GE Energy

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Project Supervisor

ISO 9001 Accredited
Quality System

GASEOUS EMISSIONS COMPLIANCE STUDY

Performed For
WRB Refining LLC

At the
Wood River Refinery
Hydrogen Plant
Roxana, Illinois
Operated By: ConocoPhillips Company

Test Date
April 19, 2007

Report No.
GE Energy Management Services, Inc. Report M22E1454I

Report Submittal Date
May 24, 2007

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GE Energy

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CERTIFICATION SHEET

Having reviewed the test program described in this report, I hereby certify the data, information, and results in this report to be accurate and true according to the methods and procedures used.

Data collected under the supervision of others is included in this report and is presumed to have been gathered in accordance with recognized standards.

GE ENERGY MANAGEMENT SERVICES, INC.

Frank H. Jarke
Manager, Quality Assurance

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GASEOUS EMISSIONS COMPLIANCE STUDY
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At The
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Roxana, Illinois
Operated By: ConocoPhillips Company
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1.0 INTRODUCTION

GE Energy Management Services, Inc. ("GE Energy") performed a gaseous emissions compliance study program on the Hydrogen Plant at the Wood River Refinery of WRB Refining LLC in Roxana, Illinois on April 19, 2007. The tests were authorized by the operator, ConocoPhillips Company and performed for WRB Refining LLC.

The purpose of this test program was to determine nitrogen oxides (NO_x) and carbon monoxide (CO) concentrations and emission rates during normal operating conditions.

1.1 Project Contact Information

Location	Address	Contact
Test Facility	WRB Refining LLC Wood River Refinery 900 South Central Roxana, Illinois 62084	Ms. Catherine Lanter 618-255-2505 (phone) catherine.m.lanter@conocophillips.com
Testing Company Representative	GE Energy 888 Industrial Drive Elmhurst, Illinois 60126	Mr. David Thompson Project Supervisor 630-530-6690 (phone) 630-530-6630 (fax) david3.thompson@ge.com

Messrs. D. Stelk, D. McNulty, T. Cassin and D. Thompson of GE Energy conducted the tests.

2.0 SUMMARY OF RESULTS

The relative accuracies of the CEM systems are as follows:

Parameter		HP-1 Unit
NO_x	ppmvd	25.9
	lb/hr	15.5
	lb/MMBtu	0.041
CO	ppmvd	0.0
	lb/hr	0.0
	lb/MMBtu	0.0
O_2 %, dry	% dry	2.2

The complete test results of this program are tabulated in Section 6.

3.0 DISCUSSION OF RESULTS

No problems were encountered with the testing equipment during the test program. Source operation appeared normal during the entire test program. Unit operating data was recorded by plant personnel and is appended to the report.

A calculated heat input value was used to calculate the emissions on a lbs/MMBtu basis and heat input data provided by plant personnel and appended to the report. The gas volumetric flow rata values that were used in the calculation of pounds per hour (lb/hr) were taken from the appended Method 2 pitot sheets.

4.0 TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed as described in the Code of Federal Regulations, Title 40, Part 60 (40CFR60), Appendix A, Methods 1, 2, 3, 3A, 4 (alternative), 7E, 10 and the latest revisions thereof. Where applicable, the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, USEPA 600/R-94/038c, September 1994 was used to supplement procedures.

4.1 Volumetric Flowrate Determination

The stack gas velocity and volumetric flowrate were determined using Reference Methods 2.

Velocity pressures were determined by traversing the test location with an S-type pitot tube. Temperatures were measured using a K-type thermocouple with a calibrated digital temperature indicator. The molecular weight and moisture content of the gases were determined to permit the calculation of the volumetric flowrate. Sampling points utilized were determined using Method 1, 40CFR60.

4.2 Oxygen (O_2)/Carbon Dioxide (CO_2) Determination

Oxygen (O_2) and carbon dioxide (CO_2) gas contents were determined in accordance with Method 3, 40CFR60. This method collected samples in an integrated manner and analyzed the samples using an Orsat gas analyzer. Several gas extractions were performed during each test run to ensure a stable reading. Mandatory leak checks were performed prior to and following each use. Chemicals are changed frequently and inspected for reactivity prior to each use.

4.3 Oxygen (O_2) Determination

An oxygen (O_2) analyzer was used to determine O_2 concentrations in the stack gas in accordance with Method 3A, 40CFR60. This instrument has a paramagnetic-based detector and operates in the range of 0% to 25% O_2. High-range calibrations were performed using EPA Protocol gas at 22.55% O_2. Low ppm pollutant in balance nitrogen calibration gases was introduced during other instrument calibrations to check instrument zero. High- and a mid-range % O_2 levels in balance nitrogen were also introduced. Mid-range and zero calibration checks were performed using EPA Protocol certified standard gas after each test run.

4.4 Moisture (H_2O) Determination

An Alternative Method for Stack Gas Moisture Determination, written by John Stanley and Peter Westlin, August 1978, Emission Measurement Branch, USEPA, was utilized to determine water (H_2O) content of the exhaust gas. The sampling equipment was the same as specified for the moisture approximation method in Method 4, 40CFR60, except for the addition of two impingers, one containing silica gel. (Note: This is not an approximation method.)

Approximately 15 mls of water were added to each of the first two impingers and the third was left empty. An impinger containing approximately 15 grams of silica gel and a glass wool packed outlet was attached following the third impinger.

The entire impinger train, excluding the inlet and outlet connectors, was weighed to the nearest 0.05 gram. The impingers were placed in an ice bath to maintain the sampled gas passed through the silica gel impinger outlet below 68°F in order to increase the accuracy of the sampled dry gas volume measurement. Each sample was extracted through a stainless steel probe at a constant sample rate of between one to four liters per minute, which was maintained during the course of the other simultaneous reference method sampling. An adequate volume was drawn to ensure accuracy. A minimum of the equivalent to one gram of moisture must be collected to acquire that accuracy. After each run, a leak check of the sampling train was performed at a vacuum greater than the sampling vacuum to determine if any leakage had occurred during sampling. Following the leak check, the impingers were removed from the ice bath and allowed to warm. Any condensed moisture on the exterior was removed and the train reweighed.

4.5 Nitrogen Oxides (NO_x) Determination

Method 7E was used for determining nitrogen oxides (NO_x) emissions from the test location. A gas sample was continuously extracted from the gas stream through a heated sampling probe and gas conditioning system. A portion of the sample stream was conveyed via a sampling line to gas analyzers for determination of NO_x content. Prior to emissions sampling, the nitric oxide (NO)/NO_x analyzer was zeroed and calibrated. High-range, mid-range, and zero gases were introduced into the NO_x sampling system.

The sample gas manifold was then adjusted for emissions sampling. Following each run, the zeroes were checked and mid-range NO_x gas was introduced into the sampling system to check calibration.

The chemiluminescent reaction of NO and ozone (O_3) provides the basis for this instrument operation. Specifically:

$$NO + O_3 \rightarrow NO_2 + O_2 + h_\upsilon$$

$$\text{where } h_\upsilon = \text{light}$$

Light emission results when electronically excited nitrogen dioxide (NO_2) molecules revert to their ground state. To measure NO concentrations, the gas sample to be analyzed was blended with O_3 in a reaction chamber. The resulting chemiluminescence was monitored through an optical filter by a high-sensitivity photomultiplier positioned at one end of the chamber. The filter/photomultiplier combination responds to light in a narrow-wavelength band unique to the above reaction (hence, no interference). The output from the photomultiplier is linearly proportional to the NO concentration.

To measure NO_x concentrations (i.e., NO plus NO_2), the sample gas flow was diverted through a NO_2-to-NO converter. The chemiluminescent response in the reaction chamber to the converted effluent is linearly proportional to the NO_x concentration entering the converter. The instrument was operated in the NO_x mode during all tests and calibrations.

4.6 Carbon Monoxide (CO) Determination

Method 10, 40CFR60, test procedure was used to determine the carbon monoxide (CO) concentrations. A continuous gas sample was extracted from a sampling point and analyzed for CO content using a nondispersive infrared analyzer (NDIR). Condensing moisture and filtering particulate prior to the analyzer conditioned the gas stream. This instrument employs an internal gas correlation filter wheel, which eliminates potential detector interference. Instruments so equipped do not require the use of an interference removal trap.

After an appropriate warm-up time, the analyzer was calibrated. High-range, mid-range, and zero gases were introduced into the sampling system. A CO-free calibration gas was used as a zero gas.

The analyzer was verified with the mid-range and zero gases after each test run.

5.0 QUALITY ASSURANCE PROCEDURES

GE Energy recognizes the previously described reference methods to be very technique oriented and attempts to minimize all factors that can increase error by implementing its Quality Assurance Program into every segment of its testing activities.

Calculations were performed on the computer. An explanation of the nomenclature and calculations along with the complete test results are appended. Also appended are the calibration data and copies of the raw field data sheets.

Dry and wet test meters are calibrated according to methods described in the *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume III, Stationary Source Specific Methods, USEPA 600/R-94/038c, September 1994, Method 5. Percent error for the wet test meter according to the methods is less than the allowable error of 1.0%. The dry test meters measure the test sample volumes to within 2% at the flow rate and conditions encountered during sampling.

All calibration gases were certified in accordance with *EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards,* USEPA 600/R-97/121, September 1997.

6.0 TEST RESULTS SUMMARY

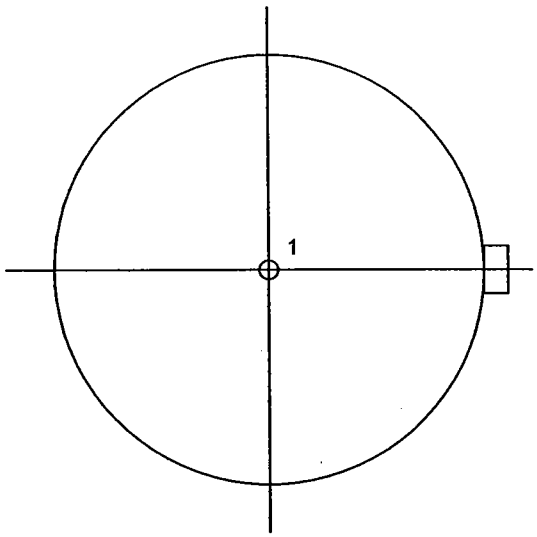
GASEOUS TEST RESULTS SUMMARY

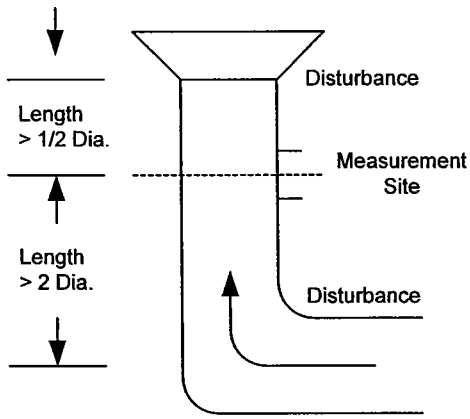
WRB Refining LLC
Wood River Refinery
Roxana, Illinois
Hydrogen Plant
April 19, 2007

Run #	O_2 % dry	NO_x			CO		
		ppmvd	lb/hr	lb/MMBtu	ppmvd	lb/hr	lb/MMBtu
1	2.7	27.0	17.0	0.044	0.0	0.0	0.0
2	2.0	25.3	14.7	0.039	0.0	0.0	0.0
3	2.0	25.3	14.7	0.040	0.0	0.0	0.0
Average	2.2	25.9	15.5	0.041	0.0	0.0	0.0

APPENDIX

GASEOUS TRAVERSE FOR ROUND DUCTS





Job: WRB Refining LLC
Wood River Refinery
Roxana, Illinois

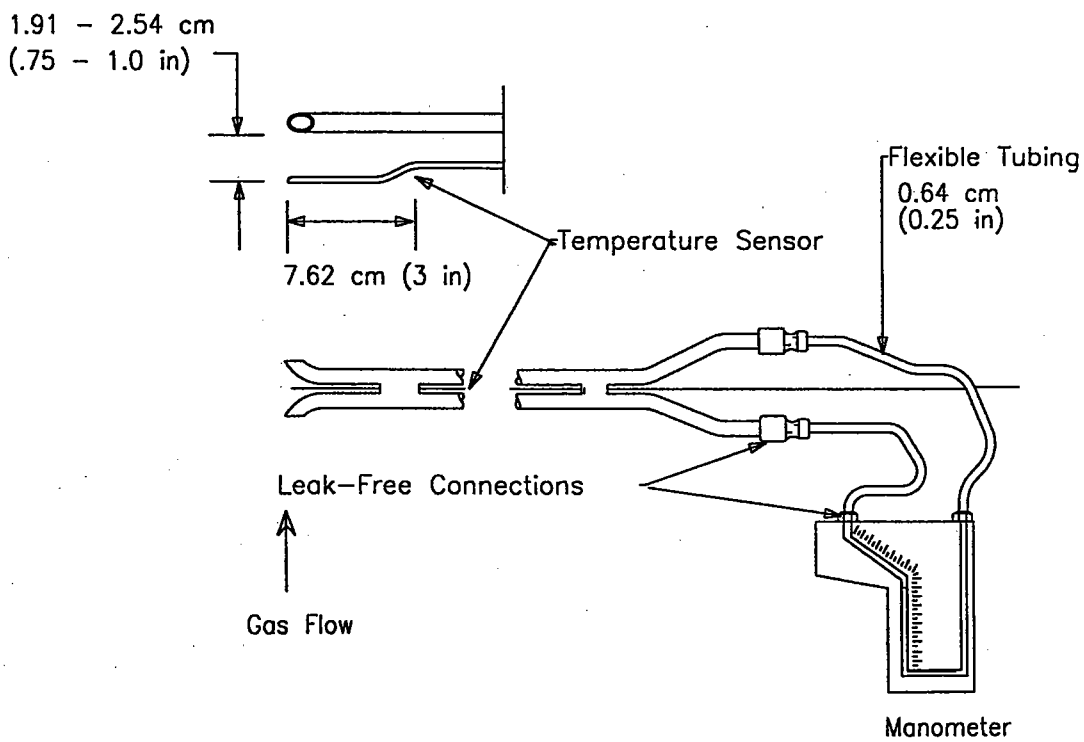
Date: April 19, 2007

Test Location: Hydrogen Plant Stack

No. Sample Points: 1

S-Type Pitot Tube Manometer Assembly

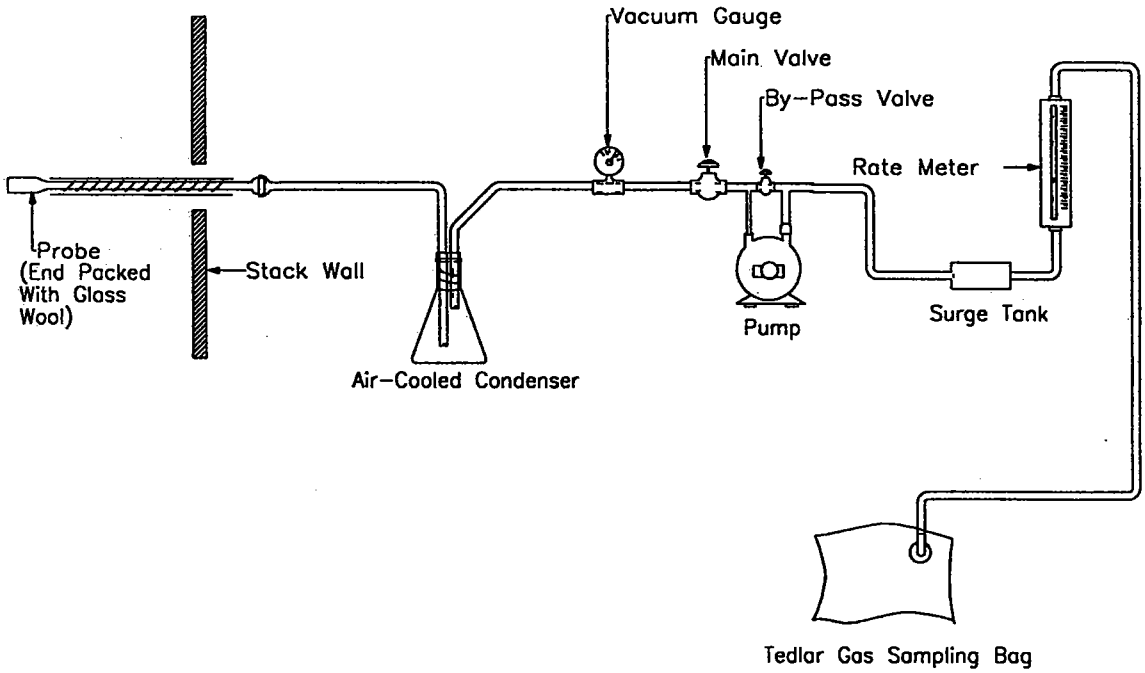
USEPA Method 2



Dwg - AD

Sampling Train for Integrated Gas Sampling

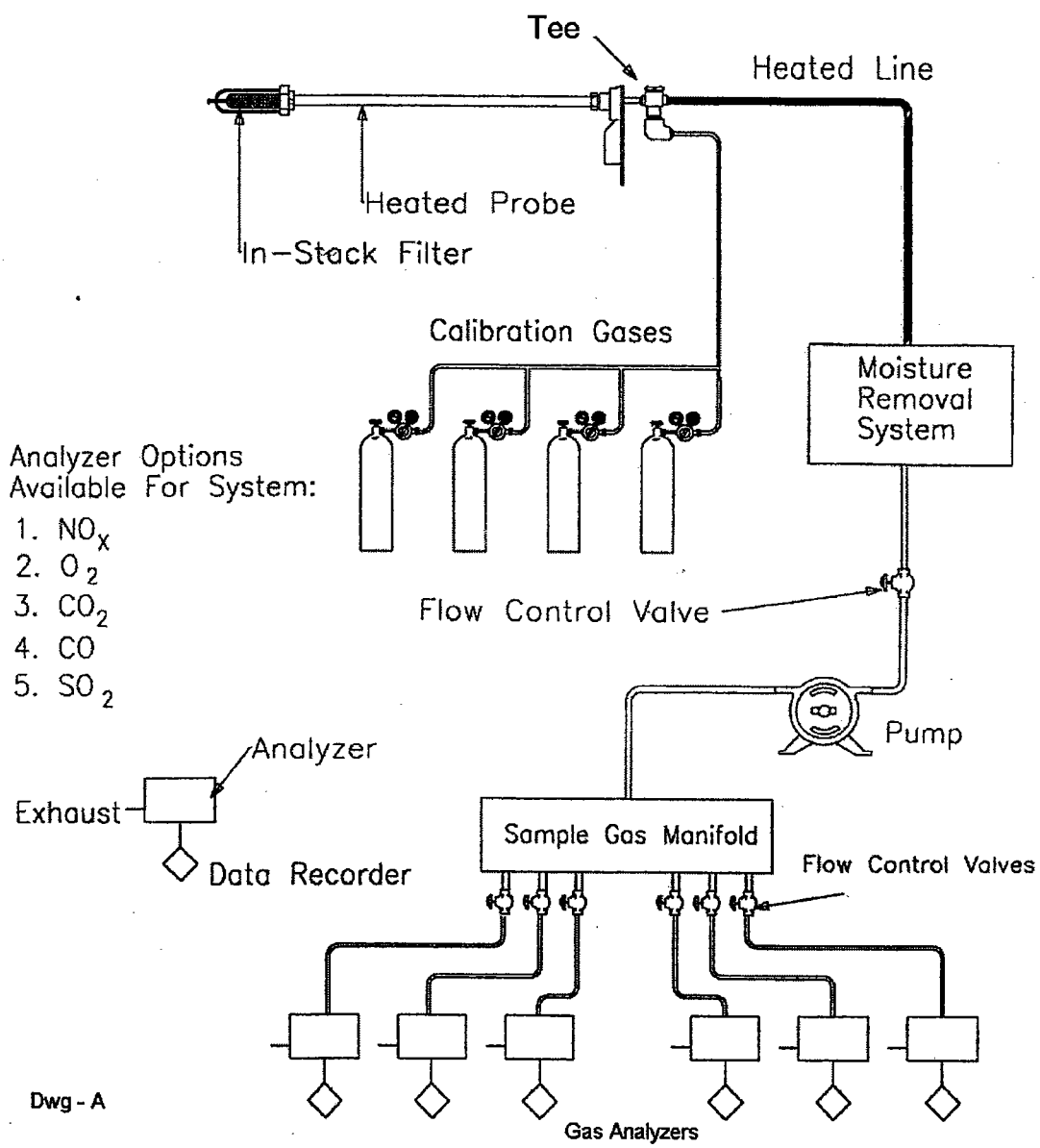
USEPA Method 3



Dwg - E

Multi-Component Gaseous Sampling Train

USEPA Methods 3A, 7E or 10



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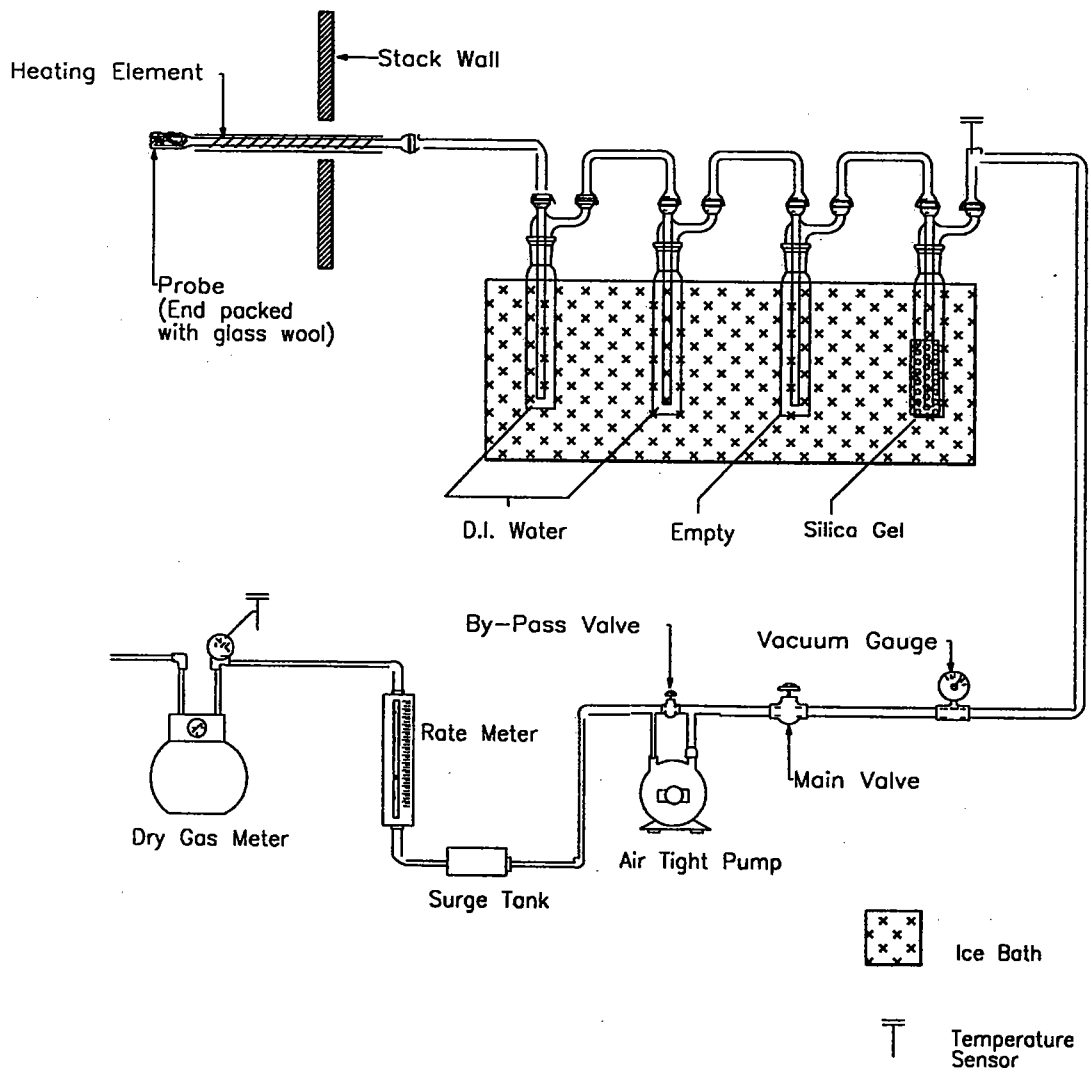
Determination of Moisture Content in Stack Gases

USEPA Method 4



Dwg - T

EFFLUENT GAS CONCENTRATION DETERMINATION

Examples for Run 1

$$C_{gas\ dry} = (C - C_0) \times \frac{C_{ma}}{C_m - C_0}$$

Where:

C_{gas} = Effluent gas concentration (ppm or %vol, dry basis)

C = Average gas concentration indicated by analyzer (ppm or %vol, dry basis)

C_0 = Average of pre- and post-test system bias checks using low range gas (ppm or % vol, dry basis)

C_m = Average of pre- and post-test system bias checks using upscale gas (ppm or % vol, dry basis)

C_{ma} = Actual concentration of upscale gas (ppm or % vol, dry basis)

NOx	C =	27.3 ppm	C_0 =	0.1 ppm
	C_m =	88.2 ppm	C_{ma} =	91.5 ppm
	NOx dry =	**28.3 ppm**		
CO	C =	-1.1 ppm	C_0 =	0.3 ppm
	C_m =	483.5 ppm	C_{ma} =	498.3 ppm
	CO dry =	**-1.4 ppm**		
O2	C =	3.8 %vol	C_0 =	0.0 %vol
	C_m =	12.6 %vol	C_{ma} =	12.8 %vol
	O2 dry =	**3.8 %vol**		

POLLUTANT EMISSION RATE, VOLUMETRIC FLOW RATE-BASED

Examples for Run 1

$$ER = C_{gas} \times MW \times 1.556E\text{-}07 \times Flow$$

Where:

ER = Pollutant emission rate (lb/hr)

C_{gas} = Pollutant concentration (ppm, wet or dry basis, but the same as flow)

MW = Pollutant molecular weight (gr/gr-mole)

Flow = Volumetric flow rate (cubic feet per minute wet or dry, but the same as C_{gas})

NOx	C_{gas} =	28.3 ppm	MW =	46.01 gr/gr-mole
	Flow =	93366 cfm		
	ERNOx =	**18.9 lb/hr**		
CO	C_{gas} =	-1.4 ppm	MW =	28.00 gr/gr-mole
	Flow =	93366 cfm		
	ERCO =	**-0.6 lb/hr**		

Example Calculations - Volumetric Flow

Company: WRB Refining LLC
Plant: Wood River Refinery
Source: Hydrogen Plant 1
Run: High (Normal) Load, Run 1
Date: 04/19/07

Moisture Content

$$V_{m(std)} = \frac{528}{29.92} \times V_m \times \frac{P_{bar} + \frac{\Delta H}{13.6}}{(460 + T_m)} \times Y_d$$

$$V_{w(std)} = (0.04707 \times V_{lc} \text{ net } H_2O) + (0.04715 \times V_{lc} \text{ silica net } H_2O)$$

$$Bws = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

$V_{w(std)}$ = 0.604 $V_{m(std)}$ = 2.892

B_{ws} = 0.173

Dry Molecular Weight

$$M_d = 0.44 \times (\%CO_2) + 0.32 \times (\%O_2) + 0.28 \times \%N_2$$

$\%CO_2$ = 17.3 $\%O_2$ = 3.5 $\%N_2$ = 79.2

M_d = 30.91

Wet Molecular Weight

$$M_s = M_d \times (1-B_{ws}) + (18.0 \times B_{ws})$$

M_d = 30.91 B_{ws} = 0.173

M_s = 28.67

Average Duct Velocity

$$V_s = 85.49 \times C_p \times (\text{Sqrt } \Delta P)_{avg} \times (T_{s\,(avg)} + 460 / (P_s \times M_s))^{1/2}$$

C_p = 0.841 $T_{s\,(avg)}$ = 351.0 $(\text{Sqrt } \Delta P)_{avg}$: 0.9441
P_s = 29.40 M_s = 28.67

V_s = 66.58

Volumetric Flow Rate

$$Q_{(Actual\ Basis)} = V_s \times A \times 60$$

V_s = 66.58 A = 44.179

Q = 176484 acfm

$$Q_{s\,(Standard\ Basis)} = \frac{528}{29.92} \times \frac{Q(\text{Actual Basis}) \times Ps}{460 + T_{s\,(avg)}}$$

$Q_{(Actual\ Basis)}$ = 176484 P_s = 29.40 $T_{s(avg)}$ = 351.0

Q_s = 112897 scfm

$$Q_{std\,(Standard\ Basis)} = \text{scfm} \times 60 \text{ min/hr}$$

Q_s = 6773805 scfh

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DERIVATION OF FACTORS USED IN CO CALCULATIONS

Factors for calculating concentration as pounds per dry standard cubic feet:

$$\text{Factor for } C_{co} = \frac{28.01 \text{ grams/gram - mole}}{2\frac{\text{gram - equivalents}}{\text{gram - mole}} \times 1000 \frac{\text{gram - milliequivalents}}{\text{gram - equivalent}} \times 453.592 \frac{\text{grams}}{\text{lb}}}$$

$$= 3.087577 \times 10^{-5} \text{ lb/g - meq } \underline{\text{Use } 3.0876 \times 10^{-5}}$$

Factors for calculating from lb/dscf to parts per million:

Using 22.414 liters of gas per gram-mole at 0°C and 1 atmosphere pressure,

One pound-mole of gas is contained in 359.04765 ft^3 at 32°F and 29.92 in. Hg, or 385.31943 ft^3 at 68°F and 29.92 in. Hg

$$\text{ppm} = \frac{\text{M lb/lb–mole}}{385.31943 \text{ dscf/lb–mole} \times 10^6} = 2.5952494 \times 10^{-9} \text{ M lb/dscf}$$

Where M = pollutant molecular weight; CO = 28.01 lb/lb-mole

$$\text{Factor for ppm CO} = \frac{1}{28.01 \times 2.5952 \times 10^{-9}} = 1.375676 \times 10^5 \text{ dscf/lb}$$

$$\underline{\text{Use } 1.3757 \times 10^5}$$

All constant values and conversion factors were taken from the CRC *Handbook of Chemistry and Physics*, 48th Edition 1967-1968 and from the latest Periodic Table of Elements.

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PPMVD TO LB/HR
CONVERSION CALCULATIONS

1. NO_x $\frac{\text{ppm } NO_x}{8.3755\times10^6}=\frac{\text{lbs } NO_x}{\text{dscf}}$ **OR** $\text{ppm } NO_x \times 1.194\times10^{-7}=\frac{\text{lbs } NO_x}{\text{dscf}}$

$$\frac{\text{lbs } NO_x}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs } NO_x}{\text{hr}}$$

2. SO_2 $\frac{\text{ppm } SO_2}{6.0151\times10^6} = \frac{\text{lbs } SO_2}{\text{dscf}}$ **OR** $\text{ppm } SO_2\times 1.660\times10^{-7}=\frac{\text{lbsSO2}}{\text{dscf}}$

$$\frac{\text{lbs } SO_2}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs } SO_2}{\text{hr}}$$

3. CO $\frac{\text{ppm CO}}{1.3762 \times 10^7} = \frac{\text{lbs CO}}{\text{dscf}}$ **OR** $\text{ppm CO}\times 7.266\times10^{-8}=\frac{\text{lbs CO}}{\text{dscf}}$

$$\frac{\text{lbs CO}}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs CO}}{\text{hr}}$$

4. CH_4 $\frac{\text{ppm } CH_4}{(1 - \text{Bws})\, 2.4017 \times 10^7} = \frac{\text{lbs } CH_4}{\text{dscf}}$

$$\frac{\text{lbs } CH_4}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs } CH_4}{\text{hr}}$$

5. C_3H_8 $\frac{\text{ppm } C_3H_8}{(1 - \text{Bws})\, 8.7573 \times 10^6} = \frac{\text{lbs } C_3H_8}{\text{dscf}}$

$$\frac{\text{lbs } C_3H_8}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs } C_3H_8}{\text{hr}}$$

VOLUMETRIC AIR FLOW CALCULATIONS

$$Vm\,(std) = \frac{528}{29.92} \times Vm \times \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{(460 + Tm)}\right] \times Y$$

$$Vw\,(std) = 0.0471 \times Vlc$$

Vlc = water + silica net

$$Bws = \left[\frac{Vw\,(std)}{Vw\,(std) + Vm\,(std)}\right]$$

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + [0.28 \times (100 - \%CO_2 - \%O_2)]$$

$$MS = Md \times (1 - Bws) + (18 \times Bws)$$

$$Vs = \sqrt{\frac{(Ts + 460)}{Ms \times Ps}} \times \sqrt{\Delta P} \times Cp \times 85.49$$

Cp = pitot tube correction factor
Ps = absolute flue gas pressure
Ms = molecular weight of gas (lb/lb mole)
Md = dry molecular weight of gas (lb/lb mole)
Bws = water vapor in gas stream proportion by volume

$$Acfm = Vs \times Area\,(of\ stack\ or\ duct) \times 60$$

$$Dscfm = Acfm \times \frac{528}{29.92} \times \left[\frac{Ps}{(460 + Ts)}\right] \times (1 - Bws)$$

$$Scfm = Acfm \times \frac{528}{29.92} \times \left[\frac{Ps}{(460 + Ts)}\right]$$

$$Scfh = Scfm \times 60 \frac{min}{hr}$$

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MOISTURE CALCULATIONS

$$V_{wc(std)} = \frac{(V_f - V_i)\,\rho_w\,R\,T_{std}}{P_{std}M_w} = 0.04707(V_f - V_i)$$

$$V_{wsg(std)} = \frac{(W_f - W_i)\,R\,T_{std}}{P_{std}\,M_w} = 0.04715\,(W_f - W_i)$$

$$V_{m(std)} = \frac{528}{29.92}\,V_m\,Y\,\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

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

Where:

B_{ws} = Water vapor in gas stream, proportion by volume

M_w = Molecular weight of water, 18.015 lb/lb-mole

P_{bar} = Barometric pressure at the testing site, in. Hg

P_{std} = Standard absolute pressure, 29.92 in. Hg

R = Ideal gas constant, 0.048137 (in. Hg)(ft^3)/(g-mole)(°R) = [21.8348(in. Hg)(ft^3)/(lb-mole)(°R)]/453.592 g-mole/lb-mole

T_m = Absolute average dry gas meter temperature, °R

T_{std} = Standard absolute temperature, 528 °R

V_f = Final volume of condenser water, ml

V_i = Initial volume of condenser water, ml

V_m = Dry gas volume measured by dry gas meter, dcf

$V_{m(std)}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, scf

$V_{wc(std)}$ = Volume of condensed water vapor, corrected to standard conditions, scf

$V_{wsg(std)}$ = Volume of water vapor collected in silica gel, corrected to standard conditions, scf

W_f = Final weight of silica gel, g

W_i = Initial weight of silica gel, g

Y = Dry gas meter calibration factor

ΔH = Average pressure exerted on dry gas meter outlet by gas sample bag, in. H_2O

ρ_w = Density of water, 0.9982 g/ml

13.6 = Specific gravity of mercury (Hg)

17.64 = T_{std}/P_{std}

0.04707 = ft^3/ml

0.04715 = ft^3/g

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GASEOUS FIELD DATA
(Methods 3A, 6C, 7E and 10)

Project:	WRB Refining LLC	Date:	4/19/07
Client:	Wood River Refinery	Operator:	DT
Location:	Haydrogen Plant	Fuel Factor:	
Source Condition:		CEMS:	
Monitors:		Model No.:	
		Serial No.:	

Test No.	Time	NO_X PPM	SO_2 PPM	CO PPM	$\%O_2$	$\%CO_2$	Emission Calculations		
1	8:36 – 8:56	27.31		-1.09	3.76				
2	9:12 – 9:32	27.36		-1.12	3.53				
3	9:48 – 10:08	25.79		-1.13	2.37				
4	10:23 – 10:43	24.97		-1.12	2.10				
5	10:58 – 11:18	24.31		-1.11	1.90				
6	11:32 – 11:52	24.58		-1.06	2.09				
7	12:07 – 12:27	24.47		-1.05	1.99				
8	12:42 – 13:02	24.39		-1.06	1.97				
9	13:17 – 13:37	24.28		-1.08	2.08				
10	13:52 – 14:12	24.32		-1.07	2.00				

Corrected Field Data									
Test No.	Time	NO_X PPM	SO_2 PPM	CO PPM	$\%O_2$	$\%CO_2$	Emission Calculations		
1	8:36 – 8:56	28.3		-1.4	3.8				
2	9:12 – 9:32	28.4		-1.4	3.6				
3	9:48 – 10:08	26.8		-1.0	2.4				
4	10:23 – 10:43	25.9		-0.9	2.1				
5	10:58 – 11:18	25.2		-1.0	1.9				
6	11:32 – 11:52	25.4		-1.0	2.1				
7	12:07 – 12:27	25.3		-1.0	2.0				
8	12:42 – 13:02	25.3		-1.0	2.0				
9	13:17 – 13:37	25.2		-1.0	2.1				
10	13:52 – 14:12	25.3		-0.9	2.0				

Component	Concentration	Cylinder No.

Component	Concentration	Cylinder No.

Current Date : 04/19/07
Current Time : 08:57

TEST 1

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
08:36	-1.12	27.41	3.84
08:37	-1.12	26.73	3.75
08:38	-1.10	27.10	3.67
08:39	-1.10	27.28	3.87
08:40	-1.09	27.21	3.88
08:41	-1.10	27.64	3.75
08:42	-1.08	27.68	4.11
08:43	-1.10	27.77	3.64
08:44	-1.08	26.88	3.81
08:45	-1.10	27.12	3.67
08:46	-1.10	27.44	3.83
08:47	-1.09	27.29	3.88
08:48	-1.09	27.67	3.41
08:49	-1.09	27.21	3.94
08:50	-1.10	27.54	3.68
08:51	-1.10	27.13	3.60
08:52	-1.11	27.05	3.65
08:53	-1.10	27.41	3.91
08:54	-1.11	27.48	3.85
08:55	-1.10	27.43	3.69
08:56	-1.10	27.23	3.73
Max :	-1.08	27.77	4.11
Min :	-1.12	26.73	3.41
Mean :	-1.09	27.31	3.76
Secs :	0021	0021	0021

22

Data : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
Flags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 09:33

TEST 2

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
09:12	-1.10	27.26	3.60
09:13	-1.10	27.34	3.74
09:14	-1.13	27.22	3.54
09:15	-1.12	27.33	3.83
09:16	-1.12	27.26	3.76
09:17	-1.11	27.47	3.83
09:18	-1.12	27.49	3.80
09:19	-1.12	27.39	3.56
09:20	-1.12	27.49	3.76
09:21	-1.12	27.33	3.48
09:22	-1.13	27.65	4.00
09:23	-1.12	27.25	3.86
09:24	-1.13	27.66	3.53
09:25	-1.12	27.17	3.89
09:26	-1.14	27.13	3.43
09:27	-1.12	27.20	3.76
09:28	-1.12	27.55	3.14
09:29	-1.13	27.66	3.02
09:30	-1.13	27.34	3.00
09:31	-1.13	27.33	2.76
09:32	-1.14	27.22	3.04
Max :	-1.10	27.66	4.00
Min :	-1.14	27.13	2.76
Mean :	-1.12	27.36	3.53
Secs :	0021	0021	0021

Data : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
Flags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 10:15

TEST 3

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
09:48	-1.13	26.15	2.48
09:49	-1.13	25.92	2.13
09:50	-1.12	26.24	2.36
09:51	-1.14	25.93	2.40
09:52	-1.14	26.06	2.21
09:53	-1.15	26.22	2.60
09:54	-1.12	26.06	2.46
09:55	-1.13	26.34	2.61
09:56	-1.13	25.97	2.53
09:57	-1.14	26.06	2.88
09:58	-1.13	25.75	2.87
09:59	-1.14	25.73	2.73
10:00	-1.14	25.84	2.79
10:01	-1.15	25.70	2.32
10:02	-1.14	25.47	2.28
10:03	-1.14	25.32	2.20
10:04	-1.14	25.76	2.26
10:05	-1.15	25.20	2.11
10:06	-1.15	25.32	1.92
10:07	-1.16	25.32	2.01
10:08	-1.16	25.34	1.81
Max :	-1.12	26.34	2.88
Min :	-1.16	25.20	1.81
Mean :	-1.13	25.79	2.37
Recs :	0021	0021	0021

24

Data : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
Flags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 10:44

TEST 4

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
10:23	-1.11	25.45	2.13
10:24	-1.11	25.03	1.85
10:25	-1.11	25.23	2.09
10:26	-1.12	24.93	1.99
10:27	-1.11	24.82	2.00
10:28	-1.14	25.36	2.34
10:29	-1.12	25.31	2.05
10:30	-1.12	25.25	2.34
10:31	-1.12	25.11	2.06
10:32	-1.13	25.44	2.38
10:33	-1.12	24.93	2.19
10:34	-1.13	24.75	2.28
10:35	-1.13	24.87	2.49
10:36	-1.13	24.26	2.11
10:37	-1.13	25.07	2.44
10:38	-1.15	25.12	2.06
10:39	-1.13	25.35	2.25
10:40	-1.14	24.46	1.69
10:41	-1.13	24.30	1.74
10:42	-1.14	24.42	1.85
10:43	-1.13	24.92	1.87
Max :	-1.11	25.45	2.49
Min :	-1.15	24.26	1.69
Mean :	-1.12	24.97	2.10
Secs :	0021	0021	0021

25

ata : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
lags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 11:19

TEST 5

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
10:58	-1.15	24.56	1.93
10:59	-.65	24.18	1.68
11:00	-1.15	24.76	2.11
11:01	-1.14	24.23	1.90
11:02	-1.15	24.55	1.96
11:03	-1.14	24.62	2.17
11:04	-1.15	24.42	1.91
11:05	-1.16	24.47	2.20
11:06	-1.16	24.34	2.05
11:07	-1.16	24.75	2.43
11:08	-1.17	24.54	2.04
11:09	-1.17	24.47	1.93
11:10	-1.17	24.46	1.95
11:11	-1.18	24.23	1.79
11:12	-1.17	24.47	2.00
11:13	-1.18	24.09	1.60
11:14	-1.17	24.40	1.68
11:15	-.68	23.55	1.49
11:16	-1.17	23.78	1.50
11:17	-1.18	24.01	1.83
11:18	-1.16	23.78	1.91
Max :	-.65	24.76	2.43
Min :	-1.18	23.55	1.49
Mean :	-1.11	24.31	1.90
Recs :	0021	0021	0021

ata : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
lags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 11:53

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

TEST 6

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
11:32	-1.06	24.37	1.74
11:33	-1.07	24.45	1.96
11:34	-1.06	24.05	1.79
11:35	-1.07	24.70	2.27
11:36	-1.06	24.15	2.18
11:37	-1.07	24.55	2.29
11:38	-1.07	24.74	2.48
11:39	-1.07	24.68	2.23
11:40	-1.06	24.84	2.47
11:41	-1.06	24.54	2.07
11:42	-1.05	24.83	2.29
11:43	-1.06	24.48	2.08
11:44	-1.06	24.66	2.00
11:45	-1.06	24.81	2.12
11:46	-1.06	24.53	1.83
11:47	-1.06	24.74	2.00
11:48	-1.07	24.25	1.78
11:49	-1.07	24.98	2.18
11:50	-1.07	24.31	1.98
11:51	-1.06	24.83	2.02
11:52	-1.07	24.81	2.29
Max :	-1.05	24.98	2.48
Min :	-1.07	24.05	1.74
Mean :	-1.06	24.58	2.09
Recs :	0021	0021	0021

27

Data : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
Flags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 12:28

TEST 7

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
12:07	-1.07	24.82	1.94
12:08	-1.07	24.64	1.98
12:09	-1.06	24.50	2.03
12:10	-1.06	24.78	2.34
12:11	-1.06	24.54	2.19
12:12	-1.07	24.77	2.09
12:13	-1.05	24.81	2.31
12:14	-1.07	24.71	2.04
12:15	-1.06	24.79	2.11
12:16	-1.06	24.33	1.83
12:17	-1.05	24.59	2.15
12:18	-1.07	24.31	1.93
12:19	-1.06	24.40	1.76
12:20	-1.08	24.47	1.85
12:21	-1.08	23.97	1.51
12:22	-1.10	24.00	1.79
12:23	-.77	23.82	1.68
12:24	-1.08	24.36	2.06
12:25	-1.09	24.23	2.11
12:26	-1.07	24.57	2.01
12:27	-1.07	24.60	2.27
ax :	-.77	24.82	2.34
in :	-1.10	23.82	1.51
ean :	-1.05	24.47	1.99
ecs :	0021	0021	0021

28

ta : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
ags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 13:03

TEST 8

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
12:42	-1.07	24.74	2.03
12:43	-1.08	24.72	2.14
12:44	-1.07	24.27	1.96
12:45	-1.07	24.87	2.33
12:46	-1.07	24.41	2.06
12:47	-1.09	24.58	1.94
12:48	-1.08	24.54	2.12
12:49	-1.10	24.44	1.84
12:50	-1.10	24.50	1.96
12:51	-.64	23.73	1.68
12:52	-1.09	24.46	2.17
12:53	-1.11	24.27	1.88
12:54	-1.10	24.21	1.85
12:55	-1.10	24.75	2.23
12:56	-1.10	24.52	1.77
12:57	-1.10	24.21	1.76
12:58	-1.08	23.92	1.78
12:59	-1.09	24.47	2.10
13:00	-1.08	24.26	1.95
13:01	-1.08	24.09	1.68
13:02	-1.09	24.40	2.20
Max :	-.64	24.87	2.33
Min :	-1.11	23.73	1.68
Mean :	-1.06	24.39	1.97
Recs :	0021	0021	0021

ata : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
lags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 13:38

TEST 9

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
13:17	-1.09	24.13	1.81
13:18	-1.10	24.93	2.30
13:19	-1.10	24.37	2.04
13:20	-1.09	24.82	2.45
13:21	-1.08	24.38	2.11
13:22	-1.09	24.17	1.80
13:23	-1.08	24.18	2.27
13:24	-1.09	24.58	1.97
13:25	-1.10	24.38	2.01
13:26	-1.12	23.91	1.72
13:27	-1.11	24.30	1.94
13:28	-1.13	23.57	1.70
13:29	-1.11	23.98	1.83
13:30	-1.13	24.35	2.09
13:31	-1.13	24.38	1.91
13:32	-1.13	24.48	2.15
13:33	-.61	23.87	1.73
13:34	-1.12	24.24	2.24
13:35	-1.11	24.27	2.07
13:36	-1.11	24.19	1.87
13:37	-1.10	24.46	2.21
Max :	-.61	24.93	2.45
Min :	-1.13	23.57	1.70
Mean :	-1.08	24.28	2.01
Recs :	0021	0021	0021

Data : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
Flags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 14:15

TEST 10

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
13:52	-1.08	24.24	1.71
13:53	-1.08	24.18	1.87
13:54	-1.08	23.91	1.82
13:55	-1.09	24.67	2.19
13:56	-1.08	24.20	2.03
13:57	-1.08	24.34	1.81
13:58	-1.09	24.20	2.10
13:59	-1.10	24.48	1.90
14:00	-1.09	24.30	2.08
14:01	-.41	23.90	1.75
14:02	-.97	24.55	2.25
14:03	-1.11	24.45	2.10
14:04	-1.10	24.28	1.92
14:05	-1.11	24.49	2.25
14:06	-1.10	24.56	1.86
14:07	-1.11	24.36	2.11
14:08	-1.09	24.11	1.87
14:09	-1.10	24.45	2.20
14:10	-1.10	24.29	2.09
14:11	-1.29	24.38	2.01
14:12	-1.29	24.47	2.24
Max :	-.41	24.67	2.25
Min :	-1.29	23.90	1.71
Mean :	-1.07	24.32	2.00
Recs :	0021	0021	0021

Data : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
Flags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

METHOD 2 VOLUMETRIC FLOW DATA

Project No:	M22E1454	**Operating Level:**	High (Normal)
Company:	WRB Refining LLC	**Run No.:**	1
Plant:	Wood River Refinery	**Date:**	04/19/2007
Source:	Hydrogen Plant 1	**Start Time:**	08:36
Pitot ID:	605A	**End Time:**	08:56
Pitot Coefficient:	0.841	**RM Testers:**	T Cass

Test Parameters	
P_{bar} - Barometric pressure, inches Hg	29.45
P_g - Stack Pressure, inches of H_2O	-0.70
P_s - Absolute stack pressure, inches Hg	29.40
t_s - Average stack temperature, °F	351.0
% CO_2	17.3
% O_2	3.5
% N_2	79.2
Md - dry basis lb/lb mole	30.91
Ms - wet basis lb/lb mole	28.67
Stack Diameter, Feet	7.50
Cross Sectional Area of Stack, Ft^2	44.18

Moisture Determination	
Meter Calibration:	0.991
Initial Meter Volume:	2.850
Final Meter Volume:	5.823
Meter Temperature:	69.60
Meter Volume Vm(std):	2.892
Meter Volume Vw(std):	0.604
Delta H:	0.10
Train Initial Wt:	508.100
Train Final Wt:	520.900
Condensate Initial Vol:	0.000
Condensate Final Vol:	0.000
Bws - Moisture content fraction	**0.173**

Port Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)
A 01	0.91	0.9539	351	67.27
A 02	0.95	0.9747	351	68.73
A 03	0.98	0.9899	351	69.81
A 04	0.95	0.9747	351	68.73
A 05	0.92	0.9592	351	67.64
A 06	0.92	0.9592	351	67.64
A 07	0.80	0.8944	351	63.07
A 08	0.61	0.7810	351	55.08
B 01	0.90	0.9487	351	66.90
B 02	1.10	1.0488	351	73.96
B 03	0.93	0.9644	351	68.01
B 04	0.97	0.9849	351	69.45
B 05	0.96	0.9798	351	69.09
B 06	0.93	0.9644	351	68.01
B 07	0.85	0.9220	351	65.02
B 08	0.65	0.8062	351	56.85

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)

Method 2 Results	
Average ΔP	0.8956
Average Sqrt ΔP	0.9441
Average Velocity Vs (ft/sec)	66.58
Q - ACFM	176,484
Qsd - DSCFM	93,366
Qs - SCFM	112,897
Qs - SCFH	6,773,805

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	M22E1454	**Operating Level:**	High (Normal)
Company:	WRB Refining LLC	**Run No.:**	2
Plant:	Wood River Refinery	**Date:**	04/19/2007
Source:	Hydrogen Plant 1	**Start Time:**	09:12
Pitot ID:	605A	**End Time:**	09:32
Pitot Coefficient:	0.841	**RM Testers:**	T Cass

Test Parameters	
P_{bar} - Barometric pressure, inches Hg	29.45
P_g - Stack Pressure, inches of H_2O	-0.70
P_s - Absolute stack pressure, inches Hg	29.40
t_s - Average stack temperature, °F	351.6
% CO_2	17.3
% O_2	3.5
% N_2	79.2
Md - dry basis lb/lb mole	30.91
Ms - wet basis lb/lb mole	28.90726
Stack Diameter, Feet	7.50
Cross Sectional Area of Stack, Ft^2	44.18

Moisture Determination	
Meter Calibration:	0.991
Initial Meter Volume:	5.957
Final Meter Volume:	9.296
Meter Temperature:	72.80
Meter Volume Vm(std):	3.228
Meter Volume Vw(std):	0.594
Delta H:	0.10
Train Initial Wt:	515.100
Train Final Wt:	527.700
Condensate Initial Vol:	0.000
Condensate Final Vol:	0.000
Bws - Moisture content fraction	**0.155**

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)
A	01	0.85	0.9220	351	64.75
A	02	0.95	0.9747	352	68.50
A	03	0.88	0.9381	352	65.93
A	04	0.94	0.9695	352	68.14
A	05	0.96	0.9798	352	68.86
A	06	0.97	0.9849	352	69.22
A	07	0.86	0.9274	352	65.17
A	08	0.60	0.7746	351	54.40
B	01	0.91	0.9539	351	67.00
B	02	0.97	0.9849	351	69.17
B	03	0.99	0.9950	351	69.88
B	04	0.92	0.9592	352	67.41
B	05	0.95	0.9747	352	68.50
B	06	0.94	0.9695	352	68.14
B	07	0.82	0.9055	352	63.64
B	08	0.58	0.7616	350	53.46

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)

Method 2 Results	
Average ΔP	0.8806
Average Sqrt ΔP	0.9360
Average Velocity Vs (ft/sec)	65.76
Q - ACFM	174,310
Qsd - DSCFM	94,158
Qs - SCFM	111,429
Qs - SCFH	6,685,743

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	M22E1454	**Operating Level:**	High (Normal)
Company:	WRB Refining LLC	**Run No.:**	3
Plant:	Wood River Refinery	**Date:**	04/19/2007
Source:	Hydrogen Plant 1	**Start Time:**	09:48
Pitot ID:	605A	**End Time:**	10:08
Pitot Coefficient:	0.841	**RM Testers:**	T Cass

Test Parameters	
P_{bar} - Barometric pressure, inches Hg	29.45
P_g - Stack Pressure, inches of H_2O	-0.70
P_s - Absolute stack pressure, inches Hg	29.40
t_s - Average stack temperature, °F	341.0
% CO_2	17.3
% O_2	3.5
% N_2	79.2
Md - dry basis lb/lb mole	30.91
Ms - wet basis lb/lb mole	28.75
Stack Diameter, Feet	7.50
Cross Sectional Area of Stack, Ft^2	44.18

Moisture Determination	
Meter Calibration:	0.991
Initial Meter Volume:	9.436
Final Meter Volume:	12.627
Meter Temperature:	75.00
Meter Volume Vm(std):	3.073
Meter Volume Vw(std):	0.618
Delta H:	0.10
Train Initial Wt:	527.700
Train Final Wt:	540.800
Condensate Initial Vol:	0.000
Condensate Final Vol:	0.000
Bws - Moisture content fraction	**0.167**

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)
A	01	0.75	0.8660	342	60.65
A	02	0.80	0.8944	340	62.56
A	03	0.80	0.8944	341	62.60
A	04	0.75	0.8660	342	60.65
A	05	0.78	0.8832	342	61.85
A	06	0.79	0.8888	342	62.25
A	07	0.70	0.8367	342	58.59
A	08	0.58	0.7616	335	53.10
B	01	0.70	0.8367	342	58.59
B	02	0.77	0.8775	342	61.45
B	03	0.79	0.8888	341	62.21
B	04	0.75	0.8660	342	60.65
B	05	0.78	0.8832	342	61.85
B	06	0.80	0.8944	342	62.64
B	07	0.75	0.8660	341	60.61
B	08	0.55	0.7416	338	51.81

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)

Method 2 Results	
Average ΔP	0.7400
Average Sqrt ΔP	0.8591
Average Velocity Vs (ft/sec)	60.13
Q - ACFM	159,378
Qsd - DSCFM	85,988
Qs - SCFM	103,227
Qs - SCFH	6,193,631

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	M22E1454	**Operating Level:**	High (Normal)
Company:	WRB Refining LLC	**Run No.:**	4
Plant:	Wood River Refinery	**Date:**	04/19/2007
Source:	Hydrogen Plant 1	**Start Time:**	10:23
Pitot ID:	605A	**End Time:**	10:43
Pitot Coefficient:	0.841	**RM Testers:**	T Cass

Test Parameters	
P_{bar} - Barometric pressure, inches Hg	29.45
P_g - Stack Pressure, inches of H_2O	-0.70
P_s - Absolute stack pressure, inches Hg	29.40
t_s - Average stack temperature, °F	336.1
% CO_2	17.3
% O_2	3.5
% N_2	79.2
Md - dry basis lb/lb mole	30.91
Ms - wet basis lb/lb mole	28.74
Stack Diameter, Feet	7.50
Cross Sectional Area of Stack, Ft^2	44.18

Moisture Determination	
Meter Calibration:	0.991
Initial Meter Volume:	12.694
Final Meter Volume:	15.978
Meter Temperature:	76.00
Meter Volume Vm(std):	3.156
Meter Volume Vw(std):	0.637
Delta H:	0.10
Train Initial Wt:	540.800
Train Final Wt:	554.300
Condensate Initial Vol:	0.000
Condensate Final Vol:	0.000
Bws - Moisture content fraction	**0.168**

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)
A	01	0.68	0.8246	337	57.58
A	02	0.70	0.8367	336	58.39
A	03	0.75	0.8660	337	60.47
A	04	0.73	0.8544	337	59.66
A	05	0.70	0.8367	337	58.42
A	06	0.72	0.8485	337	59.25
A	07	0.68	0.8246	336	57.55
A	08	0.53	0.7280	331	50.64
B	01	0.66	0.8124	337	56.73
B	02	0.72	0.8485	337	59.25
B	03	0.75	0.8660	337	60.47
B	04	0.70	0.8367	337	58.42
B	05	0.73	0.8544	336	59.62
B	06	0.73	0.8544	337	59.66
B	07	0.65	0.8062	336	56.26
B	08	0.49	0.7000	332	48.73

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)

Method 2 Results	
Average ΔP	0.6825
Average Sqrt ΔP	0.8249
Average Velocity Vs (ft/sec)	57.57
Q - ACFM	152,595
Qsd - DSCFM	82,740
Qs - SCFM	99,447
Qs - SCFH	5,966,811

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	M22E1454	**Operating Level:**	High (Normal)
Company:	WRB Refining LLC	**Run No.:**	5
Plant:	Wood River Refinery	**Date:**	04/19/2007
Source:	Hydrogen Plant 1	**Start Time:**	10:58
Pitot ID:	605A	**End Time:**	11:18
Pitot Coefficient:	0.841	**RM Testers:**	T Cass

Test Parameters	
P_{bar} - Barometric pressure, inches Hg	29.45
P_g - Stack Pressure, inches of H_2O	-0.70
P_s - Absolute stack pressure, inches Hg	29.40
t_s - Average stack temperature, °F	334.1
% CO_2	17.3
% O_2	3.5
% N_2	79.2
Md - dry basis lb/lb mole	30.91
Ms - wet basis lb/lb mole	28.67
Stack Diameter, Feet	7.50
Cross Sectional Area of Stack, Ft^2	44.18

Moisture Determination	
Meter Calibration:	0.991
Initial Meter Volume:	16.080
Final Meter Volume:	19.484
Meter Temperature:	76.90
Meter Volume Vm(std):	3.266
Meter Volume Vw(std):	0.684
Delta H:	0.10
Train Initial Wt:	516.000
Train Final Wt:	530.500
Condensate Initial Vol:	0.000
Condensate Final Vol:	0.000
Bws - Moisture content fraction	**0.173**

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)
A	01	0.65	0.8062	334	56.26
A	02	0.70	0.8367	334	58.38
A	03	0.73	0.8544	334	59.62
A	04	0.68	0.8246	335	57.58
A	05	0.69	0.8307	335	58.00
A	06	0.71	0.8426	335	58.83
A	07	0.64	0.8000	334	55.82
A	08	0.46	0.6782	331	47.24
B	01	0.62	0.7874	334	54.94
B	02	0.70	0.8367	334	58.38
B	03	0.72	0.8485	335	59.24
B	04	0.71	0.8426	335	58.83
B	05	0.68	0.8246	335	57.58
B	06	0.68	0.8246	334	57.54
B	07	0.65	0.8062	334	56.26
B	08	0.43	0.6557	332	45.70

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)

Method 2 Results	
Average ΔP	0.6531
Average Sqrt ΔP	0.8062
Average Velocity Vs (ft/sec)	56.26
Q - ACFM	149,126
Qsd - DSCFM	80,575
Qs - SCFM	97,431
Qs - SCFH	5,845,842

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	M22E1454	**Operating Level:**	High (Normal)
Company:	WRB Refining LLC	**Run No.:**	6
Plant:	Wood River Refinery	**Date:**	04/19/2007
Source:	Hydrogen Plant 1	**Start Time:**	11:32
Pitot ID:	605A	**End Time:**	11:52
Pitot Coefficient:	0.841	**RM Testers:**	T Cass

Test Parameters	
P_{bar} - Barometric pressure, inches Hg	29.45
P_g - Stack Pressure, inches of H_2O	-0.70
P_s - Absolute stack pressure, inches Hg	29.40
t_s - Average stack temperature, °F	333.3
% CO_2	17.3
% O_2	3.5
% N_2	79.2
Md - dry basis lb/lb mole	30.91
Ms - wet basis lb/lb mole	28.75
Stack Diameter, Feet	7.50
Cross Sectional Area of Stack, Ft^2	44.18

Moisture Determination	
Meter Calibration:	0.991
Initial Meter Volume:	19.571
Final Meter Volume:	22.853
Meter Temperature:	77.90
Meter Volume Vm(std):	3.143
Meter Volume Vw(std):	0.632
Delta H:	0.10
Train Initial Wt:	530.500
Train Final Wt:	543.900
Condensate Initial Vol:	0.000
Condensate Final Vol:	0.000
Bws - Moisture content fraction	**0.167**

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)
A	01	0.60	0.7746	334	53.98
A	02	0.68	0.8246	333	57.43
A	03	0.71	0.8426	333	58.68
A	04	0.70	0.8367	334	58.30
A	05	0.70	0.8367	334	58.30
A	06	0.66	0.8124	335	56.65
A	07	0.65	0.8062	334	56.18
A	08	0.46	0.6782	330	47.14
B	01	0.68	0.8246	334	57.46
B	02	0.72	0.8485	334	59.13
B	03	0.76	0.8718	334	60.75
B	04	0.69	0.8307	334	57.88
B	05	0.72	0.8485	333	59.09
B	06	0.68	0.8246	334	57.46
B	07	0.64	0.8000	332	55.68
B	08	0.51	0.7141	331	49.67

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)

Method 2 Results	
Average ΔP	0.6600
Average Sqrt ΔP	0.8109
Average Velocity Vs (ft/sec)	56.48
Q - ACFM	149,721
Qsd - DSCFM	81,561
Qs - SCFM	97,912
Qs - SCFH	5,874,710

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	M22E1454	**Operating Level:**	High (Normal)
Company:	WRB Refining LLC	**Run No.:**	7
Plant:	Wood River Refinery	**Date:**	04/19/2007
Source:	Hydrogen Plant 1	**Start Time:**	12:07
Pitot ID:	605A	**End Time:**	12:27
Pitot Coefficient:	0.841	**RM Testers:**	T Cass

Test Parameters	
P_{bar} - Barometric pressure, inches Hg	29.45
P_g - Stack Pressure, inches of H_2O	-0.70
P_s - Absolute stack pressure, inches Hg	29.40
t_s - Average stack temperature, °F	334.0
% CO_2	17.3
% O_2	3.5
% N_2	79.2
Md - dry basis lb/lb mole	30.91
Ms - wet basis lb/lb mole	28.70
Stack Diameter, Feet	7.50
Cross Sectional Area of Stack, Ft^2	44.18

Moisture Determination	
Meter Calibration:	0.991
Initial Meter Volume:	22.951
Final Meter Volume:	26.455
Meter Temperature:	81.20
Meter Volume Vm(std):	3.335
Meter Volume Vw(std):	0.688
Delta H:	0.10
Train Initial Wt:	519.100
Train Final Wt:	533.700
Condensate Initial Vol:	0.000
Condensate Final Vol:	0.000
Bws - Moisture content fraction	**0.171**

Port Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)
A 01	0.66	0.8124	334	56.66
A 02	0.70	0.8367	334	58.35
A 03	0.72	0.8485	334	59.18
A 04	0.68	0.8246	335	57.55
A 05	0.70	0.8367	335	58.39
A 06	0.69	0.8307	335	57.97
A 07	0.64	0.8000	335	55.83
A 08	0.49	0.7000	331	48.73
B 01	0.64	0.8000	334	55.80
B 02	0.77	0.8775	335	61.24
B 03	0.75	0.8660	335	60.44
B 04	0.73	0.8544	335	59.63
B 05	0.68	0.8246	334	57.51
B 06	0.69	0.8307	334	57.93
B 07	0.67	0.8185	334	57.09
B 08	0.45	0.6708	330	46.67

Port Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)

Method 2 Results	
Average ΔP	0.6663
Average Sqrt ΔP	0.8145
Average Velocity Vs (ft/sec)	56.81
Q - ACFM	150,581
Qsd - DSCFM	81,565
Qs - SCFM	98,389
Qs - SCFH	5,903,356

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	M22E1454	**Operating Level:**	High (Normal)
Company:	WRB Refining LLC	**Run No.:**	8
Plant:	Wood River Refinery	**Date:**	04/19/2007
Source:	Hydrogen Plant 1	**Start Time:**	12:42
Pitot ID:	605A	**End Time:**	13:02
Pitot Coefficient:	0.841	**RM Testers:**	T Cass

Test Parameters	
P_{bar} - Barometric pressure, inches Hg	29.45
P_g - Stack Pressure, inches of H_2O	-0.70
P_s - Absolute stack pressure, inches Hg	29.40
t_s - Average stack temperature, °F	335.4
% CO_2	17.3
% O_2	3.5
% N_2	79.2
Md - dry basis lb/lb mole	30.91
Ms - wet basis lb/lb mole	28.65
Stack Diameter, Feet	7.50
Cross Sectional Area of Stack, Ft^2	44.18

Moisture Determination	
Meter Calibration:	0.991
Initial Meter Volume:	26.561
Final Meter Volume:	30.054
Meter Temperature:	83.20
Meter Volume Vm(std):	3.313
Meter Volume Vw(std):	0.703
Delta H:	0.10
Train Initial Wt:	520.400
Train Final Wt:	535.300
Condensate Initial Vol:	0.000
Condensate Final Vol:	0.000
Bws - Moisture content fraction	**0.175**

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)
A	01	0.64	0.8000	337	55.95
A	02	0.71	0.8426	336	58.90
A	03	0.71	0.8426	336	58.90
A	04	0.70	0.8367	336	58.48
A	05	0.69	0.8307	336	58.06
A	06	0.68	0.8246	336	57.64
A	07	0.64	0.8000	336	55.92
A	08	0.45	0.6708	334	46.83
B	01	0.67	0.8185	335	57.18
B	02	0.72	0.8485	336	59.31
B	03	0.75	0.8660	336	60.53
B	04	0.68	0.8246	336	57.64
B	05	0.71	0.8426	336	58.90
B	06	0.69	0.8307	335	58.02
B	07	0.65	0.8062	335	56.32
B	08	0.47	0.6856	331	47.77

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)

Method 2 Results	
Average ΔP	0.6600
Average Sqrt ΔP	0.8107
Average Velocity Vs (ft/sec)	56.64
Q - ACFM	150,143
Qsd - DSCFM	80,789
Qs - SCFM	97,926
Qs - SCFH	5,875,552

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	M22E1454	**Operating Level:**	High (Normal)
Company:	WRB Refining LLC	**Run No.:**	9
Plant:	Wood River Refinery	**Date:**	04/19/2007
Source:	Hydrogen Plant 1	**Start Time:**	13:17
Pitot ID:	605A	**End Time:**	13:37
Pitot Coefficient:	0.841	**RM Testers:**	T Cass

Test Parameters	
P_{bar} - Barometric pressure, inches Hg	29.45
P_g - Stack Pressure, inches of H_2O	-0.70
P_s - Absolute stack pressure, inches Hg	29.40
t_s - Average stack temperature, °F	332.8
% CO_2	17.3
% O_2	3.5
% N_2	79.2
Md - dry basis lb/lb mole	30.91
Ms - wet basis lb/lb mole	28.75
Stack Diameter, Feet	7.50
Cross Sectional Area of Stack, Ft^2	44.18

Moisture Determination	
Meter Calibration:	0.991
Initial Meter Volume:	30.154
Final Meter Volume:	33.525
Meter Temperature:	84.30
Meter Volume Vm(std):	3.191
Meter Volume Vw(std):	0.641
Delta H:	0.10
Train Initial Wt:	535.300
Train Final Wt:	548.900
Condensate Initial Vol:	0.000
Condensate Final Vol:	0.000
Bws - Moisture content fraction	**0.167**

Port Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)
A 01	0.62	0.7874	334	54.87
A 02	0.70	0.8367	333	58.26
A 03	0.74	0.8602	333	59.91
A 04	0.68	0.8246	334	57.46
A 05	0.71	0.8426	334	58.72
A 06	0.66	0.8124	334	56.61
A 07	0.60	0.7746	331	53.87
A 08	0.47	0.6856	330	47.65
B 01	0.68	0.8246	333	57.43
B 02	0.75	0.8660	333	60.31
B 03	0.71	0.8426	334	58.72
B 04	0.72	0.8485	334	59.13
B 05	0.69	0.8307	334	57.88
B 06	0.67	0.8185	333	57.00
B 07	0.63	0.7937	332	55.24
B 08	0.46	0.6782	329	47.11

Port Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)

Method 2 Results	
Average ΔP	0.6556
Average Sqrt ΔP	0.8079
Average Velocity Vs (ft/sec)	56.26
Q - ACFM	149,121
Qsd - DSCFM	81,285
Qs - SCFM	97,581
Qs - SCFH	5,854,887

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	M22E1454	**Operating Level:**	High (Normal)
Company:	WRB Refining LLC	**Run No.:**	10
Plant:	Wood River Refinery	**Date:**	04/19/2007
Source:	Hydrogen Plant 1	**Start Time:**	13:52
Pitot ID:	605A	**End Time:**	14:12
Pitot Coefficient:	0.841	**RM Testers:**	T Cass

Test Parameters	
P_{bar} - Barometric pressure, inches Hg	29.45
P_g - Stack Pressure, inches of H_2O	-0.70
P_s - Absolute stack pressure, inches Hg	29.40
t_s - Average stack temperature, °F	333.1
% CO_2	17.3
% O_2	3.5
% N_2	79.2
Md - dry basis lb/lb mole	30.91
Ms - wet basis lb/lb mole	28.84
Stack Diameter, Feet	7.50
Cross Sectional Area of Stack, Ft^2	44.18

Moisture Determination	
Meter Calibration:	0.991
Initial Meter Volume:	33.630
Final Meter Volume:	36.885
Meter Temperature:	83.30
Meter Volume Vm(std):	3.086
Meter Volume Vw(std):	0.589
Delta H:	0.10
Train Initial Wt:	548.900
Train Final Wt:	561.400
Condensate Initial Vol:	0.000
Condensate Final Vol:	0.000
Bws - Moisture content fraction	**0.160**

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)
A	01	0.62	0.7874	333	54.75
A	02	0.71	0.8426	333	58.59
A	03	0.73	0.8544	334	59.44
A	04	0.70	0.8367	334	58.21
A	05	0.69	0.8307	334	57.79
A	06	0.71	0.8426	333	58.59
A	07	0.68	0.8246	333	57.34
A	08	0.46	0.6782	330	47.07
B	01	0.68	0.8246	334	57.37
B	02	0.70	0.8367	334	58.21
B	03	0.73	0.8544	334	59.44
B	04	0.69	0.8307	333	57.76
B	05	0.68	0.8246	334	57.37
B	06	0.72	0.8485	334	59.03
B	07	0.65	0.8062	332	56.02
B	08	0.47	0.6856	331	47.61

Port	Point	ΔP (in. H_2O)	Sqrt. ΔP	Temp (°F)	Velocity (V)

Method 2 Results	
Average ΔP	0.6638
Average Sqrt ΔP	0.8130
Average Velocity Vs (ft/sec)	56.53
Q - ACFM	149,855
Qsd - DSCFM	82,339
Qs - SCFM	98,023
Qs - SCFH	5,881,382

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ConocoPhillips Petroleum

Heat Input Calculation

April 19, 2007

Run #	Time		Natural Gas Flow	Off Gas Flow	Natural Gas Heat Input	Off Gas Heat Input	Total Heat Input
	Start	Stop	mmscfd	mmscfd	mmBtu/hr	mmBtu/hr	mmBtu/hr
1	8:36	08:56	4.851	16.56	209.2	184.2	393.4
2	09:12	09:32	4.911	16.32	211.8	181.6	393.4
3	09:48	10:08	4.676	16.85	201.7	187.5	389.2
4	10:23	10:43	4.589	16.42	197.9	182.7	380.6
		Average	**4.725**	**16.53**	**203.8**	**183.9**	**387.7**
5	10:58	11:18	4.407	16.83	190.1	187.2	377.3
6	11:32	11:52	4.299	16.52	185.4	183.8	369.2
7	12:07	12:27	4.301	16.74	185.5	186.2	371.7
		Average	**4.336**	**16.70**	**187.0**	**185.7**	**372.7**
8	12:42	13:02	4.300	16.49	185.4	183.5	368.9
9	13:17	13:37	4.301	16.74	185.5	186.2	371.7
10	13:52	14:12	4.295	16.47	185.2	183.2	368.4
		Average	**4.299**	**16.57**	**185.4**	**184.3**	**369.7**
		Total Average	**4.453**	**16.60**	**192.1**	**184.7**	**376.7**

Natural Gas 1035 BTU/dscf
Off Gas 267 BTU/dscf

Example Calulation: Run 1

Natural Gas Heat Input

$$\frac{\text{Gas flow mmscfd x btu/(}}{\text{24 hour}} = \frac{4.851 \times 1035}{24}$$

$$= 209.2 \quad \text{mmbtu/hr}$$

Off Gas Heat Input

$$\frac{\text{Gas flow mmscfd x btu/(}}{\text{24 hour}} = \frac{16.56 \times 267}{24}$$

$$= 184.2 \quad \text{mmbtu/hr}$$

Total heat Input = Natural Gas Heat Input + Off gas Heat Input

= 209.2 + 184.2

= **393.4** **mmBtu/hr**

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Average Values Report
Version 52.0
Generated: 4/19/2007 09:18

TEST 1

Company: Conoco Phillips
Plant:
City/St: Wood River, Illinois
Source: HP1

Period Start: 4/19/2007 08:36
Period End: 4/19/2007 08:56
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	CO ppm	O2 %O2	gas_fl_ng mmscfd	gas_fl_og mmscfd	stk_fl_c kscfm	stk_fl akcfm	H2O_pct %
4/19/2007 08:36	1.5	3.68	4.839	16.71	93.77	185.58	17.8
4/19/2007 08:37	1.5	3.84	4.855	17.04	93.78	185.58	17.8
4/19/2007 08:38	1.5	3.79	4.854	17.04	94.28	186.51	17.8
4/19/2007 08:39	1.5	3.98	4.847	15.79	94.25	186.51	17.8
4/19/2007 08:40	1.5	4.00	4.847	15.79	94.27	186.51	17.8
4/19/2007 08:41	1.5	3.84	4.847	16.01	95.19	188.37	17.8
4/19/2007 08:42	1.5	4.14	4.848	16.01	94.77	187.44	17.8
4/19/2007 08:43	1.5	3.75	4.855	16.63	94.74	187.44	17.8
4/19/2007 08:44	1.6	3.81	4.855	16.72	95.64	189.29	17.8
4/19/2007 08:45	1.5	3.82	4.855	17.52	95.64	189.29	17.8
4/19/2007 08:46	1.5	3.90	4.854	17.44	94.70	187.44	17.8
4/19/2007 08:47	1.5	3.92	4.847	16.67	95.24	188.37	17.8
4/19/2007 08:48	1.5	3.55	4.847	16.67	95.24	188.37	17.8
4/19/2007 08:49	1.5	3.93	4.847	16.01	92.89	183.69	17.8
4/19/2007 08:50	1.5	3.75	4.848	16.01	96.16	190.21	17.8
4/19/2007 08:51	1.5	3.60	4.855	15.97	95.60	189.29	17.8
4/19/2007 08:52	1.5	3.93	4.855	16.04	94.63	187.44	17.8
4/19/2007 08:53	1.5	3.93	4.855	16.63	94.62	187.44	17.8
4/19/2007 08:54	1.5	3.99	4.855	16.69	94.62	187.44	17.8
4/19/2007 08:55	1.5	3.72	4.855	17.21	94.15	186.51	17.8
4/19/2007 08:56	1.5	3.73	4.855	17.21	95.10	188.37	17.8
Final Average*	1.5	3.84	4.851	16.56	94.73	187.48	17.8
Maximum*	1.6	4.14	4.855	17.52	96.16	190.21	17.8
Minimum*	1.5	3.55	4.839	15.79	92.89	183.69	17.8

*Does not include Invalid Averaging Periods ("N/A")

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Average Values Report
Version 52.0
Generated: 4/19/2007 09:45

TEST 2

Company: Conoco Phillips
Plant:
City/St: Wood River, Illinois
Source: HP1

Period Start: 4/19/2007 09:12
Period End: 4/19/2007 09:32
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	CO ppm	O2 %O2	gas_fl_ng mmscfd	gas_fl_og mmscfd	stk_fl_c kscfm	stk_fl akcfm	H2O_pct %
4/19/2007 09:12	1.5	3.74	4.926	17.30	95.55	189.29	17.8
4/19/2007 09:13	1.5	3.66	4.917	16.81	95.15	188.37	17.8
4/19/2007 09:14	1.6	3.88	4.917	16.81	95.16	188.37	17.8
4/19/2007 09:15	1.5	3.83	4.917	15.83	95.17	188.37	17.8
4/19/2007 09:16	1.5	3.90	4.918	15.83	94.23	186.51	17.8
4/19/2007 09:17	1.5	3.84	4.927	15.57	94.23	186.51	17.8
4/19/2007 09:18	1.5	3.76	4.927	15.57	93.77	185.58	17.8
4/19/2007 09:19	1.5	3.76	4.927	15.70	93.29	184.64	17.8
4/19/2007 09:20	1.5	3.58	4.927	15.70	91.41	180.83	17.8
4/19/2007 09:21	1.5	4.04	4.927	16.27	93.83	185.58	17.8
4/19/2007 09:22	1.5	3.81	4.927	16.32	94.30	186.51	17.8
4/19/2007 09:23	1.5	3.90	4.927	16.72	93.80	185.58	17.8
4/19/2007 09:24	1.5	3.75	4.926	16.72	93.77	185.58	17.8
4/19/2007 09:25	1.5	3.73	4.917	16.81	93.77	185.58	17.8
4/19/2007 09:26	1.5	3.63	4.917	16.81	94.71	187.44	17.8
4/19/2007 09:27	1.5	3.46	4.917	16.19	90.97	179.87	17.8
4/19/2007 09:28	1.5	3.34	4.914	16.19	89.66	176.99	17.8
4/19/2007 09:29	1.5	2.98	4.882	16.06	90.73	178.93	17.8
4/19/2007 09:30	1.5	2.98	4.879	16.06	91.26	179.89	17.8
4/19/2007 09:31	1.5	2.93	4.847	16.67	91.29	179.89	17.8
4/19/2007 09:32	1.5	3.00	4.850	16.70	90.32	177.96	17.8
Final Average*	1.5	3.60	4.911	16.32	93.16	184.20	17.8
Maximum*	1.6	4.04	4.927	17.30	95.55	189.29	17.8
Minimum*	1.5	2.93	4.847	15.57	89.66	176.99	17.8

*Does not include Invalid Averaging Periods ("N/A")

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Average Values Report
Version 52.0
Generated: 4/19/2007 10:23

TEST 3

Company: Conoco Phillips
Plant:
City/St: Wood River, Illinois
Source: HP1

Period Start: 4/19/2007 09:48
Period End: 4/19/2007 10:08
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	CO ppm	O2 %O2	gas_fl_ng mmscfd	gas_fl_og mmscfd	stk_fl_c kscfm	stk_fl akcfm	H2O_pct %
4/19/2007 09:48	1.6	2.23	4.706	17.04	87.92	172.06	17.8
4/19/2007 09:49	1.5	2.53	4.722	17.07	89.00	174.05	17.8
4/19/2007 09:50	1.5	2.31	4.719	17.13	88.55	173.13	17.8
4/19/2007 09:51	1.5	2.40	4.696	17.70	89.09	174.11	17.8
4/19/2007 09:52	1.5	2.50	4.697	17.70	88.62	173.13	17.8
4/19/2007 09:53	1.5	2.56	4.704	17.16	88.61	173.13	17.8
4/19/2007 09:54	1.5	2.71	4.704	17.16	87.65	171.15	17.8
4/19/2007 09:55	1.5	2.49	4.704	15.79	88.18	172.15	17.8
4/19/2007 09:56	1.5	2.97	4.701	15.79	87.21	170.16	17.8
4/19/2007 09:57	1.5	2.88	4.677	15.83	87.69	171.15	17.8
4/19/2007 09:58	1.5	2.88	4.674	15.83	88.23	172.15	17.8
4/19/2007 09:59	1.5	2.88	4.642	16.15	87.21	170.16	17.8
4/19/2007 10:00	1.5	2.58	4.642	16.15	86.78	169.15	17.8
4/19/2007 10:01	1.5	2.37	4.642	16.90	87.82	171.15	17.8
4/19/2007 10:02	1.5	2.24	4.644	16.90	87.33	170.16	17.8
4/19/2007 10:03	1.5	2.50	4.659	16.95	87.87	171.15	17.8
4/19/2007 10:04	1.5	2.11	4.658	16.95	86.85	169.15	17.8
4/19/2007 10:05	1.5	2.14	4.652	17.70	86.33	168.14	17.8
4/19/2007 10:06	1.5	1.99	4.652	17.70	86.85	169.15	17.8
4/19/2007 10:07	1.5	2.10	4.652	17.12	85.86	167.13	17.8
4/19/2007 10:08	1.9	1.84	4.652	17.12	85.39	166.10	17.8
Final Average*	1.5	2.44	4.676	16.85	87.57	170.85	17.8
Maximum*	1.9	2.97	4.722	17.70	89.09	174.11	17.8
Minimum*	1.5	1.84	4.642	15.79	85.39	166.10	17.8

*Does not include Invalid Averaging Periods ("N/A")

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Average Values Report
Version 52.0
Generated: 4/19/2007 10:54

TEST 4

Company: Conoco Phillips
Plant:
City/St: Wood River, Illinois
Source: HP1

Period Start: 4/19/2007 10:23
Period End: 4/19/2007 10:43
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	CO ppm	O2 %O2	gas_fl_ng mmscfd	gas_fl_og mmscfd	stk_fl_c kscfm	stk_fl akcfm	H2O_pct %
4/19/2007 10:23	1.5	1.94	4.597	16.23	86.06	167.13	17.8
4/19/2007 10:24	1.5	2.18	4.597	16.23	85.55	166.10	17.8
4/19/2007 10:25	1.5	2.06	4.597	15.57	85.01	165.07	17.8
4/19/2007 10:26	1.5	2.02	4.597	15.57	85.55	166.10	17.8
4/19/2007 10:27	1.5	2.29	4.597	15.97	84.99	165.07	17.8
4/19/2007 10:28	1.5	2.26	4.598	15.97	84.98	165.07	17.8
4/19/2007 10:29	1.5	2.29	4.607	16.37	84.99	165.07	17.8
4/19/2007 10:30	1.6	2.15	4.607	16.41	84.97	165.07	17.8
4/19/2007 10:31	1.5	2.50	4.607	16.76	84.98	165.07	17.8
4/19/2007 10:32	1.5	2.21	4.606	16.83	85.50	166.10	17.8
4/19/2007 10:33	1.5	2.41	4.597	17.47	86.02	167.13	17.8
4/19/2007 10:34	1.5	2.44	4.597	17.49	86.49	168.14	17.8
4/19/2007 10:35	1.5	2.37	4.597	17.65	86.48	168.14	17.8
4/19/2007 10:36	1.5	2.33	4.596	17.54	85.95	167.13	17.8
4/19/2007 10:37	1.5	2.24	4.589	16.59	85.46	166.10	17.8
4/19/2007 10:38	1.5	2.41	4.588	16.50	85.49	166.10	17.8
4/19/2007 10:39	1.5	1.90	4.579	15.66	83.93	163.00	17.8
4/19/2007 10:40	2.7	1.81	4.577	15.68	83.98	163.00	17.8
4/19/2007 10:41	2.5	1.78	4.562	15.83	84.00	163.00	17.8
4/19/2007 10:42	1.5	2.11	4.558	15.83	83.48	161.95	17.8
4/19/2007 10:43	1.5	1.88	4.519	16.59	84.02	163.00	17.8
Final Average*	1.6	2.17	4.589	16.42	85.14	165.36	17.8
Maximum*	2.7	2.50	4.607	17.65	86.49	168.14	17.8
Minimum*	1.5	1.78	4.519	15.57	83.48	161.95	17.8

*Does not include Invalid Averaging Periods ("N/A")

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Average Values Report
Version 52.0
Generated: 4/19/2007 11:29

TEST 5

Company: Conoco Phillips
Plant:
City/St: Wood River, Illinois
Source: HP1

Period Start: 4/19/2007 10:58
Period End: 4/19/2007 11:18
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	CO ppm	O2 %O2	gas_fl_ng mmscfd	gas_fl_og mmscfd	stk_fl_c kscfm	stk_fl akcfm	H2O_pct %
4/19/2007 10:58	1.7	1.72	4.469	16.15	83.59	161.95	17.8
4/19/2007 10:59	2.7	2.23	4.429	16.81	84.11	163.00	17.8
4/19/2007 11:00	1.9	1.90	4.428	16.81	84.66	164.04	17.8
4/19/2007 11:01	1.5	2.12	4.419	17.30	84.64	164.04	17.8
4/19/2007 11:02	1.5	2.08	4.418	17.30	84.11	163.00	17.8
4/19/2007 11:03	1.5	2.16	4.411	17.35	84.15	163.00	17.8
4/19/2007 11:04	1.6	2.08	4.410	17.28	84.15	163.00	17.8
4/19/2007 11:05	1.5	2.08	4.401	16.67	85.16	165.07	17.8
4/19/2007 11:06	1.5	2.56	4.402	16.67	84.64	164.04	17.8
4/19/2007 11:07	1.5	2.16	4.411	15.52	85.18	165.07	17.8
4/19/2007 11:08	1.5	2.13	4.410	15.52	84.13	163.00	17.8
4/19/2007 11:09	1.5	1.97	4.401	15.87	83.08	160.89	17.8
4/19/2007 11:10	1.5	1.95	4.401	15.95	84.16	163.00	17.8
4/19/2007 11:11	1.5	1.96	4.401	16.67	84.68	164.04	17.8
4/19/2007 11:12	1.6	1.74	4.401	16.69	84.14	163.00	17.8
4/19/2007 11:13	2.6	1.93	4.401	16.86	83.07	160.89	17.8
4/19/2007 11:14	2.3	1.46	4.400	16.86	83.09	160.89	17.8
4/19/2007 11:15	2.6	1.66	4.394	17.47	83.11	160.89	17.8
4/19/2007 11:16	2.7	1.74	4.392	17.47	83.13	160.89	17.8
4/19/2007 11:17	2.8	1.90	4.376	18.19	84.21	163.00	17.8
4/19/2007 11:18	2.5	2.30	4.367	18.03	84.72	164.04	17.8
Final Average*	1.9	1.99	4.407	16.83	84.09	162.89	17.8
Maximum*	2.8	2.56	4.469	18.19	85.18	165.07	17.8
Minimum*	1.5	1.46	4.367	15.52	83.07	160.89	17.8

*Does not include Invalid Averaging Periods ("N/A")

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Average Values Report
Version 52.0
Generated: 4/19/2007 12:03

TEST 6

Company: Conoco Phillips
Plant:
City/St: Wood River, Illinois
Source: HP1

Period Start: 4/19/2007 11:32
Period End: 4/19/2007 11:52
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	CO ppm	O2 %O2	gas_fl_ng mmscfd	gas_fl_og mmscfd	stk_fl_c kscfm	stk_fl akcfm	H2O_pct %
4/19/2007 11:32	1.5	2.00	4.255	17.30	84.19	163.00	17.8
4/19/2007 11:33	1.6	1.69	4.296	16.81	83.62	161.95	17.8
4/19/2007 11:34	2.7	2.43	4.293	16.81	82.56	159.83	17.8
4/19/2007 11:35	1.6	2.09	4.261	15.66	82.56	159.83	17.8
4/19/2007 11:36	1.6	2.49	4.267	15.66	83.05	160.89	17.8
4/19/2007 11:37	1.5	2.42	4.321	16.01	83.05	160.89	17.8
4/19/2007 11:38	1.5	2.42	4.319	16.01	83.04	160.89	17.8
4/19/2007 11:39	1.5	2.45	4.304	16.27	82.99	160.89	17.8
4/19/2007 11:40	1.5	2.23	4.303	16.27	82.99	160.89	17.8
4/19/2007 11:41	1.5	2.43	4.296	16.99	82.47	159.83	17.8
4/19/2007 11:42	1.5	2.12	4.297	16.99	82.98	160.89	17.8
4/19/2007 11:43	1.5	2.23	4.304	17.30	82.94	160.89	17.8
4/19/2007 11:44	1.5	2.09	4.305	17.30	82.41	159.83	17.8
4/19/2007 11:45	1.5	2.07	4.314	17.30	82.97	160.89	17.8
4/19/2007 11:46	1.5	2.08	4.317	17.30	82.41	159.83	17.8
4/19/2007 11:47	1.6	1.71	4.341	16.50	81.87	158.76	17.8
4/19/2007 11:48	2.7	2.36	4.337	16.50	81.86	158.76	17.8
4/19/2007 11:49	1.6	1.95	4.296	15.83	82.45	159.83	17.8
4/19/2007 11:50	1.5	2.22	4.294	15.83	82.41	159.83	17.8
4/19/2007 11:51	1.5	2.18	4.278	16.15	82.96	160.89	17.8
4/19/2007 11:52	1.5	2.29	4.278	16.15	82.97	160.89	17.8
Final Average*	1.6	2.19	4.299	16.52	82.80	160.48	17.8
Maximum*	2.7	2.49	4.341	17.30	84.19	163.00	17.8
Minimum*	1.5	1.69	4.255	15.66	81.86	158.76	17.8

*Does not include Invalid Averaging Periods ("N/A")

Font09

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Average Values Report
Version 52.0
Generated: 4/19/2007 12:38

TEST 7

Company: Conoco Phillips
Plant:
City/St: Wood River, Illinois
Source: HP1

Period Start: 4/19/2007 12:07
Period End: 4/19/2007 12:27
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	CO ppm	O2 %O2	gas_fl_ng mmscfd	gas_fl_og mmscfd	stk_fl_c kscfm	stk_fl akcfm	H2O_pct %
4/19/2007 12:07	1.5	2.00	4.314	16.41	N/A	N/A	17.8
4/19/2007 12:08	1.5	2.00	4.313	16.41	N/A	N/A	17.8
4/19/2007 12:09	1.5	2.46	4.304	16.99	83.49	161.95	17.8
4/19/2007 12:10	1.6	2.21	4.304	17.03	84.02	163.00	17.8
4/19/2007 12:11	1.5	2.31	4.304	17.44	82.92	160.89	17.8
4/19/2007 12:12	1.5	2.26	4.304	17.43	83.48	161.95	17.8
4/19/2007 12:13	1.5	2.26	4.304	17.30	82.94	160.89	17.8
4/19/2007 12:14	1.5	2.21	4.303	17.30	84.02	163.00	17.8
4/19/2007 12:15	1.5	1.87	4.296	16.55	83.49	161.95	17.8
4/19/2007 12:16	2.6	2.30	4.296	16.55	83.49	161.95	17.8
4/19/2007 12:17	1.7	1.98	4.296	15.61	84.02	163.00	17.8
4/19/2007 12:18	1.5	2.03	4.296	15.61	82.93	160.89	17.8
4/19/2007 12:19	1.5	1.80	4.296	16.01	82.39	159.83	17.8
4/19/2007 12:20	1.7	1.76	4.296	16.01	81.85	158.76	17.8
4/19/2007 12:21	2.7	1.73	4.296	16.55	82.98	160.89	17.8
4/19/2007 12:22	2.6	1.69	4.297	16.55	82.98	160.89	17.8
4/19/2007 12:23	2.7	2.14	4.304	16.90	82.99	160.89	17.8
4/19/2007 12:24	1.8	2.03	4.304	16.90	83.54	161.95	17.8
4/19/2007 12:25	1.5	2.25	4.304	17.44	84.07	163.00	17.8
4/19/2007 12:26	1.5	2.18	4.303	17.44	83.49	161.95	17.8
4/19/2007 12:27	1.5	2.33	4.296	17.16	84.03	163.00	17.8
Final Average*	1.8	2.09	4.301	16.74	83.32	161.61	17.8
Maximum*	2.7	2.46	4.314	17.44	84.07	163.00	17.8
Minimum*	1.5	1.69	4.296	15.61	81.85	158.76	17.8

*Does not include Invalid Averaging Periods ("N/A")

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Average Values Report
Version 52.0
Generated: 4/19/2007 13:14

TEST 8

Company: Conoco Phillips
Plant:
City/St: Wood River, Illinois
Source: HP1

Period Start: 4/19/2007 12:42
Period End: 4/19/2007 13:02
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	CO ppm	O2 %O2	gas_fl_ng mmscfd	gas_fl_og mmscfd	stk_fl_c kscfm	stk_fl akcfm	H2O_pct %
4/19/2007 12:42	1.5	2.19	4.296	17.39	82.93	160.89	17.8
4/19/2007 12:43	1.5	1.88	4.296	16.86	83.48	161.95	17.8
4/19/2007 12:44	1.5	2.52	4.296	16.74	82.91	160.89	17.8
4/19/2007 12:45	1.6	2.12	4.296	15.70	82.39	159.83	17.8
4/19/2007 12:46	1.6	2.16	4.296	15.70	82.39	159.83	17.8
4/19/2007 12:47	1.5	2.07	4.296	15.97	82.41	159.83	17.8
4/19/2007 12:48	1.5	2.08	4.297	15.97	81.87	158.76	17.8
4/19/2007 12:49	1.5	2.06	4.304	16.19	81.87	158.76	17.8
4/19/2007 12:50	1.9	1.58	4.303	16.23	82.41	159.83	17.8
4/19/2007 12:51	2.7	2.31	4.296	16.59	82.44	159.83	17.8
4/19/2007 12:52	2.0	1.97	4.297	16.59	82.45	159.83	17.8
4/19/2007 12:53	1.5	1.97	4.304	17.44	81.89	158.76	17.8
4/19/2007 12:54	1.5	2.09	4.304	17.44	82.45	159.83	17.8
4/19/2007 12:55	1.5	2.15	4.304	17.39	81.89	158.76	17.8
4/19/2007 12:56	1.5	1.77	4.304	17.39	81.38	157.69	17.8
4/19/2007 12:57	2.2	1.74	4.304	16.59	81.97	158.76	17.8
4/19/2007 12:58	2.6	2.25	4.304	16.59	81.94	158.76	17.8
4/19/2007 12:59	1.5	1.99	4.304	15.61	81.41	157.69	17.8
4/19/2007 13:00	1.5	1.92	4.303	15.61	81.45	157.69	17.8
4/19/2007 13:01	1.5	1.98	4.296	16.10	82.55	159.83	17.8
4/19/2007 13:02	1.6	2.28	4.296	16.10	83.08	160.89	17.8
Final Average*	1.7	2.05	4.300	16.49	82.26	159.47	17.8
Maximum*	2.7	2.52	4.304	17.44	83.48	161.95	17.8
Minimum*	1.5	1.58	4.296	15.61	81.38	157.69	17.8

*Does not include Invalid Averaging Periods ("N/A")

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Average Values Report
Version 52.0
Generated: 4/19/2007 13:51

TEST 9

Company: Conoco Phillips
Plant:
City/St: Wood River, Illinois
Source: HP1

Period Start: 4/19/2007 13:17
Period End: 4/19/2007 13:37
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	CO ppm	O2 %O2	gas_fl_ng mmscfd	gas_fl_og mmscfd	stk_fl_c kscfm	stk_fl akcfm	H2O_pct %
4/19/2007 13:17	2.1	2.20	4.296	16.32	83.09	160.89	17.8
4/19/2007 13:18	1.5	2.11	4.297	16.32	83.63	161.95	17.8
4/19/2007 13:19	1.5	2.57	4.304	16.76	84.14	163.00	17.8
4/19/2007 13:20	1.6	2.24	4.303	16.76	83.57	161.95	17.8
4/19/2007 13:21	2.2	2.05	4.296	17.44	83.05	160.89	17.8
4/19/2007 13:22	1.5	2.08	4.297	17.44	83.07	160.89	17.8
4/19/2007 13:23	1.5	2.27	4.304	17.26	83.60	161.95	17.8
4/19/2007 13:24	1.5	2.02	4.303	17.22	83.60	161.95	17.8
4/19/2007 13:25	1.5	1.79	4.296	16.90	83.59	161.95	17.8
4/19/2007 13:26	2.7	2.17	4.297	16.78	82.50	159.83	17.8
4/19/2007 13:27	1.5	1.67	4.304	15.75	83.05	160.89	17.8
4/19/2007 13:28	2.4	1.95	4.304	15.75	83.04	160.89	17.8
4/19/2007 13:29	1.5	2.00	4.304	16.19	83.54	161.95	17.8
4/19/2007 13:30	1.5	2.11	4.304	16.19	83.54	161.95	17.8
4/19/2007 13:31	1.5	2.11	4.304	16.27	83.54	161.95	17.8
4/19/2007 13:32	1.8	1.84	4.304	16.33	83.54	161.95	17.8
4/19/2007 13:33	2.6	2.31	4.304	16.86	83.54	161.95	17.8
4/19/2007 13:34	1.8	2.14	4.304	16.86	83.54	161.95	17.8
4/19/2007 13:35	1.5	2.09	4.304	17.44	82.99	160.89	17.8
4/19/2007 13:36	1.5	2.09	4.303	17.44	83.01	160.89	17.8
4/19/2007 13:37	1.5	2.25	4.296	17.21	83.02	160.89	17.8
Final Average*	1.7	2.10	4.301	16.74	83.34	161.50	17.8
Maximum*	2.7	2.57	4.304	17.44	84.14	163.00	17.8
Minimum*	1.5	1.67	4.296	15.75	82.50	159.83	17.8

*Does not include Invalid Averaging Periods ("N/A")

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Average Values Report
Version 52.0
Generated: 4/19/2007 14:13

TEST 10

Company: Conoco Phillips
Plant:
City/St: Wood River, Illinois
Source: HP1

Period Start: 4/19/2007 13:52
Period End: 4/19/2007 14:12
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	CO ppm	O2 %O2	gas_fl_ng mmscfd	gas_fl_og mmscfd	stk_fl_c kscfm	stk_fl akcfm	H2O_pct %
4/19/2007 13:52	2.7	1.83	4.293	17.39	82.52	159.83	17.8
4/19/2007 13:53	1.5	1.77	4.269	16.72	83.61	161.95	17.8
4/19/2007 13:54	2.1	2.36	4.270	16.72	82.49	159.83	17.8
4/19/2007 13:55	1.5	2.03	4.278	15.52	81.89	158.76	17.8
4/19/2007 13:56	1.5	2.06	4.281	15.52	82.50	159.83	17.8
4/19/2007 13:57	1.5	1.98	4.304	16.01	82.51	159.83	17.8
4/19/2007 13:58	1.5	2.11	4.303	16.01	83.01	160.89	17.8
4/19/2007 13:59	1.5	2.08	4.296	16.41	83.02	160.89	17.8
4/19/2007 14:00	1.7	1.77	4.296	16.41	83.04	160.89	17.8
4/19/2007 14:01	2.7	2.35	4.296	16.72	83.58	161.95	17.8
4/19/2007 14:02	1.9	2.14	4.297	16.72	83.05	160.89	17.8
4/19/2007 14:03	1.5	2.14	4.304	17.35	82.99	160.89	17.8
4/19/2007 14:04	1.5	2.12	4.303	17.35	82.47	159.83	17.8
4/19/2007 14:05	1.5	2.16	4.296	17.35	83.03	160.89	17.8
4/19/2007 14:06	1.5	2.06	4.297	17.35	83.05	160.89	17.8
4/19/2007 14:07	1.5	1.93	4.304	16.50	83.61	161.95	17.8
4/19/2007 14:08	1.5	2.33	4.304	16.50	83.62	161.95	17.8
4/19/2007 14:09	1.5	2.07	4.304	15.52	83.62	161.95	17.8
4/19/2007 14:10	1.5	2.23	4.303	15.58	83.08	160.89	17.8
4/19/2007 14:11	1.5	2.15	4.296	16.10	83.64	161.95	17.8
4/19/2007 14:12	1.5	2.27	4.297	16.10	83.62	161.95	17.8
Final Average*	1.7	2.09	4.295	16.47	83.05	160.89	17.8
Maximum*	2.7	2.36	4.304	17.39	83.64	161.95	17.8
Minimum*	1.5	1.77	4.269	15.52	81.89	158.76	17.8

*Does not include Invalid Averaging Periods ("N/A")

CALIBRATION PROCEDURES

PITOT TUBES

The pitot tubes used during this test program are fabricated according to the specification described and illustrated in the *Code of Federal Regulations*, Title 40, Part 60, Appendix A, Methods 1 through 5 as published in the *Federal Register*, Volume 42, No. 160; hereafter referred to by the appropriate method number. The pitot tubes comply with the alignment specifications in Method 2, Section 4; and the pitot tube assemblies are in compliance with specifications in the same section.

Pitot tube assemblies are calibrated in accordance with Method 2, Section 4, against a standard hemispherical pitot utilizing a wind tunnel meeting the specification in Method 2, Section 4.1.2.

TEMPERATURE SENSING DEVICES

The potentiometer and thermocouples are calibrated against a mercury thermometer in a calibration well. Alternatively, readings are checked utilizing a NBS traceable millivolt source.

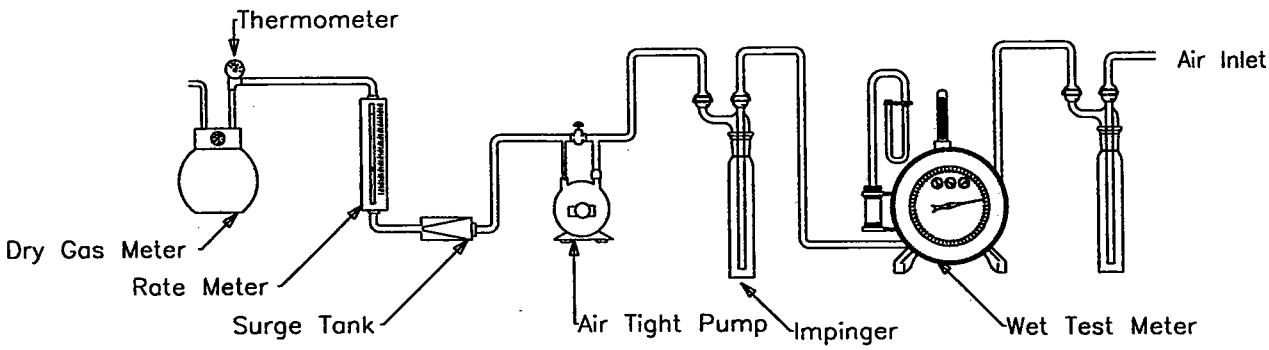
DRY GAS METERS

The test meters are calibrated according to Method 5, Section 5.3 and "Procedures for Calibrating and Using Dry Gas Volume Meters as Calibration Standards" by P.R. Westlin and R.T. Shigehara, March 10, 1978.

ANALYTICAL BALANCE

The accuracy of the analytical balance is checked with Class S, Stainless Steel Type 303 weights manufactured by F. Hopken and Son, Jersey City, New Jersey.

Gas Meter Calibration Train



Dwg - AF

Pre Test DGM Calibration

Control Module No.	F 4	Date:	03-08-07
Standard Meter No.	2962157	Calibrated By:	A.Cortes
Standard Meter (Yr)	0.999	Barometric Pressure :	29.67

Run Number	Orifice Setting in. H_20 (set value)	Orifice Setting in. H_20 (read value)	Standard Meter Volume Vr	Control Module DGM Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Δ H@
Initial			609.795	165.920	66	70	67					
Final			614.813	171.012	66	70	68					
Difference 1	0.15	0.15	5.018	5.092	66	70	67.5	68.75	23	36	0.990	1.86540968
Initial			599.084	155.217	66	68	67					
Final			604.011	160.185	66	70	67					
Difference 2	0.25	0.26	4.927	4.968	66	69	67	68	16	34	0.995	1.655067115
Initial			604.310	160.470	66	70	67					
Final			609.370	165.612	66	71	67					
Difference 3	0.35	0.36	5.060	5.142	66	70.5	67	68.75	14	3	0.988	1.560538152

Specifications: CFR 40, Part 60, Appendix A, Method 5, section 10.3.1. Calibration Before Use.

Pre Test Calibration Factor (Y) 0.991 1.694

Pre Test Temperature Indicator Calibration
(For K-Type Thermocouples)

Date: 03/08/2007

Name: A.Cortes

Control Module Number: F 4

Ambient (room) Temperature: 66 °F

Reference Thermocouple Calibrator: Omega Engineering, Inc. Model No. CL23A
Reference Thermocouple Calibrator Serial Number: T-236796
Date of Reference Calibration Verification: 05/06/2006

Primary Standards Directly Traceable to:
National Institute of Standards and Technology (NIST)

Reference Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-1	0.2
600	599	0.1
1200	1199	0.1

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

Post Test DGM Calibration

Control Module No.	F4	Date:	4/27/07
Standard Meter No.	3623853	Calibrated By:	DST
Standard Meter (Yr)	0.995	Barometric Pressure :	29.26

Run Number	Orifice Setting in. H_20 (set value)	Orifice Setting in. H_20 (read value)	Standard Meter Gas Volume Vr	Control Module DGM Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Δ H@
Initial			412.424	254.181	65	72	68					
Final			417.522	259.518	65	79	74					
Difference 1	0.25	0.25	5.098	5.337	65	75.5	71	73.25	17	58	0.970	1.749
Initial			417.522	259.518	65	77	74					
Final			423.792	266.161	65	81	77					
Difference 2	0.25	0.25	6.270	6.643	65	79	75.5	77.25	21	24	0.965	1.628
Initial			423.792	266.161	65	80	77					
Final			429.332	272.039	65	81	78					
Difference 3	0.25	0.25	5.540	5.878	65	80.5	77.5	79	18	52	0.967	1.615

Post Test Calibration Factor (Y)	0.967	1.664
Pre Test Calibration Factor (Y)	0.991	
Pre Test Calibration (Date):	3/8/2007	
% diff. between Pre & Post (Y)	2.4	

Specifications: CFR 40, Part 60, Appendix A, Method 5, section 10.3.2. Calibration After Use.

If difference between Pre & Post is less than 5% use Pre Test (Y)

Post Test Temperature Indicator Calibration
(For K-Type Thermocouples)

Date: 4/27/07

Name: D. Thompson

Control Module Number: F4

Ambient (room) Temperature: 67 °F

Reference Thermocouple Calibrator: Omega Engineering, Inc. Model No. CL23A
Reference Thermocouple Calibrator Serial Number: T-236796
Date of Reference Calibration Verification: 05/06/2006

Primary Standards Directly Traceable to:
National Institute of Standards and Technology (NIST)

Reference Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	0	0.0
600	601	0.1
1200	1202	0.1

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? x yes ____ no

Pitot tube openings damaged? ____ yes (explain below) x no

α_1 = 3 ° (<10°), α_2 = 3 ° (<10°) z = A sin γ = 0.020 (in.); (<0.125 in.)

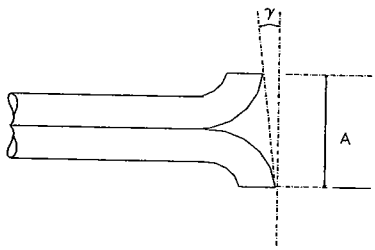
β_1 = 1 ° (<5°), β_2 = 1 ° (<5°) w = A sin θ = 0.020 (in.); (<0.03125 in.)

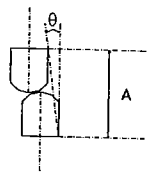
γ = 1 °, θ = 1 °, A = 1.121 (in.) P_A = 0.561 (in.), P_B = 0.561 (in.), D_t = 0.375 (in.)

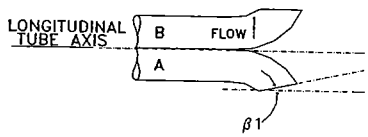
Comments:

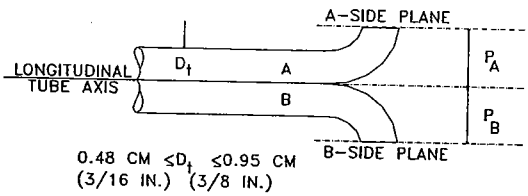
Calibration required? ____ yes X no

Pitot Tube No.: 605 Date: 04/27/2007 Name: D.Thompson

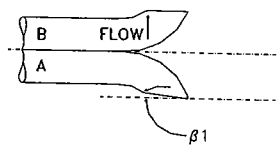


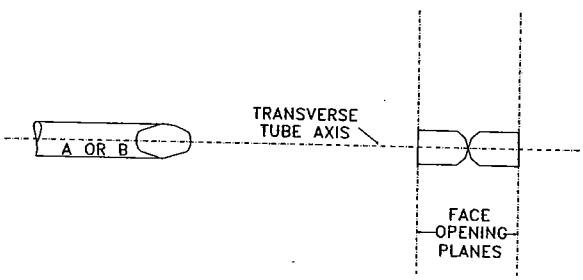


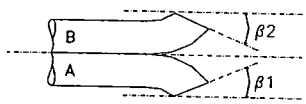


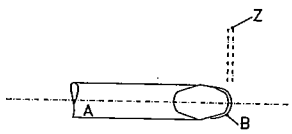


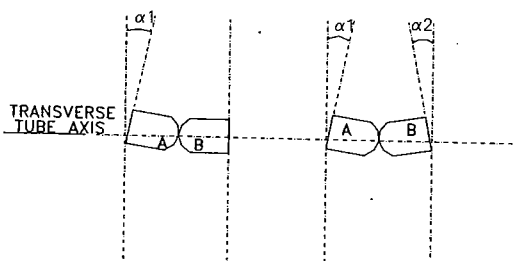
NOTE:
1.05 D_t<P_t <1.50 D
P_A = P_B

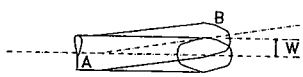












TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? x yes ____ no

Pitot tube openings damaged? ____ yes (explain below) x no

α_1 = 2 ° (<10°), α_2 = 2 ° (<10°) z = A sin γ = 0.019 (in.); (<0.125 in.)

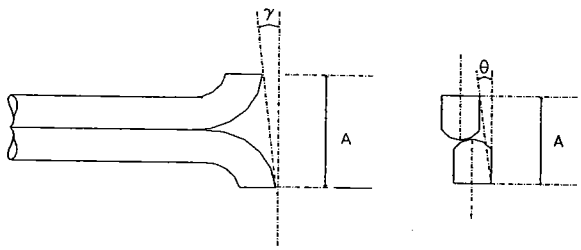
β_1 = 2 ° (<5°), β_2 = 1 ° (<5°) w = A sin θ = 0.019 (in.); (<0.03125 in.)

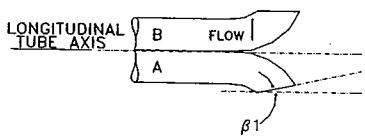
γ = 1 °, θ = 1 °, A = 1.116 (in.) P_A = 0.558 (in.), P_B = 0.558 (in.), D_t = 0.375 (in.)

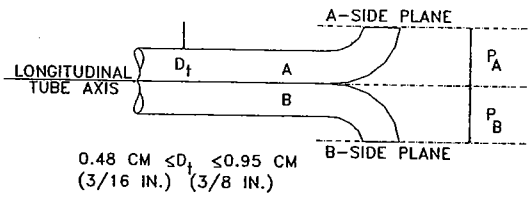
Comments: _____

Calibration required? ____ yes X no

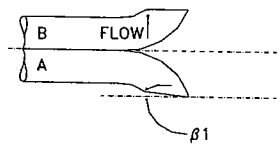
Pitot Tube No.: 605 Date: 10/12/2006 Name: T.Mei

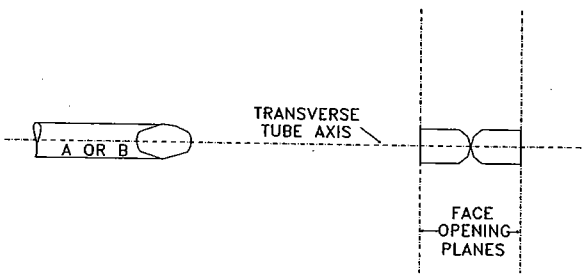


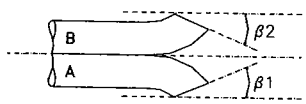


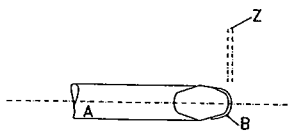


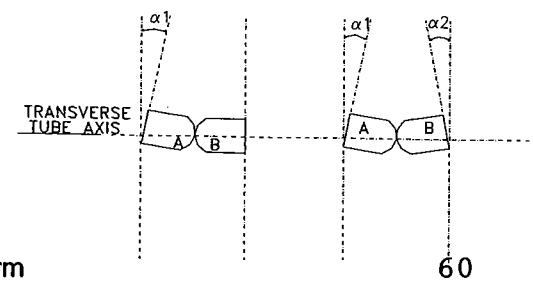
NOTE:
1.05 D_t<P_t <1.50 D
P_A = P_B

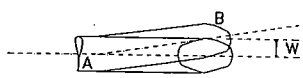












PITOT TUBE CALIBRATION DATA

Type "S" Pitot Tube ID Number: 605 Size (OD): 3/8" Leak Check: pass

Calibration Pitot Tube

Type: Hemispherical (std) Size (OD): 1/4" Cp(std) = 1.00 ID #: Dwyer 160-8

Calibration Date: 10/11/99 Performed By: R. Russ

P_{std}, (in.) H_2O		A-Side Calibration		
Set Value	Read Value	P_s, (in.) H_2O	$C_{p(S)}$ [a]	DEV. [b]
0.25	0.25	0.35	0.845	0.004
0.55	0.56	0.79	0.842	0.001
0.85	0.84	1.20	0.837	0.004
1.00	1.05	1.50	0.837	0.004
2.00	2.05	2.90	0.841	0.000
3.00	3.00	4.20	0.845	0.004
		Average	0.841	0.003

P_{std}, (in.) H_2O		B-Side Calibration		
Set Value	Read Value	P_s, (in.) H_2O	$C_{p(S)}$ [a]	DEV. [b]
0.25	0.25	0.35	0.845	0.004
0.55	0.56	0.79	0.842	0.001
0.85	0.84	1.20	0.837	0.004
1.00	1.05	1.50	0.837	0.004
2.00	2.05	2.90	0.841	0.000
3.00	3.00	4.20	0.845	0.004
		Average	0.841	0.003

$\overline{C_p}(A) - \overline{C_p}(B) =$ 0.000
(must be ≤ 0.01)

[a] $C_{p(S)} = C_{p(std)}\sqrt{\frac{\Delta P_{std}}{\Delta P_s}}$

[b] $DEV = C_{p(S)} - \overline{C_p}$
(must be ≤ 0.01)

CALIBRATION ERROR SUMMARY

Date: 4/19/07

Plant: WRB Refining - Conoco Phillips

Location: HP-1 Stack

Box Truck No: Trailer 10

Analyzer Type and Span	Linearity Settings	Cylinder ID Serial Number	Cal Value	Response	Difference As % of Span
NO_x 0-167.6	Zero	—	0.0	-0.01	0.0
	Mid	ALM010319	91.49	91.37	0.1
	High	ALM019237	167.6	167.83	0.1
SO_2 ____	Zero				
	Mid				
	High				
CO_2 ____	Zero				
	Mid				
	High				
CO 0-898.1	Zero	—	~~0.0~~	0.03	0.0
	Low				
	Mid	ALM047609	498.3	489.68	1.0
	High	ALM011304	898.1	895.15	0.3
O_2 0-22.55	Zero	—	0.0	0.0	0.0
	Mid	ALM055061	12.83	12.72	0.5
	High	ALM027288	22.55	22.57	0.1

Calculation:

$$\frac{\text{CalGas Value} - \text{Analyzer Response}}{\text{Span}} \times 100$$

(Must be ≤ ±2%)

CALIBRATION DRIFT SUMMARY
(METHODS 3A, 6C, 7E AND 10)

	Time		Cal Value	Response	Drift	System Bias	C_o or C_m
Pre 1	NO_x	Zero	0.0	0.28			—
		Mid	91.49	88.39			—
	SO_2	Zero					—
		Mid					—
	CO_2	Zero					—
		Mid					—
	CO	Zero	0.0	-0.09			—
		Mid	498.3	483.14			—
	O_2	Zero	0.0	0.0			—
		Mid	12.83	12.64			—
Post 1/ Pre 2	NO_x	Zero	0.0	0.0	0.2		C_o =
		Mid	91.49	88.08	0.2		C_m =
	SO_2	Zero					C_o =
		Mid					C_m =
	CO_2	Zero					C_o =
		Mid					C_m =
	CO	Zero	0.0	0.61	0.1		C_o =
		Mid	498.3	483.78	0.1		C_m =
	O_2	Zero	0.0	0.0	0.0		C_o =
		Mid	12.83	12.62	0.1		C_m =
Post 2/ Pre 3	NO_x	Zero	0.0	-0.02	0.0		C_o =
		Mid	91.49	87.91	0.1		C_m =
	SO_2	Zero					C_o =
		Mid					C_m =
	CO_2	Zero					C_o =
		Mid					C_m =
	CO	Zero	0.0	-0.13	0.1		C_o =
		Mid	498.3	484.23	0.1		C_m =
	O_2	Zero	0.0	0.0	0.0		C_o =
		Mid	12.83	12.63	0.0		C_m =
Post 3/ Pre 4	NO_x	Zero	0.0	0.08	0.1		C_o =
		Mid	91.49	88.10	0.1		C_m =
	SO_2	Zero					C_o =
		Mid					C_m =
	CO_2	Zero					C_o =
		Mid					C_m =
	CO	Zero	0.0	-0.17	~~0.0~~ 0.0		C_o =
		Mid	498.3	484.61	0.0		C_m =
	O_2	Zero	0.0	0.0	0.0		C_o =
		Mid	12.83	12.61	0.1		C_m =
Post 4/ Pre 5	NO_x	Zero	0.0	0.09	0.0		C_o =
		Mid	91.49	88.07	0.0		C_m =
	SO_2	Zero					C_o =
		Mid					C_m =
	CO_2	Zero					C_o =
		Mid					C_m =
	CO	Zero	0.0	-0.19	0.0		C_o =
		Mid	498.3	484.8	0.0		C_m =
	O_2	Zero	0.0	0.0	0.0		C_o =
		Mid	12.83	12.62	0.0		C_m =
Post 5/ Pre 6	NO_x	Zero	0.0	0.09	0.0		C_o =
		Mid	91.49	88.17	0.1		C_m =
	SO_2	Zero					C_o =
		Mid					C_m =
	CO_2	Zero					C_o =
		Mid					C_m =
	CO	Zero	0.0	-0.15	0.0		C_o =
		Mid	498.3	484.40	0.0		C_m =
	O_2	Zero	0.0	0.0	0.0		C_o =
		Mid	12.83	12.61	0.0		C_m =

	Time		Cal Value	Response	Drift	System Bias	C_o or C_m
Post 6/ Pre 7	NO_x	Zero	0.0	0.22	0.1		C_o =
		Mid	91.49	88.08	0.1		C_m =
	SO_2	Zero					C_o =
		Mid					C_m =
	CO_2	Zero					C_o =
		Mid					C_m =
	CO	Zero	0.0	-0.06	0.0		C_o =
		Mid	498.3	481.69	0.3		C_m =
	O_2	Zero	0.0	0.0	0.0		C_o =
		Mid	12.83	12.61	0.0		C_m =
Post 7/ Pre 8	NO_x	Zero	0.0	0.24	0.0		C_o =
		Mid	91.49	88.00	0.0		C_m =
	SO_2	Zero					C_o =
		Mid					C_m =
	CO_2	Zero					C_o =
		Mid					C_m =
	CO	Zero	0.0	-0.06	0.0		C_o =
		Mid	498.3	484.02	0.3		C_m =
	O_2	Zero	0.0	0.0	0.0		C_o =
		Mid	12.83	12.60			C_m =
Post 8/ Pre 9	NO_x	Zero	0.0	0.05	0.0		C_o =
		Mid	91.49	87.91	0.1		C_m =
	SO_2	Zero					C_o =
		Mid					C_m =
	CO_2	Zero					C_o =
		Mid					C_m =
	CO	Zero	0.0	-0.07	0.0		C_o =
		Mid	498.3	482.68	0.1		C_m =
	O_2	Zero	0.0	0.0	0.0		C_o =
		Mid	12.83	12.60	0.0		C_m =
Post 9/ Pre 10	NO_x	Zero	0.0	0.23	0.1		C_o =
		Mid	91.49	87.88	0.0		C_m =
	SO_2	Zero					C_o =
		Mid					C_m =
	CO_2	Zero					C_o =
		Mid					C_m =
	CO	Zero	0.0	-0.08	0.0		C_o =
		Mid	498.3	483.24	0.1		C_m =
	O_2	Zero	0.0	0.0	0.0		C_o =
		Mid	12.83	12.60	0.0		C_m =
Post 10/ Pre 11	NO_x	Zero	0.0	-0.03	0.2		C_o =
		Mid	91.49	~~-0.30~~ 0.08	~~0.0~~		C_m =
	SO_2	Zero		87.69	0.1		C_o =
		Mid					C_m =
	CO_2	Zero					C_o =
		Mid					C_m =
	CO	Zero	0.0	-0.30	0.0		C_o =
		Mid	498.3	483.45	0.0		C_m =
	O_2	Zero	0.0	0.0	0.0		C_o =
		Mid	12.83	12.60	0.0		C_m =
Post 11/ Pre 12	NO_x	Zero					C_o =
		Mid					C_m =
	SO_2	Zero					C_o =
		Mid					C_m =
	CO_2	Zero					C_o =
		Mid					C_m =
	CO	Zero					C_o =
		Mid					C_m =
	O_2	Zero					C_o =
		Mid					C_m =

	Time		Cal Value	Response	Drift	System Bias	C_o or C_m
Post 12	NO_x	Zero					C_o =
		Mid					C_m =
	SO_2	Zero					C_o =
		Mid					C_m =
	CO_2	Zero					C_o =
		Mid					C_m =
	CO	Zero					C_o =
		Mid					C_m =
	O_2	Zero					C_o =
		Mid					C_m =

Necessary Calculations

$$\text{Drift} = \frac{\text{Post Cal Response - Pre Cal Response}}{\text{Span}} \times 100$$

(Must be $\leq 3\%$)

$$C_{gas} = (C - C_o)\frac{C_{ma}}{C_m - C_o}$$

where:

C_{gas} = Effluent gas concentration, dry basis, ppm.

C = Average gas concentration indicated by gas analyzer, dry basis, ppm.

C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm.

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm.

C_{ma} = Actual concentration of the upscale calibration gas, ppm.

CALIBRATION AND MOISTURE CORRECTED DATA

Plant Name:	WRB Refining LLC	Location:	Stack
Unit No.:	Hydrogen Plant 1	Date:	04/19/07
Source Condition:	Normal	Mobile Lab:	DST
		Box Truck	Trailer 10

Run #	Start Time	End Time	NOx ppmd	NOx lbs/MMBtu	NOx lb/hr	CO lbs/MMBtu	CO ppmd	CO lb/hr	O2 %vold	Flow dscfm
1	8:36	8:56	28.3	0.048	18.9	-0.002	-1.4	-0.6	3.8	93366
2	9:12	9:32	28.4	0.049	19.1	-0.002	-1.4	-0.6	3.6	94158
3	9:48	10:08	26.8	0.042	16.5	-0.001	-1.0	-0.4	2.4	85988
4	10:23	10:43	25.9	0.040	15.3	-0.001	-0.9	-0.3	2.1	82740
Average			**27.0**	**0.044**	**17.0**	**-0.001**	**-1.1**	**-0.4**	**2.7**	**87629**
5	10:58	11:18	25.2	0.038	14.5	-0.001	-1.0	-0.4	1.9	80575
6	11:32	11:52	25.4	0.040	14.8	-0.001	-1.0	-0.4	2.1	81561
7	12:07	12:27	25.3	0.040	14.8	-0.001	-1.0	-0.4	2.0	81565
Average			**25.3**	**0.039**	**14.7**	**-0.001**	**-1.0**	**-0.4**	**2.0**	**81234**
8	12:42	13:02	25.3	0.040	14.6	-0.001	-1.0	-0.4	2.0	80789
9	13:17	13:37	25.2	0.040	14.7	-0.001	-1.0	-0.4	2.1	81285
10	13:52	14:12	25.3	0.040	14.9	-0.001	-0.9	-0.3	2.0	82339
Average			**25.3**	**0.040**	**14.7**	**-0.001**	**-1.0**	**-0.4**	**2.0**	**81471**
Total Average			**25.9**	**0.041**	**15.5**	**-0.001**	**-1.0**	**-0.4**	**2.2**	**83444**

* Note - Heat input value provided by plant personnel.

M22E1454

Company Name:	WRB Refining LLC	Facility Name:	Wood River Refinery
Unit Tested:	Hydrogen Plant 1	Test Location:	Stack
Mobile Lab#:	Trailer 10	Operator:	DST
Test Date:	04/19/07		

NOx Test Summary

Direct Analyzer Calibration Responses

	Cylinder ID	Cylinder Value (ppm)	Analyzer Response (ppm)	Absolute Difference (ppm)	Difference (% of span)	Status
Low Gas	0	0.00	-0.01	0.0	0.0	Pass
Mid gas	ALM010319	91.49	91.37	0.1	0.1	Pass
High gas	ALM019237	167.60	167.83	0.2	0.1	Pass

Calibration Span: 167.6

Start Time	End Time	Run	Cma	System Responses					Cgas	Co	Cm
				Pre Span	Post Span	Pre Zero	Post Zero	Cs			
8:36	8:56	1	91.49	88.39	88.08	0.28	0.00	27.31	28.3	0.1	88.2
9:12	9:32	2	91.49	88.08	87.91	0.00	-0.02	27.36	28.4	0.0	88.0
9:48	10:08	3	91.49	87.91	88.10	-0.02	0.08	25.79	26.8	0.0	88.0
10:23	10:43	4	91.49	88.10	88.07	0.08	0.09	24.97	25.9	0.1	88.1
10:58	11:18	5	91.49	88.07	88.17	0.09	0.09	24.31	25.2	0.1	88.1
11:32	11:52	6	91.49	88.17	88.08	0.09	0.22	24.58	25.4	0.2	88.1
12:07	12:27	7	91.49	88.08	88.00	0.22	0.24	24.47	25.3	0.2	88.0
12:42	13:02	8	91.49	88.00	87.91	0.24	0.05	24.39	25.3	0.1	88.0
13:17	13:37	9	91.49	87.91	87.88	0.05	0.23	24.28	25.2	0.1	87.9
13:52	14:12	10	91.49	87.88	87.69	0.23	-0.03	24.32	25.3	0.1	87.8

Company Name:	WRB Refining LLC	Facility Name:	Wood River Refinery
Unit Tested:	Hydrogen Plant 1	Test Location:	Stack

CO Test Summary

Direct Analyzer Calibration Responses

	Cylinder ID	Cylinder Value (ppm)	Analyzer Response (ppm)	Absolute Difference (ppm)	Difference (% of span)	Status
Low Gas	0	0.00	0.03	0.0	0.0	Pass
Mid gas	ALM047609	498.30	489.68	8.6	1.0	Pass
High gas	ALM011304	898.10	895.15	3.0	0.3	Pass

Calibration Span: 898.1

Start Time	End Time	Run	Cma	System Responses					Cgas	Co	Cm
				Pre Span	Post Span	Pre Zero	Post Zero	Cs			
8:36	8:56	1	498.30	483.14	483.78	-0.09	0.61	-1.09	-1.4	0.3	483.5
9:12	9:32	2	498.30	483.78	484.23	0.61	-0.13	-1.12	-1.4	0.2	484.0
9:48	10:08	3	498.30	484.23	484.61	-0.13	-0.17	-1.13	-1.0	-0.2	484.4
10:23	10:43	4	498.30	484.61	484.80	-0.17	-0.14	-1.12	-0.9	-0.2	484.7
10:58	11:18	5	498.30	484.80	484.40	-0.14	-0.15	-1.11	-1.0	-0.1	484.6
11:32	11:52	6	498.30	484.40	481.69	-0.15	-0.06	-1.06	-1.0	-0.1	483.0
12:07	12:27	7	498.30	481.69	484.02	-0.06	-0.06	-1.05	-1.0	-0.1	482.9
12:42	13:02	8	498.30	484.02	482.68	-0.06	-0.07	-1.06	-1.0	-0.1	483.4
13:17	13:37	9	498.30	482.68	483.24	-0.07	-0.08	-1.08	-1.0	-0.1	483.0
13:52	14:12	10	498.30	483.24	483.45	-0.08	-0.30	-1.07	-0.9	-0.2	483.3

Company Name: WRB Refining LLC
Unit Tested: Hydrogen Plant 1

Facility Name: Wood River Refinery
Test Location: Stack

NOx System Bias and Drift Summary

Run #	Calibration Gas Level	Certified Calibration Gas Value (ppm)	Initial Values System Response (ppm)	Initial Values System Bias (% of span)	Final Values System Response (ppm)	Final Values System Bias (% of span)	Drift (% of span)
1	Low Level Gas	0.0	0.3	0.2	0.0	0.0	0.2
	Upscale Gas	91.5	88.4	-1.8	88.1	-2.0	0.2
2	Low Level Gas	0.0	0.0	0.0	0.0	0.0	0.0
	Upscale Gas	91.5	88.1	-2.0	87.9	-2.1	0.1
3	Low Level Gas	0.0	0.0	0.0	0.1	0.1	0.1
	Upscale Gas	91.5	87.9	-2.1	88.1	-2.0	0.1
4	Low Level Gas	0.0	0.1	0.1	0.1	0.1	0.0
	Upscale Gas	91.5	88.1	-2.0	88.1	-2.0	0.0
5	Low Level Gas	0.0	0.1	0.1	0.1	0.1	0.0
	Upscale Gas	91.5	88.1	-2.0	88.2	-1.9	0.1
6	Low Level Gas	0.0	0.1	0.1	0.2	0.1	0.1
	Upscale Gas	91.5	88.2	-1.9	88.1	-2.0	0.1
7	Low Level Gas	0.0	0.2	0.1	0.2	0.1	0.0
	Upscale Gas	91.5	88.1	-2.0	88.0	-2.0	0.0
8	Low Level Gas	0.0	0.2	0.1	0.1	0.0	0.1
	Upscale Gas	91.5	88.0	-2.0	87.9	-2.1	0.1
9	Low Level Gas	0.0	0.1	0.0	0.2	0.1	0.1
	Upscale Gas	91.5	87.9	-2.1	87.9	-2.1	0.0
10	Low Level Gas	0.0	0.2	0.1	0.0	0.0	0.2
	Upscale Gas	91.5	87.9	-2.1	87.7	-2.2	0.1

Company Name: WRB Refining LLC
Unit Tested: Hydrogen Plant 1

Facility Name: Wood River Refinery
Test Location: Stack

CO System Bias and Drift Summary

Run #	Calibration Gas Level	Certified Calibration Gas Value (ppm)	Initial Values System Response (ppm)	Initial Values System Bias (% of span)	Final Values System Response (ppm)	Final Values System Bias (% of span)	Drift (% of span)
1	Low Level Gas	0.0	-0.1	0.0	0.6	0.1	0.1
	Upscale Gas	498.3	483.1	-0.7	483.8	-0.7	0.1
2	Low Level Gas	0.0	0.6	0.1	-0.1	0.0	0.1
	Upscale Gas	498.3	483.8	-0.7	484.2	-0.6	0.1
3	Low Level Gas	0.0	-0.1	0.0	-0.2	0.0	0.0
	Upscale Gas	498.3	484.2	-0.6	484.6	-0.6	0.0
4	Low Level Gas	0.0	-0.2	0.0	-0.1	0.0	0.0
	Upscale Gas	498.3	484.6	-0.6	484.8	-0.5	0.0
5	Low Level Gas	0.0	-0.1	0.0	-0.2	0.0	0.0
	Upscale Gas	498.3	484.8	-0.5	484.4	-0.6	0.0
6	Low Level Gas	0.0	-0.2	0.0	-0.1	0.0	0.0
	Upscale Gas	498.3	484.4	-0.6	481.7	-0.9	0.3
7	Low Level Gas	0.0	-0.1	0.0	-0.1	0.0	0.0
	Upscale Gas	498.3	481.7	-0.9	484.0	-0.6	0.3
8	Low Level Gas	0.0	-0.1	0.0	-0.1	0.0	0.0
	Upscale Gas	498.3	484.0	-0.6	482.7	-0.8	0.1
9	Low Level Gas	0.0	-0.1	0.0	-0.1	0.0	0.0
	Upscale Gas	498.3	482.7	-0.8	483.2	-0.7	0.1
10	Low Level Gas	0.0	-0.1	0.0	-0.3	0.0	0.0
	Upscale Gas	498.3	483.2	-0.7	483.5	-0.7	0.0

Company Name:	WRB Refining LLC	Facility Name:	Wood River Refinery
Unit Tested:	Hydrogen Plant 1	Test Location:	Stack

O_2 Test Summary

Direct Analyzer Calibration Responses

	Cylinder ID	Cylinder Value (%vol)	Analyzer Response (%vol)	Absolute Difference (%vol)	Difference (% of span)	Status
Low Gas	0	0.00	0.00	0.0	0.0	Pass
Mid gas	ALM055661	12.83	12.72	0.1	0.5	Pass
High gas	ALM027288	22.55	22.57	0.0	0.1	Pass

Calibration Span:	22.55

Start Time	End Time	Run	Cma	System Responses					Cgas	Co	Cm
				Pre Span	Post Span	Pre Zero	Post Zero	Cs			
8:36	8:56	1	12.83	12.64	12.62	0.00	0.00	3.76	3.8	0.0	12.6
9:12	9:32	2	12.83	12.62	12.63	0.00	0.00	3.53	3.6	0.0	12.6
9:48	10:08	3	12.83	12.63	12.61	0.00	0.00	2.37	2.4	0.0	12.6
10:23	10:43	4	12.83	12.61	12.62	0.00	0.00	2.10	2.1	0.0	12.6
10:58	11:18	5	12.83	12.62	12.61	0.00	0.00	1.90	1.9	0.0	12.6
11:32	11:52	6	12.83	12.61	12.61	0.00	0.00	2.09	2.1	0.0	12.6
12:07	12:27	7	12.83	12.61	12.60	0.00	0.00	1.99	2.0	0.0	12.6
12:42	13:02	8	12.83	12.60	12.60	0.00	0.00	1.97	2.0	0.0	12.6
13:17	13:37	9	12.83	12.60	12.60	0.00	0.00	2.08	2.1	0.0	12.6
13:52	14:12	10	12.83	12.60	12.60	0.00	0.00	2.00	2.0	0.0	12.6

Company Name:	WRB Refining LLC	Facility Name:	Wood River Refinery
Unit Tested:	Hydrogen Plant 1	Test Location:	Stack

O2 System Bias and Drift Summary

Run #	Calibration Gas Level	Certified Calibration Gas Value (%vol)	Initial Values System Response (%vol)	Initial Values System Bias (% of span)	Final Values System Response (%vol)	Final Values System Bias (% of span)	Drift (% of span)
1	Low Level Gas	0.0	0.0	0.0	0.0	0.0	0.0
	Upscale Gas	12.8	12.6	-0.4	12.6	-0.4	0.1
2	Low Level Gas	0.0	0.0	0.0	0.0	0.0	0.0
	Upscale Gas	12.8	12.6	-0.4	12.6	-0.4	0.0
3	Low Level Gas	0.0	0.0	0.0	0.0	0.0	0.0
	Upscale Gas	12.8	12.6	-0.4	12.6	-0.5	0.1
4	Low Level Gas	0.0	0.0	0.0	0.0	0.0	0.0
	Upscale Gas	12.8	12.6	-0.5	12.6	-0.4	0.0
5	Low Level Gas	0.0	0.0	0.0	0.0	0.0	0.0
	Upscale Gas	12.8	12.6	-0.4	12.6	-0.5	0.0
6	Low Level Gas	0.0	0.0	0.0	0.0	0.0	0.0
	Upscale Gas	12.8	12.6	-0.5	12.6	-0.5	0.0
7	Low Level Gas	0.0	0.0	0.0	0.0	0.0	0.0
	Upscale Gas	12.8	12.6	-0.5	12.6	-0.5	0.0
8	Low Level Gas	0.0	0.0	0.0	0.0	0.0	0.0
	Upscale Gas	12.8	12.6	-0.5	12.6	-0.5	0.0
9	Low Level Gas	0.0	0.0	0.0	0.0	0.0	0.0
	Upscale Gas	12.8	12.6	-0.5	12.6	-0.5	0.0
10	Low Level Gas	0.0	0.0	0.0	0.0	0.0	0.0
	Upscale Gas	12.8	12.6	-0.5	12.6	-0.5	0.0

ırrent Date : 04/19/07
ırrent Time : 08:39

PRE 1 CAL

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

aram :	CO-SYS1	NOX-SYS2	O2-SYS2
nits :	PPM	PPM	%
ime			
8:12	-1.09	25.00	3.85
8:13	-1.10	27.53	3.93
8:14	-1.08	27.73	3.78
8:15	-1.09	27.59	3.57
8:16	2.15	20.60	8.45
8:17	1.07	.51	12.63
8:18	-.09 Z	.28 Z	12.64 M
8:19	-.18	.33	9.91
8:20	-1.09	25.05	3.86
8:21	-1.09	26.97	3.65
8:22	-1.10	27.22	3.41
8:23	-1.10	26.55	3.88
8:24	-1.11	26.95	3.58
8:25	-1.11	62.59	.02
8:26	-1.12	88.26	.01
8:27	-1.11	88.39 M	.00 Z
8:28	120.00	65.05	.00
8:29	476.66	.27	.00
8:30	483.14 M	.18	.00
8:31	470.80	.35	.86
ax :	483.14	88.39	12.64
in :	-1.12	.18	.00
ean :	77.01	28.37	3.90
ecs :	0020	0020	0020

ıta : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
ıags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 09:22

Post 1/Pre 2 cal

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
08:57	29.54	35.48	1.05
08:58	3.18	85.73	.00
08:59	-.11	87.94	.00
09:00	-.57	88.08 M	.00 Z
09:01	272.90	32.85	.00
09:02	483.78 M	.16	.00
09:03	486.39	.14	.85
09:04	162.03	.08	12.52
09:05	1.71	-.01	12.61
09:06	.61 Z	.00 Z	12.62 M
09:07	-.09	.68	9.71
09:08	-.90	25.77	3.67
Max :	486.39	88.08	12.62
Min :	-.90	-.01	.00
Mean :	119.87	29.74	4.41
Recs :	0012	0012	0012

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Data Flags :
'<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 11:57

Post 2/Pre 3 cat

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
09:33	-.49	12.75	11.15
09:34	-.13	.18	12.62
09:35	-.13	-.02 Z	12.63 M
09:36	190.85	.02	2.73
09:37	484.23 M	-.09	.01
09:38	486.89	-.07	.84
09:39	119.52	46.01	.02
09:40	1.22	87.66	.00
09:41	-.13 M	87.91 M	.00 Z
09:42	-.14	67.44	1.96
09:43	-1.11	26.45	3.18
09:44	-1.13	25.94	3.02
Max :	486.89	87.91	12.63
Min :	-1.13	-.09	.00
Mean :	106.62	29.51	4.01
Recs :	0012	0012	0012

73

Data Flags :
'<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 10:46

Post 3 / Pre 4

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
10:09	-.34	15.93	11.26
10:10	-.17 Z	.08 Z	12.61 M
10:11	-.08	.04	11.93
10:12	317.09	-.07	.06
10:13	484.33	-.12	.00
10:14	484.61 M	-.09	.00
10:15	134.63	48.73	.00
10:16	1.30	88.02	.00
10:17	-.19	88.10 M	.00 Z
10:18	-.21	66.26	1.45
10:19	-1.17	25.03	2.24
Max :	484.61	88.10	12.61
Min :	-1.17	-.12	.00
Mean :	129.07	30.17	3.59
Secs :	0011	0011	0011

Data Flags :
'<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 11:20

Post 4/Pre 5 CALS

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
10:44	-.45	23.47	11.12
10:45	-.15	.10	12.61
10:46	-.14 Z	.09 Z	12.62 M
10:47	207.27	.01	2.09
10:48	481.18	-.10	.01
10:49	484.80 M	-.12	.00
10:50	243.57	42.83	.00
10:51	1.98	87.80	.00
10:52	.11	88.07 M	.00 Z
10:53	-.38	53.10	2.03
10:54	-1.15	24.48	2.08
Max :	484.80	88.07	12.62
Min :	-1.15	-.12	.00
Mean :	128.78	29.06	3.86
Recs :	0011	0011	0011

Data : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
Flags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 11:30

Post 5/Pre 6 CAL

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
11:19	-.43	18.24	11.70
11:20	-.15 Z	.09 Z	12.61 M
11:21	-.15	.02	12.25
11:22	296.83	-.08	.11
11:23	482.03	-.12	.00
11:24	484.40 M	-.12	.00
11:25	281.89	24.92	.00
11:26	2.57	87.87	.00
11:27	.14	88.17 M	.00 Z
11:28	-.29	42.97	1.78
Max :	484.40	88.17	12.61
Min :	-.43	-.12	.00
Mean :	154.68	26.19	3.84
Recs :	0010	0010	0010

Data Flags :
'<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 12:08

Post 6/Pre 7 CALS

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
11:53	-.29	22.49	10.95
11:54	-.06 z	.22 z	12.60
11:55	-.05	.31	12.61 M
11:56	251.52	.11	1.04
11:57	480.87	.07	.00
11:58	481.69 M	.02	.00
11:59	230.05	39.13	.00
12:00	1.91	87.92	.00
12:01	.14	88.08 M	.00 z
12:02	-.18	59.37	1.54
12:03	-1.06	25.01	2.17
Max :	481.69	88.08	12.61
Min :	-1.06	.02	.00
Mean :	131.32	29.33	3.71
Secs :	0011	0011	0011

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Data : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
Flags : 'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 13:04

Post 7/Pre 8 cal

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
12:28	-.28	19.53	11.07
12:29	-.06 Z	.24 Z	12.60 M
12:30	-.06	.32	10.91
12:31	-.71	58.88	.03
12:32	-1.08	87.84	.01
12:33	-1.09	88.00 M	.00 Z
12:34	214.03	47.42	.00
12:35	481.99	.28	.00
12:36	484.02 M	.31	-.01
12:37	311.39	10.98	1.36
12:38	6.46	24.66	2.20
Max :	484.02	88.00	12.60
Min :	-1.09	.24	-.01
Mean :	135.87	30.76	3.47
Recs :	0011	0011	0011

Data Flags : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 13:13

Post 8/Pre 9 CAL

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
13:03	30.41	13.06	9.81
13:04	2.06	.20	12.60
13:05	-.07 Z	.05 Z	12.60 M
13:06	207.00	.03	2.09
13:07	481.76	.08	.00
13:08	482.68 M	.02	.00
13:09	222.62	34.63	.00
13:10	1.72	87.70	.00
13:11	.22	87.91 M	.00 Z
13:12	1.22	55.62	1.32
Max :	482.68	87.91	12.60
Min :	-.07	.02	.00
Mean :	142.96	27.93	3.84
Recs :	0010	0010	0010

Data Flags :
'<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 14:19

Post 9 / Pre 10 CAL

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
13:38	-.26	15.53	11.47
13:39	-.08 Z	.23 Z	12.60 M
13:40	-.10	.19	10.58
13:41	-.79	63.15	.03
13:42	-1.09	87.76	.01
13:43	-1.10	87.88 M	.00 Z
13:44	168.01	45.61	.00
13:45	479.16	.34	.00
13:46	483.24 M	.13	.00
13:47	287.94	12.43	1.36
13:48	4.11	24.49	2.16
Max :	483.24	87.88	12.60
Min :	-1.10	.13	.00
Mean :	129.00	30.70	3.47
Recs :	0011	0011	0011

Data Flags : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

Current Date : 04/19/07
Current Time : 14:27

Post 10 cal

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
14:13	31.33	11.21	10.92
14:14	.95	-.03 Z	12.60
14:15	-.30 Z	-.14	12.60 M
14:16	-.29	20.28	4.09
14:17	-1.19	85.99	.01
14:18	-1.30	87.69 M	.00 Z
14:19	235.52	39.81	.00
14:20	480.70	.04	.00
14:21	483.45 M	.04	.00
14:22	249.01	12.69	1.42
Max :	483.45	87.69	12.60
Min :	-1.30	-.14	.00
Mean :	147.78	25.75	4.16
Recs :	0010	0010	0010

Data Flags : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,
'V' - DIS #1 Obs, 'W' - DIS #2 Obs, 'X' - DIS #3 Obs, 'Y' - DIS #4 Obs, 'Z' - DIS #5 Obs,
'f' - Floor Exceeded, 'c' - Ceiling Exc.

PITOT TRAVERSE DATA

Project: Conoco Wood River

Location: HP-1

Date: 4/19/07 Test No: #1 Time: 8:36-856

Point No.	ΔP	√ΔP	t_s	α	Point No.	ΔP	√ΔP	t_s	α
1-1	.91		351	+2	2-1	.90		351	+3
2	.95		351	+3	2	1.1		351	-1
3	.98		351	0	3	.93		351	0
4	.95		351	0	4	.97		351	+2
5	.92		351	+1	5	.96		351	+4
6	.82		351	-3	6	.93		351	+0
7	.80		351	+4	7	.85		351	+1
8	.61		351	-1	8	.65		351	-2

Preliminary Velocity Calculation (This data has not been peer reviewed and may not be accurate)

P_{bar} 29.45 "Hg Static -.7 "H_2O P_g ____ "Hg P_s ____ "Hg Pitot ID 6054 $C_{p,i}$ .841 Temp. ID F4

0.44 × 17.3 %CO_2 = ____ $\sqrt{\Delta P}$ ____ t_s ____ °F T ____ °R Flue Area 44.18 ft^2

0.32 × 3.5 %O_2 = + ____ Duct Dimensions 7.5

0.28 × ____ %N_2 = + ____ B_{ws} ____ 1 - B_{ws} ____ Disturbance: Upstream ____

(____ Md × ____ 1-Bws) + (18 × ____ Bws) = ____ (Ms) Downstream ____

$$v_s = 85.49 \times ____ Cp \times \sqrt{\frac{(_____)Ts\ °R}{____ Ms \times ____ Ps}} \times ____ \sqrt{\Delta P} = ____ ft/sec(Vs)$$

Q_{acfm} = ____ Vs × ____ Flue Area × 60 = ____ acfm Port Length 6.5 Inches

$Q_{scfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R}$ = 112897 SCFM

$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws)$ = 93,366 DSCFM

Pre-test leak check ✓ "H_2O

Post-test leak check ____ "H_2O Data Taken By: T Cass

PITOT TRAVERSE DATA

Project: Conoco Wood River

Location: HP-1

Date: 4/19/07 Test No: # 2 Time: 9:12-9:32

Point No	ΔP	√ΔP	t	α	Point No	ΔP	√ΔP	t	α
1	.85		354		1	.91		351	
2	.95		352		2	.97		351	
3	.88		352		3	.99		351	
4	.94		352		4	.92		352	
5	.96		352		5	.95		352	
6	.97		352		6	.94		352	
7	.86		352		7	.82		352	
8	.60		351		8	.58		350	

Preliminary Velocity Calculation (This data has not been peer reviewed and may not be accurate)

P_{bar} 29.45 "Hg Static -.7 "H_2O P_g ____ "Hg P_s ____ "Hg Pitot ID 605A C_p .841 Temp. ID F4

0.44 × 17.7 %CO_2 = ____ $\sqrt{\Delta P}$ ____ t_s ____ °F T ____ °R Flue Area 44.18 ft^2

0.32 × 3.5 %O_2 = + ____ Duct Dimensions ____

0.28 × 79.2 %N_2 = + ____ B_{ws} ____ 1 - B_{ws} ____ Disturbance: Upstream ____

(____ Md × ____ 1-Bws) + (18 × ____ Bws) = ____ (Ms) Downstream ____

$$v_s = 85.49 \times ____ Cp \times \sqrt{\frac{(_____)Ts\ °R}{____ Ms \times ____ Ps}} \times ____ \sqrt{\Delta P} = ____ ft/sec(Vs)$$

Q_{acfm} = ____ Vs × ____ Flue Area × 60 = ____ acfm Port Length 6.5 Inches

$$Q_{scfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} = 111,429 \text{ SCFM}$$

$$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws) = 94,158 \text{ DSCFM}$$

Pre-test leak check ✓ "H_2O

Post-test leak check ✓ "H_2O Data Taken By: T CASS

Form 1012

GE Energy

PITOT TRAVERSE DATA

Project: Conoco Wood River

Location: HP-1

Date: 4-19-07 Test No: #3 Time: 9:48 -10:08

Point No.	ΔP	√ΔP	t_s	α	Point No.	ΔP	√ΔP	t_s	α
1-1	.75		342		2-1	.70		342	
2	.80		340		2	.77		342	
3	.80		341		3	.79		341	
4	.75		342		4	.75		342	
5	.78		342		5	.78		342	
6	.79		342		6	.80		342	
7	.70		342		7	.75		341	
8	.58		335		8	.55		338	

Preliminary Velocity Calculation (This data has not been peer reviewed and may not be accurate)

P_{bar} 29.45 "Hg Static -.7 "H_2O P_g ____ "Hg P_s ____ "Hg Pitot ID 605A C_p .841 Temp. ID F4

0.44 × 17.3 %CO_2 = ____ $\sqrt{\Delta P}$ ____ t_s ____ °F T ____ °R Flue Area ____ ft^2

0.32 × 7.5 %O_2 = + ____ Duct Dimensions 7.5

0.28 × ____ %N_2 = + ____ B_{ws} ____ 1 - B_{ws} ____ Disturbance: Upstream ____

(____ Md × ____ 1-Bws) + (18 × ____ Bws) = ____ (Ms) Downstream ____

$$v_s = 85.49 \times ____ Cp \times \sqrt{\frac{(_____)Ts\ °R}{____ Ms \times ____ Ps}} \times ____ \sqrt{\Delta P} = ____ ft/sec (Vs)$$

Q_{acfm} = ____ Vs × ____ Flue Area × 60 = ____ acfm Port Length 6.5 Inches

$Q_{scfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R}$ = 103,227 SCFM

$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws)$ = 85,988 DSCFM

Pre-test leak check ✓ "H_2O

Post-test leak check ✓ "H_2O Data Taken By: T Cass

PITOT TRAVERSE DATA

Project: Conoco Wood River

Location: HP-1

Date: 4/19/07 Test No: #4 Time: 10:23 - 10:43

Point No	ΔP	√ΔP	t	α	Point No	ΔP	√ΔP	t	α
1-1	.68		337		2-1	.66		337	
2	.70		336		2	.72		337	
3	.75		337		3	.75		337	
4	.73		337		4	.70		337	
5	.70		337		5	.73		336	
6	.72		337		6	.73		337	
7	~~.74~~ .68	TC	336		7	.65		336	
8	.53		331		8	.49		332	

Preliminary Velocity Calculation (This data has not been peer reviewed and may not be accurate)

P_{bar} 29.45 "Hg Static -.7 "H_2O P_g ____ "Hg P_s ____ "Hg Pitot ID 605A C_p .841 Temp. ID F4

0.44 × 17.7 %CO_2 = ____ $\sqrt{\Delta P}$ ____ t_s ____ °F T ____ °R Flue Area ____ ft^2

0.32 × 3.5 %O_2 = + ____ Duct Dimensions 7.5

0.28 × ____ %N_2 = + ____ B_{ws} ____ 1 - B_{ws} ____ Disturbance: Upstream ____

(____ Md × ____ 1-Bws) + (18 × ____ Bws) = ____ (Ms) Downstream ____

$$v_s = 85.49 \times ____ Cp \times \sqrt{\frac{(_____)Ts\ °R}{____ Ms \times ____ Ps}} \times ____ \sqrt{\Delta P} = ____ ft/sec(Vs)$$

Q_{acfm} = ____ Vs × ____ Flue Area × 60 = ____ acfm Port Length 6.5 Inches

$Q_{scfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R}$ = 99,447 SCFM

$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws)$ = 82,740 DSCFM

Pre-test leak check ✓ "H_2O

Post-test leak check ✓ "H_2O Data Taken By: T Cass

Form 1012

GE Energy

PITOT TRAVERSE DATA

Project: Conoco Wood River

Location: HP-1

Date: 4/19/01 Test No: 5 Time: 10:58 - 11:18

Point No.	ΔP	√ΔP	t_s	α	Point No.	ΔP	√ΔP	t_s	α
1-1	.65		334		2-1	.62		334	
2	.70		334		2	.70		334	
3	.73		334		3	.72		335	
4	.68		335		4	.71		335	
5	.69		335		5	.68		335	
6	.71		335		6	.68		334	
7	.64		334		7	.65		334	
8	.46		331		8	.43		332	

Preliminary Velocity Calculation (This data has not been peer reviewed and may not be accurate)

P_{bar} 29.45 "Hg Static .7 "H_2O P_g ____ "Hg P_s ____ "Hg Pitot ID 605A C_p .841 Temp. ID F4

0.44 × 17.9 %CO_2 = ____ $\sqrt{\Delta P}$ ____ t_s ____ °F T ____ °R Flue Area ____ ft^2

0.32 × 3.5 %O_2 = + ____ Duct Dimensions 7.5

0.28 × ____ %N_2 = + ____ B_{ws} ____ 1 - B_{ws} ____ Disturbance: Upstream ____

(____ Md × ____ 1-Bws) + (18 × ____ Bws) = ____ (Ms) Downstream ____

$$v_s = 85.49 \times ____ Cp \times \sqrt{\frac{(_____)Ts\ °R}{____ Ms \times ____ Ps}} \times ____ \sqrt{\Delta P} = ____ ft/sec(Vs)$$

Q_{acfm} = ____ Vs × ____ Flue Area × 60 = ____ acfm Port Length 6.5 Inches

$$Q_{scfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} = 97,431 \text{ SCFM}$$

$$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws) = 80,575 \text{ DSCFM}$$

Pre-test leak check ✓ "H_2O

Post-test leak check ✓ "H_2O Data Taken By: T CASS

PITOT TRAVERSE DATA

Project: CONOCO WOOD RIVER

Location: HP-1

Date: 4/19/07 Test No: 6 Time: 11:32 - 11:52

Point No.	ΔP	√ΔP	t_s	α	Point No.	ΔP	√ΔP	t_s	α
1-1	.60		334		2-1	.68		334	
2	.68		333		2	.72		334	
3	.71		333		3	.76		334	
4	.70		334		4	.69		334	
5	.70		334		5	.72		333	
6	.66		335		6	.68		334	
7	.65		334		7	.64		332	
8	.46		330		8	.51		331	

Preliminary Velocity Calculation (This data has not been peer reviewed and may not be accurate)

P_{bar} 29.45 "Hg Static .7 "H_2O P_g ____ "Hg P_s ____ "Hg Pitot ID 605A C_p .841 Temp. ID F4

0.44 × 17.3 %CO_2 = ____ √ΔP ____ t_s ____ °F T ____ °R Flue Area ____ ft^2

0.32 × 3.5 %O_2 = + ____ Duct Dimensions 7.5

0.28 × ____ %N_2 = + ____ B_{ws} ____ 1 - B_{ws} ____ Disturbance: Upstream ____

(____ Md × ____ 1-Bws) + (18 × ____ Bws) = ____ (Ms) Downstream ____

$$v_s = 85.49 \times ____ Cp \times \sqrt{\frac{(_____)Ts\ °R}{____ Ms \times ____ Ps}} \times ____ \sqrt{\Delta P} = ____ ft/sec(Vs)$$

Q_{acfm} = ____ Vs × ____ Flue Area × 60 = ____ acfm Port Length 6.5 Inches

$Q_{scfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R}$ = 97,912 SCFM

$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws)$ = 87,541 DSCFM

Pre-test leak check √ "H_2O

Post-test leak check ____ "H_2O Data Taken By: T CASS

Form 1012 GE Energy

PITOT TRAVERSE DATA

Project: CONOCO WOOD RIVER

Location: HP-1

Date: 4/19/02 Test No: #7 Time: 12:07 - 12:27

Point No.	ΔP	√ΔP	t_s	α	Point No.	ΔP	√ΔP	t_s	α
1-1	.66		334		2-1	.64		334	
2	.70		334		2	.77		335	
3	.72		334		3	.75		335	
4	.68		335		4	.73		335	
5	.70		335		5	.68		334	
6	.69		335		6	.69		334	
7	.64		335		7	.67		334	
8	.49		331		8	.45		330	

Preliminary Velocity Calculation (This data has not been peer reviewed and may not be accurate)

P_{bar} 29.45 "Hg Static -.7 "H_2O P_g ____ "Hg P_s ____ "Hg Pitot ID 60-1A C_p .841 Temp. ID F4

0.44 × 17.3 %CO_2 = ____ √ΔP ____ t_s ____ °F T ____ °R Flue Area ____ ft^2

0.32 × 3.5 %O_2 = + ____ Duct Dimensions 7.5

0.28 × ____ %N_2 = + ____ B_{ws} ____ 1 - B_{ws} ____ Disturbance: Upstream ____

(____ Md × ____ 1-Bws) + (18 × ____ Bws) = ____ (Ms) Downstream ____

$$v_s = 85.49 \times ____ Cp \times \sqrt{\frac{(_____)Ts\ °R}{____ Ms \times ____ Ps}} \times ____ \sqrt{\Delta P} = ____ ft/sec(Vs)$$

Q_{acfm} = ____ Vs × ____ Flue Area × 60 = ____ acfm Port Length 65 Inches

$Q_{scfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R}$ = 98,389 SCFM

$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws)$ = 81,565 DSCFM

Pre-test leak check ✓ "H_2O

Post-test leak check ✓ "H_2O Data Taken By: T CASS

PITOT TRAVERSE DATA

Project: Conoco Wood River

Location: HP-1

Date: 4/19/07 Test No: 8 Time: 12:42-13:02

Point No.	ΔP	√ΔP	t_s	α	Point No.	ΔP	√ΔP	t_s	α
1-1	.64		337		2-1	.67		335	
2	.71		336		2	.72		336	
3	.71		336		3	.75		336	
4	.70		336		4	.68		336	
5	.69		336		5	.71		336	
6	.68		336		6	.69		335	
7	.64		336		7	.65		335	
8	.45		334		8	.47		331	

Preliminary Velocity Calculation (This data has not been peer reviewed and may not be accurate)

P_{bar} 29.45 "Hg Static -.7 "H_2O P_g ____ "Hg P_s ____ "Hg Pitot ID 6054 C_p .841 Temp. ID F4

0.44 × 17.3 %CO_2 = ____ $\sqrt{\Delta P}$ ____ t_s ____ °F T ____ °R Flue Area ____ ft^2

0.32 × 3.5 %O_2 = + ____ Duct Dimensions 7.5

0.28 × ____ %N_2 = + ____ B_{ws} ____ 1 - B_{ws} ____ Disturbance: Upstream ____

(____ Md × ____ 1-Bws) + (18 × ____ Bws) = ____ (Ms) Downstream ____

$$v_s = 85.49 \times ____ Cp \times \sqrt{\frac{(____)Ts\ °R}{____ Ms \times ____ Ps}} \times ____ \sqrt{\Delta P} = ____ ft/sec (Vs)$$

Q_{acfm} = ____ Vs × ____ Flue Area × 60 = ____ acfm Port Length 6.5 Inches

$Q_{scfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R}$ = ~~[illegible]~~ SCFM 97,926 TC

$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws)$ = ~~[illegible]~~ DSCFM 80,789 TC

Pre-test leak check ✓ "H_2O

Post-test leak check ✓ "H_2O Data Taken By: T CASS

Form 1012 GE Energy

PITOT TRAVERSE DATA

Project: CONOCO WOOD RIVER

Location: HP-1

Date: 4/19/07 Test No: 9 Time: 13:17-13-37

Point No	ΔP	√ΔP	t	α	Point No	ΔP	√ΔP	t	α
1-1	.62		334		2-1	.68		333	
2	.70		333		2	.75		333	
3	.74		333		3	.71		334	
4	.68		334		4	.72		334	
5	.71		334		5	.69		334	
6	.66		334		6	.67		333	
7	.60		331		7	.63		332	
8	.47		330		8	.46		329	

Preliminary Velocity Calculation (This data has not been peer reviewed and may not be accurate)

P_{bar} 29.45 "Hg Static -.7 "H_2O P_g ____ "Hg P_s ____ "Hg Pitot ID 605A C_p .841 Temp. ID F4

0.44 × 17.3 %CO_2 = ____ $\sqrt{\Delta P}$ ____ t_s ____ °F T ____ °R Flue Area ____ ft^2

0.32 × 3.5 %O_2 = + ____ Duct Dimensions 7.5

0.28 × ____ %N_2 = + ____ B_{ws} ____ 1 - B_{ws} ____ Disturbance: Upstream ____

(____ Md × ____ 1-Bws) + (18 × ____ Bws) = ____ (Ms) Downstream ____

$$v_s = 85.49 \times ____ Cp \times \sqrt{\frac{(_____)Ts\ °R}{____ Ms \times ____ Ps}} \times ____ \sqrt{\Delta P} = ____ ft/sec(Vs)$$

Q_{acfm} = ____ Vs × ____ Flue Area × 60 = ____ acfm Port Length 6.5 Inches

$Q_{scfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R}$ = 97,581 SCFM

$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\ °R} \times (1\text{-}Bws)$ = 81,285 DSCFM

Pre-test leak check ✓ "H_2O

Post-test leak check ✓ "H_2O Data Taken By: T CASS

PITOT TRAVERSE DATA

Project: Conoco Wood River

Location: HP-1

Date: 4-19-07 Test No: 10 Time: 13:52 - 14:12

Point No.	ΔP	√ΔP	t_s	α	Point No.	ΔP	√ΔP	t_s	α
1-1	.62		333		2-1	.68		334	
2	.71		333		2	.70		334	
3	.73		334		3	.73		334	
4	.70		334		4	.69		333	
5	.69		334		5	.68		334	
6	.71		333		6	.72		334	
7	.68		333		7	.65		332	
8	.46		330		8	.47		331	

Preliminary Velocity Calculation (This data has not been peer reviewed and may not be accurate)

P_{bar} 29.45 "Hg Static .7 "H_2O P_g ____ "Hg P_s ____ "Hg Pitot ID 605A C_p .841 Temp. ID F4

0.44 × 17.3 %CO_2 = ____ $\sqrt{\Delta P}$ ____ t_s ____ °F T ____ °R Flue Area ____ ft^2

0.32 × 3.5 %O_2 = + ____ Duct Dimensions 7.5

0.28 × ____ %N_2 = + ____ B_{ws} ____ 1 - B_{ws} ____ Disturbance: Upstream ____

(____ Md × ____ 1-Bws) + (18 × ____ Bws) = ____ (Ms) Downstream ____

$$v_s = 85.49 \times ____ Cp \times \sqrt{\frac{(____)Ts\,°R}{____ Ms \times ____ Ps}} \times ____ \sqrt{\Delta P} = ____ ft/sec(Vs)$$

Q_{acfm} = ____ Vs × ____ Flue Area × 60 = ____ acfm Port Length 6.5 Inches

$Q_{scfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\,°R}$ = 98,023 SCFM

$Q_{dscfm} = 17.647 \times ACFM \times \frac{Ps}{Ts\,°R} \times (1\text{-}Bws)$ = 82,339 DSCFM

Pre-test leak check ✓ "H_2O

Post-test leak check ✓ "H_2O Data Taken By: T Cross

Form 1012 GE Energy

MOISTURE FIELD DATA SHEET

Project: CONOCO Date: 4/19/07
Sampling Location: HP-1
Source Condition: Normal Monitor: Model F4
Dry Gas Meter No. F4 Y = .991 Serial No.
Top Loading Balance Calibration Check. Challenge Weight Used: 240.2 Resultant Weight 240.1 Pass? Y/S

Test (Run) No. 1 Barometric Pressure (P_{bar}) 29.45 in. Hg
Gas Temperature °F Static Pressure -.7 in. Hg

Orsat Analysis: 17.3 %CO_2 3.5 %O_2

Clock Time 24 hour	Meter Volume (V_m) ft³	Meter Gage Pressure (ΔH) in. H_2O	Meter Temp. (t_m) °F		Impgr. Outlet Temp °F
8:36	2.850	.10	70	66	67
8 41	3.593	.10	70	66	fully
8 46	4.336	.10	71	68	ICB
8 51	5.079	.10	72	69	
8 56	5.823	.10	73	71	
Avg. .743			69.6	(T_m)	°R

Condensate
mls (V_f)
mls (V_i)
mls
× 0.04707 =
ft³ [$V_{wc(std)}$] +
$V_{m(std)}$ = ft³

Silica Gel or Train
520.9 grams (W_f)
-508.1 grams (W_i)
grams
× 0.04715 =
ft³ [$V_{wsg(std)}$]
= ft³ [$V_{w(std)}$]

Water Vapor, proportion by volume
B_{ws} = .173

Leak Check: OK 0.000 / OK 0.000

Moisture correction factor:
1 - B_{ws} =

Comments:

Test (Run) No. 2 Barometric Pressure (P_{bar}) 29.45 in. Hg
Gas Temperature °F Static Pressure -.7 in. Hg

Orsat Analysis: 17.3 %CO_2 3.5 %O_2

Clock Time 24 hour	Meter Volume (V_m) ft³	Meter Gage Pressure (ΔH) in. H_2O	Meter Temp. (t_m) °F		Impgr. Outlet Temp °F
9:12	5.957	.10	71	70	67
9 17	6.796	.10	73	70	fully
9 22	7.625	.10	75	71	ICB
9 27	8.459	.10	76	73	
9 32	9.298	.10	76	73	
Avg. .834			72.8	(T_m)	°R

Condensate
mls (V_f)
mls (V_i)
mls
× 0.04707 =
ft³ [$V_{wc(std)}$] +
$V_{m(std)}$ = ft³

Silica Gel or Train
527.7 grams (W_f)
-515.8 grams (W_i)
grams
× 0.04715 =
ft³ [$V_{wsg(std)}$]
= .555 ft³ [$V_{w(std)}$]

Water Vapor, proportion by volume
B_{ws} = .155

Leak Check: OK 0.0 / OK 0.000

Moisture correction factor:
1 - B_{ws} =

Comments:

$$V_{m(std)} = 17.64\, V_m Y \frac{P_{bar} + \frac{DH}{13.6}}{T_m}$$

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

Operator TOASS

Form 1047

MOISTURE FIELD DATA SHEET

Project: CONOCO WOOD RIVER Date: 4-19
Sampling Location: HP-1
Source Condition: Normal Monitor: Model F4
Dry Gas Meter No. F4 Y = .991 Serial No.
Top Loading Balance Calibration Check. Challenge Weight Used: 240.2 Resultant Weight 240.1 Pass?

Test (Run) No. 3 Barometric Pressure (P_{bar}) 29.45 in. Hg
Gas Temperature °F Static Pressure -.7 in. Hg
Orsat Analysis 17.3 %CO_2 3.5 %O_2

Clock Time 24 hour	Meter Volume (V_m) ft³	Meter Gage Pressure (ΔH) in. H_2O	Meter Temp. (t_m) °F		Impgr. Outlet Temp °F
9:48	9.436	.10	72	74	67
9:53	10.233	.10	75	72	full
9 58	11.030	.10	77	73	Icc
9 03	11.827	.10	78	79	
10 08	12.627	.10	78	79	
	3.191				
Avg. .797			75.0	(T_m)	°R

Condensate
mls (V_f)
- mls (V_i)
mls
× 0.04707 =
ft³ [$V_{wc(std)}$] +
$V_{m(std)}$ = ft³

Silica Gel or Train
540.8 grams (W_f)
-527.7 grams (W_i)
grams
× 0.04715 =
ft³ [$V_{wsg(std)}$]
= ft³ [$V_{w(std)}$]

Water Vapor, proportion by volume
B_{ws} = .167

Leak Check: OK C .000 / OK C .000

Moisture correction factor:
1 - B_{ws} =

Comments:

Test (Run) No. 4 Barometric Pressure (P_{bar}) in. Hg
Gas Temperature °F Static Pressure in. Hg
Orsat Analysis %CO_2 %O_2

Clock Time 24 hour	Meter Volume (V_m) ft³	Meter Gage Pressure (ΔH) in. H_2O	Meter Temp. (t_m) °F		Impgr. Outlet Temp °F
10:23	12.694	.10	72	73	67
10:28	13.510	.10	77	74	fully
10:33	14.336	.10	79	75	Icc
10:38	15.157	.10	79	76	
10:43	15.978	.10	79	76	
	3.294				
Avg. .821			76.0	(T_m)	°R

Condensate
mls (V_f)
- mls (V_i)
mls
× 0.04707 =
ft³ [$V_{wc(std)}$] +
$V_{m(std)}$ = ft³

Silica Gel or Train
554.3 grams (W_f)
-540.8 grams (W_i)
grams
× 0.04715 =
ft³ [$V_{wsg(std)}$]
= ft³ [$V_{w(std)}$]

Water Vapor, proportion by volume
B_{ws} = .168

Leak Check: OK C .000 / OK C .000

Moisture correction factor:
1 - B_{ws} =

Comments:

$$V_{m(std)} = 17.64\, V_m Y \frac{P_{bar} + \frac{DH}{13.6}}{T_m}$$

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

Operator T. CASS

Form 1047

MOISTURE FIELD DATA SHEET

Project: Conoco Wood River Date: 4/18/07
Sampling Location: HP-1
Source Condition: Normal Monitor: Model F4
Dry Gas Meter No. F4 Y = .991 Serial No.
Top Loading Balance Calibration Check. Challenge Weight Used: 240.2 Resultant Weight 240.1 Pass? Yes

Test (Run) No. 3 Barometric Pressure (P_{bar}) 29.45 in. Hg
Gas Temperature °F Static Pressure -.7 in. Hg
Orsat Analysis 17.3 %CO_2 3.5 %O_2

Clock Time 24 hour	Meter Volume (V_m) ft^3	Meter Gage Pressure (ΔH) in. H_2O	Meter Temp. (t_m) °F		Impgr. Outlet Temp °F
10:58	16.080	.10	75	76	67
11:03	16.931	.10	77	75	full
11:08	17.732	.10	79	76	Icy
11:13	18.623	.10	79	76	
11:18	19.484	.10	79	76	
	3.404				
Avg. .851			76.8	(T_m)	°R

Condensate
mls (V_f)
mls (V_i)
mls
× 0.04707 =
ft^3 [$V_{wc(std)}$] + ft^3 [$V_{wsg(std)}$]
= ft^3 [$V_{w(std)}$]

Silica Gel or Train
530.5 grams (W_f)
-516.0 grams (W_i)
grams
× 0.04715 =

$V_{m(std)}$ = ft^3
Water Vapor, proportion by volume
B_{ws} = .173
Leak Check: OK 0.000 OK 0.000
Moisture correction factor:
1 - B_{ws} =
Comments:

Test (Run) No. 4 Barometric Pressure (P_{bar}) 29.45 in. Hg
Gas Temperature °F Static Pressure -.7 in. Hg
Orsat Analysis 17.3 %CO_2 3.5 %O_2

Clock Time 24 hour	Meter Volume (V_m) ft^3	Meter Gage Pressure (ΔH) in. H_2O	Meter Temp. (t_m) °F		Impgr. Outlet Temp °F
11:32	19.521	.10	75	77	67
11:37	20.341	.10	79	77	full
11:42	21.211	.10	80	77	Icy
11:47	22.031	.10	80	77	
11:52	22.853	.10	80	77	
	3.282				
Avg. .820			77.9	(T_m)	°R

Condensate
mls (V_f)
mls (V_i)
mls
× 0.04707 =
ft^3 [$V_{wc(std)}$] + ft^3 [$V_{wsg(std)}$]
= ft^3 [$V_{w(std)}$]

Silica Gel or Train
543.9 grams (W_f)
-530.5 grams (W_i)
grams
× 0.04715 =

$V_{m(std)}$ = ft^3
Water Vapor, proportion by volume
B_{ws} = .167
Leak Check: OK 0.000 OK 0.000
Moisture correction factor:
1 - B_{ws} =
Comments:

$$V_{m(std)} = 17.64\, V_m Y \frac{P_{bar} + \frac{DH}{13.6}}{T_m}$$

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

Operator T Cass

Form 1047 GE Energy

MOISTURE FIELD DATA SHEET

Project: Conoco Wood River Date: 4/19/07
Sampling Location: HP-1
Source Condition: Normal Monitor: Model E4
Dry Gas Meter No. E4 Y = .991 Serial No.
Top Loading Balance Calibration Check. Challenge Weight Used: 240.2 Resultant Weight 240.1 Pass? yes

Test (Run) No. 7 Barometric Pressure (P_{bar}) 29.43 in. Hg
Gas Temperature °F Static Pressure -.7 in. Hg
Orsat Analysis 17.3 %CO_2 3.5 %O_2

Clock Time 24 hour	Meter Volume (V_m) ft³	Meter Gage Pressure (ΔH) in. H_2O	Meter Temp. (t_m) °F		Impgr. Outlet Temp °F
12:07	22.951	.10	78	79	67
12:12	23.827	.10	82	78	full
12:17	24.703	.10	84	79	Icc
12:22	25.579	.10	83	80	
12:27	26.455	.10	85	81	
	3.504				
Avg. .876			81.2	(T_m)	°R

Condensate
mls (V_f)
mls (V_i)
mls
× 0.04707 =
ft³ [$V_{wc(std)}$] +
ft³ [$V_{wsg(std)}$]
= ft³ [$V_{w(std)}$]

Silica Gel or Train
533.7 grams (W_f)
-519.1 grams (W_i)
grams
× 0.04715 =

$V_{m(std)}$ = ft³

Water Vapor, proportion by volume
B_{ws} = .171

Leak Check: OK 0.000 / OK 0.000

Moisture correction factor:
1 - B_{ws} =

Comments:

Test (Run) No. 8 Barometric Pressure (P_{bar}) 29.45 in. Hg
Gas Temperature °F Static Pressure -.7 in. Hg
Orsat Analysis 12.3 %CO_2 3.5 %O_2

Clock Time 24 hour	Meter Volume (V_m) ft	Meter Gage Pressure (ΔH) in. H_2O	Meter Temp (t_m) °F		Impgr. Outlet Temp °F
12 42	24.561	.10	83	83	67
12 47	27.499	.10	84	82	full
12 52	28.307	.10	84	82	Icc
12 57	29.180	.10	85	82	
13 02	30.054	.10	85	82	
	3.493				
Avg. .873			83.2	(T_m)	°R

Condensate
mls (V_f)
mls (V_i)
mls
× 0.04707 =
ft³ [$V_{wc(std)}$] +
ft³ [$V_{wsg(std)}$]
= ft³ [$V_{w(std)}$]

Silica Gel or Train
535.7 grams (W_f)
-520.4 grams (W_i)
grams
× 0.04715 =

$V_{m(std)}$ = ft³

Water Vapor, proportion by volume
B_{ws} = .175

Leak Check: OK .0000 / OK 0.000

Moisture correction factor:
1 - B_{ws} =

Comments:

$$V_{m(std)} = 17.64\, V_m Y \frac{P_{bar} + \frac{DH}{13.6}}{T_m}$$

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

Operator TCOSS

MOISTURE FIELD DATA SHEET

Project: Conoco Wood River Date: 4/19/07
Sampling Location: HP-1
Source Condition: Normal Monitor: Model E4
Dry Gas Meter No. E4 Y = .991 Serial No.
Top Loading Balance Calibration Check. Challenge Weight Used: 240.2 Resultant Weight 240.1 Pass? Yes

Test (Run) No. 9 Barometric Pressure (P_{bar}) 29.45 in. Hg
Gas Temperature °F Static Pressure -.7 in. Hg

Orsat Analysis: 17.3 %CO_2 3.5 %O_2

Clock Time 24 hour	Meter Volume (V_m) ft³	Meter Gage Pressure (ΔH) in. H_2O	Meter Temp. (t_m) °F		Impgr. Outlet Temp °F
13:17	30.154	.10	83	89	67
13:22	30.946	.10	85	82	Cully
13:27	31.838	.10	86	82	Icw
13:32	32.680	.10	87	83	
13:37	33.525	.10	88	84	
	3.371				
Avg. .842			84.3	(T_m)	°R

Condensate
mls (V_f)
- mls (V_i)
mls
× 0.04707 =
ft³ [$V_{wc(std)}$] + ft³ [$V_{wsg(std)}$]
= ft³ [$V_{w(std)}$]

Silica Gel or Train
548.9 grams (W_f)
-535.3 grams (W_i)
grams
× 0.04715 =

$V_{m(std)}$ = ft³

Water Vapor, proportion by volume
B_{ws} = .167

Leak Check: OK 0.000 OK 0.000

Moisture correction factor:
1 - B_{ws} =

Comments:

Test (Run) No. 10 Barometric Pressure (P_{bar}) 29.45 in. Hg
Gas Temperature °F Static Pressure -.7 in. Hg

Orsat Analysis: 17.3 %CO_2 3.5 %O_2

Clock Time 24 hour	Meter Volume (V_m) ft³	Meter Gage Pressure (ΔH) in. H_2O	Meter Temp. (t_m) °F		Impgr. Outlet Temp °F
13:52	33.630	.10	82	84	67
13:57	34.443	.10	84	82	Cully
14:02	35.256	.10	85	82	Icw
14:07	36.069	.10	85	82	
14:12	36.885	.10	85	82	
	3.255				
Avg. .813			83.3	(T_m)	°R

Condensate
mls (V_f)
- mls (V_i)
mls
× 0.04707 =
ft³ [$V_{wc(std)}$] + ft³ [$V_{wsg(std)}$]
= ft³ [$V_{w(std)}$]

Silica Gel or Train
561.4 grams (W_f)
-548.9 grams (W_i)
grams
× 0.04715 =

$V_{m(std)}$ = ft³

Water Vapor, proportion by volume
B_{ws} = .160

Leak Check: OK 0.000 OK 0.000

Moisture correction factor:
1 - B_{ws} =

Comments:

$$V_{m(std)} = 17.64\, V_m Y \frac{P_{bar} + \frac{DH}{13.6}}{T_m}$$

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

Operator T CAS

NO_x ANALYZER - CONVERTER EFFICIENCY TEST

Date:	4/19/07	Max NO_x Gas Value:	74.99
Auditor:	DST	Low NO_x Gas Value:	74.24
Monitor Serial No:	0	Percent of Peak Value:	99.73
Monitor Model/MFG:	TECO 42C	Converter Temperature:	0509110850
Monitor Range:	0 - 200	Cylinder Number:	
NO_x Cylinder Value:	91.99 ppm		AM010319

The efficiency of the NO_2 to NO converter housed in the NO_x analyzer will be checked by having the analyzer sample a gas mixture of NO in N_2 standard gas and zero air from a Tedlar® bag. When this bag is mixed and exposed to sunlight the NO is oxidized to NO_2. This reaction is monitored with the NO_x analyzer for a minimum of a 30-minute period. If the NO_x instrument's converter is 100% efficient, then the NO_x response does not decline as the NO in the bag is converted to NO_2. The conversion efficiency is acceptable if the maximum stable reading does not differ by more than 2% over the 30-minute test period.

PROCEDURE:

1. Turn on the analyzer and converter and allow it to warm up for a 1-2 hour period. (Note: Be sensitive to converter temperature requirements, 650°C for stainless and approximately 325°C for Moly)

2. Perform a calibration error check of the analyzer (local calibration is fine) running in the NO_x mode.

3. Fill a Tedlar bag (minimum volume 35L) approximately ½ full with zero and ½ full with nominal 300 ppm NO_x calibration gas or the anticipated mid level calibration gas.

4. Hook up the gas to the analyzer inlet and allow the reading to stabilize.

5. Monitor the analyzer output at one-minute intervals for a minimum of 30 minutes.

6. Printout the data for the 30-minute period.

7. Calculate the difference between the peak value and the value after 30 minutes and evaluate the efficiency using the following equation:

$$\frac{\text{Peak Value - Value after 30 minutes}}{\text{Peak Value}} \times 100 \leq 2\%$$

8. If the result is >2% the system is unacceptable, notify the CEM department immediately to take corrective action and repeat the test.

9. If result is ≤2% tag the unit with date and required converter temperature.

Required appendices to the completed test.

a. 30-Minute data logger report

b. Completed calibration error test form

Daniel E. Thorp

Current Date : 04/19/07
Current Time : 08:00

NO_x Converter Test

Minute Summary Report
Conoco Phillips - Hydrogen Plant 1 Stack
04/19/07

Logger Id : 01 Logger Name : LOGGER Interval : 001M

Param :	CO-SYS1	NOX-SYS2	O2-SYS2
Units :	PPM	PPM	%
Time			
07:28	893.86	74.33	.00
07:29	759.27	74.37	-.01
07:30	37.66	74.40	-.02
07:31	117.42	74.33	.00
07:32	484.95	74.38	-.01
07:33	489.68	74.33	-.01
07:34	377.62	74.39	12.88
07:35	11.06	74.37	20.82
07:36	.17	74.38	20.82
07:37	-.09	74.38	20.82
07:38	-.11	74.35	20.82
07:39	-.10	74.37	20.82
07:40	-.11	74.40	20.82
07:41	-.10	74.38	20.83
07:42	-.10	74.44	20.83
07:43	-.10	74.31	20.83
07:44	-.10	74.42	20.83
07:45	-.11	74.34	20.83
07:46	-.11	74.38	20.84
07:47	-.11	74.35	20.84
07:48	-.11	74.32	20.84
07:49	-.10	74.42	20.84
07:50	-.27	74.27	20.84
07:51	-.11	74.24	20.84
07:52	-.11	74.37	20.84
07:53	-.10	74.35	20.84
07:54	-.11	74.25	20.84
07:55	-.26	74.24	20.84
07:56	-.11	74.30	20.84
07:57	-.12	74.35	20.84
Max :	893.86	74.44	20.84
Min :	-.27	74.24	-.02
Mean :	105.63	74.35	16.39
Recs :	0030	0030	0030

Data Flags : '<' - Less than ##% Data, 'P' - Power Fail, 'D' - Disabled, 'T' - Out-of-Control, 'F' - Boiler Off-Line,
'B' - Bad Status, 'C' - Calibration, 'M' - Maintenance, 'O' - Analog Overrange, 'U' - Analog Underrange,
'A' - Arithmetic Error, '+' - Maximum, '-' - Minimum, 'R' - Rate of Change, 'H' - High-High Alarm,
'L' - Low-Low Alarm, 'h' - High Alarm, 'l' - Low Alarm, 'J' - High Rate of Change, 'j' - Low Rate of Change,

GE ENERGY

RESPONSE TIME TEST

Date of Test: April 19, 2007 – Hydrogen Plant 1

Analyzer Type: TECO 42C (NO_X), TECO 48C (CO), Servomex (O_2)

S/N: 42CHL-77506-386 (NO_X), 48C-73898-375 (CO), 1420D/3496 (O_2)

Span Gas Concentration: 167.6 ppm (NO_X), 898.1 ppm (CO), 22.55% (O_2)

Analyzer Span Setting: 0 – 200 ppm (NO_X), 0-1000 (CO), 0 – 25% (O_2)

UPSCALE RESPONSE:			
	Start	95% Response	Time (minutes)
1	8:19 (NO_X)	8:21	2.0
2	8:19 (CO)	8:20	1.0
3	8:31 (O_2)	8:32	1.0

DOWNSCALE RESPONSE:			
	Start	95% Response	Time
1	8:16 (NO_X)	8:17	1.0
2	8:16 (CO)	8:17	1.0
3	8:19 (O_2)	8:20	1.0

UPSCALE RESPONSE = Time required to reach 95% of stable reading shifting from stable zero to stack gas.

DOWNSCALE RESPONSE = Time required to reach 95% of stable reading shifting from stable high-level cal to stack gas.

RESPONSE TIME = The longer of the two mean times.

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: GE/IL
Project No.: 05-52372-001

Customer

GE ENERGY/ELMURST

888 INDUSTRIAL DRIVE
ELMHURST IL 60126-1012

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM019237 **Certification Date:** 23Jun2006 **Exp. Date:** 22Jun2008
Cylinder Pressure*:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
NITRIC OXIDE	167.6	PPM	+/- 1%	Direct NIST and NMi
NITROGEN - OXYGEN FREE		BALANCE		
TOTAL OXIDES OF NITROGEN	167.6	PPM		Reference Value Only

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1685	01Jan2010	AAL071109	246.1 PPM	NITRIC OXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR//0928621	08Jun2006	FTIR

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

NITRIC OXIDE

First Triad Analysis			Second Triad Analysis			Calibration Curve	
Date: 23Jun2006	Response Unit: PPM		Date: 30Jun2006	Response Unit: PPM		Concentration=A+Bx+Cx2+Dx3+Ex4	
Z1=-0.43939	R1=248.8935	T1=170.5451	Z1=-0.43939	R1=248.8935	T1=168.5284	r=9.99994E-1	
R2=249.0676	Z2=-0.15229	T2=170.1244	R2=249.0676	Z2=-0.15229	T2=169.2307	Constants:	A=0.00000E+0
Z3=0.21469	T3=170.9941	R3=249.3288	Z3=0.21469	T3=169.5689	R3=249.3288	B=9.26992E-1	C=3.80000E-5
Avg. Concentration:	168.0	PPM	Avg. Concentration:	167.1	PPM	D=0.00000E+0	E=0.00000E+0

Special Notes: NO RANGE: 160.0 - 190.0 PPM TOTAL NOX NTE 190.0 PPM

APPROVED BY: _____
Scott King

Scott Specialty Gases

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: GE/IL
Project No.: 05-53026-003

Customer

GE ENERGY/ELMURST

888 INDUSTRIAL DRIVE
ELMHURST IL 60126-1012

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM010319 **Certification Date:** 22Mar2006 **Exp. Date:** 21Mar2008
Cylinder Pressure*:** 1802 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
NITRIC OXIDE	91.49	PPM	+/- 1%	Direct NIST and NMi
NITROGEN - OXYGEN FREE		BALANCE		
TOTAL OXIDES OF NITROGEN	91.55	PPM		Reference Value Only

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
SRM 1684B	01Oct2006	FF16469	97.50 PPM	NITRIC OXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR//0928621	16Mar2006	FTIR

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

NITRIC OXIDE

First Triad Analysis			Second Triad Analysis			Calibration Curve	
Date: 14Mar2006	Response Unit: PPM		Date: 22Mar2006	Response Unit: PPM		Concentration=A+Bx+Cx2+Dx3+Ex4	
Z1=-0.34730	R1=98.13370	T1=91.29222	Z1=-0.46346	R1=98.78466	T1=91.64866	r=9.99994E-1	
R2=98.33743	Z2=-0.04962	T2=91.55458	R2=98.84076	Z2=0.02541	T2=91.80966	Constants:	A=0.00000E+0
Z3=0.03906	T3=91.59452	R3=98.34157	Z3=0.24838	T3=91.88987	R3=98.94060	B=1.00169E+0	C=4.60000E-5
Avg. Concentration:	91.62	PPM	Avg. Concentration:	91.36	PPM	D=0.00000E+0	E=0.00000E+0

APPROVED BY: _____
Scott King

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: GEE049
Project No.: 05-47232-001

Customer

GE ENERGY/ELMURST

888 INDUSTRIAL DRIVE
ELMHURST IL 60126-1012

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM047609 **Certification Date:** 28Sep2006 **Exp. Date:** 27Sep2009
Cylinder Pressure*:** 1906 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
CARBON MONOXIDE	498.3	PPM	+/- 1%	Direct NIST and NMi
NITROGEN		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1681	01Mar2008	ALM024603	1013. PPM	CARBON MONOXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR//0928621	28Sep2006	FTIR

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

CARBON MONOXIDE

First Triad Analysis

Date: 19Sep2006	Response Unit:PPM	
Z1=0.00187	R1=498.7498	T1=498.9303
R2=499.1919	Z2=0.26892	T2=499.5892
Z3=0.39973	T3=500.1854	R3=499.7050
Avg. Concentration:	498.3	PPM

Second Triad Analysis

Date: 28Sep2006	Response Unit: PPM	
Z1=0.05395	R1=1018.158	T1=501.1017
R2=1018.601	Z2=0.63197	T2=501.2699
Z3=0.65836	T3=501.4706	R3=1019.053
Avg. Concentration:	498.3	PPM

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4	
r=9.99973E-1	
Constants:	A=-4.43978E+3
B=1.86347E+0	C=0.00000E+0
D=0.00000E+0	E=0.00000E+0

APPROVED BY: _____
JEFF CROTEAU

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: GE ENERGY STOCK
05-35866-001

Customer

GE ENERGY - ELMHURST

888 INDUSTRIAL DRIVE
ELMHURST IL 60126-1012

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM011304 **Certification Date:** 11Oct2005 **Exp. Date:** 10Oct2008
Cylinder Pressure*:** 1862 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
CARBON MONOXIDE	898.1	PPM	+/- 1%	Direct NIST and NMi
NITROGEN		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1681	01Mar2008	ALM036176	1013. PPM	CARBON MONOXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR//0928621	26Sep2005	FTIR

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

CARBON MONOXIDE

First Triad Analysis

Date: 04Oct2005	Response Unit:PPM	
Z1=-0.02886	R1=1015.790	T1=900.5306
R2=1016.302	Z2=0.42055	T2=901.3710
Z3=0.43236	T3=901.6446	R3=1017.915
Avg. Concentration:	897.9	PPM

Second Triad Analysis

Date: 11Oct2005	Response Unit: PPM	
Z1=-0.08180	R1=1014.094	T1=899.1427
R2=1014.279	Z2=0.30868	T2=899.5201
Z3=0.35112	T3=899.5965	R3=1014.525
Avg. Concentration:	898.2	PPM

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4	
r=9.99990E-1	
Constants:	A=0.00000E+0
B=9.90012E-1	C=3.75000E-4
D=0.00000E+0	E=0.00000E+0

Special Notes: SEND CERT WITH CYLINDER

APPROVED BY: _____
JEFF CROTEAU

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: GE ENERGY STOCK
Project No.: 05-47218-001

Customer

GE ENERGY - ELMHURST

888 INDUSTRIAL DRIVE
ELMHURST IL 60126-1012

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM055661 **Certification Date:** 20Sep2006 **Exp. Date:** 19Sep2009

Cylinder Pressure*:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
OXYGEN	12.83	%	+/- 1%	Direct NIST and NMi
NITROGEN		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2657	30Jun2007	AAL067856	1.995 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
ROSEMOUNT/755R/1000430	18Sep2006	PARAMAGNETIC

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

OXYGEN

First Triad Analysis			Second Triad Analysis	Calibration Curve	
Date: 20Sep2006	Response Unit:MV			Concentration=A+Bx+Cx2+Dx3+Ex4	
Z1=0.00000	R1=1.98000	T1=12.73000		r=1.00000	
R2=1.98000	Z2=0.00000	T2=12.73000		Constants:	A=-0.002267
Z3=0.00000	T3=12.73000	R3=1.98000		B=0.999983	C=0
Avg. Concentration:	12.83	%		D=0	E=0

Special Notes: SEND CERT WITH CYLINDER

APPROVED BY: _____
HILARY TEATCHER

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RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: GE ENERGY STOCK
05-35681-001

Customer

GE ENERGY - ELMHURST

888 INDUSTRIAL DRIVE
ELMHURST IL 60126-1012

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM027288 **Certification Date:** 04Oct2005 **Exp. Date:** 03Oct2008
Cylinder Pressure*:** 1900 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
OXYGEN	22.55 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2350	01May2009	K026542	23.48 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
ROSEMOUNT/755R/1000430	03Oct2005	PARAMAGNETIC

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis

OXYGEN

Date: 03Oct2005	Response Unit:MV	
Z1=0.00000	R1=23.46000	T1=22.51000
R2=23.48000	Z2=0.00000	T2=22.55000
Z3=0.00000	T3=22.62000	R3=23.56000
Avg. Concentration:	22.55	%

Second Triad Analysis

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4	
r=0.999999	
Constants:	A=0.009018
B=1.000858	C=0
D=0	E=0

Special Notes: SEND CERT WITH CYLINDER

APPROVED BY: _____