values:

NO_X	27.7 ppm v/v Dry
CO	1.8 ppm v/v Dry

Mass Flow:

NO_X	0.88 PPH
CO	0.03 PPH
NO_X	0.037 lb/mmBTU
CO	0.001 lb/mmBTU

Montana Refining Company
NO_x/CO Computer Logger Data
10/08/08

Time	NO_x-PPM v/v Dry	CO-PPM v/v Dry	Comments
7:15	0.0	0.1	Initial Calibration Information:
7:16	0.0	0.1	Response Check
7:17	0.0	29.9	
7:18	0.0	43.6	Response Check
7:19	29.9	22.4	
7:20	50.1	0.2	Response Check
7:21	16.4	78.6	
7:22	0.1	93.1	Response Check
7:23	67.4	22.5	
7:24	100.3	0.1	Response Check
7:25	36.8	0.1	NOx Tanks:
7:26	0.0	34.6	LL31587 @ 100.7 ppm; Exp. 08/11/10
7:27	0.0	43.5	AL88466 @ 51.6 ppm; Exp. 03/19/09
7:28	0.0	12.4	ET0001887 @ 50.2 ppm; Exp. 10/15/09
7:29	0.0	0.2	NOx Instrument: CAI 400
7:30	32.6	0.2	
7:31	50.0	0.2	CO Tanks:
7:32	14.6	0.2	ER0000536 @ 43.8 ppm; Exp. 10/02/2009
7:33	0.1	0.2	ER0000533 @ 93.5 ppm; Exp. 10/02/2009
7:34	40.1	0.2	CO Instrument: CAI 100
7:35	47.4	0.2	
7:36	47.4	0.2	NO_x Conversion Efficiency Check
7:37	17.5	0.2	
7:38	27.6	0.5	
7:39	26.1	1.6	Stratification Test
7:40	26.9	1.5	Stratification Test
7:41	27.6	1.3	Stratification Test
7:42	27.0	1.2	Stratification Test
7:43	27.2	1.3	Stratification Test
7:44	28.0	1.3	Stratification Test
7:45	27.5	1.5	**Start Run 1** **Plant Reformer 1810**
7:46	26.0	1.4	
7:47	26.8	1.5	
7:48	27.7	1.5	
7:49	27.5	1.5	
7:50	26.8	1.6	
7:51	27.3	1.4	
7:52	26.2	1.5	
7:53	26.7	1.5	
7:54	27.9	1.4	
7:55	26.5	1.6	
7:56	27.1	1.2	
7:57	26.4	1.4	
7:58	26.4	1.4	
7:59	27.6	1.5	
8:00	26.8	1.4	
8:01	27.8	1.3	
8:02	27.4	1.5	
8:03	27.0	1.3	
8:04	27.2	1.3	
8:05	27.4	1.3	
8:06	27.0	1.4	

Montana Refining Company
NO_x/CO Computer Logger Data
10/08/08

Time	NO_x-PPM v/v Dry	CO-PPM v/v Dry	Comments
8:07	26.9	1.6	
8:08	26.7	1.5	
8:09	26.4	1.2	
8:10	27.7	1.6	
8:11	27.3	1.6	
8:12	27.6	1.8	
8:13	27.8	1.7	
8:14	27.5	1.7	
8:15	26.9	1.8	
8:16	26.5	1.7	
8:17	26.3	1.6	
8:18	26.9	1.5	
8:19	25.9	1.9	
8:20	26.9	1.7	
8:21	27.7	1.6	
8:22	28.7	1.7	
8:23	29.3	1.8	
8:24	25.1	1.5	
8:25	24.3	1.6	
8:26	26.3	1.5	
8:27	28.1	1.9	
8:28	29.4	1.8	
8:29	30.8	1.7	
8:30	29.3	1.8	
8:31	24.5	1.6	
8:32	25.0	1.7	
8:33	27.5	1.5	
8:34	28.9	1.9	
8:35	30.1	1.8	
8:36	30.7	1.8	
8:37	25.7	1.7	
8:38	24.0	1.5	
8:39	25.6	1.7	
8:40	27.4	1.8	
8:41	28.2	2.0	
8:42	28.8	1.9	
8:43	25.2	1.8	
8:44	24.3	1.6	End Run 1
8:45	2.9	0.3	
8:46	0.2	0.2	
8:47	28.7	0.2	
8:48	49.9	0.2	
8:49	15.3	32.6	
8:50	0.2	43.5	
8:51	5.5	0.8	
8:52	26.1	1.7	Start Run 2
8:53	28.2	1.7	
8:54	29.2	1.7	
8:55	30.6	1.6	
8:56	30.6	1.7	
8:57	24.8	1.6	
8:58	24.3	1.8	

Montana Refining Company
NO_x/CO Computer Logger Data
10/08/08

Time	NO_x-PPM v/v Dry	CO-PPM v/v Dry	Comments
8:59	26.7	1.6	
9:00	28.3	1.8	
9:01	29.5	1.5	
9:02	30.9	1.3	
9:03	27.7	1.6	
9:04	24.4	1.7	
9:05	24.9	1.5	
9:06	27.1	1.7	
9:07	28.1	1.7	
9:08	29.4	1.8	
9:09	28.9	1.4	
9:10	25.0	1.7	
9:11	24.6	1.3	
9:12	26.4	1.4	
9:13	27.1	1.5	
9:14	28.0	1.6	
9:15	29.3	1.7	
9:16	30.0	1.8	
9:17	25.3	1.9	
9:18	24.2	1.9	
9:19	26.2	2.0	
9:20	28.1	1.9	
9:21	29.0	2.0	
9:22	30.7	2.3	
9:23	31.4	2.4	
9:24	25.1	2.6	
9:25	24.4	2.6	
9:26	26.8	2.7	
9:27	28.7	2.9	
9:28	30.0	3.0	
9:29	31.3	3.1	
9:30	27.2	3.1	
9:31	24.2	2.4	
9:32	25.1	2.5	
9:33	27.3	2.3	
9:34	28.3	2.4	
9:35	29.2	2.3	
9:36	28.1	2.6	
9:37	25.1	2.5	
9:38	25.5	2.2	
9:39	27.3	2.7	
9:40	28.1	2.5	
9:41	29.0	2.4	
9:42	30.0	2.5	
9:43	29.8	2.2	
9:44	25.6	2.7	
9:45	25.3	2.7	
9:46	27.3	2.2	
9:47	29.0	2.5	
9:48	30.3	2.3	
9:49	32.0	2.4	
9:50	31.3	2.7	

Montana Refining Company
NO_x/CO Computer Logger Data
10/08/08

Time	NO_x-PPM v/v Dry	CO-PPM v/v Dry	Comments
9:51	25.2	2.5	End Run 2
9:52	3.5	0.4	
9:53	0.2	0.2	
9:54	30.4	0.2	
9:55	49.9	0.2	
9:56	11.3	33.4	
9:57	0.2	43.5	
9:58	12.2	8.5	
9:59	24.9	2.3	Start Run 3
10:00	27.1	2.4	
10:01	28.2	2.6	
10:02	29.5	2.5	
10:03	28.4	2.2	
10:04	24.6	2.3	
10:05	25.1	2.5	
10:06	26.7	2.3	
10:07	27.6	2.6	
10:08	28.4	2.4	
10:09	29.3	2.7	
10:10	30.0	2.5	
10:11	25.8	1.7	
10:12	24.8	1.8	
10:13	27.0	1.8	
10:14	29.0	2.1	
10:15	29.9	2.0	
10:16	31.2	1.9	
10:17	30.8	2.1	
10:18	25.2	1.9	
10:19	25.2	1.7	
10:20	27.7	2.1	
10:21	29.1	2.1	
10:22	30.2	1.9	
10:23	31.1	1.8	
10:24	26.6	1.9	
10:25	24.6	1.8	
10:26	25.8	1.8	
10:27	27.5	1.9	
10:28	28.5	1.7	
10:29	29.4	1.9	
10:30	27.8	1.7	
10:31	25.3	1.8	
10:32	25.7	2.0	
10:33	27.4	1.9	
10:34	27.8	1.3	
10:35	28.9	1.4	
10:36	29.9	1.4	
10:37	29.3	1.5	
10:38	25.1	1.6	
10:39	25.0	1.6	
10:40	27.3	1.5	
10:41	29.0	1.6	
10:42	30.1	1.6	

Montana Refining Company
NO$_x$/CO Computer Logger Data
10/08/08

Time	NO$_x$-PPM v/v Dry	CO-PPM v/v Dry	Comments
10:43	31.3	1.6	
10:44	28.8	1.9	
10:45	24.7	1.8	
10:46	25.6	1.7	
10:47	28.2	1.7	
10:48	29.3	1.7	
10:49	30.7	1.8	
10:50	30.3	1.8	
10:51	25.6	1.9	
10:52	24.4	1.9	
10:53	26.2	2.0	
10:54	27.6	1.8	
10:55	28.7	2.0	
10:56	26.8	2.0	
10:57	27.0	2.5	
10:58	26.6	2.8	End Run 3
10:59	5.2	0.6	
11:00	0.2	0.2	
11:01	29.6	0.2	
11:02	50.0	0.2	
11:03	11.5	26.7	
11:04	0.2	43.6	
11:05	0.1	7.8	
11:06	0.1	0.2	**Initial Calibrations:**
11:07	0.1	0.2	**Diesel Hydrotreater Heater 1701**
11:08	29.9	0.2	
11:09	50.0	26.6	Response Check
11:10	12.4	43.5	Response Check
11:11	0.3	20.0	
11:12	36.6	0.3	
11:13	100.4	45.4	Response Check
11:14	24.7	93.1	Response Check
11:15	0.1	23.6	
11:16	29.6	0.2	
11:17	49.9	0.2	
11:18	17.5	0.2	
11:19	0.2	0.2	
11:20	0.2	32.4	
11:21	0.2	43.5	
11:22	0.2	15.3	
11:23	0.2	0.3	
11:24	8.8	0.7	
11:25	43.3	1.6	
11:26	42.2	1.7	
11:27	43.1	1.8	
11:28	41.2	1.7	
11:29	41.8	1.8	
11:30	43.3	1.8	
11:31	41.4	1.7	
11:32	43.0	1.5	
11:33	42.5	1.6	
11:34	43.2	1.7	**Diesel Hydrotreater Heater 1701**

Montana Refining Company
NO_x/CO Computer Logger Data
10/08/08

Time	NO_x-PPM v/v Dry	CO-PPM v/v Dry	Comments
11:35	42.9	1.7	Start Run 4
11:36	41.9	1.8	
11:37	41.6	1.7	
11:38	41.5	1.6	
11:39	40.4	1.9	
11:40	40.4	1.5	
11:41	44.1	1.5	
11:42	45.8	1.8	
11:43	44.1	1.6	
11:44	25.6	1.8	
11:45	40.6	1.5	
11:46	43.1	1.6	
11:47	43.3	1.8	
11:48	42.7	1.7	
11:49	45.1	1.6	
11:50	44.2	1.6	
11:51	43.6	1.5	
11:52	43.6	1.7	
11:53	44.3	1.7	
11:54	44.5	1.5	
11:55	43.9	1.7	
11:56	43.8	1.5	
11:57	43.3	1.9	
11:58	43.5	1.5	
11:59	45.5	1.8	
12:00	45.3	1.9	
12:01	44.4	1.5	
12:02	44.7	1.5	
12:03	44.0	1.5	
12:04	42.5	1.5	
12:05	44.6	1.5	
12:06	45.2	1.6	
12:07	39.3	1.6	
12:08	37.7	1.8	
12:09	42.7	1.5	
12:10	45.9	1.4	
12:11	45.7	1.5	
12:12	45.1	1.6	
12:13	44.8	1.6	
12:14	42.9	1.6	
12:15	42.3	1.7	
12:16	43.1	1.7	
12:17	43.1	1.6	
12:18	43.7	1.7	
12:19	42.5	1.7	
12:20	42.4	1.7	
12:21	43.7	1.7	
12:22	45.0	1.7	
12:23	44.0	1.7	
12:24	44.1	1.7	
12:25	44.1	1.7	
12:26	45.7	1.8	

Montana Refining Company
NO_x/CO Computer Logger Data
10/08/08

Time	NO_x-PPM v/v Dry	CO-PPM v/v Dry	Comments
12:27	44.4	1.8	
12:28	44.2	1.8	
12:29	45.4	1.8	
12:30	44.3	1.9	
12:31	43.5	1.9	
12:32	45.0	2.0	
12:33	44.5	2.0	
12:34	45.7	2.0	End Run 4
12:35	14.3	0.6	
12:36	0.2	0.3	
12:37	31.5	0.3	
12:38	49.9	0.3	
12:39	12.6	27.8	
12:40	0.2	43.5	
12:41	21.5	8.7	
12:42	43.7	1.8	Start Run 5
12:43	45.1	1.8	
12:44	44.1	1.9	
12:45	43.9	2.1	
12:46	45.1	1.9	
12:47	45.8	1.8	
12:48	44.9	1.8	
12:49	45.0	1.8	
12:50	44.9	1.8	
12:51	46.3	2.0	
12:52	45.2	1.7	
12:53	44.7	1.8	
12:54	40.9	1.8	
12:55	39.0	2.0	
12:56	40.4	1.7	
12:57	45.9	2.1	
12:58	45.7	1.9	
12:59	45.0	2.0	
13:00	45.2	1.7	
13:01	44.1	1.8	
13:02	43.8	2.0	
13:03	45.0	2.1	
13:04	45.0	1.7	
13:05	45.9	1.7	
13:06	45.1	1.9	
13:07	42.9	1.6	
13:08	43.1	1.5	
13:09	45.7	1.6	
13:10	44.2	1.5	
13:11	43.1	1.6	
13:12	43.4	1.5	
13:13	43.5	1.5	
13:14	43.7	1.3	
13:15	44.2	1.4	
13:16	45.7	1.7	
13:17	44.1	1.6	
13:18	43.9	1.4	

Montana Refining Company
NO_x/CO Computer Logger Data
10/08/08

Time	NO_x-PPM v/v Dry	CO-PPM v/v Dry	Comments
13:19	46.0	1.4	
13:20	44.1	1.4	
13:21	42.9	1.5	
13:22	43.7	1.5	
13:23	44.3	1.6	
13:24	45.4	1.5	
13:25	46.5	1.4	
13:26	43.9	1.4	
13:27	42.8	1.6	
13:28	44.7	1.6	
13:29	44.0	1.4	
13:30	44.1	1.4	
13:31	44.3	1.4	
13:32	44.1	1.5	
13:33	44.5	1.5	
13:34	44.8	1.7	
13:35	43.7	1.4	
13:36	43.6	1.4	
13:37	43.4	1.5	
13:38	44.3	1.5	
13:39	45.3	1.6	
13:40	45.7	1.6	
13:41	45.8	1.6	End Run 5
13:42	10.4	0.4	
13:43	0.2	0.2	
13:44	34.0	0.2	
13:45	49.9	0.2	
13:46	20.5	35.2	
13:47	0.2	43.5	
13:48	16.8	7.9	
13:49	42.8	1.7	Start Run 6
13:50	44.4	1.7	
13:51	45.0	1.8	
13:52	44.0	1.5	
13:53	42.2	1.7	
13:54	42.3	1.7	
13:55	44.2	1.6	
13:56	42.6	1.6	
13:57	44.5	1.7	
13:58	45.5	1.9	
13:59	45.1	1.8	
14:00	45.1	1.9	
14:01	43.3	1.8	
14:02	42.4	1.8	
14:03	43.3	1.9	
14:04	44.3	1.9	
14:05	45.2	1.8	
14:06	43.5	1.7	
14:07	42.8	1.7	
14:08	43.5	1.6	
14:09	43.3	1.7	
14:10	45.9	1.9	

Montana Refining Company
NO_x/CO Computer Logger Data
10/08/08

Time	NO_x-PPM v/v Dry	CO-PPM v/v Dry	Comments
14:11	44.1	1.6	
14:12	43.4	1.8	
14:13	44.1	1.8	
14:14	44.3	1.6	
14:15	45.6	1.6	
14:16	43.8	1.7	
14:17	43.5	1.8	
14:18	43.0	2.0	
14:19	43.8	2.0	
14:20	43.4	2.0	
14:21	43.5	2.1	
14:22	43.6	1.7	
14:23	43.4	1.8	
14:24	44.5	1.8	
14:25	45.6	2.0	
14:26	45.2	1.9	
14:27	44.4	1.8	
14:28	43.0	1.8	
14:29	42.7	2.0	
14:30	43.7	1.8	
14:31	44.2	2.0	
14:32	44.1	1.9	
14:33	42.5	1.7	
14:34	43.5	1.9	
14:35	45.9	2.0	
14:36	43.6	1.9	
14:37	42.4	1.9	
14:38	43.9	1.8	
14:39	45.5	1.7	
14:40	42.9	1.7	
14:41	42.8	1.8	
14:42	44.2	2.1	
14:43	43.7	1.7	
14:44	43.8	1.8	
14:45	44.1	1.9	
14:46	42.6	1.7	
14:47	43.1	1.8	
14:48	42.7	1.7	End Run 6
14:49	9.4	0.5	
14:50	0.3	0.2	
14:51	32.8	0.2	
14:52	50.0	0.2	
14:53	17.7	36.2	
14:54	0.3	43.5	
14:55	0.3	13.6	
14:56	0.3	0.3	
14:57	0.2	0.2	

EEMC

EPA METHODS # 1 - 4
GAS FLOW / MOISTURE
EXAMPLE CALCULATION

COMPANY NAME: Montana Refining Co
PLANT LOCATION: Great Falls, Montana
SOURCE TESTED: Plant Reformer H1810
TEST DATE: 10/8/08
RUN #: 1 CF/H2O

Pm"Hg = 26.30 Pb"Hg + (2.0 ΔH "H_2O/13.6) = 26.447 Pm"Hg ③

Ps"Hg = 26.30 Pb"Hg + (0.02 Static "H_2O/13.6) = 26.301 Ps"Hg ③

1) Vm(std) = (42.763 ③ Vm)(17.65)(1.01 ② Y)(26.447 Pm"Hg / 524. ① Tm°A) = 38.475 ③ dscf

2) Vw(std) = (0.04707)(130.0 ml) = 6.119 ③ scf

3) Bws = (6.119 scf) / (6.119 scf + 38.475 dscf) = .1372 ③ Bws x 100 = 13.72 ② $\%H_2O$

4) Vm(actual) = (____ Y)(____ Vm)(____ Ts°A)(____ Pm"Hg) / (1- ____ Bws)(____ ① Tm°A)(____ ③ Ps"Hg) = ____ ③ awcf

5) Md = 0.44(13.0 ① $\%CO_2$)+0.32(5.2 ① $\%O_2$)+0.28(81.8 ① $\%N_2$+%CO) = 30.29 ② lb/lb mole

6) Ms = (30.29 lb/lb mole)(1- .1372 Bws)+(18 x .1372 Bws) = 28.60 ② lb/lb mole

7a) Area = (3.1416)(2.917 dia ③ ft./2)^2 = .8620 6.683 ③ sq.ft. ✗

7b) Area = (____ ③ ft.)(____ ③ ft.) = ____ ③ sq.ft. ⊟

8) Vs = (85.49)(.84 cp)(Avg SQRT .299 ΔP ②)(794 Ts°A / 26.301 Ps"Hg (28.60 lb/lb mole)) = 22.06 ② fps

9a) AWCFM = (22.06 fps)(6.683 sq.ft)(60sec/min) = 8,845.6 ① awcfm

9b) ADCFM = (8,845.6 awcfm)(1 - .1372 Bws) = 7,624.9 ① adcfm

.8620

10a)

Qsw = 3600(22.06 fps)(6.683 sq.ft)(528°A / 794. Ts°A)(26.301 Ps"Hg / 29.92 "Hg) = 310,244.6 ① wscf/hr

10b)

Qsd = (1 - .1372 Bws)(310,244.1 wscf/hr) = 267,678.6 ① dcsf/hr

.8620

EPA Methods #1-4
Field Data & Calculations
Gas Flow/Moisture

Client: Montana Refining Company, Inc. **Test #:** 1-GF/H_2O
Location: Great Falls, Montana **Time:** 07:45-08:45
Source: Hydrogen Plant Reformer Heater H1810 **Date:** 10/08/08

Sample Point #	Clock Time (min.)	Meter Reading (cu.ft.)	Delta P ("H_2O)	Delta H ("H_2O)	Meter Temp. Deg. F	Stack Temp. Deg. F	SQRT Delta P
1	5	984.000	0.09	2.0	64	334	0.300
2	10		0.09	2.0	64	334	0.300
3	15		0.09	2.0	64	334	0.300
4	20		0.08	2.0	65	333	0.283
5	25		0.08	2.0	65	333	0.283
6	30		0.08	2.0	65	333	0.283
7	35		0.08	2.0	65	333	0.283
8	40		0.09	2.0	64	334	0.300
9	45		0.10	2.0	64	334	0.316
10	50		0.10	2.0	64	335	0.316
11	55		0.10	2.0	64	335	0.316
12	60		0.09	2.0	65	335	0.300
1		1,026.763	0.09			335	0.300
2			0.09			335	0.300
3			0.09			335	0.300
4			0.08			334	0.283
5			0.08			334	0.283
6			0.09			334	0.300
7			0.10			334	0.316
8			0.10			333	0.316
9			0.10			333	0.316
10			0.09			333	0.300
11			0.09			334	0.300
12			0.08			334	0.283

Client:	**Montana Refining Company, Inc.**	**Test #:**	**1-GF/H2O**
Source:	**Hydrogen Plant Reformer Heater H1810**	**Date:**	**10/08/08**

FIELD DATA INPUT: (CONTINUED)

Barometric Pressure (Pb)	26.30 in. Hg	Orsat	
Static Pressure	0.02 in H_2O	$\%CO_2$ Average	13.0 %
Meter Cal. Factor	1.01 Y	$\%O_2$ Average	5.2 %
Pitot Factor (cp)	0.84		
		Stack Dimensional Data:	
Total Test Time	60 min	Circular	
Sample Time Interval	5 min	Diameter	2.917 ft
Meter Volume (Vm)	42.763 dcf		
Water Volume	130 ml	Rectangular	
		Width	0.000 ft
		Length	0.000 ft

FIELD DATA AVERAGES:

Average Delta H	2.0 in. H_2O	Average SQRT Dp	0.299 in. H_2O
Average Meter		Average Stack	
Temperature (Tm)	64 deg F	Temperature (Ts)	334 deg F
Temperature (Tm)	524 deg A (R)	Temperature (Ts)	794 deg A (R)
Pressure Meter (Pm)	26.447 in. Hg	Pressure Stack (Ps)	26.301 in. Hg
		Moisture (Bws)	0.1372

CALCULATIONS:

Standard Meter		Stack Gas:	
Volume, Vm(std)	38.475 dscf	Velocity (Vs)	22.06 fps
Actual Meter			
Volume, Vm(actual)	76.273 awcf	Volume (actual conditions)	8,845.6 awcfm
Volume Water			7,632.0 adcfm
Vapor, Vw(std)	6.119 scf		
		Volume (std. Conditions)	310,244.1 wscf/hr
Percent Moisture	13.72 %	(@ 68 deg F & 29.9 "Hg)	5,170.7 wscfm
			267,678.6 dscf/hr
Gas Density:			4,461.3 dscfm
Dry (Md)	30.29 lb/lb-mole		
Wet (Ms)	28.60 lb/lb-mole		
Stack Area	6.683 sq.ft.		

PARTICULATE FIELD DATA

COMPANY NAME: MT Refining Co.
PLANT LOCATION: Great Falls
SOURCE TESTED: Hydrogen Plant Reformer Heater (H-1810)
METER BOX OPERATOR: RW TECHNICIANS: DW
RUN #:
DATE: 10/08/08
START TIME: 0745
END TIME: 0845

EQUIPMENT / IDENTIFICATION CHECKS:

- ✓ PITOTS, PRE-TEST
- ✓ PITOTS, POST-TEST
- ✓ ORSAT SAMPLING SYSTEM
- ✓ TEDLAR BAG
- ✓ THERMOCOUPLE @ °F
- 26.30 BAROMETRIC PRESSURE ("Hg)

- 120 PITOT
- SR METER BOX
- 1.01 Y FACTOR
- 15 PRE / 14 POST
- .000 PRE / .000 POST
- +.02 STATIC PRESSURE ("H2O)

- — NOZZLE # C6 TEST TIME
- NOZZLE DIA.
- M T/C READOUT
- TRAIN LEAK TEST VACUUM ("Hg)
- TRAIN LEAK TEST (ft3/min)
- 35" STACK DIMENSIONS

Sample Point	Time (min)	Dry Gas Meter Reading (ft^3)	Pitot Reading ^P("H_2O)	Meter ^H	Meter Temp. Tm (°F)	Pump Vacuum (Hg)	Filter Box (°F)	Imp. Exit (°F)	Stack Temp. (°F)	% CO2	% O2
		984.000									
1	5		.09	2	64	4	—	40	334		
2	10		.09		64	4		40	334		
3	15		.09		64	4		40	334		
4	20		.08		65	4		40	333		
5	25		.08		65	4		41	333		
6	30		.08		65	4		41	333		
7	35		.08		65	4		41	333		
8	40		.09		64	4		41	334		
9	45		.10		64	4		40	334		
10	50	✓	.10		64	4		40	335		
11	55	1,026.763	.10		64	4		40	335		
12	60	26.963	.09		65	4		40	335		
		+42.763									
1			.09						335		
2			.09						335		
3			.09						335		
4			.08						334		
5			.08						334		
6			.09						334		
7			.10						334		
8			.10						333		
9			.10						333		
10			.09						333		
11			.09						334		
12			.08						334		

Revised 5-10-07 af

EEMC

MOISTURE DETERMINATION

COMPANY NAME:	MT Refining Co.	RUN #	1
PLANT LOCATION:	Great Falls	TEST DATE:	10/08/08
SOURCE TESTED:	#1810	Start Time:	
Weighed By:	JW	Balance Level: ✓ Balance Zeroed: ✓	End Time:

Weight (grams)

Impinger #1

Final Weight	708
Initial Weight	643
Weight Gain	65 ↘

Impinger #2

Final Weight	649
Initial Weight	607
Weight Gain	42 ↘

Impinger #3

Final Weight	537
Initial Weight	532
Weight Gain	5 ↘

Impinger #4 (if applicable)

Final Weight	
Initial Weight	
Weight Gain	

Silica Gel Impinger

Final Weight	804
Initial Weight	786
Weight Gain	18 ↘

Total Mass of Moisture Captured: 130 ↘ grams

Notes:

WorldDrive01:/Forms/Forms/Moisture4.xls
Revised 6/20/07 jmf

EPA Methods #1-4
Field Data & Calculations
Gas Flow/Moisture

Client: Montana Refining Company, Inc.
Location: Great Falls, Montana
Source: Hydrogen Plant Reformer Heater H1810

Test #: 2-GF/H_2O
Time: 08:52-09:52
Date: 10/08/08

Sample Point #	Clock Time (min.)	Meter Reading (cu.ft.)	Delta P ("H_2O)	Delta H ("H_2O)	Meter Temp. Deg. F	Stack Temp. Deg. F	SQRT Delta P
1	5	30.150	0.08	2.0	65	334	0.283
2	10		0.08	2.0	65	334	0.283
3	15		0.08	2.0	65	334	0.283
4	20		0.08	2.0	64	334	0.283
5	25		0.09	2.0	64	335	0.300
6	30		0.09	2.0	64	335	0.300
7	35		0.09	2.0	64	335	0.300
8	40		0.10	2.0	65	334	0.316
9	45		0.10	2.0	65	333	0.316
10	50		0.09	2.0	65	333	0.300
11	55		0.09	2.0	66	333	0.300
12	60		0.08	2.0	66	334	0.283
1		73.698	0.08			334	0.283
2			0.08			334	0.283
3			0.08			334	0.283
4			0.09			333	0.300
5			0.09			333	0.300
6			0.09			333	0.300
7			0.09			333	0.300
8			0.10			334	0.316
9			0.10			334	0.316
10			0.10			335	0.316
11			0.09			335	0.300
12			0.09			335	0.300

Client:	**Montana Refining Company, Inc.**	**Test #:**	**2-GF/H2O**
Source:	**Hydrogen Plant Reformer Heater H1810**	**Date:**	**10/08/08**

FIELD DATA INPUT: (CONTINUED)

Barometric Pressure (Pb)	26.30 in. Hg	Orsat	
Static Pressure	0.02 in H_2O	$\%CO_2$ Average	13.1 %
Meter Cal. Factor	1.01 Y	$\%O_2$ Average	5.3 %
Pitot Factor (cp)	0.84		
		Stack Dimensional Data:	
Total Test Time	60 min	Circular	
Sample Time Interval	5 min	Diameter	2.917 ft
Meter Volume (Vm)	43.548 dcf		
Water Volume	138 ml	Rectangular	
		Width	0.000 ft
		Length	0.000 ft

FIELD DATA AVERAGES:

Average Delta H	2.0 in. H_2O	Average SQRT Dp	0.298 in. H_2O
Average Meter		Average Stack	
Temperature (Tm)	65 deg F	Temperature (Ts)	334 deg F
Temperature (Tm)	525 deg A (R)	Temperature (Ts)	794 deg A (R)
Pressure Meter (Pm)	26.447 in. Hg	Pressure Stack (Ps)	26.301 in. Hg
		Moisture (Bws)	0.1424

CALCULATIONS:

Standard Meter		Stack Gas:	
Volume, Vm(std)	39.107 dscf	Velocity (Vs)	22.00 fps
Actual Meter			
Volume, Vm(actual)	77.996 awcf	Volume (actual conditions)	8,821.6 awcfm
Volume Water			7,565.4 adcfm
Vapor, Vw(std)	6.496 scf		
		Volume (std. Conditions)	309,400.3 wscf/hr
Percent Moisture	14.24 %	(@ 68 deg F & 29.9 "Hg)	5,156.7 wscfm
			265,341.7 dscf/hr
Gas Density:			4,422.4 dscfm
Dry (Md)	30.31 lb/lb-mole		
Wet (Ms)	28.56 lb/lb-mole		
Stack Area	6.683 sq.ft.		

PARTICULATE FIELD DATA

COMPANY NAME: MT Refining Co.
PLANT LOCATION: Great Falls
SOURCE TESTED: #1 B10
METER BOX OPERATOR: JW
TECHNICIANS: DW

RUN #: 2
DATE: 10/08/08
START TIME: 852
END TIME: 952

EQUIPMENT / IDENTIFICATION CHECKS:

- ✓ PITOTS, PRE-TEST
- ✓ PITOTS, POST-TEST
- ✓ ORSAT SAMPLING SYSTEM
- ✓ TEDLAR BAG
- ✓ THERMOCOUPLE @ °F
- 120 PITOT
- BR METER BOX
- 1.01 Y FACTOR
- 15 PRE / 15 POST TRAIN LEAK TEST VACUUM ("Hg)
- 000 PRE / 000 POST TRAIN LEAK TEST (ft3/min)
- 26.30 BAROMETRIC PRESSURE ("Hg)
- +.02 STATIC PRESSURE ("H2O)
- — NOZZLE # C8 TEST TIME
- — NOZZLE DIA.
- M T/C READOUT
- 35" STACK DIMENSIONS

Sample Point	Time (min)	Dry Gas Meter Reading (ft^3)	Pitot Reading ^P("H_2O)	Meter ^H	Meter Temp. Tm (°F)	Pump Vacuum (Hg)	Filter Box (°F)	Imp. Exit (°F)	Stack Temp. (°F)	% CO2	% O2
		30.150									
1	5		.08	2	65	4	—	41	334		
2	10		.08		65	4		41	334		
3	15		.08		65	4		41	334		
4	20		.08		64	4		41	334		
5	25		.09		64	4		42	335		
6	30		.09		64	4		42	335		
7	35		.09		64	4		42	335		
8	40		.10		65	4		42	334		
9	45		.10		65	4		41	333		
10	50		.09		65	4		41	333		
11	55		.09		66	4		41	333		
12	60	73.698	.08		66	4		41	334		
		+43.548									
		↘									
1			.08						334		
2			.08						334		
3			.08						334		
4			.09						333		
5			.09						333		
6			.09						333		
7			.09						333		
8			.10						334		
9			.10						334		
10			.10						335		
11			.09						335		
12			.09						335		

Revised 5-10-07 af

EEMC

MOISTURE DETERMINATION

COMPANY NAME: MT Refining Co. RUN # 2
PLANT LOCATION: Great Falls TEST DATE: 10/08/08
SOURCE TESTED: H1810 Start Time:
Weighed By: SW Balance Level: ✓ Balance Zeroed: ✓ End Time:

Weight (grams)

Impinger #1
Final Weight 714
Initial Weight 647
Weight Gain 67 ↘

Impinger #2
Final Weight 673
Initial Weight 633
Weight Gain 40 ↘

Impinger #3
Final Weight 511
Initial Weight 503
Weight Gain 8 ↘

Impinger #4 (if applicable)
Final Weight
Initial Weight
Weight Gain

Silica Gel Impinger
Final Weight 821
Initial Weight 798
Weight Gain 23 ↘

Total Mass of Moisture Captured: 138 ↘ grams

Notes:

WorldDrive01:/Forms/Forms/Moisture4.xls
Revised 6/20/07 jmf

EPA Methods #1-4
Field Data & Calculations
Gas Flow/Moisture

Client: Montana Refining Company, Inc. **Test #:** 3-GF/H_2O
Location: Great Falls, Montana **Time:** 09:59-10:59
Source: Hydrogen Plant Reformer Heater H1810 **Date:** 10/08/08

Sample Point #	Clock Time (min.)	Meter Reading (cu.ft.)	Delta P ("H_2O)	Delta H ("H_2O)	Meter Temp. Deg. F	Stack Temp. Deg. F	SQRT Delta P
1	5	78.530	0.08	2.0	65	334	0.283
2	10		0.08	2.0	65	334	0.283
3	15		0.09	2.0	65	334	0.300
4	20		0.09	2.0	64	335	0.300
5	25		0.09	2.0	64	335	0.300
6	30		0.08	2.0	64	335	0.283
7	35		0.08	2.0	64	335	0.283
8	40		0.08	2.0	64	334	0.283
9	45		0.10	2.0	63	334	0.316
10	50		0.10	2.0	63	335	0.316
11	55		0.10	2.0	63	336	0.316
12	60		0.09	2.0	63	336	0.300
1		121.183	0.09			335	0.300
2			0.08			335	0.283
3			0.08			335	0.283
4			0.09			334	0.300
5			0.09			334	0.300
6			0.10			334	0.316
7			0.10			334	0.316
8			0.10			334	0.316
9			0.09			336	0.300
10			0.09			336	0.300
11			0.09			334	0.300
12			0.08			334	0.283

Client:	**Montana Refining Company, Inc.**	**Test #:**	**3-GF/H2O**
Source:	**Hydrogen Plant Reformer Heater H1810**	**Date:**	**10/08/08**

FIELD DATA INPUT: (CONTINUED)

Barometric Pressure (Pb)	26.30 in. Hg
Static Pressure	0.02 in H_2O
Meter Cal. Factor	1.01 Y
Pitot Factor (cp)	0.84
Total Test Time	60 min
Sample Time Interval	5 min
Meter Volume (Vm)	42.653 dcf
Water Volume	136 ml

Orsat	
%CO_2 Average	13.2 %
%O_2 Average	5.2 %
Stack Dimensional Data:	
Circular	
Diameter	2.917 ft
Rectangular	
Width	0.000 ft
Length	0.000 ft

FIELD DATA AVERAGES:

Average Delta H	2.0 in. H_2O	Average SQRT Dp	0.298 in. H_2O
Average Meter Temperature (Tm)	64 deg F	Average Stack Temperature (Ts)	335 deg F
Temperature (Tm)	524 deg A (R)	Temperature (Ts)	795 deg A (R)
Pressure Meter (Pm)	26.447 in. Hg	Pressure Stack (Ps)	26.301 in. Hg
		Moisture (Bws)	0.1430

CALCULATIONS:

Standard Meter Volume, Vm(std)	38.376 dscf	Stack Gas: Velocity (Vs)	22.02 fps
Actual Meter Volume, Vm(actual)	76.688 awcf	Volume (actual conditions)	8,829.6 awcfm
			7,567.0 adcfm
Volume Water Vapor, Vw(std)	6.402 scf		
		Volume (std. Conditions)	309,292.0 wscf/hr
Percent Moisture	14.30 %	(@ 68 deg F & 29.9 "Hg)	5,154.9 wscfm
			265,063.2 dscf/hr
Gas Density:			4,417.7 dscfm
Dry (Md)	30.32 lb/lb-mole		
Wet (Ms)	28.56 lb/lb-mole		
Stack Area	6.683 sq.ft.		

PARTICULATE FIELD DATA

COMPANY NAME: MT Refining Co.
PLANT LOCATION Great Falls
SOURCE TESTED #1&10
METER BOX OPERATOR: JW
TECHNICIANS: DW

RUN #: 3
DATE: 10/08/08
START TIME: 959
END TIME: 1059

EQUIPMENT / IDENTIFICATION CHECKS:

- ✓ PITOTS, PRE-TEST
- ✓ PITOTS, POST-TEST
- ✓ ORSAT SAMPLING SYSTEM
- ✓ TEDLAR BAG
- ✓ THERMOCOUPLE @ °F
- 26.38 BAROMETRIC PRESSURE ("Hg)

- 120 PITOT
- BR METER BOX
- 1.01 Y FACTOR
- 15 PRE / 13 POST
- 000 PRE / 000 POST
- +.02 STATIC PRESSURE ("H2O)

- — NOZZLE # 60 TEST TIME
- — NOZZLE DIA.
- M T/C READOUT
- TRAIN LEAK TEST VACUUM ("Hg)
- TRAIN LEAK TEST (ft3/min)
- 35" STACK DIMENSIONS

Sample Point	Time (min)	Dry Gas Meter Reading (ft^3)	Pitot Reading ^P("H_2O)	Meter ^H	Meter Temp. Tm (°F)	Pump Vacuum (Hg)	Filter Box (°F)	Imp. Exit (°F)	Stack Temp. (°F)	% CO2	% O2
		78.530									
1	5		.08	2	65	4	—	43	334		
2	10		.08		65	4		43	334		
3	15		.09		65	4		43	334		
4	20		.09		64	4		44	335		
5	25		.09		64	4		44	335		
6	30		.08		64	4		44	335		
7	35		.08		64	4		44	335		
8	40		.08		64	4		45	334		
9	45		.10		63	4		45	334		
10	50		.10		63	4		45	335		
11	55		.10		63	4		44	336		
12	60	121.183	.09		63	4		44	336		
		+42.653									
1			.09						335		
2			.08						335		
3			.08						335		
4			.09						334		
5			.09						334		
6			.10						334		
7			.10						334		
8			.10						336		
9			.09						336		
10			.09						334		
11			.09						334		
12			.08						334		

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MOISTURE DETERMINATION

COMPANY NAME:	MT Refining Co.	RUN #	3
PLANT LOCATION:	Great Falls	TEST DATE:	10/08/08
SOURCE TESTED:	#1 B10		
Weighed By:	JW	Balance Level: ✓	Balance Zeroed: ✓
		Start Time:	
		End Time:	

Weight (grams)

Impinger #1

Final Weight 711
Initial Weight 648
Weight Gain 63 ↘

Impinger #2

Final Weight 682
Initial Weight 633
Weight Gain 49 ↘

Impinger #3

Final Weight 529
Initial Weight 526
Weight Gain 3 ↘

Impinger #4 (if applicable)

Final Weight
Initial Weight
Weight Gain

Silica Gel Impinger

Final Weight 822
Initial Weight 801
Weight Gain 21 ↘

Total Mass of Moisture Captured: 136 ↘ grams

Notes:

WorldDrive01:/Forms/Forms/Moisture4.xls
Revised 6/20/07 jmf

Compliance Data
EPA Methods #7E & 10

Client: Montana Refining Company, Inc.
Location: Great Falls, Montana
Source: Diesel Hydrotreater Heater (HTU) H1701

Run #: 4-NO_x/CO
Time: 11:35-12:34
Date: 10/08/08

#	Time	NO_x - ppm v/v Dry	CO - ppm v/v Dry	#	Time	NO_x - ppm v/v Dry	CO - ppm v/v Dry
1	11:35	42.9	1.7	31	12:05	44.6	1.5
2	11:36	41.9	1.8	32	12:06	45.2	1.6
3	11:37	41.6	1.7	33	12:07	39.3	1.6
4	11:38	41.5	1.6	34	12:08	37.7	1.8
5	11:39	40.4	1.9	35	12:09	42.7	1.5
6	11:40	40.4	1.5	36	12:10	45.9	1.4
7	11:41	44.1	1.5	37	12:11	45.7	1.5
8	11:42	45.8	1.8	38	12:12	45.1	1.6
9	11:43	44.1	1.6	39	12:13	44.8	1.6
10	11:44	25.6	1.8	40	12:14	42.9	1.6
11	11:45	40.6	1.5	41	12:15	42.3	1.7
12	11:46	43.1	1.6	42	12:16	43.1	1.7
13	11:47	43.3	1.8	43	12:17	43.1	1.6
14	11:48	42.7	1.7	44	12:18	43.7	1.7
15	11:49	45.1	1.6	45	12:19	42.5	1.7
16	11:50	44.2	1.6	46	12:20	42.4	1.7
17	11:51	43.6	1.5	47	12:21	43.7	1.7
18	11:52	43.6	1.7	48	12:22	45.0	1.7
19	11:53	44.3	1.7	49	12:23	44.0	1.7
20	11:54	44.5	1.5	50	12:24	44.1	1.7
21	11:55	43.9	1.7	51	12:25	44.1	1.7
22	11:56	43.8	1.5	52	12:26	45.7	1.8
23	11:57	43.3	1.9	53	12:27	44.4	1.8
24	11:58	43.5	1.5	54	12:28	44.2	1.8
25	11:59	45.5	1.8	55	12:29	45.4	1.8
26	12:00	45.3	1.9	56	12:30	44.3	1.9
27	12:01	44.4	1.5	57	12:31	43.5	1.9
28	12:02	44.7	1.5	58	12:32	45.0	2.0
29	12:03	44.0	1.5	59	12:33	44.5	2.0
30	12:04	42.5	1.5	60	12:34	45.7	2.0
					Averages:	**43.31**	**1.68**

Client: Montana Refining Company, Inc. **Test #:** 4-NOx/CO
Source: Diesel Hydrotreater Heater (HTU) H1701 **Date:** 10/8/2008

Instrument Calibration Checks

NO_X Instrument

Calibration Span, CS: 100.7 ppm v/v Dry

NO_X Calibration Error Tests

Time	Tank Value C_v	Instrument Resp., C_{Dir}	System CE, SCE (< 2% of span)
11:07	0.0	0.1	0.1
11:09	50.2	50.0	-0.2
11:13	100.7	100.4	-0.3

Initial System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_i (< 5% of span)
11:19	0.0	0.2	0.2
11:17	50.2	49.9	-0.3

Post System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_f (< 5% of span)	Drift, D (SB_f - SB_i) (< 3% of span)
12:36	0.0	0.2	0.2	0.0
12:38	50.2	49.9	-0.3	0.0

CO Instrument

Calibration Span, CS: 93.5 ppm v/v Dry

CO Calibration Error Tests

Time	Tank Value C_v	Instrument Resp., C_{Dir}	System CE, SCE (< 2% of span)
11:07	0	0.2	0.2
11:10	43.8	43.5	-0.3
11:14	93.5	93.1	-0.4

Initial System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_i (< 5% of span)
11:23	0	0.3	0.3
11:21	43.8	43.5	-0.3

Post System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_f (< 5% of span)	Drift, D (SB_f - SB_i) (< 3% of span)
12:36	0	0.3	0.3	0.0
12:40	43.8	43.5	-0.3	0.0

Instrument Response Times:

	Zero	High
NO_X	27	24 seconds
CO	25	27 seconds

Client:	**Montana Refining Company, Inc.**	**Test #:**	**4-NOx/CO**
Source:	**Diesel Hydrotreater Heater (HTU) H1701**	**Date:**	**10/8/2008**

Data From Concurrent Run:

Ps	26.298 IN Hg
Gas Flow	5,518.9 adcfm
Avg. Temp	619 Deg. F
	1079 Deg. A (R)
NOx Molecular Wt.	46
CO Molecular Wt.	28
Oxygen	2.9 % v/v dry
cu.ft/lb-mole	
Act Conditions	895.756 ft^3/#mole
Fd Factor (O_2 Basis)	8,714 dscf/MMBtu

Calculations:

Averages:

NO_X	43.31 ppm v/v Dry
CO	1.68 ppm v/v Dry

Calibration Corrected Values:

NO_X	43.5 ppm v/v Dry
CO	1.4 ppm v/v Dry

Mass Flow:

NO_X	0.74 PPH
CO	0.01 PPH
NO_x	0.053 lb/MMBTU
CO	0.001 lb/MMBTU

Compliance Data
EPA Methods #7E & 10

Client: Montana Refining Company, Inc.
Location: Great Falls, Montana
Source: Diesel Hydrotreater Heater (HTU) H1701

Run #: 5-NO_x/CO
Time: 12:42-13:41
Date: 10/08/08

#	Time	NO_X - ppm v/v Dry	CO - ppm v/v Dry	#	Time	NO_X - ppm v/v Dry	CO - ppm v/v Dry
1	12:42	43.7	1.8	31	13:12	43.4	1.5
2	12:43	45.1	1.8	32	13:13	43.5	1.5
3	12:44	44.1	1.9	33	13:14	43.7	1.3
4	12:45	43.9	2.1	34	13:15	44.2	1.4
5	12:46	45.1	1.9	35	13:16	45.7	1.7
6	12:47	45.8	1.8	36	13:17	44.1	1.6
7	12:48	44.9	1.8	37	13:18	43.9	1.4
8	12:49	45.0	1.8	38	13:19	46.0	1.4
9	12:50	44.9	1.8	39	13:20	44.1	1.4
10	12:51	46.3	2.0	40	13:21	42.9	1.5
11	12:52	45.2	1.7	41	13:22	43.7	1.5
12	12:53	44.7	1.8	42	13:23	44.3	1.6
13	12:54	40.9	1.8	43	13:24	45.4	1.5
14	12:55	39.0	2.0	44	13:25	46.5	1.4
15	12:56	40.4	1.7	45	13:26	43.9	1.4
16	12:57	45.9	2.1	46	13:27	42.8	1.6
17	12:58	45.7	1.9	47	13:28	44.7	1.6
18	12:59	45.0	2.0	48	13:29	44.0	1.4
19	13:00	45.2	1.7	49	13:30	44.1	1.4
20	13:01	44.1	1.8	50	13:31	44.3	1.4
21	13:02	43.8	2.0	51	13:32	44.1	1.5
22	13:03	45.0	2.1	52	13:33	44.5	1.5
23	13:04	45.0	1.7	53	13:34	44.8	1.7
24	13:05	45.9	1.7	54	13:35	43.7	1.4
25	13:06	45.1	1.9	55	13:36	43.6	1.4
26	13:07	42.9	1.6	56	13:37	43.4	1.5
27	13:08	43.1	1.5	57	13:38	44.3	1.5
28	13:09	45.7	1.6	58	13:39	45.3	1.6
29	13:10	44.2	1.5	59	13:40	45.7	1.6
30	13:11	43.1	1.6	60	13:41	45.8	1.6
					Averages:	**44.32**	**1.65**

Client: Montana Refining Company, Inc. **Test #:** 5-NOx/CO
Source: Diesel Hydrotreater Heater (HTU) H1701 **Date:** 10/8/2008

Instrument Calibration Checks

NO_X Instrument

Calibration Span, CS: 100.7 ppm v/v Dry

NO_X Calibration Error Tests

Time	Tank Value C_v	Instrument Resp., C_{Dir}	System CE, SCE (< 2% of span)
11:07	0.0	0.1	0.1
11:09	50.2	50.0	-0.2
11:13	100.7	100.4	-0.3

Initial System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_i (< 5% of span)
12:36	0.0	0.2	0.2
12:38	50.2	49.9	-0.3

Post System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_f (< 5% of span)	Drift, D (SB_f - SB_i) (< 3% of span)
13:43	0.0	0.2	0.2	0.0
13:45	50.2	49.9	-0.3	0.0

CO Instrument

Calibration Span, CS: 93.5 ppm v/v Dry

CO Calibration Error Tests

Time	Tank Value C_v	Instrument Resp., C_{Dir}	System CE, SCE (< 2% of span)
11:07	0	0.2	0.2
11:10	43.8	43.5	-0.3
11:14	93.5	93.1	-0.4

Initial System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_i (< 5% of span)
12:36	0	0.3	0.3
12:40	43.8	43.5	-0.3

Post System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_f (< 5% of span)	Drift, D (SB_f - SB_i) (< 3% of span)
13:43	0	0.2	0.2	-0.1
13:47	43.8	43.5	-0.3	0.0

Instrument Response Times:

	Zero	High
NO_X	27	24 seconds
CO	25	27 seconds

Client:	**Montana Refining Company, Inc.**	**Test #:**	**5-NOx/CO**
Source:	**Diesel Hydrotreater Heater (HTU) H1701**	**Date:**	**10/8/2008**

Data From Concurrent Run:

Ps	26.298	IN Hg
Gas Flow	5,645.5	adcfm
Avg. Temp	620	Deg. F
	1080	Deg. A (R)
NOx Molecular Wt.	46	
CO Molecular Wt.	28	
Oxygen	2.8	% v/v dry
cu.ft/lb-mole Act Conditions	896.586	ft^3/#mole
Fd Factor (O_2 Basis)	8,714	dscf/MMBtu

Calculations:

Averages:

NO_X	44.32	ppm v/v Dry
CO	1.65	ppm v/v Dry

Calibration Corrected Values:

NO_X	44.6	ppm v/v Dry
CO	1.4	ppm v/v Dry

Mass Flow:

NO_X	0.78	PPH
CO	0.01	PPH
NO_X	0.054	lb/MMBTU
CO	0.001	lb/MMBTU

Compliance Data
EPA Methods #7E & 10

Client:	**Montana Refining Company, Inc.**	**Run #:**	**6-NO_x/CO**
Location:	**Great Falls, Montana**	**Time:**	**13:49-14:48**
Source:	**Diesel Hydrotreater Heater (HTU) H1701**	**Date:**	**10/08/08**

#	Time	NO_x - ppm v/v Dry	CO - ppm v/v Dry	#	Time	NO_x - ppm v/v Dry	CO - ppm v/v Dry
1	13:49	42.8	1.7	31	14:19	43.8	2.0
2	13:50	44.4	1.7	32	14:20	43.4	2.0
3	13:51	45.0	1.8	33	14:21	43.5	2.1
4	13:52	44.0	1.5	34	14:22	43.6	1.7
5	13:53	42.2	1.7	35	14:23	43.4	1.8
6	13:54	42.3	1.7	36	14:24	44.5	1.8
7	13:55	44.2	1.6	37	14:25	45.6	2.0
8	13:56	42.6	1.6	38	14:26	45.2	1.9
9	13:57	44.5	1.7	39	14:27	44.4	1.8
10	13:58	45.5	1.9	40	14:28	43.0	1.8
11	13:59	45.1	1.8	41	14:29	42.7	2.0
12	14:00	45.1	1.9	42	14:30	43.7	1.8
13	14:01	43.3	1.8	43	14:31	44.2	2.0
14	14:02	42.4	1.8	44	14:32	44.1	1.9
15	14:03	43.3	1.9	45	14:33	42.5	1.7
16	14:04	44.3	1.9	46	14:34	43.5	1.9
17	14:05	45.2	1.8	47	14:35	45.9	2.0
18	14:06	43.5	1.7	48	14:36	43.6	1.9
19	14:07	42.8	1.7	49	14:37	42.4	1.9
20	14:08	43.5	1.6	50	14:38	43.9	1.8
21	14:09	43.3	1.7	51	14:39	45.5	1.7
22	14:10	45.9	1.9	52	14:40	42.9	1.7
23	14:11	44.1	1.6	53	14:41	42.8	1.8
24	14:12	43.4	1.8	54	14:42	44.2	2.1
25	14:13	44.1	1.8	55	14:43	43.7	1.7
26	14:14	44.3	1.6	56	14:44	43.8	1.8
27	14:15	45.6	1.6	57	14:45	44.1	1.9
28	14:16	43.8	1.7	58	14:46	42.6	1.7
29	14:17	43.5	1.8	59	14:47	43.1	1.8
30	14:18	43.0	2.0	60	14:48	42.7	1.7
					Averages:	**43.82**	**1.80**

Client: Montana Refining Company, Inc. **Test #:** 6-NOx/CO
Source: Diesel Hydrotreater Heater (HTU) H1701 **Date:** 10/8/2008

Instrument Calibration Checks

NO_X Instrument

Calibration Span, CS: 100.7 ppm v/v Dry

NO_X Calibration Error Tests

Time	Tank Value C_v	Instrument Resp., C_{Dir}	System CE, SCE (< 2% of span)
11:07	0.0	0.1	0.1
11:09	50.2	50.0	-0.2
11:13	100.7	100.4	-0.3

Initial System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_i (< 5% of span)
13:43	0.0	0.2	0.2
13:45	50.2	49.9	-0.3

Post System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_f (< 5% of span)	Drift, D (SB_f - SB_i) (< 3% of span)
14:50	0.0	0.3	0.3	0.1
14:52	50.2	50.0	-0.2	0.1

CO Instrument

Calibration Span, CS: 93.5 ppm v/v Dry

CO Calibration Error Tests

Time	Tank Value C_v	Instrument Resp., C_{Dir}	System CE, SCE (< 2% of span)
11:07	0	0.2	0.2
11:10	43.8	43.5	-0.3
11:14	93.5	93.1	-0.4

Initial System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_i (< 5% of span)
13:43	0	0.2	0.2
13:47	43.8	43.5	-0.3

Post System Bias Check

Time	Tank Value C_v	Instrument Resp., C_S	System Bias, SB_f (< 5% of span)	Drift, D (SB_f - SB_i) (< 3% of span)
14:50	0	0.2	0.2	0.0
14:54	43.8	43.5	-0.3	0.0

Instrument Response Times:

	Zero	High
NO_X	27	24 seconds
CO	25	27 seconds

Client:	**Montana Refining Company, Inc.**	**Test #:**	**6-NOx/CO**
Source:	**Diesel Hydrotreater Heater (HTU) H1701**	**Date:**	**10/8/2008**

Data From Concurrent Run:

Ps	26.298	IN Hg
Gas Flow	5,658.9	adcfm
Avg. Temp	620	Deg. F
	1080	Deg. A (R)
NOx Molecular Wt.	46	
CO Molecular Wt.	28	
Oxygen	2.8	% v/v dry
cu.ft/lb-mole		
Act Conditions	896.586	ft^3/#mole
Fd Factor (O_2 Basis)	8,714	dscf/MMBtu

Calculations:

Averages:

NO_X	43.82	ppm v/v Dry
CO	1.80	ppm v/v Dry

Calibration Corrected Values:

NO_X	44.0	ppm v/v Dry
CO	1.6	ppm v/v Dry

Mass Flow:

NO_X	0.77	PPH
CO	0.02	PPH
NO_X	0.053	lb/MMBTU
CO	0.001	lb/MMBTU

EPA Methods #1-4
Field Data & Calculations
Gas Flow/Moisture

Client: Montana Refining Company, Inc.
Location: Great Falls, Montana
Source: Diesel Hydrotreater Heater (HTU) H1701

Test #: 4-GF/H_2O
Time: 11:35-12:35
Date: 10/08/08

Sample Point #	Clock Time (min.)	Meter Reading (cu.ft.)	Delta P ("H_2O)	Delta H ("H_2O)	Meter Temp. Deg. F	Stack Temp. Deg. F	SQRT Delta P
1	5	125.000	0.04	2.0	70	619	0.200
2	10		0.04	2.0	70	619	0.200
3	15		0.03	2.0	70	619	0.173
4	20		0.04	2.0	70	618	0.200
5	25		0.04	2.0	71	618	0.200
6	30		0.04	2.0	71	618	0.200
7	35		0.04	2.0	71	618	0.200
8	40		0.03	2.0	71	619	0.173
9	45		0.04	2.0	70	619	0.200
10	50		0.04	2.0	70	620	0.200
11	55		0.04	2.0	71	620	0.200
12	60		0.04	2.0	71	620	0.200
1		167.758	0.04			620	0.200
2			0.04			620	0.200
3			0.04			620	0.200
4			0.03			621	0.173
5			0.03			621	0.173
6			0.04			621	0.200
7			0.04			620	0.200
8			0.04			620	0.200
9			0.04			619	0.200
10			0.04			619	0.200
11			0.04			619	0.200
12			0.04			618	0.200

Client:	**Montana Refining Company, Inc.**	**Test #:**	**4-GF/H2O**
Source:	**Diesel Hydrotreater Heater (HTU) H1701**	**Date:**	**10/08/08**

FIELD DATA INPUT: (CONTINUED)

Barometric Pressure (Pb)	26.30 in. Hg
Static Pressure	-0.03 in H_2O
Meter Cal. Factor	1.01 Y
Pitot Factor (cp)	0.84
Total Test Time	60 min
Sample Time Interval	5 min
Meter Volume (Vm)	42.758 dcf
Water Volume	70 ml

Orsat	
%CO_2 Average	9.4 %
%O_2 Average	2.9 %
Stack Dimensional Data:	
Circular	
Diameter	2.750 ft
Rectangular	
Width	0.000 ft
Length	0.000 ft

FIELD DATA AVERAGES:

Average Delta H	2.0 in. H_2O	Average SQRT Dp	0.196 in. H_2O
Average Meter Temperature (Tm)	71 deg F	Average Stack Temperature (Ts)	619 deg F
Temperature (Tm)	531 deg A (R)	Temperature (Ts)	1079 deg A (R)
Pressure Meter (Pm)	26.447 in. Hg	Pressure Stack (Ps)	26.298 in. Hg
		Moisture (Bws)	0.0799

CALCULATIONS:

Standard Meter Volume, Vm(std)	37.963 dscf	Stack Gas: Velocity (Vs)	16.83 fps
Actual Meter Volume, Vm(actual)	95.915 awcf	Volume (actual conditions)	5,998.2 awcfm
Volume Water Vapor, Vw(std)	3.295 scf		5,518.9 adcfm
Percent Moisture	7.99 %	Volume (std. Conditions) (@ 68 deg F & 29.9 "Hg)	154,791.3 wscf/hr
			2,579.9 wscfm
Gas Density:			142,423.5 dscf/hr
Dry (Md)	29.62 lb/lb-mole		2,373.7 dscfm
Wet (Ms)	28.69 lb/lb-mole		
Stack Area	5.940 sq.ft.		

PARTICULATE FIELD DATA

COMPANY NAME: MBC
PLANT LOCATION: Great Falls
SOURCE TESTED: H120
METER BOX OPERATOR: JW
TECHNICIANS: DW JA
RUN #: 4
DATE: 10/08/08
START TIME: 1132
END TIME: 1235

EQUIPMENT / IDENTIFICATION CHECKS:

- ✓ PITOTS, PRE-TEST
- ✓ PITOTS, POST-TEST
- ✓ ORSAT SAMPLING SYSTEM
- ✓ TEDLAR BAG
- ✓ THERMOCOUPLE @ °F
- 26.30 BAROMETRIC PRESSURE ("Hg)

- 120 PITOT
- SR METER BOX
- 1.01 Y FACTOR
- 15 PRE / 15 POST
- 000 PRE / 000 POST
- -.03 STATIC PRESSURE ("H2O)

- — NOZZLE # 60 TEST TIME
- ____ NOZZLE DIA.
- M T/C READOUT
- TRAIN LEAK TEST VACUUM ("Hg)
- TRAIN LEAK TEST (ft3/min)
- 33" STACK DIMENSIONS

Sample Point	Time (min)	Dry Gas Meter Reading (ft^3)	Pitot Reading ^P("H_2O)	Meter ^H	Meter Temp. Tm (°F)	Pump Vacuum (Hg)	Filter Box (°F)	Imp. Exit (°F)	Stack Temp. (°F)	% CO2	% O2
		125.000								9.4	2.9
1	5		.04	2	70	4	—	48	619		
2	10		.04		70	4		48	619		
3	15		.03		70	4		48	619		
4	20		.04		70	4		47	618		
5	25		.04		71	4		47	618		
6	30		.04		71	4		47	619		
7	35		.04		71	4		46	618		
8	40		.03		71	4		46	619		
9	45		.04		70	4		46	619		
10	50		.04		70	4		46	620		
11	55		.04		71	4		47	620		
12	60	167.758	.04		71	4		47	620		
		+42.758	.04		71	4		47	620		
		↘									
1			.04						620		
2			.04						620		
3			.04						621		
4			.03						621		
5			.03						621		
6			.04						621		
7			.04						620		
8			.04						620		
9			.04						619		
10			.04						619		
11			.04						619		
12			.04						618		

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MOISTURE DETERMINATION

COMPANY NAME:	MBC	RUN #	4
PLANT LOCATION:	Great Falls	TEST DATE:	10/08/08
SOURCE TESTED:	H1701	Start Time:	
Weighed By:	JW	Balance Level: ✓ Balance Zeroed: ✓	End Time:

Weight (grams)

Impinger #1

Final Weight	657
Initial Weight	626
Weight Gain	31 ↘

Impinger #2

Final Weight	765
Initial Weight	743
Weight Gain	22 ↘

Impinger #3

Final Weight	518
Initial Weight	517
Weight Gain	1 ↘

Impinger #4 (if applicable)

Final Weight	
Initial Weight	
Weight Gain	

Silica Gel Impinger

Final Weight	812
Initial Weight	796
Weight Gain	16 ↘

Total Mass of Moisture Captured: 70 ↘ grams

Notes:

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EPA Methods #1-4
Field Data & Calculations
Gas Flow/Moisture

Client: Montana Refining Company, Inc.
Location: Great Falls, Montana
Source: Diesel Hydrotreater Heater (HTU) H1701

Test #: 5-GF/H_2O
Time: 12:42-13:42
Date: 10/08/08

Sample Point #	Clock Time (min.)	Meter Reading (cu.ft.)	Delta P ("H_2O)	Delta H ("H_2O)	Meter Temp. Deg. F	Stack Temp. Deg. F	SQRT Delta P
1	5	172.010	0.04	2.0	71	620	0.200
2	10		0.04	2.0	71	620	0.200
3	15		0.04	2.0	71	620	0.200
4	20		0.04	2.0	71	621	0.200
5	25		0.04	2.0	72	621	0.200
6	30		0.04	2.0	72	621	0.200
7	35		0.04	2.0	72	621	0.200
8	40		0.04	2.0	72	621	0.200
9	45		0.03	2.0	72	620	0.173
10	50		0.04	2.0	72	620	0.200
11	55		0.04	2.0	72	620	0.200
12	60		0.04	2.0	72	620	0.200
1		215.431	0.04			619	0.200
2			0.04			619	0.200
3			0.04			619	0.200
4			0.04			620	0.200
5			0.04			620	0.200
6			0.04			620	0.200
7			0.04			620	0.200
8			0.04			620	0.200
9			0.04			621	0.200
10			0.04			621	0.200
11			0.04			621	0.200
12			0.04				

Client:	**Montana Refining Company, Inc.**	**Test #:**	**5-GF/H2O**
Source:	**Diesel Hydrotreater Heater (HTU) H1701**	**Date:**	**10/08/08**

FIELD DATA INPUT: (CONTINUED)

Barometric Pressure (Pb)	26.30 in. Hg	Orsat	
Static Pressure	-0.03 in H_2O	%CO_2 Average	9.5 %
Meter Cal. Factor	1.01 Y	%O_2 Average	2.8 %
Pitot Factor (cp)	0.84		
		Stack Dimensional Data:	
Total Test Time	60 min	Circular	
Sample Time Interval	5 min	Diameter	2.750 ft
Meter Volume (Vm)	43.421 dcf		
Water Volume	63 ml	Rectangular	
		Width	0.000 ft
		Length	0.000 ft

FIELD DATA AVERAGES:

Average Delta H	2.0 in. H_2O	Average SQRT Dp	0.199 in. H_2O
Average Meter		Average Stack	
Temperature (Tm)	72 deg F	Temperature (Ts)	620 deg F
Temperature (Tm)	532 deg A (R)	Temperature (Ts)	1080 deg A (R)
Pressure Meter (Pm)	26.447 in. Hg	Pressure Stack (Ps)	26.298 in. Hg
		Moisture (Bws)	0.0715

CALCULATIONS:

Standard Meter		Stack Gas:	
Volume, Vm(std)	38.480 dscf	Velocity (Vs)	17.06 fps
Actual Meter			
Volume, Vm(actual)	96.428 awcf	Volume (actual conditions)	6,080.2 awcfm
Volume Water			5,645.5 adcfm
Vapor, Vw(std)	2.965 scf		
		Volume (std. Conditions)	156,761.4 wscf/hr
Percent Moisture	7.15 %	(@ 68 deg F & 29.9 "Hg)	2,612.7 wscfm
			145,553.0 dscf/hr
Gas Density:			2,425.9 dscfm
Dry (Md)	29.63 lb/lb-mole		
Wet (Ms)	28.80 lb/lb-mole		
Stack Area	5.940 sq.ft.		

PARTICULATE FIELD DATA

COMPANY NAME: MRC
PLANT LOCATION: Great Falls
SOURCE TESTED: #1701
METER BOX OPERATOR: JW
TECHNICIANS: DW JA
RUN #: 3
DATE: 10/08/08
START TIME: 1242
END TIME: 1342

EQUIPMENT / IDENTIFICATION CHECKS:

- ✓ PITOTS, PRE-TEST
- ✓ PITOTS, POST-TEST
- ✓ ORSAT SAMPLING SYSTEM
- ✓ TEDLAR BAG
- ✓ THERMOCOUPLE @ °F
- 26.30 BAROMETRIC PRESSURE ("Hg)

- 178 PITOT
- 38 METER BOX
- 1.01 Y FACTOR
- 15 PRE / 14 POST — TRAIN LEAK TEST VACUUM ("Hg)
- 000 PRE / 000 POST — TRAIN LEAK TEST (ft3/min)
- -.03 STATIC PRESSURE ("H2O)

- — NOZZLE # C0 — TEST TIME
- — NOZZLE DIA.
- M T/C READOUT
- 33" STACK DIMENSIONS

Sample Point	Time (min)	Dry Gas Meter Reading (ft^3)	Pitot Reading ^P("H_2O)	Meter ^H	Meter Temp. Tm (°F)	Pump Vacuum (Hg)	Filter Box (°F)	Imp. Exit (°F)	Stack Temp. (°F)	% CO2	% O2
		172.010									
1	5		.04	2	71	4	—	49	620	9.5	2.8
2	10		.04		71	4		49	620		
3	15		.04		71	4		49	620		
4	20		.04		71	4		49	621		
5	25		.04		72	4		49	621		
6	30		.04		72	4		49	621		
7	35		.04		72	4		50	621		
8	40		.04		72	4		50	621		
9	45		.03		72	4		50	620		
10	50		.04		72	4		51	620		
11	55		.04		72	4		51	620		
12	60	215.431	.04		72	4		51	620		
		+43.421									
		↘									
1			.04						619		
2			.04						619		
3			.04						619		
4			.04						619		
5			.04						620		
6			.04						620		
7			.04						620		
8			.04						620		
1			.04						620		
10			.04						621		
11			.04						621		
12			.04						621		

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MOISTURE DETERMINATION

COMPANY NAME:	MBC	RUN #	3
PLANT LOCATION:	Great Falls	TEST DATE:	10/08/08
SOURCE TESTED:	H1201	Start Time:	
Weighed By:	JW	Balance Level: ✓	Balance Zeroed: ✓ End Time:

Weight (grams)

Impinger #1

Final Weight	634
Initial Weight	601
Weight Gain	33 ↘

Impinger #2

Final Weight	698
Initial Weight	683
Weight Gain	15 ↘

Impinger #3

Final Weight	516
Initial Weight	516
Weight Gain	0 ↘

Impinger #4 (if applicable)

Final Weight	
Initial Weight	
Weight Gain	

Silica Gel Impinger

Final Weight	298
Initial Weight	283
Weight Gain	15 ↘

Total Mass of Moisture Captured: 63 ↘ grams

Notes:

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EPA Methods #1-4
Field Data & Calculations
Gas Flow/Moisture

Client: Montana Refining Company, Inc.
Location: Great Falls, Montana
Source: Diesel Hydrotreater Heater (HTU) H1701

Test #: 6-GF/H_2O
Time: 13:49-14:49
Date: 10/08/08

Sample Point #	Clock Time (min.)	Meter Reading (cu.ft.)	Delta P ("H_2O)	Delta H ("H_2O)	Meter Temp. Deg. F	Stack Temp. Deg. F	SQRT Delta P
1	5	220.000	0.04	2.0	72	621	0.200
2	10		0.04	2.0	72	621	0.200
3	15		0.04	2.0	72	621	0.200
4	20		0.04	2.0	72	621	0.200
5	25		0.04	2.0	71	620	0.200
6	30		0.04	2.0	71	620	0.200
7	35		0.04	2.0	71	620	0.200
8	40		0.04	2.0	71	620	0.200
9	45		0.04	2.0	70	619	0.200
10	50		0.04	2.0	70	619	0.200
11	55		0.04	2.0	70	619	0.200
12	60		0.04	2.0	70	619	0.200
1		263.340	0.04			620	0.200
2			0.04			620	0.200
3			0.04			620	0.200
4			0.04			621	0.200
5			0.04			621	0.200
6			0.04			621	0.200
7			0.04			621	0.200
8			0.04			621	0.200
9			0.04			620	0.200
10			0.04			620	0.200
11			0.04			620	0.200
12			0.04			620	0.200

Client:	**Montana Refining Company, Inc.**	**Test #:**	**6-GF/H2O**
Source:	**Diesel Hydrotreater Heater (HTU) H1701**	**Date:**	**10/08/08**

FIELD DATA INPUT: (CONTINUED)

Barometric Pressure (Pb)	26.30 in. Hg
Static Pressure	-0.03 in H_2O
Meter Cal. Factor	1.01 Y
Pitot Factor (cp)	0.84
Total Test Time	60 min
Sample Time Interval	5 min
Meter Volume (Vm)	43.340 dcf
Water Volume	66 ml

Orsat

%CO_2 Average	9.5 %
%O_2 Average	2.8 %

Stack Dimensional Data:

Circular	
Diameter	2.750 ft
Rectangular	
Width	0.000 ft
Length	0.000 ft

FIELD DATA AVERAGES:

Average Delta H	2.0 in. H_2O	Average SQRT Dp	0.200 in. H_2O
Average Meter Temperature (Tm)	71 deg F	Average Stack Temperature (Ts)	620 deg F
Temperature (Tm)	531 deg A (R)	Temperature (Ts)	1080 deg A (R)
Pressure Meter (Pm)	26.447 in. Hg	Pressure Stack (Ps)	26.298 in. Hg
		Moisture (Bws)	0.0747

CALCULATIONS:

Standard Meter Volume, Vm(std)	38.480 dscf	Stack Gas: Velocity (Vs)	17.16 fps
Actual Meter Volume, Vm(actual)	96.763 awcf	Volume (actual conditions)	6,115.8 awcfm
			5,658.9 adcfm
Volume Water Vapor, Vw(std)	3.107 scf		
		Volume (std. Conditions)	157,680.3 wscf/hr
Percent Moisture	7.47 %	(@ 68 deg F & 29.9 "Hg)	2,628.0 wscfm
			145,901.6 dscf/hr
Gas Density:			2,431.7 dscfm
Dry (Md)	29.63 lb/lb-mole		
Wet (Ms)	28.76 lb/lb-mole		
Stack Area	5.940 sq.ft.		

PARTICULATE FIELD DATA

COMPANY NAME: MRC
PLANT LOCATION: Great Falls
SOURCE TESTED: H-201
METER BOX OPERATOR: SW
TECHNICIANS: DW, JA

RUN #: 6
DATE: 10/08/08
START TIME: 1349
END TIME: 1449

EQUIPMENT / IDENTIFICATION CHECKS:

- ✓ PITOTS, PRE-TEST
- ✓ PITOTS, POST-TEST
- ✓ ORSAT SAMPLING SYSTEM
- ✓ TEDLAR BAG
- ✓ THERMOCOUPLE @ °F
- 26.30 BAROMETRIC PRESSURE ("Hg)

- 120 PITOT
- [illegible] METER BOX
- 1.01 Y FACTOR
- 15 PRE / 15 POST
- 000 PRE / 000 POST
- -.03 STATIC PRESSURE ("H2O)

- ____ NOZZLE # 60 TEST TIME
- ____ NOZZLE DIA.
- M T/C READOUT
- TRAIN LEAK TEST VACUUM ("Hg)
- TRAIN LEAK TEST (ft3/min)
- 33" STACK DIMENSIONS

Sample Point	Time (min)	Dry Gas Meter Reading (ft^3)	Pitot Reading ΔP("H_2O)	Meter ΔH	Meter Temp. Tm (°F)	Pump Vacuum (Hg)	Filter Box (°F)	Imp. Exit (°F)	Stack Temp. (°F)	% CO2	% O2
		220.000									
1	5		.04	2	72	4	—	49	G21	9.5	2.8
2	10		.04		72	4		49	G21		
3	15		.04		72	4		49	G21		
4	20		.04		72	4		49	G21		
5	25		.04		71	4		50	G20		
6	30		.04		71	4		50	G20		
7	35		.04		71	4		50	G20		
8	40		.04		71	4		50	G20		
9	45		.04		70	4		51	G19		
10	50		.04		70	4		51	G19		
11	55		.04		70	4		51	G19		
12	60	263.340	.04		70	4		51	G19		
		+43.340									
		↘									
1			.04						G20		
2			.04						G20		
3			.04						G20		
4			.04						G21		
5			.04						G21		
6			.04						G21		
7			.04						G21		
8			.04						G21		
9			.04						G20		
10			.04						G20		
11			.04						G20		
12			.04						G20		

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MOISTURE DETERMINATION

COMPANY NAME:	MBC	RUN #	6
PLANT LOCATION:	Great Falls	TEST DATE:	10/08/08
SOURCE TESTED:	#1201	Start Time:	
Weighed By:	JW	Balance Level: ✓	Balance Zeroed: ✓ End Time:

Weight (grams)

Impinger #1

Final Weight	651
Initial Weight	620
Weight Gain	31 ↘

Impinger #2

Final Weight	734
Initial Weight	712
Weight Gain	22 ↘

Impinger #3

Final Weight	507
Initial Weight	506
Weight Gain	1 ↘

Impinger #4 (if applicable)

Final Weight	
Initial Weight	
Weight Gain	

Silica Gel Impinger

Final Weight	823
Initial Weight	811
Weight Gain	12 ↘

Total Mass of Moisture Captured: 66 ↘ grams

Notes:

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EEMC

ORSAT SHEET

COMPANY NAME: MRC
PLANT LOCATION: Great Falls
SOURCE TESTED: H 1810 H 1701
TEST DATE: 10 - 8 - 08

	Gas	1	2	3	Average
Run # H 1810 1	Total $CO_2 + O_2$				
	CO_2	13.0	13.0	12.9	13.0
	O_2	5.1	5.2	5.2	5.2
Run # 2	Total $CO_2 + O_2$				
	CO_2	13.1	13.1	13.0	13.1
	O_2	5.3	5.2	5.3	5.3
Run # 3	Total $CO_2 + O_2$				
	CO_2	13.2	13.2	13.2	13.2
	O_2	5.2	5.1	5.2	5.2
Run # H 1701 4	Total $CO_2 + O_2$				
	CO_2	9.4	9.4	9.3	9.4
	O_2	2.9	2.9	3.0	2.9
Run # 5	Total $CO_2 + O_2$				
	CO_2	9.5	9.5	9.4	9.5
	O_2	2.8	2.8	2.9	2.8
Run # 6	Total $CO_2 + O_2$				
	CO_2	9.5	9.5	9.4	9.5
	O_2	2.8	2.8	2.8	2.8
Run #	Total $CO_2 + O_2$				
	CO_2				
	O_2				
Run #	Total $CO_2 + O_2$				
	CO_2				
	O_2				
Run #	Total $CO_2 + O_2$				
	CO_2				
	O_2				
Run #	Total $CO_2 + O_2$				
	CO_2				
	O_2				

Notes:

WorldDrive01:\Forms\Forms\Orsat3.xls
Revised 4/12/07 jmf

Montana Refining Company,inc.
Hydrogen Plant Reformer Heater Stack &
Diesel Hydrotreater Heater (HTU)
Process Data
10/08/08

Source	Fuel Flow scfh	Btu Content Btu/scf (Nominal)
Hydrogen Plant Heater	62,903	300
Diesel Hydrotreater Heater	6,173	1,000

EEMC

From: "Ray Martinich" <rmartinich@montanarefining.com>
To: <eemc@bresnan.net>
Sent: Tuesday, October 14, 2008 2:33 PM
Subject: Process data during testing

Dave,

Here is the process data for the HTU and hydrogen plant during the testing last week:

1) HTU unit feed rate 4,000 barrel per day (5,000 bpd max) – 80% of capacity

We could not go to higher feed rate because it would cause pressure problems in a downstream fuel gas unit (NaHS unit). At time of testing, HTU feed was gas oil, which provides the greater heater firing rate as opposed to diesel as HTU feed. HTU heater fuel firing rate during testing was approx. 148 mscfd – the average firing rate for the previous 12 months was approx. 135 mscfd.

2) Hydrogen plant production rate is dependent on the HTU rate – the H_2 plant heater firing rate was at 82% of rated.

Please let me know if you need anything else.

Thanks.

Ray Martinich
Montana Refining Company, Inc.
1900 10th Street NE
Great Falls, MT 59404
(406) 454-9862 direct
(406) 761-4100 refinery
rmartinich@montanarefining.com

The "City Gas" report is for natural gas, which is the sole fuel for the HTU heater. The hydrogen plant heater is fired primarily on vent gas from the unit and supplemented with natural gas. The fuel gas rates at the time of testing are as follows:

HTU heater fuel: average of 6,173 scfh natural gas over the test period
Hydrogen plant heater: average of 1,658 scfh natural gas and 62,903 scfh vent gas (natural gas has a nominal BTU content of 1,000 BTU/scf while the vent gas has a nominal BTU content of 300 BTU/scf)

Calculation of Fd Factor

Source: Hydrogen Plant Reformer Heater H1810
Type of Fuel: Vent Gas
Sample Taken: 10/08/08

Compound		Mole % *	Mol Wt	Weight Lbs	Wt Fract	Wt of H Lbs	Wt of C Lbs	Wt of N Lbs	Wt of O Lbs
Hydrogen	H_2	50.39	2.0160	1.0159	0.0559	1.0159	0.0000	0.0000	0.0000
Carbon Dioxide	CO_2	29.91	44.0100	13.1634	0.7245	0.0000	3.5925	0.0000	9.5706
Oxygen	O_2	0.24	31.9988	0.0768	0.0042	0.0000	0.0000	0.0000	0.0768
Nitrogen	N_2	4.09	28.0134	1.1457	0.0631	0.0000	0.0000	1.1457	0.0000
Carbon Monoxide	CO	2.53	28.0100	0.7087	0.0390	0.0000	0.3039	0.0000	0.4048
Methane	CH_4	12.83	16.0400	2.0579	0.1133	0.5173	1.5410	0.0000	0.0000
Ethane	C_2H_6	0.00	30.0700	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ethylene	C_2H_4	0.00	28.5400	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Propane	C_3H_8	0.00	44.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Propylene	C_3H_6	0.00	42.5100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
iso-butane	iC_4H_{10}	0.00	58.1200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-butane	nC_4H_{10}	0.00	58.1200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1-butene	C_4H_8	0.00	56.6800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
iso-butylene	C_4H_{10}	0.00	58.1200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
trans-2-butene	C_4H_8	0.00	56.6800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
cis-2-Butene	C_4H_8	0.00	56.6800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1,3 Butadiene	C_4H_6	0.00	54.5200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
iso-pentane	iC_5H_{12}	0.00	72.1500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-pentane	nC_5H_{12}	0.00	72.1500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C6+	C_6H_{14}	0.00	87.1800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
hexane	C_6H_{14}	0.00	87.1800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hydrogen Sulfide	H_2S	0.00	34.0800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		99.99		18.1684	1.0000	1.5332	5.4374	1.1457	10.0522
			Percent(w/w%)		100.00	8.44	29.93	6.31	55.33

Calculation of Fd Factor

Source: Hydrogen Plant Reformer Heater H1810
Type of Fuel: Vent Gas
Sample Taken: 10/08/08

	% of Fuel by Weight
%H	8.4388
%C	29.9278
%N	6.3060
%O	55.3279

Molecular Weights utilized for calculations:	
H	1.008
C	12.011
N	14.007
O	15.999

Compound		Wt Fraction	Standard Btu/lb**	Sample Btu/lb
Hydrogen	H_2	0.0559	61,095	3,415
Carbon Dioxide	CO_2	0.7245	0	0
Oxygen	O_2	0.0042	0	0
Nitrogen	N_2	0.0631	0	0
Carbon Monoxide	CO	0.0390	4,347	170
Methane	CH_4	0.1133	23,875	2,705
Ethane	C_2H_6	0.0000	22,323	0
Ethylene	C_2H_4	0.0000	21,636	0
n-Propane	C_3H_8	0.0000	21,669	0
Propylene	C_3H_6	0.0000	21,048	0
iso-butane	iC_4H_{10}	0.0000	21,271	0
n-butane	nC_4H_{10}	0.0000	21,321	0
1-butene	C_4H_8	0.0000	20,854	0
iso-butylene	C_4H_{10}	0.0000	20,737	0
trans-2-butene	C_4H_8	0.0000	20,854	0
cis-2-butene	C_4H_8	0.0000	20,854	0
n-pentene	C_5H_{10}	0.0000	20,720	0
iso-pentane	iC_5H_{12}	0.0000	21,047	0
n-pentane	nC_5H_{12}	0.0000	21,095	0
C6+	C_6H_{14}	0.0000	20,966	0
hexane	C_6H_{14}	0.0000	20,966	0
			Total	6,290 Btu/lb

GCV 6,290 Btu/lb

Fd = [(3.64*%H+1.53*%C+0.14*%N - 0.46*%O)]*1000000/GCV
Fd = 8,258

* From Montana Refining Fuel Analysis

Montana Refining Gas Report

Sample Name: MISC H_2 Vent R
Date: 10/8/2008 7:41:02 AM
Data Acquisition Time: 10/8/2008 7:23:54 AM
Operator: gcmachine

Sample Number: 1
Study:
Cycle: 1
Reprocess Number: mrci-001: 7362

Instrument Name: Autosystem 1

Software Version; Date:

Sequence File: C:\Tcsequences\A1_MISC.seq
Inst Method: c:\tcmethods\a1_tcd1 from C:\Tcdata\Autosystem1\MISC\A1_TCD1_2008_10_08_MISC_

Channel:A
Raw Data File: C:\Tcdata\Autosystem1\MISC\A1_TCD1_2008_10_08_MISC_001.raw
Result File: C:\Tcdata\Autosystem1\MISC\A1_TCD1_2008_10_08_MISC_001.rst
Proc Method: c:\tcmethods\a1_tcd1 from C:\Tcdata\Autosystem1\MISC\A1_TCD1_2008_10_08_MISC
Calib Method: c:\tcmethods\a1_tcd1 from C:\Tcdata\Autosystem1\MISC\A1_TCD1_2008_10_08_MISC
Report Format File: c:\tcmethods\a1_MISC_tcd1.rpt

Channel:B
Raw Data File: C:\Tcdata\Autosystem1\MISC\A1_TCD2_2008_10_08_MISC_001.raw
Result File: C:\Tcdata\Autosystem1\MISC\A1_TCD2_2008_10_08_MISC_001.rst
Proc Method: c:\tcmethods\a1_tcd2 from C:\Tcdata\Autosystem1\MISC\A1_TCD2_2008_10_08_MISC
Calib Method: c:\tcmethods\a1_tcd2 from C:\Tcdata\Autosystem1\MISC\A1_TCD2_2008_10_08_MISC
Report Format File: c:\tcmethods\a1_MISC_tcd2.rpt

A/B	Component Name	Concentration Amount	Normalized
B	C5=,C6+	0.0000	0.00
B	Propane	0.0000	0.00
B	Propylene	0.0000	0.00
B	I-Butane	0.0000	0.00
B	Propedlene	0.0000	0.00
B	n-Butane	0.0000	0.00
B	Butene 1	0.0000	0.00
B	i-Butylene	0.0000	0.00
B	t-Butene 2	0.0000	0.00
B	c-Butene 2	0.0000	0.00
B	1,3-Butadiene	0.0000	0.00
B	I-Pentane	0.0000	0.00
B	n-Pentane	0.0000	0.00
A	Hydrogen	46.4078	50.39
A	Carbon Dioxide	28.7386	29.91
A	Ethylene	0.0000	0.00
A	Ethane	0.0000	0.00
A	H2S	0.0000	0.00
A	Oxygen	0.2320	0.24
A	Nitrogen	3.9328	4.09
A	Methane	12.3299	12.83
A	Carbon Monoxide	2.4291	2.53
		96.0702	100.00

Operator: H_2 Plant Vent Tank

Calculation of Fd Factor

Source: Diesel Hydrotreater Heater (HTU) H1701
Type of Fuel: Fuel Gas
Sample Taken: 09/20/07

Compound		Mole % *	Mol Wt	Weight Lbs	Wt Fract	Wt of H Lbs	Wt of C Lbs	Wt of N Lbs	Wt of O Lbs
Hydrogen	H_2	0.00	2.0160	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Carbon Dioxide	CO_2	0.13	44.0100	0.0572	0.0033	0.0000	0.0156	0.0000	0.0416
Oxygen	O_2	0.19	31.9988	0.0608	0.0035	0.0000	0.0000	0.0000	0.0608
Nitrogen	N_2	7.31	28.0134	2.0478	0.1167	0.0000	0.0000	2.0478	0.0000
Carbon Monoxide	CO	0.00	28.0100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Methane	CH_4	89.62	16.0400	14.3750	0.8189	3.6135	10.7642	0.0000	0.0000
Ethane	C_2H_6	1.75	30.0700	0.5262	0.0300	0.1058	0.4204	0.0000	0.0000
Ethylene	C_2H_4	0.00	28.5400	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Propane	C_3H_8	0.73	44.1000	0.3219	0.0183	0.0589	0.2630	0.0000	0.0000
Propylene	C_3H_6	0.00	42.5100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
iso-butane	iC_4H_{10}	0.11	58.1200	0.0639	0.0036	0.0111	0.0528	0.0000	0.0000
n-butane	nC_4H_{10}	0.13	58.1200	0.0756	0.0043	0.0131	0.0625	0.0000	0.0000
1-butene	C_4H_8	0.00	56.6800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
iso-butylene	C_4H_{10}	0.00	58.1200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
trans-2-butene	C_4H_8	0.00	56.6800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
cis-2-Butene	C_4H_8	0.00	56.6800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1,3 Butadiene	C_4H_6	0.00	54.5200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
iso-pentane	iC_5H_{12}	0.00	72.1500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-pentane	nC_5H_{12}	0.00	72.1500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C6+	C_6H_{14}	0.03	87.1800	0.0262	0.0015	0.0042	0.0217	0.0000	0.0000
hexane	C_6H_{14}	0.00	87.1800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hydrogen Sulfide	H_2S	0.00	34.0800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		100.00		17.5546	1.0001	3.8066	11.6002	2.0478	0.1024
			Percent(w/w%)		100.01	21.68	66.08	11.67	0.58

Calculation of Fd Factor

Source: **Diesel Hydrotreater Heater (HTU) H1701**
Type of Fuel: **Fuel Gas**
Sample Taken: **09/20/07**

	% of Fuel by Weight
%H	21.6843
%C	66.0807
%N	11.6653
%O	0.5833

Molecular Weights utilized for calculations:	
H	1.008
C	12.011
N	14.007
O	15.999

Compound		**Wt Fraction**	**Standard Btu/lb**	**Sample Btu/lb**
Hydrogen	H_2	0.0000	61,095	0
Carbon Dioxide	CO_2	0.0033	0	0
Oxygen	O_2	0.0035	0	0
Nitrogen	N_2	0.1167	0	0
Carbon Monoxide	CO	0.0000	4,347	0
Methane	CH_4	0.8189	23,875	19,551
Ethane	C_2H_6	0.0300	22,323	670
Ethylene	C_2H_4	0.0000	21,636	0
n-Propane	C_3H_8	0.0183	21,669	397
Propylene	C_3H_6	0.0000	21,048	0
iso-butane	iC_4H_{10}	0.0036	21,271	77
n-butane	nC_4H_{10}	0.0043	21,321	92
1-butene	C_4H_8	0.0000	20,854	0
iso-butylene	C_4H_{10}	0.0000	20,737	0
trans-2-butene	C_4H_8	0.0000	20,854	0
cis-2-butene	C_4H_8	0.0000	20,854	0
n-pentene	C_5H_{10}	0.0000	20,720	0
iso-pentane	iC_5H_{12}	0.0000	21,047	0
n-pentane	nC_5H_{12}	0.0000	21,095	0
C6+	C_6H_{14}	0.0015	20,966	31
hexane	C_6H_{14}	0.0000	20,966	0
			Total	20,817 Btu/lb

GCV 20,817 Btu/lb

Fd = [(3.64*%H+1.53*%C+0.14*%N - 0.46*%O)]*1000000/GCV
Fd = 8,714

* From Montana Refining Fuel Analysis

Montana Refining Gas Report

Sample Name: MISC City Gas
Date: 10/8/2008 8:58:43 AM
Data Acquisition Time: 10/8/2008 8:41:36 AM
Operator: gcmachine

Sample Number: 1
Study:
Cycle: 1
Reprocess Number: mrci-001; 7366

Instrument Name: Autosystem 1

Software Version; Date:

Sequence File: C:\Tcsequences\A1_MISC.seq
Inst Method: c:\tcmethods\a1_tcd1 from C:\Tcdata\Autosystem1\MISC\A1_TCD1_2008_10_08_MISC_

Channel:A
Raw Data File: C:\Tcdata\Autosystem1\MISC\A1_TCD1_2008_10_08_MISC_001-20081008-084143.
Result File: C:\Tcdata\Autosystem1\MISC\A1_TCD1_2008_10_08_MISC_001-20081008-085843.
Proc Method: c:\tcmethods\a1_tcd1 from C:\Tcdata\Autosystem1\MISC\A1_TCD1_2008_10_08_MISC
Calib Method: c:\tcmethods\a1_tcd1 from C:\Tcdata\Autosystem1\MISC\A1_TCD1_2008_10_08_MISC
Report Format File: c:\tcmethods\a1_MISC_tcd1.rpt

Channel:B
Raw Data File: C:\Tcdata\Autosystem1\MISC\A1_TCD2_2008_10_08_MISC_001-20081008-084144.
Result File: C:\Tcdata\Autosystem1\MISC\A1_TCD2_2008_10_08_MISC_001-20081008-085852.
Proc Method: c:\tcmethods\a1_tcd2 from C:\Tcdata\Autosystem1\MISC\A1_TCD2_2008_10_08_MISC
Calib Method: c:\tcmethods\a1_tcd2 from C:\Tcdata\Autosystem1\MISC\A1_TCD2_2008_10_08_MISC
Report Format File: c:\tcmethods\a1_MISC_tcd2.rpt

A/B	Component Name	Concentration Amount	Normalized
B	C5=,C6+	0.0334	0.03
B	Propane	0.7411	0.73
B	Propylene	0.0000	0.00
B	i-Butane	0.1072	0.11
B	Propadiene	0.0000	0.00
B	n-Butane	0.1341	0.13
B	Butene 1	0.0000	0.00
B	i-Butylene	0.0000	0.00
B	t-Butene 2	0.0000	0.00
B	c-Butene 2	0.0000	0.00
B	1,3-Butadiene	0.0000	0.00
B	i-Pentane	0.0000	0.00
B	n-Pentane	0.0000	0.00
A	Hydrogen	0.0033	0.00
A	Carbon Dioxide	0.1279	0.13
A	Ethylene	0.0000	0.00
A	Ethane	1.7808	1.75
A	H2S	0.0000	0.00
A	Oxygen	0.1905	0.19
A	Nitrogen	7.4307	7.31
A	Methane	91.0926	89.62
A	Carbon Monoxide	0.0000	0.00
		101.6416	100.00

Operator: City Gas - Low Pressure

EQUIPMENT CALIBRATION

Montana Refining Company, Inc.
Diesel Hydrotreater Heater (HTU) H1701 &
Hydrogen Plant Reformer Heater H1810 Stacks
Great Falls, Montana

10/08/08

1) Meter Box
8-R
08/18/08 @ 1.01 (Full Profile)
10/14/08 @ 1.02 (@ 2.0"H_20 Delta H and 7.0" Hg Vacuum)

2) Thermocouple (M) and Dial Thermometers
Note attached following sheets.

3) Pitot Tube (S-type, #170)
A S-Type pitot was utilized as manufactured by EEMC. Note attached data sheets for specifications.

4) Barometer (aneroid)
The aneroid barometer was calibrated with a mercury wall barometer prior to and after the test series. See attached data sheet.

5) NO_x/CO
EPA Protocol 1 span gases were utilized for calibration. N_2 zero gas was employed. Instrument calibration drift and bias determinations follow each run. NO_x converter efficiency is noted on the computer/logger.

METER BOX CALIBRATION

Date: 8-18-08 Calibrated By: DJW Dry Gas Meterbox ID: 8R

Barometric Pressure, Pb: 26.62 Vacuum: _____

Orifice Manometer Setting Δ H in. H_2O	0.5	1.0	2.0	3.0	4.0	5.0
Gas Volume Wet Test Meter Vw, ft3	5	5	7.5	10		
Gas Volume Dry Gas Meter M Final	533.891	539.048	546.775	557.058		
M Initial	529.000	534.100	539.300	547.000		
Vd, ft3	4.891	4.948	7.475	10.058		
Wet Test Meter tw F°	74	74	74	74		
tw A°	534	534	534	534		
Dry Gas Meter Outlet, tmo 1)	73	73	74	74		
2)	73	74	74	75		
3)	73	74	74	75		
Dry Gas Meter Inlet, tmi 1)	75	75	76	76		
2)	75	75	76	77		
3)	75	76	76	77		
Mean tm F°	74	75	75	76		
tm A°	534	535	535	536		
Time θ minutes	727/12.12	536/8.93	577/9.62	633/10.55		
Results, Y= (Vw)(Pb)(tm) / Vd (Pb+ΔH/13.6)(tw)	1.02	1.01	1.00	.99		
$\Delta H @ = \frac{.0317(H)}{Pb(tm)}\left[\frac{(tw)\theta}{Vw}\right]^2$	1.87	2.02	2.09	2.12		

Averages: Y= 1.01 **ΔH=** 2.03

Notes:

Pb+ΔH/13.6 = Pm

28.97 = molecular weight of air

y = ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01.

ΔH = Orifice pressure differential that gives 0.75 cfm of air at 70 °F and 29.92 in. of Hg in H_2O. Tolerance ± 0.15.

Revised 5-25-07 af

METER BOX CALIBRATION

Date: 10-14-08 Calibrated By: DFW Dry Gas Meterbox ID: 8R

Barometric Pressure, Pb: 26.55 Vacuum: 7"

post test

Orientation Manometer Setting Δ H in. H2O	2.0 ~~0.5~~	2.0 ~~1.0~~	2.0 ~~2.0~~	3.0	4.0	5.0
Gas Volume Wet Test Meter Vw, ft3	5	5	5			
Gas Volume Dry Gas Meter M Final	729.883	734.778	739.718			
M Initial	725.000	729.883	734.778			
Vd, ft3	4.883	4.895	4.940			
Wet Test Meter tw F°	73	73	73			
tw A°	533	533	533			
Dry Gas Meter Outlet, tmo 1)	73	73	74			
2)	73	73	74			
3)	73	74	74			
Dry Gas Meter Inlet, tmi 1)	75	76	76			
2)	76	76	77			
3)	76	76	77			
Mean tm F°	74	75	75			
tm A°	534	535	535			
Time θ minutes						
Results, $Y = \frac{(Vw)(Pb)(tm)}{Vd\ (Pb+\Delta H/13.6)(tw)}$	1.02	1.02	1.01			
$\Delta H @ = \frac{.0317(H)}{Pb(tm)}\left[\frac{(tw)\theta}{Vw}\right]^2$						

Averages: Y= 1.02 **ΔH=** _____

Notes:

Pb+ΔH/13.6 = Pm

28.97 = molecular weight of air

y = ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01.

ΔH = Orifice pressure differential that gives 0.75 cfm of air at 70 °F and 29.92 in. of Hg in H2O. Tolerance ± 0.15.

Revised 5-25-07 af

1744 Mullowney Lane
Billings, MT 59101

3730 N. Pellegrino Drive
Tucson, AZ 85749

Thermocouple Calibration

Date: 8-25-08
Ambient Temperature: 73 °F
Calibrator: Dfw

Themocouple No.: M
Barometric Pressure: 26.60 "Hg
Reference: Mercury in glass: x
Other: _____

Reference Point No. [a]	Source [b] (specify)	Reference Thermocouple Temperature °F	°C	Thermocouple Potentiometer Temperature °F	°C	Difference [c]
	water	50	10.0	50	10	0
	"	100	37.8	100	37.8	0
	"	150	65.6	150	65.6	0
	"	200	93.3	199	92.8	.1
	oven	250	121.1	249	120.6	.1
	"	300	148.9	300	148.9	0
	"	350	176.7	350	176.7	0
	"	400	204.4	400	204.4	0
	"	450	232.2	449	231.7	.1
	"	500	260.0	497	258.3	.3
	"	550	287.8	546	285.6	.4
	"	600	315.6	596	313.3	.4
	"	650	343.3	645	340.6	.4
	"	700	371.1	696	368.9	.3
	"	750	398.9	744	395.6	.5
	"	800	426.7	794	423.3	.5
	"	850	454.4	844	451.1	.5

[a] Every 30°C (50°F) for each reference point
[b] Type of Calibration system used
[c] [(Ref. Temp: °C + 273) - (Test Therm. Temp: °C +273)] / (Ref. Temp. °C + 273) x 100 < 1.5%

1744 Mullowney Lane
Billings, MT 59101

3730 N. Pellegrino Drive
Tucson, AZ 85749

Thermocouple Calibration

Date: 10 - 14 - 08
Ambient Temperature: 73 °F
Calibrator: DJW

Themocouple No.: M
Barometric Pressure: 26.55 "Hg
Reference: Mercury in glass: x
Other: _____

Reference Point No. [a]	Source [b] (specify)	Reference Thermocouple Temperature °F	°C	Thermocouple Potentiometer Temperature °F	°C	Difference [c]
	water	50	10.0	50	10	0
	"	100	37.8	100	37.8	0
	"	150	65.6	150	65.6	0
	"	200	93.3	198	92.2	.3
	oven	250	121.1	248	120	.3
	"	300	148.9	300	148.9	0
	"	350	176.7	350	176.7	0
	"	400	204.4	400	204.4	0
	"	450	232.2	448	231.1	.2
	"	500	260.0	497	258.3	.3
	"	550	287.8	546	285.6	.4
	"	600	315.6	596	313.3	.4
	"	650	343.3	645	340.6	.4
	"	700	371.1	696	368.9	.3
	"	750	398.9	744	395.6	.5
	"	800	426.7	795	423.9	.4
	"	850	454.4	844	451.1	.5

[a] Every 30°C (50°F) for each reference point
[b] Type of Calibration system used
[c] [(Ref. Temp: °C + 273) - (Test Therm. Temp: °C +273)] / (Ref. Temp. °C + 273) x 100 < 1.5%

WorldDrive01:\Forms\Forms\Thermocouple1.doc
Revised 7/13/07 jmf

EEMC

Sample Train Temperature Calibration Data
Dial Thermometers

Ref. No. 8R

Standard: Glass Thermometer X

Date 10-4-08

PRE-TEST

Thermometer	**Boiling Water** 207	**Ambient** 73	**Acceptable Range** +/- 2°F
Impinger	207	72	
Meter 1	206	73	
Meter 2	205	72	
Collection Box	205	72	

Date 10-14-08

POST-TEST

Thermometer	**Boiling Water** 207	**Ambient** 72	**Acceptable Range** +/- 2°F
Impinger	206	71	
Meter 1	207	72	
Meter 2	206	71	
Collection Box	205	71	

Revised 5-10-07 af

EEMC

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot Number 170 Date 10-14-08

Pitot tube assembly level ? X yes _____ no

Pitot tube openings damaged ? _____ yes (explain below) X no

α_1 = .5 ° (<10°), α_2 = 0 ° (<10°), β_1 = .5 ° (<5°), β_2 = 1.0 ° (<5°)

γ = 0 °, θ = 0 °, A = .960 (in.)

z = A sin γ = 0 (in.); < 0.32 (< 1/8 in.)

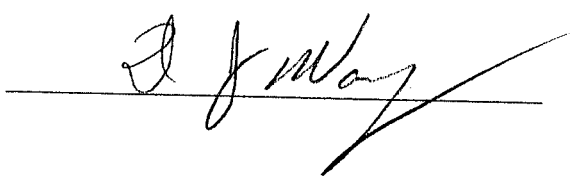
w = A sin θ = 0 (in.); < .08 (< 1/32 in.)

P_A .480 (in.) P_b .480 (in.)

D_t = .375 (in.)

Comments: _____

Calibration required ? _____ yes X no

Signature 

Revised 5-10-07 af

EEMC

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot Number 170 Date 10-4-08

Pitot tube assembly level ? X yes _____ no

Pitot tube openings damaged ? _____ yes (explain below) X no

α_1 = .5 ° (<10°), α_2 = 0 ° (<10°), β_1 = .5 ° (<5°), β_2 = 1.0 ° (<5°)

γ = 0 °, θ = 0 °, A = .960 (in.)

z = A sin γ = 0 (in.); < 0.32 (< 1/8 in.)

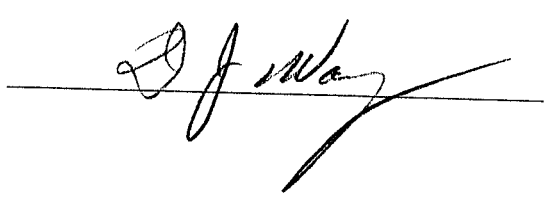
w = A sin θ = 0 (in.); < .08 (< 1/32 in.)

P_A .480 (in.) P_b .480 (in.)

D_t = .375 (in.)

Comments: _____

Calibration required ? _____ yes X no

Signature 

Revised 5-10-07 af

1744 Mullowney Lane
Billings, MT 59101

3730 N. Pellegrino Drive
Tucson, AZ 85749

BAROMETER CALIBRATION

Date	Hg Barometer Reading	Aneroid Barometer	Difference
5-17-07	26.62	26.62	.00
6-19-07	26.65	26.64	.01
7-31-07	26.66	26.67	.01
8-15-07	26.65	26.65	.00
8-31-07	26.69	26.68	.01
9-26-07	26.58	26.58	.00
10-18-07	26.40	26.40	.00
11-16-07	26.71	26.71	.00
12-15-07	26.62	26.63	.01
1-9-08	26.31	26.31	.00
1-24-08	26.47	26.46	.01
2-27-08	26.50	26.50	.00
3-21-08	26.46	26.46	.00
4-2-08	26.58	26.57	.01
4-25-08	26.55	26.55	.00
5-15-08	26.77	26.78	.01
5-22-08	26.45	26.45	.00
6-12-08	26.49	26.48	.01
6-28-08	26.69	26.69	.00
7-17-08	26.63	26.62	.01
8-2-08	26.58	26.58	.00
8-29-08	26.65	26.64	.01
9-20-08	26.55	26.55	.00
10-4-08	26.53	26.53	.00
10-14-08	26.55	26.54	.01

AMERICAN INDUSTRIAL GASES, INC.
AMERICAN RARE GASES, INC.

6055 BRENT DR. TOLEDO, OH 43611
419-729-7732 FAX 419-729-2411

THE AMERICAN GAS GROUP

www.americangasgroup.com

ANALYTICAL REPORT

Certificate ID: 101507010 **Date:** 10/15/2007

Customer Name: General Distributing - Billings

Customer Address: 1327 S 29th St.

Billings MT 59102

Purchase Order: 121010 **Work Order:** 067784-02

Lot Number: 1001HG07 **Product Name:** 2-Component Mixture, EPA Protocol

Size: 16A **Pressure:** 2200 psig @ 90 Deg F

Content: NA

Serial #: ET0001857

Analysis Date: 10/15/2007

Shelf Life: 24 months **Expiration Date:** 10/15/2009

Component	Nominal	Actual	Accuracy	Method
Nitrogen Oxides (NOx)	50 ppm	50.2 ppm	+/- 1% rel	Chemiluminescence
Nitrogen	Balance	Balance		

REFERENCE STANDARD

Std Type	Std #	Cyl #	Concentration	Exp Date
GMIS	0329SH07	EB0005004	251.0000	6/14/2009

INSTRUMENTATION

Instrument / ID	Component
Rosemount 951A	NOx

Note: * ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS - SEPTEMBER 1997:G1
* DO NOT USE STANDARD WHEN PRESSURE IS BELOW 150 PSIG

Protocal
Specialty Gases of America, Inc

Issued by: Josh Jones

AIR LIQUIDE™

CERTIFICATION OF ANALYSIS

Interference Free Multi-Component EPA Protocol Gases

Note: Analytical uncertainty and NIST traceability are in compliance with EPA-600/R-97/121
Section 2.2, Procedure G-1

Cylinder S/N: AL88466

Customer: VALLEY WELDERS & INDUSTRIAL SUPPLY
Location: LA PORTE, TX

Shipping Order Number: 30580498
Transfer Number:
Lot Number: SFS124405
Valve: CGA 660
Cylinder Pressure*: 2000 PSIG
*Cylinder should not be used when gas pressure is below 150 psig

P.O. Number: 82493
Item Number:

Assay Date: 19-Sep-2008 **Expiration Date: 19-Mar-2009**

Components	Requested Concentration	Assay Concentration
Nitrogen	Balance	Balance
Nitrogen Dioxide	55 ppm	51.6 ± 1.3 ppm

ence Standard(s) Employed For Analysis

Certified Concentration and Uncertainty				Component	Balance	Cyl. No.	SRM/PRM/Mix No.	Exp. Date	Sample No.	Type
51.4	±	1.2	ppm	Nitrogen Dioxide	Nitrogen	EB0009973	SFS119543	12-Jul-2010	BI	GMIS

tical Data

Component:	Nitrogen Dioxide
ina formation	
ina e:	Fourier Transform IR
Manu er:	MKS Instruments
Model Number:	2031
Serial Number:	10387278
MPR Last Calibrated:	4-Sep-2008
Analytical Principle:	FTIR

	FIRST TRIAD ANALYSIS 11-Sep-2008			
	Trial 1	Trial 2	Trial 3	Units
Zero	0.010	0.011	0.015	ppm
Reference	51.326	51.325	51.331	ppm
Candidate	51.581	51.794	51.666	ppm
Result	51.66	51.87	51.74	ppm
Evaluation	Valid	Valid	Valid	
Mean Analytical Result:			51.76	ppm

	SECOND TRIAD ANALYSIS 19-Sep-2008			
	Trial 1	Trial 2	Trial 3	Units
Zero	-0.025	-0.013	-0.015	ppm
Reference	51.232	51.234	51.257	ppm
Candidate	51.235	51.176	51.275	ppm
Result	51.40	51.34	51.42	ppm
Evaluation	Valid	Valid	Valid	
Mean Analytical Result:			51.39	ppm

Analyst: _____ Thuan Tran Approved by: _____ Tan Ngo

AIR LIQUIDE AMERICA, L.P. 8832 Dice Road, Santa Fe Springs, CA 90670-2516
Phone: (562) 945-1383 ● Fax: (562) 693-1156

Airgas

Airgas Specialty Gases
12722 S. Wentworth Avenue
Chicago, IL 60628
1-773-785-3000
FAX: 1-773-785-1928
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02NI99E80A2906	Reference Number:	54-124146707-2
Cylinder Number:	LL31587	Cylinder Volume:	83 Cu.Ft.
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2215 PSIG
Analysis Date:	Aug 11, 2008	Valve Outlet:	660

Expiration Date: Aug 11, 2010

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NITRIC OXIDE	98.00 PPM	100.6 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

Total oxides of nitrogen 100.7 PPM For Reference Only

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM/NO	11106	CC207573	93.2PPM NITRIC OXIDE/	Jan 01, 2010

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Thermo 6700	FTIR	Aug 04, 2008

Triad Data Available Upon Request

Notes:

QA Approval

A GG
THE AMERICAN GAS GROUP

SPECIALTY GASES OF AMERICA, INC.
AMERICAN INDUSTRIAL GASES, INC.
AMERICAN RARE GASES, INC.

6055 BRENT DR. TOLEDO, OH 43611
419-729-7732 FAX 419-729-2411

www.americangasgroup.com

ANALYTICAL REPORT

Certificate ID: 100206L008 **Date:** 10/2/2006

Customer Name: General Distributing

Customer Address: 103 Bridger Center Dr

Bozeman MT 59772

406-454-1351

Purchase Order: 107478 **Work Order:** 054213-03

Lot Number: 0921SA06 **Product Name:** 3-Component Mixture, EPA Protocol

Size: 16A **Pressure:** 2000 psig @ 70 degF

Content: NA

Serial #: ER0000536

Analysis Date: 10/2/2006

Shelf Life: 36 months **Expiration Date:** 10/2/2009

Component	Nominal	Actual	Accuracy	Method
Carbon Monoxide	43 ppm	43.8 ppm	+/- 0.1 ppm	NDIR
Oxygen	8.6%	8.63%	+/- 0.03%	Paramagnetic
Nitrogen	Balance	Balance		

REFERENCE STANDARD

Std Type	Std #	Cyl #	Concentration	Exp Date
GMIS	1011BC05	EB0000910	99.5 ppm	2/8/2008
GMIS	1206BJ05	EB0001482	9.985%	2/7/2008

INSTRUMENTATION

Instrument / ID	Component
Horiba VA-3000	CO
Rosemount 755R	O2

Note: * ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS - SEPTEMBER 1997:G1
* DO NOT USE STANDARD WHEN PRESSURE IS BELOW 150 PSIG

Protocal
Specialty Gases of America, Inc

Issued by: Duncan Lam

AMERICAN INDUSTRIAL GASES, INC.
AMERICAN RARE GASES, INC.

6055 BRENT DR. TOLEDO, OH 43611
419-729-7732 FAX 419-729-2411

THE AMERICAN GAS GROUP

www.americangasgroup.com

ANALYTICAL REPORT

Certificate ID: 100206L010 **Date:** 10/2/2006

Customer Name: General Distributing

Customer Address: 103 Bridger Center Dr

Bozeman MT 59772

406-454-1351

Purchase Order: 107478 **Work Order:** 054213-00

Lot Number: 0921BB06 **Product Name:** 2-Component Mixture, EPA Protocol

Size: 16A **Pressure:** 2000 psig @ 70 degF

Content: NA

Serial #: ER0000533

Analysis Date: 10/2/2006

Shelf Life: 36 months **Expiration Date:** 10/2/2009

Component	Nominal	Actual	Accuracy	Method
Carbon Monoxide	97 ppm	93.5 ppm	+/- 0.2 ppm	NDIR
Nitrogen	Balance	Balance		

REFERENCE STANDARD	Std Type	Std #	Cyl #	Concentration	Exp Date
	GMIS	1011BC05	EB0000910	99.5 ppm	2/8/2008

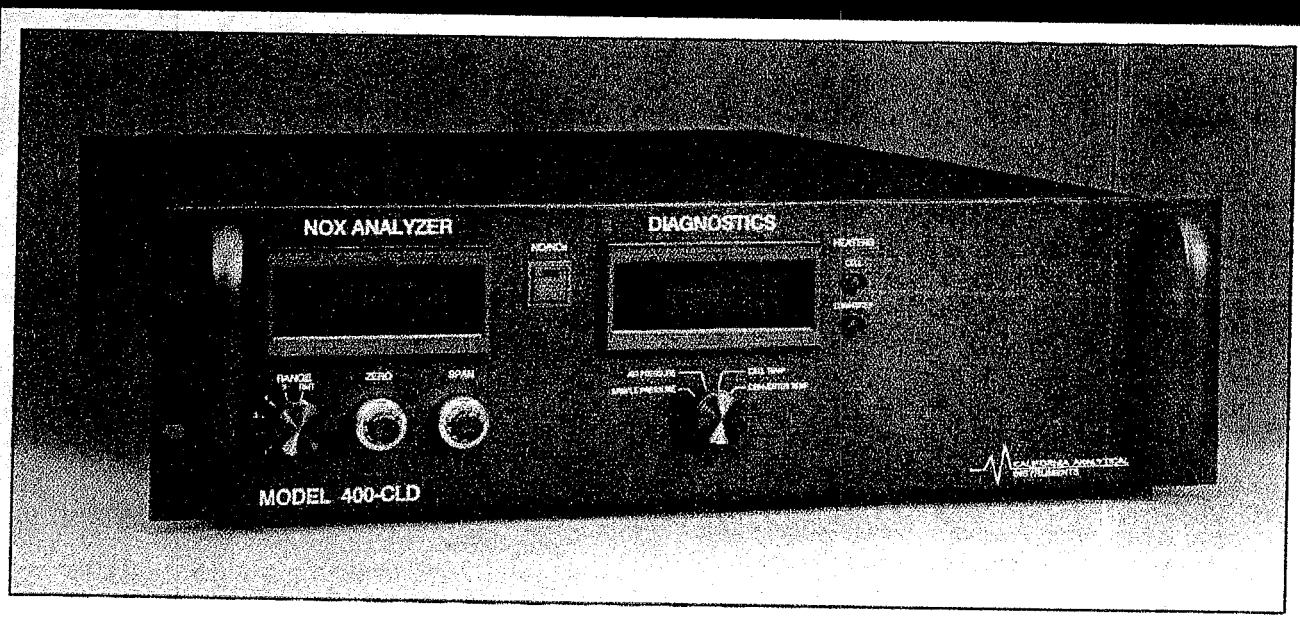
INSTRUMENTATION	Instrument / ID	Component
	Horiba VA-3000	CO

Note: * ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS - SEPTEMBER 1997:G1
* DO NOT USE STANDARD WHEN PRESSURE IS BELOW 150 PSIG

Protocal
Specialty Gases of America, Inc

Issued by: Duncan Lam

CHEMILUMINESCENT NO/NO_x ANALYZER



Model 400 CLD

FEATURES

- Sensitivity to 3 ppm NO/NO_x Full Scale
- Automatic High Voltage Shutdown with Loss of Ozone Air
- Complete Digital Presentation Including Sample & Air Pressure (No Gauges)
- Five Ranges
- Remote Operation Capability
- Sample Pump (Optional)
- CE Approved

CLD OPTIONS

- 19 Inch Rack Mount Slides
- Remote In-line Sample Filter
- Built-in Sample Pump

APPLICATIONS

- Stack Gases (CEM)
- Source Monitoring
- Scrubber Efficiency
- Process Chemical Gas Analysis
- Personnel Safety
- Power Plant Stack De-Nitrification
- Vehicle Emissions
- Low NO_x Applications

California Analytical Instruments, Inc.

CALIFORNIA ANALYTICAL INSTRUMENTS, INC.

ANALYZER ASSEMBLY & CALIBRATION CHECKLIST

ASSEMBLY NUMBER: 110556-1 MODEL NUMBER: 400 CLD

SERIAL NUMBER: P12023

ASSEMBLY COMPLETED BY: _____ DATE: _____

CHECKLIST:

- ☐ Front panel assembly complete per CAI assembly drawings
- ☐ Rear panel assembly complete per CAI assembly drawings
- ☐ Solenoid valves leak tested where applicable
- ☐ Oven assembly complete per CAI assembly drawings
- ☐ Sealants applied to fitting per MFG'S specifications
- ☐ Fittings tightened per MFG'S specifications
- ☐ PCB's pre-tested
- ☐ RTD's, T/C's and heaters pre-tested
- ☐ Mechanical parts & assemblies installed per CAI assembly drawings
- ☐ Electrical parts & assemblies installed per CAI assembly drawing

COMMENTS: _____

CALIBRATION COMPLETED BY: Jon Woods DATE: 12-20-03

- ☑ Pre burn-in complete
- ☑ Burn-In: In date: 12-18-03 Out date: 12-22-03
- ☑ Final test complete

COMMENTS: 0-1VDC output

CALIFORNIA ANALYTICAL INSTRUMENTS, INC.

400 CLD QA Check List

Customer: EEMC Corp S/N: P/2023

Sales Order: 12007 Date: 12-20-03 By: Jon Woods

1. PS Voltages Ref. +12 V ✓ -12 V ✓ +5 V ✓
   +20 V ✓ +12.000 V ✓ AC Wiring ✓
2. PGA (Zero) Adjust ✓
3. Sample Pressure Zero and Span Adjust ✓
4. Air Pressure Zero and Span Adjust ✓
5. O2/Air Lamp Set at 2.0 PSI +/- 0.5 ✓
6. Cell Temperature Span Adjust ✓
7. Converter Temperature Span Adjust ✓
8. Cell Heater Temperature 46 °C
9. Converter Heater Temperature 205 °C
10. Solenoid Valves Leak Check NA
11. Air Pressure Regulator Set to 25 PSI ✓
12. O2/Air Pressure 12.75 PS Flow Rate 600 cc/Min
13. Sample Pressure 3.65 PS Flow Rate 180 cc/Min
14. Converter By Pass Flow Rate 247 cc/Min
15. Sample By Pass Flow Rate 62 cc/Min
16. EPC By Pass Flow Rate 1500 cc/Min
17. Calibrate 0-1 VDC &/or 4-20 MADC Output ✓ 0-1vDC
18. Amplifier Gain Adjust ✓
19. Front Panel Displays Zero and Span Adjusted ✓
20. 3,000 ppm Range Adjusted N/A
21. Remote Range Change Tested ✓
22. Remote NO/NOx Solenoid Tested ✓
23. Remote Mode Tested ✓
24. Remote Sample Pressure and Converter Temperature Output Tested ✓
25. Response Time NO Mode (0-90% FS) 1.5 Seconds
26. Response Time NOx Mode (0-90% FS) 1.8 Seconds
27. NOx Converter Efficiency 97 %
28. CO2 Quench Value 2.2 %
29. Noise Level Range 1 <1 % FS
30. Front Panel Dial Settings Number Zero 6.00 Span 5.00

100/200/300 SERIES

NDIR/O_2

Infrared/Oxygen Multi-Component Analyzer

APPLICATIONS

- Stack Gases (CEM)
- Combustion Efficiency
- Process Chemical Gas Analysis
- Vehicle Emissions
- EPA Compliance
- Controlled Atmospheres
- Landfill Emissions

OPTIONS

- Two or Three NDIR Channels or One to Two NDIR Channels And Oxygen
- Choice of Paramagnetic or Fuel Cell Technology for Oxygen
- Alarms
- 19 Inch Rack Mount

FEATURES

- From ppm to 100%
- Single Beam Optics
- No Optical or Mechanical Adjustments Required
- Microflow Detector
- Unmatched Reliability
- Excellent Stability
- Lowest Sensitivity to Vibration
- Digital Concentration Display
- Linear or Nonlinear Output

CAI

1312 West Grove Avenue
Orange, CA 92865-4134
Phone: 714-974-5560 Fax: 714-921-2531
www.gasanalyzers.com

Listing of Quality Control Procedures
EPA #1-4, #5, #6, #8, #17, #201A & #202 Testing Methodology
Particulates/SO_2/SO_3/Condensible Particulates

I. Calibration of Equipment

A. Meter box (meter)

The meter box is calibrated with a wet test meter prior to and after the test series. In addition the initial test includes a profile covering pertinent Delta H values (completed at least every six months).

The post meter box calibration includes a triplicate calibration at the mean Delta H at the maximum meter vacuum experienced during the test series.*

*If an orifice slip stream is utilized the meter calibration is conducted at the maximum slip stream flow rate encountered during testing.

B. Thermometers

1) Dry gas meter (2)
2) Silica gel impinger effluent (1)

These dial thermometers are checked at ambient and water boiling conditions prior to and after the test series. If they are off more than +/- 5.4 °F for the Dry Gas Meter thermometer or Collection Box thermometer or +/-2.0 °F for the Impinger thermometer they are adjusted or replaced (if not correctable). In addition, all thermometers in the field are daily checked prior to sampling utilizing ambient temperatures (reference glass thermometers and/or an Omega Simulator (thermocouple)).

C. Manometer (vertical/inclined)

This device is a primary standard. It is leak checked prior to and during field utilization. During use it is operated at level conditions (bubble indicator).

D. Vacuum Gauge

The vacuum gauge is an indicator of train vacuum - it does not affect the sample. Performance is checked each time the unit is utilized. If it is suspect, it is discarded and replaced.

E. Meter Box Leak Integrity

The meter box is placed under positive pressure just prior to field testing to determine if a leak exists. This procedure is repeated prior to each meter calibration.

II. Sampling - continued

C. Temperature (Thermocouple)

An electronic simulator is utilized for field determination of response accuracy at the stack temperature.

D. Temperature

Dial - Train Thermometers are checked against ambient air to determine continued field integrity.

E. Orsat

Ambient air is analyzed in the field to assess orsat performance.

F. Impinger balance

The balance is zeroed and checked for accuracy with standard weights.

G. Probe cleaning

After probe wash/clean out the probe is visually inspected.

H. Sample Removal

The samples are placed into glass or inert plastic bottles for removal to the laboratory. Labeling includes (minimum):

a) Date
b) Run #
c) Level mark
d) Sample description
e) Source I.D.

I. Post Purge

Upon completion of Method #8 sampling a 15 minute post purge is conducted utilizing carbon filtered ambient air or tank N_2.

III. Laboratory Analysis

A. Particulates

The laboratory balance is calibrated (with S weights) <u>just prior to each act of weighing</u>. Standard interim weights are utilized to determine if the calibration has been successful (+/- 0.2mg).

B. Sample Weighing

1) Filters (initial - tare)

The desiccated filters are tared to a constant weight (+/- 0.5 mg).

IV. Post Sampling

A. Particulates

Samples are washed from each train component three times utilizing the specified wash material (acetone, ester, or MeCl2). The resultant captures are removed to EEMC's laboratory for analysis.

B. SO_2/SO_3

1) SO_2 samples are usually analyzed in the field and reanalyzed in the EEMC's laboratory
2) SO_3 samples can also be evaluated in the field but are usually returned to EEMC's laboratory for analysis.

If SO_3 is sampled/captured, a post sample purge of the 80%IPA Solution is conducted prior to analysis (15minutes with air or N_2)

This document is not designed to be a redundant dissertation of EPA methods. Instead, it is a brief commentary on general practices as routinely employed and almost all of which are described in EPA reference methods and quality control manuals.

Listing of Quality Control Procedures for EPA Methods #3A & 7E Testing Methodology

I. Calibration of Equipment (NO_X in N_2 or Air)

A) Zero and Span

EPA Protocol 1 calibration gases are utilized for instrument zero/span purposes. The filtered air or N_2 tank is utilized for zero purposes.

B) Chemiluminescents instrumentation or equivalent is utilized for NO_X concentration determination. Converter efficiency is determined utilizing tank gas containing NO/NO_2 as per Method #7E.

Interferences have been determined (by the vendors) to meet selectivity requirements.

C) All calibrations must be drawn through the sample interface. All instruments are checked for linearity via EPA Protocol 1 gases before each test series (zero and three calibration gas concentrations).

D) Sample Moisture

Moisture removal is via a thermoelectric cooler at the head of the interface and in the case of heavy moisture additionally at the terminal end of the interface prior to injection to the instruments.

II. Sampling (NO_X)

A) The results are recorded on an integrating computer/logger on a minute by minute basis.

B) Sample Interface

The interface is leak checked prior to and after each sampling session.

Listing of Quality Control Procedures
EPA Method #10 Testing Methodology

I. Calibration of Equipment (CO in N_2)

A) Zero and Span

EPA Protocol 1 gases are utilized for cell CO calibration. Linearity is initially determined by the introduction of zero and three calibration gas concentrations (~0% of scale, ~30% of scale, and one at high span ~60-90% of scale).

B) Interferences (CO_2)

The NDIR Monitor utilized does not respond significantly to CO_2. A high concentration of CO_2 (~12%) when injected into the CO NDIR Monitors does not indicate any interference (<0.1% of scale or 5ppm v/v @ 0-5000 pp, v/v span). Ascarite as a result is not normally utilized in the sample train.

C) Sample Flow

The monitors pump their own gas sample. The flow rate is maintained during the sample run.

D) Sample Interface

The interface is leak checked prior to and after each sampling session. All calibrations must be drawn through the sample interface.

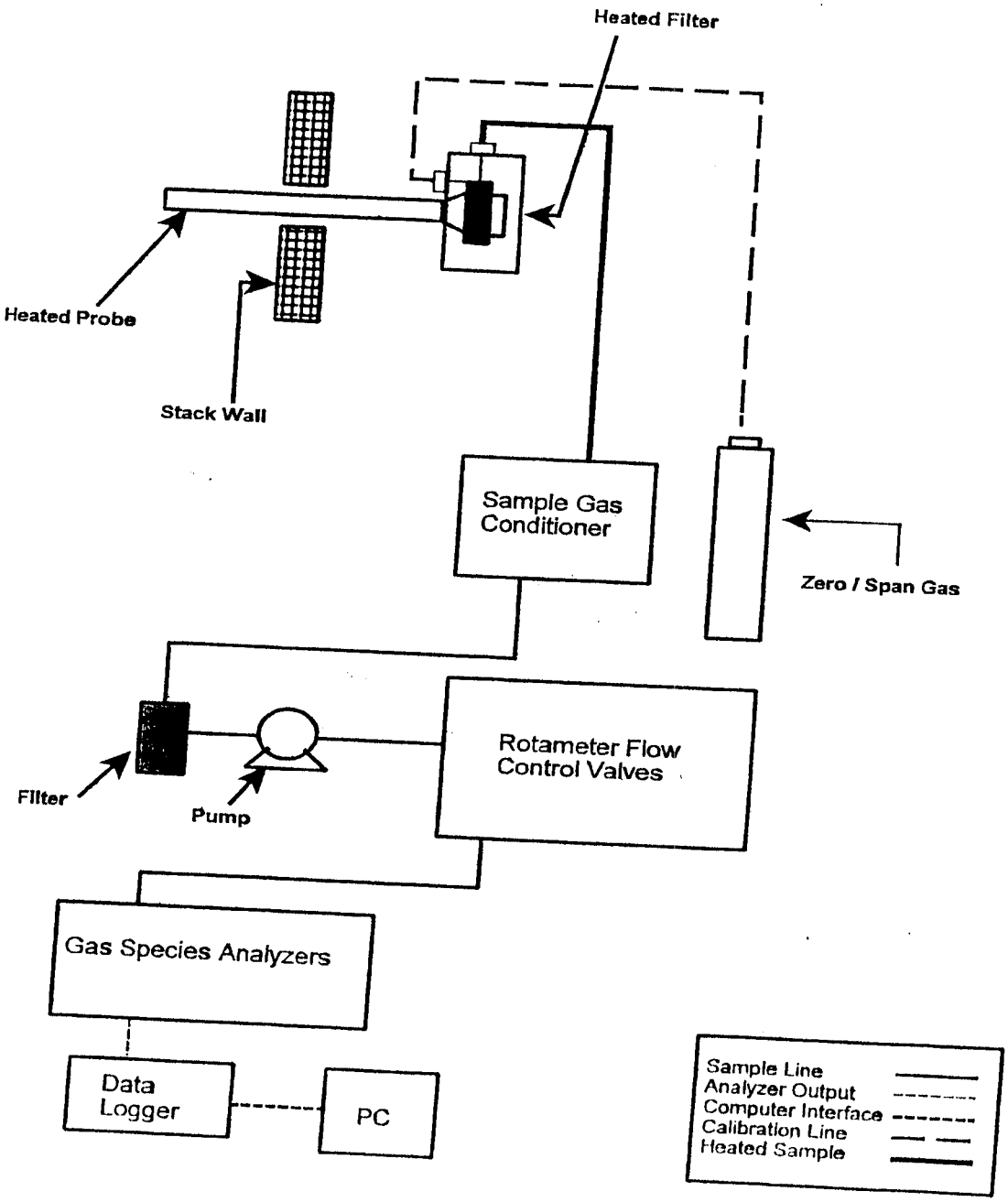
E) Sample Moisture

Moisture removal is via a thermoelectric cooler at the head of the interface and in the case of heavy moisture additionally at the terminal end of the interface prior to injection to the instruments.

II Sampling (CO)

CO instrument data is computer logged automatically utilizing one minute integrations.

EPA Methods
3A / 6C / 7E / 10
O_2 & CO_2 / SO_2 / NO_x / CO
Example Sampling Train



EPA Methods #1-4
Gas Flow / CO2 / O2 / Moisture
Example Sampling Train