

TEST REPORT

COMPLIANCE EMISSION TEST PROGRAM

SRU NO. 544 TGI EXHAUST STACK (EPN E-02-SCOT)
TCEQ FLEXIBLE AIR PERMIT NOS. 6825A, PSD-TX-49 AND N65

VALERO PORT ARTHUR REFINERY
PORT ARTHUR, TEXAS

PREPARED FOR:

***THE PREMCOR REFINING GROUP, INC.
A VALERO COMPANY***

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REPORT CERTIFICATION

STATEMENT OF CONFORMANCE AND TEST REPORT CERTIFICATION

I certify, to the best of my knowledge, that this test program was conducted in a manner conforming to the criteria set forth in ASTM D 7036-04: Standard Practice for Competence of Air Emission Testing Bodies, and that project management and supervision of all project related activities were performed by qualified individuals as defined by this practice.

I further certify that this test report and all attachments were prepared under my direction or supervision in accordance with the ARI Environmental, Inc. quality management system designed to ensure that qualified personnel gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analysis relating to this performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete.

A handwritten signature in black ink, appearing to read "Greg Burch", is written over a horizontal line.

Greg Burch, QSTI
South Central Regional Manager, Source Testing Division
ARI Environmental, Inc.



SECTION ONE

Introduction and Summary

ARI Environmental, Inc. (ARI) was retained by Valero Port Arthur Refinery (Valero) to conduct a compliance emission test program on the Sulfur Recovery Unit (SRU) No. 544 Tail Gas Incinerator (TGI) Exhaust Stack at Valero's refinery located in Port Arthur, Texas.

Emission testing at the exhaust stack was conducted to determine the concentrations and emission rates of sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO) and hydrogen sulfide (H₂S). The test program followed the regulatory requirements and sampling procedures listed below:

- Code of Federal Regulations, Title 40, Part 51 (40 CFR 51), Appendix M, Method 205.
- 40 CFR 60, Appendix A, Methods 1-4, 6C, 7E, 10 and 11.
- Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.
- Texas Commission on Environmental Quality (TCEQ) Sampling Procedures Manual.
- TCEQ Flexible Permit Nos. 6825A, PSD-TX-49 and N65.

Mr. Greg Burch managed the test program and performed testing with the assistance of Messrs. Dustin Manthei and Zack McCain.

During the compliance test program, SRU 544 operated with a sulfur production rate of 202 long tons per day (LT/D) or 63% of its capacity. Process data provided by Mr. Robert Hill of Valero is provided in Appendix E of this report.

Table 1-1 presents the results of the test program performed on October 14, 2009. Detailed results are presented in Section 3 of this report.

TABLE 1-1. SUMMARY OF SRU 544 TGI EXHAUST COMPLIANCE TEST PROGRAM

Run No.	1	2	3	
Time	<u>11:46-12:46</u>	<u>14:03-15:03</u>	<u>16:20-17:20</u>	<u>Average</u>
Sulfur Dioxide (SO₂)				
ppmv db	149.3	197.8	155.3	167.5
lb/hr	27.60	31.82	26.89	28.77
Nitrogen Oxides (NO_x)				
ppmv db	11.66	8.54	6.81	9.00
lb/hr	1.55	0.99	0.85	1.13
Carbon Monoxide (CO)				
ppmv db	4.8	205.7	326.9	179.1
lb/hr	0.39	14.47	24.77	13.21
Hydrogen Sulfide (H₂S)				
ppmv db	<0.10	<0.10	0.43	<0.21
lb/hr	<0.010	<0.009	0.040	<0.019



SECTION TWO

Compliance Test Procedures

2.1 OVERVIEW

ARI conducted a compliance emission test on the SRU 544 TGI exhaust at Valero's facility located in Port Arthur, Texas. The purpose of the test program was to determine pollutant concentrations and mass emission rates to atmosphere of SO₂, NO_x, CO and H₂S.

Test methods followed those as detailed in 40 CFR 60, Appendix A, Methods 1-4, 6C, 7E, 10 and 11; and 40 CFR 51, Appendix M, Method 205 as outlined in Table 2-1.

TABLE 2-1. USEPA TEST METHODS

USEPA Method	Description
1	Sample and Velocity Traverses for Stationary Sources
2	Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
3A	Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)
4	Determination of Moisture Content in Stack Gases
6C	Determination of Sulfur Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)
7E	Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)
10	Determination of Carbon Monoxide Emissions from Stationary Sources
11	Determination of Hydrogen Sulfide Content of Fuel Gas Streams in Petroleum Refineries
205	Verification of Gas Dilution Systems for Field Instrument Calibrations

2.2 USEPA METHOD 1 - SAMPLE AND VELOCITY TRAVERSE LOCATIONS

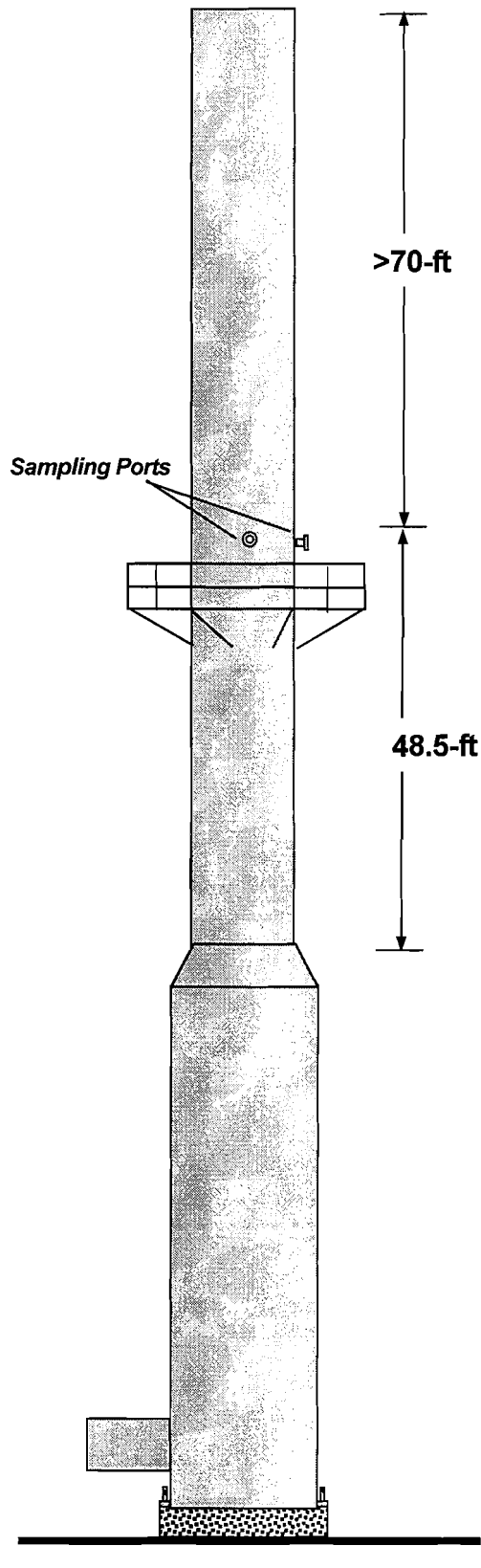
Sampling was conducted using the two 3-inch diameter sampling ports provided. The sampling ports on the 67.0-inch diameter stack were located approximately 48.5 feet (8.7 duct diameters) downstream and greater than 70 feet (>12 duct diameters) upstream from the nearest flow disturbances. The sampling point locations were determined following USEPA Method 1 procedures. Specifically, six sampling points were used for each sample port for a total of twelve sampling points as presented in Figure 2-1.

2.3 USEPA METHOD 2 - VELOCITY AND VOLUMETRIC FLOW RATE DETERMINATION

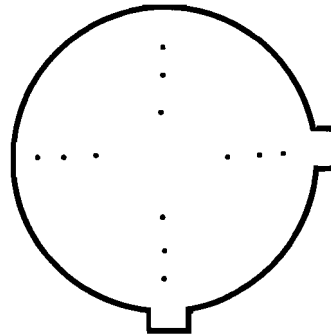
Velocity traverses were performed using a Type "S" Pitot tube with the velocity head pressure measured on a Dwyer oil gauge extended range inclined manometer to the nearest 0.005 in. H₂O. Temperature measurements in the ducts were performed with a Chromel-Alumel thermocouple connected to a digital direct read-out potentiometer.

SECTION TWO

Compliance Test Procedures



CROSS SECTION



TRAVERSE POINTS: 12
NUMBER OF PORTS: 2
POINTS/PORT: 6
STACK ID: 67.0 in.
PORT LENGTH: 8.0 in.

TRAVERSE POINT NO.	DISTANCE FROM INSIDE WALL, in.
1	3.0
2	9.8
3	19.9
4	47.1
5	57.3
6	64.0

**FIGURE 2-1. VALERO PORT ARTHUR REFINERY
SRU 544 TGI EXHAUST
STACK SAMPLING LOCATION**



SECTION TWO

Compliance Test Procedures

2.4 USEPA METHOD 3A - CO₂, O₂ AND MOLECULAR WEIGHT DETERMINATION

The molecular weight of the stack gas was determined following USEPA Method 3A. Specifically, for each sampling run, the exhaust gas was analyzed for carbon dioxide (CO₂), oxygen (O₂) and nitrogen (N₂) (by difference) using the analyzers described in Subsection 2.6.

2.5 USEPA METHOD 4 - MOISTURE

Stack gas moisture determination was conducted in accordance with USEPA Method 4 procedures. Specifically, stack gas was extracted at a constant rate through a series of chilled impingers as presented in Figure 2-2. The first two impingers contained deionized/distilled water, the third was initially empty and the final impinger contained silica gel for final water vapor removal. Total moisture collected was determined based upon the volumetric gains of impingers one through three and the weight gain of the silica gel contained in impinger four. Stack gas moisture was determined from the volume of water vapor condensed from the stack gas, the volume of gas sampled and the ideal gas law.

2.6 USEPA METHODS 3A, 6C, 7E AND 10 - O₂, CO₂, SO₂, NO_x AND CO

Sampling for O₂, CO₂, SO₂, NO_x and CO was performed following procedures from USEPA Methods 3A, 6C, 7E and 10. ARI's gaseous reference method (RM) sampling system consisted of a heated probe with an in-stack filter followed by a calibration tee connected to a heated Teflon sample line. The Teflon sample line was used to transport the sample to an electronic sample conditioner (Universal Analyzer Model No. 3082) to condition the sample by cooling and removing moisture. A sample manifold was connected to the exhaust side of the sample conditioner with intake lines for ARI's RM analyzers as presented in Figure 2-3.

USEPA Method 3A was used for RM sampling of O₂ and CO₂ using ARI's Servomex Model 1440 combination analyzer. For the analysis of O₂ in the sample stream, a paramagnetic detector was utilized. For the measurement of CO₂, a non-dispersive infrared detector was utilized. USEPA Method 6C was used for reporting of SO₂ concentrations using a Bovar Western Research Model 721-ATM analyzer equipped with an ultraviolet infrared detector. USEPA Method 7E was used for RM sampling of NO_x using ARI's California Analytical Model 600C chemiluminescent analyzer. USEPA Method 10 was used for CO analysis of the sample stream using ARI's Thermo Environmental Instruments, Inc. Model 48i gas filter correlation infrared analyzer.

Prior to the test, initial calibration error checks were performed for each constituent using zero gas (N₂), followed by high and mid level standards prepared from an EPA Protocol standard diluted with N₂ following the procedures from USEPA Method 205 as detailed in Subsection 2.8. The analyzer response for each calibration gas introduced was less than two percent of the corresponding span value as determined by the span gas concentration.

Following the calibration error test and prior to sampling, a NO₂ converter test was performed using a certified NO₂ standard of approximately 50 ppm. The results were within 10% of the cylinder certified concentration.

SECTION TWO

Compliance Test Procedures

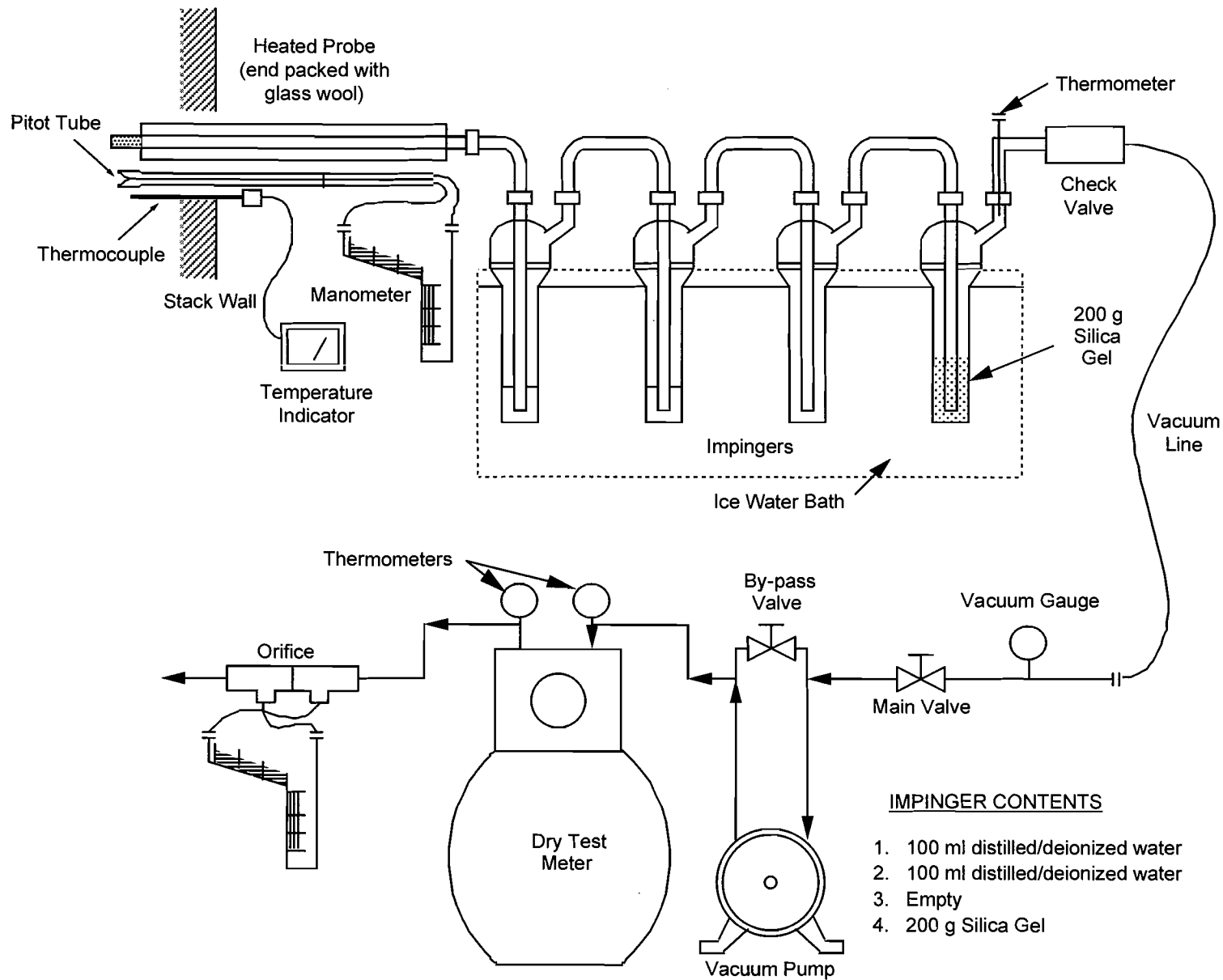


FIGURE 2-2. USEPA METHOD 4 SAMPLING TRAIN (MOISTURE)

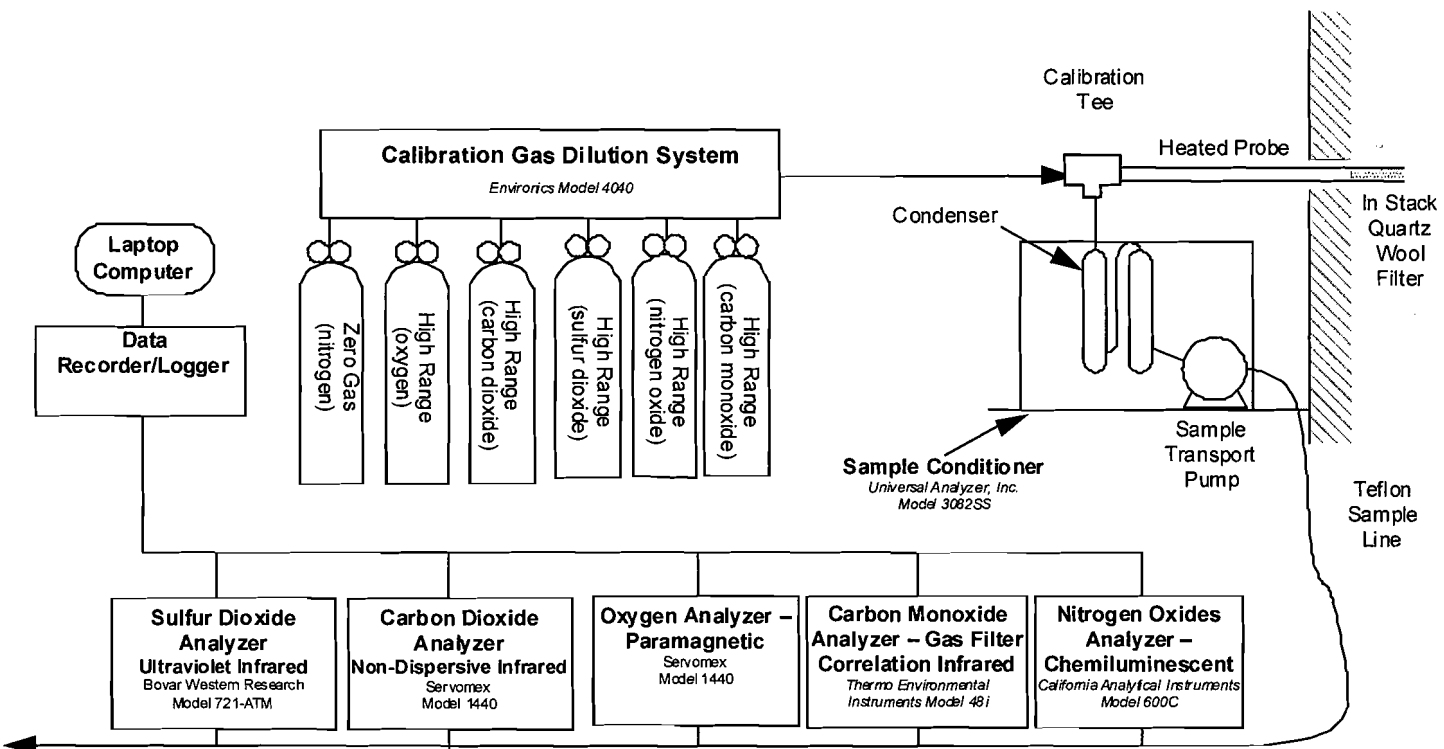


FIGURE 2-3. ARI REFERENCE METHOD O₂, CO₂, SO₂, NO_x AND CO SAMPLING SYSTEM



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Compliance Test Procedures

System bias checks were performed immediately before and after each run for each RM analyzer. This bias check consisted of introducing calibration gases into the sample system at a calibration tee placed between the sample probe and the heated sample line. The sample gas was introduced at a rate slightly higher than the sample rate to ensure excess gas flowed out the tip of the probe, preventing stack gas from entering the sample system during calibrations. System bias checks were performed using a zero gas and the mid or span level calibration gas. The pre-test and post-test system bias results were within the 5% of span allowed for each calibration gas. The system bias results were also used to calculate system drift during each run. The drift test results were within the 3% of span allowed for each test run. Analyzer calibration specification data are provided in Table 2-2. Calibration response and gas certification data are provided in Appendix D. Raw RM data are presented in Appendix C of this report.

TABLE 2-2. ARI RM ANALYZER CALIBRATION SPECIFICATIONS

RM Analyzer	Mid Cal Standard (40 – 60% of Span)	High Cal Standard (Span)
O ₂ , Servomex Model 1440	4.50%	9.00%
CO ₂ , Servomex Model 1440	5.00%	10.00%
SO ₂ , Bovar Model 721-ATM	150.0 ppm	300.0 ppm
NO _x , CAI Model 600C	40.0 ppm	80.0 ppm
CO, Thermo Environmental Instruments, Inc. Model 48i	1,000 ppm	1,983 ppm

Prior to the first run, response times were determined upscale and downscale for each analyzer. The start of each run was delayed for a period of at least twice the length of the longest response time following calibrations.

Data was recorded and archived on ARI's data acquisition system consisting of a data recorder/logger linked to a computer for digital data archives and reduction. All calibration data, including calibration gas specifications, calibration span values, recorded responses, and certifications relevant to this test program are presented in the appendices of this report.

All calibration gases were certified by USEPA Protocol 1 procedures. ARI's Envirionics Model 4040 Gas Dilution System introduced calibration gases to the analyzers. The gas dilution system was determined to be acceptable following the procedures described in USEPA Method 205. The procedures and results are discussed in Subsection 2.8.

2.7 USEPA METHOD 11 – H₂S CONTENT OF FUEL

Sampling and analytical procedures for the determination of H₂S concentrations in the exhaust stream were determined in accordance with USEPA Method 11 procedures.



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Compliance Test Procedures

This sampling train consisted of a sampling valve connected to a series of six midjet impingers followed by a rotameter and dry gas meter. The first impinger contained 15 mL of hydrogen peroxide (H_2O_2); the second impinger was empty, the third, fourth and fifth impingers each contained 15 mL of cadmium sulfate absorbing solution and the sixth impinger contained 25 grams of silica gel as detailed in Figure 2-4.

The sampling system was leak checked before and after each sampling run. At the end of each run, a 15-minute air purge was conducted through the impinger train at a rate of approximately 1 Lpm.

The contents of the first impinger were discarded and the contents of impingers three through five were analyzed on-site following the iodine titration techniques described in USEPA Method 11.

During sampling, the exhaust stream H_2S combines with the cadmium sulfate to form cadmium sulfide. The sample is recovered using precisely 50.0 mL of an acidified 0.01 N iodine solution. The combined solution is then allowed to react for a period of 30 minutes in a dark area. The unreacted iodine is then quantified by titration using 0.01 N sodium thiosulfate. The H_2S concentration is then calculated based on the amount of unreacted iodine in the sample solution.

2.8 USEPA METHOD 205 - GAS DILUTION SYSTEM VERIFICATION

All diluted calibration standards were prepared using an Environics Model 4040 Gas Dilution System, which was verified by a field evaluation at the job site prior to testing following the requirements of USEPA Method 205.

ARI's Servomex Model 1440 paramagnetic O_2 analyzer was calibrated following USEPA Method 3A procedures. After the calibration procedure was complete, diluted mid and high range standards and a mid-range USEPA Protocol 1 standard were alternately introduced in triplicate and an average instrument response was calculated for each standard. No single response differed by more than $\pm 2\%$ from the average response for each standard as presented in Table 2-3.

The difference between the instrument average and the predicted concentration was less than $\pm 2\%$ for each diluted standard. The difference between the certified gas concentration and the average instrument response for the mid-range USEPA Protocol 1 standard was less than $\pm 2\%$. Complete documentation of the USEPA Method 205 Gas Dilution System Verification is presented in Appendix D.

TABLE 2-3. USEPA METHOD 205 RESULTS

<u>Calibration Point</u>	<u>Concentration</u>	<u>Average Response</u>	<u>Percent Difference</u>
Target Conc. No. 1 (mid point)	7.50	7.60	1.33
Target Conc. No. 2 (high point)	15.00	15.00	0.01
Mid Protocol Standard	7.57	7.51	0.84

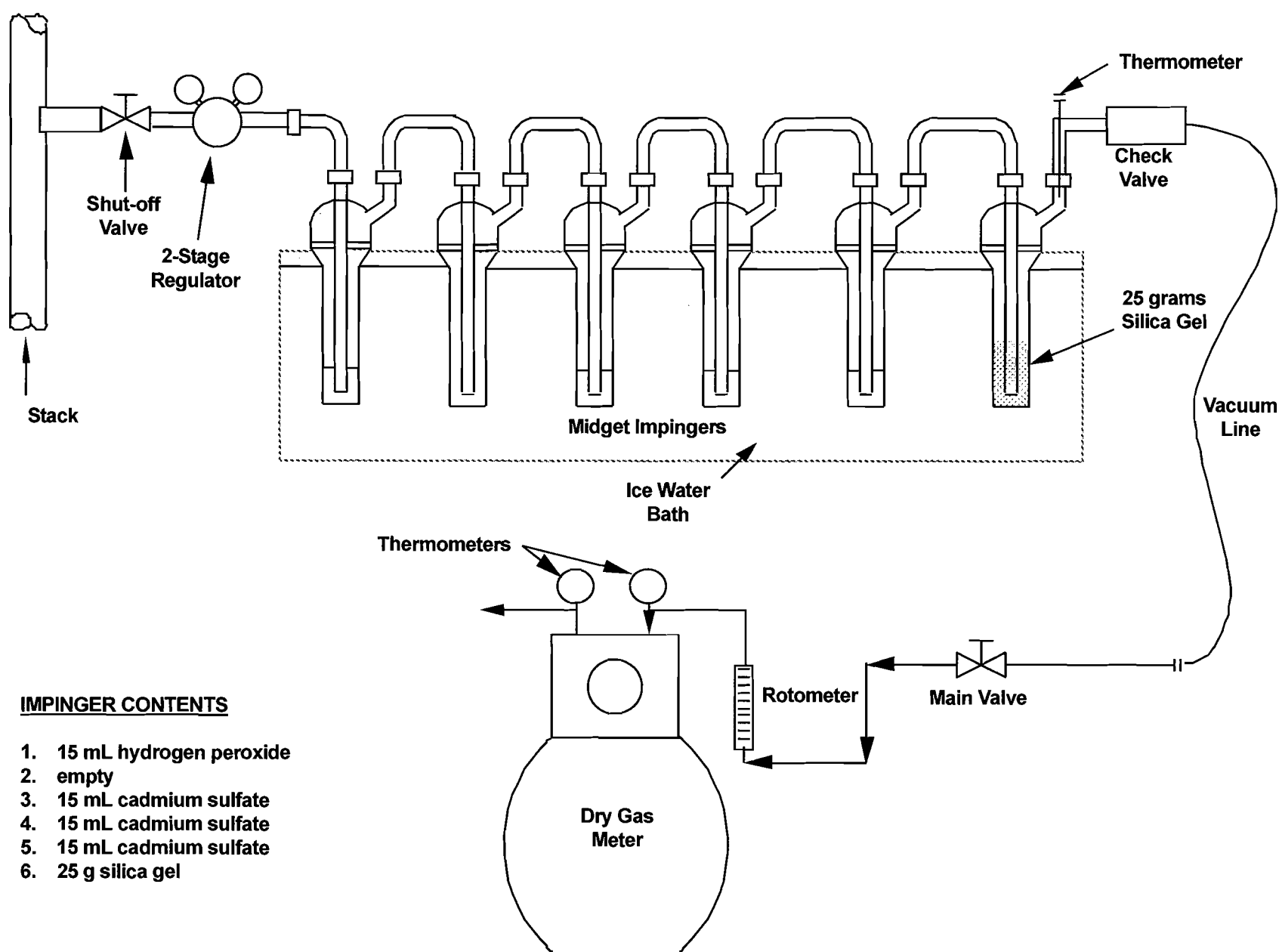


FIGURE 2-4. USEPA METHOD 11 - HYDROGEN SULFIDE SAMPLING TRAIN



SECTION THREE

Results

The data collected for the compliance emission testing are presented in Table 3-1. The test runs represent data collected on the exhaust of the SRU 544 TGI.

Appendix A presents example calculations and computer generated printouts of calculated values from the field data. Appendix B presents the field data. Appendix C contains the reference method monitoring data. Appendix D presents the calibration data and cylinder gas certification sheets. The data supplied by plant personnel for the process operating levels are presented in Appendix E. Appendix F presents the test program qualifications.



SECTION THREE

Results

TABLE 3-1. SRU 544 TGI EXHAUST TEST RESULTS

Company	: Valero Port Arthur Refinery			
Location	: Port Arthur, Texas			
Source	: SRU 544 TGI Exhaust			
Operators	: G. Burch, D. Manthei, Z. McCain			
Test Run	:	1	2	3
Test Date	:	10/14/2009	10/14/2009	10/14/2009
Test Time	:	<u>11:46-12:46</u>	<u>14:03-15:03</u>	<u>16:20-17:20</u>
				<u>Average</u>

PROCESS DATA

Acid gas charge, MSCFH	287.9	294.6	289.5	290.7
Sulfur production, LT/D	200	205	201	202
TGI firebox temp, °F	1,320	1,111	902	1,111
Nat gas flow, MSCFH	20.58	15.84	14.98	17.13

STACK GAS PARAMETERS

Temperature, av. °F	1,191.3	1,100.9	827.8	1,040.0
Velocity, ft/sec	46.31	39.63	35.21	40.38
Volume flow, acfm	68,034	58,212	51,731	59,325
Volume flow, dscfm	18,546	16,139	17,374	17,353
Volume flow, dscfh	1,112,770	968,362	1,042,433	1,041,189
Moisture, % vol	14.13	17.44	17.49	16.35
CO ₂ , % vol, db	4.33	3.92	3.78	4.01
O ₂ , % vol, db	1.13	1.01	2.20	1.45

SULFUR DIOXIDE

Concentration				
ppmv db	149.3	197.8	155.3	167.5
ppmv db @ 0% O ₂	157.8	207.9	173.5	179.7
lb/dscf x 10 ⁻⁶	24.80	32.86	25.80	27.82
Emission rate				
lb/hr	27.60	31.82	26.89	28.77
ton/yr	120.9	139.4	117.8	126.0

NITROGEN OXIDES as NO₂

Concentration				
ppmv db	11.66	8.54	6.81	9.00
lb/dscf x 10 ⁻⁶	1.39	1.02	0.81	1.07
Emission rate				
lb/hr	1.55	0.99	0.85	1.13
ton/yr	6.78	4.32	3.71	4.94



SECTION THREE

Results

TABLE 3-1 (CONTINUED). SRU 544 TGI EXHAUST TEST RESULTS

Test Run	:	1	2	3	
Test Date	:	10/14/2009	10/14/2009	10/14/2009	
Test Time	:	<u>11:46-12:46</u>	<u>14:03-15:03</u>	<u>16:20-17:20</u>	<u>Average</u>

CARBON MONOXIDE

Concentration				
ppmv db	4.8	205.7	326.9	179.1
lb/dscf x 10 ⁻⁶	0.3	14.9	23.8	13.0
Emission rate				
lb/hr	0.39	14.47	24.77	13.21
ton/yr	1.7	63.4	108.5	57.9

HYDROGEN SULFIDE

Concentration				
ppmv db	<0.10	<0.10	0.43	<0.21
lb/dscf x 10 ⁻⁶	<0.009	<0.009	0.038	<0.019
Emission rate				
lb/hr	<0.0098	<0.0086	0.0396	<0.0193
ton/yr	<0.0431	<0.0375	0.1732	<0.0846



Valero Port Arthur Refinery
Source: SRU 544 TGI Exhaust
Test Date: October 14, 2009

APPENDIX A

Calculation Summaries

MONITOR DATA SUMMARY

COMPANY : Valero
SOURCE : SRU 544 TGI
REPETITION : 1
TEST DATE : 10/14/2009
START TIME : 11:46
END TIME : 12:46

GAS ANALYZER **O₂**

SPAN VALUE : 9.00 %
 AVERAGE CAL. BIAS (C_m): 4.622
 AVERAGE ZERO BIAS (C_o): 0.067
 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 4.50
 % CORRECTED (C_{gas}): **1.13**

GAS ANALYZER **NO_x**

SPAN VALUE : 80.0 ppm
 AVERAGE CAL. BIAS (C_m): 41.01
 AVERAGE ZERO BIAS (C_o): 0.28
 CALIBRATION GAS: EPA Protocol NO
 CALIBRATION PPM (C_{ma}): 40.0
 PPM CORRECTED (C_{gas}): **11.7**

GAS ANALYZER **CO**

SPAN VALUE : 1983 ppm
 AVERAGE CAL. BIAS (C_m): 1011.02
 AVERAGE ZERO BIAS (C_o): 1.13
 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 1000.0
 PPM CORRECTED (C_{gas}): **4.8**

GAS ANALYZER **SO₂**

SPAN VALUE : 300.0 ppm
 AVERAGE CAL. BIAS (C_m): 149.04
 AVERAGE ZERO BIAS (C_o): 1.51
 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 150.0
 PPM CORRECTED (C_{gas}): **149.3**
 PPM @ 0% O₂: **157.8**

GAS ANALYZER **CO₂**

SPAN VALUE : 10.00 %
 AVERAGE CAL. BIAS (C_m): 5.07
 AVERAGE ZERO BIAS (C_o): -0.04
 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 5.00
 % CORRECTED (C_{gas}): **4.33**

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
11:46	0					
11:47	1	12.3	154.5	6.3	1.24	4.36
11:48	2	12.2	152.5	6.3	1.23	4.36
11:49	3	12.2	149.4	6.6	1.24	4.35
11:50	4	12.3	149.9	7.7	1.27	4.37
11:51	5	12.4	152.4	6.3	1.24	4.38
11:52	6	12.4	155.8	5.9	1.22	4.38
11:53	7	12.2	152.0	5.6	1.21	4.39
11:54	8	12.3	150.0	6.3	1.25	4.39
11:55	9	12.2	149.4	6.3	1.25	4.40
11:56	10	12.4	152.5	5.9	1.25	4.41
11:57	11	12.3	153.5	4.5	1.17	4.43
11:58	12	12.3	154.4	4.9	1.18	4.42
11:59	13	12.2	153.9	4.8	1.20	4.40
12:00	14	12.2	152.2	5.9	1.22	4.40
12:01	15	12.2	146.8	6.2	1.21	4.40
12:02	16	12.2	142.4	6.3	1.20	4.41
12:03	17	12.3	139.8	6.3	1.21	4.42
12:04	18	12.3	139.4	6.3	1.26	4.41
12:05	19	12.3	141.5	6.3	1.30	4.39
12:06	20	12.5	146.0	5.6	1.28	4.41
12:07	21	12.4	150.0	4.9	1.19	4.43
12:08	22	12.4	149.0	4.5	1.17	4.43
12:09	23	12.2	147.3	4.1	1.14	4.43
12:10	24	11.9	146.9	5.6	1.20	4.41
12:11	25	12.2	143.9	7.8	1.26	4.39
12:12	26	12.4	145.1	7.8	1.26	4.41
12:13	27	12.5	148.4	6.3	1.23	4.42
12:14	28	12.5	149.9	4.9	1.17	4.44
12:15	29	12.4	150.8	3.4	1.12	4.44
12:16	30	12.2	151.2	3.7	1.11	4.42
12:17	31	12.0	147.7	6.0	1.20	4.37
12:18	32	12.0	146.6	7.0	1.24	4.36
12:19	33	12.2	146.8	7.8	1.27	4.38
12:20	34	12.5	151.3	5.5	1.21	4.41
12:21	35	12.2	153.0	4.1	1.15	4.42
12:22	36	12.0	150.9	4.8	1.16	4.38
12:23	37	12.0	143.9	5.2	1.18	4.36
12:24	38	12.0	143.1	6.3	1.20	4.35
12:25	39	11.9	144.0	6.7	1.22	4.33
12:26	40	12.1	147.6	7.8	1.26	4.34
12:27	41	12.3	148.5	7.4	1.25	4.36
12:28	42	12.4	148.7	6.0	1.22	4.37
12:29	43	12.3	147.1	4.9	1.17	4.38
12:30	44	11.9	147.9	4.5	1.16	4.38
12:31	45	11.9	151.4	4.9	1.20	4.35
12:32	46	11.9	151.8	4.9	1.17	4.35
12:33	47	11.9	152.2	6.3	1.22	4.34
12:34	48	11.8	152.3	7.0	1.24	4.35
12:35	49	12.0	150.3	7.8	1.25	4.36
12:36	50	12.1	149.6	7.1	1.25	4.38
12:37	51	12.0	147.2	5.5	1.20	4.39
12:38	52	12.1	147.0	4.5	1.15	4.39
12:39	53	12.0	149.0	3.4	1.12	4.39
12:40	54	11.8	149.4	3.4	1.12	4.38
12:41	55	11.7	152.4	3.8	1.12	4.36
12:42	56	11.6	150.1	6.8	1.19	4.32
12:43	57	11.5	142.8	10.4	1.31	4.31
12:44	58	11.9	136.3	12.0	1.35	4.34
12:45	59	12.2	137.2	7.5	1.27	4.38
12:46	60	12.3	143.0	4.1	1.17	4.40
Uncorrected Average =		12.15	148.34	5.94	1.212	4.386

Example Calculation =
$$C_{\text{gas}} = \left(\bar{C} - C_o \right) \frac{C_{ma}}{C_m - C_o}$$

ARI ENVIRONMENTAL, INC.
MOISTURE CALCULATION SUMMARY

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
TEST DATE: 10/14/2009
RUN NUMBER: Run 1

γ FACTOR:	0.999	STACK DIAM:	67.0 inches
BAROMETRIC:	29.76 in. Hg	METER VOLUME:	46.548 ft ³
STATIC PRES:	-0.74 in.H ₂ O	METER TEMP:	110.6 °F
STACK TEMP:	1191.3 °F	LIQUID COLL:	150.3 milliliters
SQ. RT ΔP:	0.4513 in.H ₂ O	CO₂:	4.33 % by volume
ΔH:	1.91 in.H ₂ O	O₂:	1.13 % by volume

ENGLISH UNITS
(29.92 in.Hg & 68 °F)

VOLUME OF SAMPLE
@ STANDARD CONDITIONS, DRY BASIS

$$V_{mstd} = \left(\frac{528}{29.92} \right) \times V_m \times \gamma \times \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 43.003 \text{ dscf}$$

$\gamma = 0.999$

VOLUME OF WATER IN SAMPLE
@ STANDARD CONDITIONS

$$V_{wstd} = 0.04707 \times V_{lc} = 7.075 \text{ scf}$$

$V_{lc} = 150.3 \text{ mL}$

FRACTIONAL MOISTURE CONTENT OF STACK GAS AS MEASURED

$$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.141$$

FRACTIONAL MOISTURE CONTENT OF STACK GAS @ SATURATION

$$MF = \frac{10^{\left[8.361 - \left(\frac{1893.5}{T - 27.65} \right) \right]} - 0.5}{P} = 1.000$$

$T = 917.1 \text{ °K}$
 $P = 754.5 \text{ mmHg}$

FRACTIONAL MOISTURE CONTENT USED IN CALCULATIONS

$$B_{ws} = 0.141$$

ARI ENVIRONMENTAL, INC.
FLOW RATE CALCULATION SUMMARY

COMPANY: Valero
LOCATION: Port Arthur, Texas
RUN NUMBER: Run 1

SOURCE: SRU 544 TGI
TEST DATE: 10/14/2009

BAROMETRIC: 29.76 in. Hg
STATIC PRES: -0.74 in.H₂O
STACK TEMP: 1191.3 °F
SQ.RT ΔP: 0.4513 in.H₂O

STACK DIAM: 67.0 inches
CO₂: 4.33 % by volume
O₂: 1.13 % by volume

DRY MOLECULAR WEIGHT OF STACK GAS

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.74 \text{ lb/lb-mole}$$

MOLECULAR WEIGHT OF STACK GAS, wet basis

$$M_s = M_d(1 - B_{ws}) + 18B_{ws} = 27.22 \text{ lb/lb-mole}$$

PITOT TUBE COEFFICIENT

$$C_p \text{ (from calibration curve or geometric specifications)} = 0.84$$

AVERAGE VELOCITY HEAD OF STACK GAS, in. H₂O

$$\sqrt{\Delta P} = \frac{1}{n} \sum_{i=1}^n \sqrt{\Delta p_i} = 0.4513 \text{ in. H}_2\text{O}$$

AVERAGE ABSOLUTE STACK GAS TEMPERATURE

$$T_s = 1191.3 \text{ °F} + 460 = 1,651 \text{ °R}$$

ABSOLUTE STACK GAS PRESSURE

$$P_s = P_{bar} + \frac{P_{static}}{13.6} = 29.71 \text{ in.Hg}$$

STACK GAS VELOCITY

$$V_s = (85.49)(C_p)(\text{avg } \sqrt{\Delta P}) \sqrt{\frac{T_s}{(P_s)(M_s)}} = 46.31 \text{ ft/sec}$$

STACK GAS VOLUMETRIC FLOW RATE, actual

$$Q_s = 60 \times V_s \times A_s = 68,034 \text{ acfm}$$

$$\text{Stack Area} = 24.484 \text{ ft}^2$$

**STACK GAS VOLUMETRIC FLOW RATE,
standard conditions, wet basis**

$$Q_{stdw} = \left(\frac{528}{29.92} \right) (Q_s) \left(\frac{P_s}{T_s} \right) = \begin{matrix} 21,597 & \text{scfm, wb} \\ 1,295,839 & \text{scfh, wb} \end{matrix}$$

**STACK GAS VOLUMETRIC FLOW RATE,
standard conditions, dry basis**

$$Q_{std} = \left(\frac{528}{29.92} \right) (Q_s) \left(\frac{P_s}{T_s} \right) (1 - B_{ws}) = \begin{matrix} 18,546 & \text{dscfm} \\ 1,112,770 & \text{dscfh} \end{matrix}$$

SO₂ CALIBRATION CORRECTION DATA SHEET
USEPA METHOD 6C

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
MONITOR ID: Bovar 721-ATM
RUN NO: 1
TEST DATE: 10/14/2009

INPUT

SO₂ AVERAGE CHART READING (C): 148.3 ppmv
AVG PRE/POST ZERO DRIFT READING (C_o): 1.5 ppmv
CAL GAS CONCENTRATION (C_{ma}): 150.0 ppmv
AVG CAL PRE/POST TEST READING (C_m): 149.0 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 1,112,770 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 148.3 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv (corrected)} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 149.3 \text{ ppmv db}$$

SO₂ CONC.(lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 24.80 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 1,112,770 dscfh

STACK SO₂ EMISSION RATE =

$$\boxed{\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 27.60 \text{ lbs/hr}$$
$$= 120.9 \text{ ton/yr}$$

NO_x CALIBRATION CORRECTION DATA SHEET
USEPA METHOD 7E

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
MONITOR ID: CAI 600C
RUN NO: 1
TEST DATE: 10/14/2009

INPUT

NO_x AVERAGE CHART READING (C): 12.15 ppmv
AVG PRE/POST ZERO DRIFT READING (C_o): 0.3 ppmv
CAL GAS CONCENTRATION (C_{ma}): 40.0 ppmv
AVG CAL PRE/POST TEST READING (C_m): 41.0 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 1,112,770 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 12.15 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv} = \text{(corrected)} \quad C_{\text{gas,ppm}} = \left(\bar{C} - C_o \right) \frac{C_{ma}}{C_m - C_o} = 11.66 \text{ ppmv db}$$

NO_x CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 1.392 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 1,112,770 dscfh

STACK NO_x EMISSION RATE =

$$\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 1.549 \text{ lbs/hr} \\ = 6.78 \text{ ton/yr}$$

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
MONITOR ID: Thermo Environmental Model 48i
RUN NO: 1
TEST DATE: 10/14/2009

INPUT

CO AVERAGE CHART READING (C): 5.9 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 1.1 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 1000.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 1011.0 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 1,112,770 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 5.9 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv} = \text{(corrected)} \quad C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o} = 4.8 \text{ ppmv db}$$

CO CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 / \text{lb - mole}} \right) = 0.35 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 1,112,770 dscfh

STACK CO EMISSION RATE =

$$CO_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.39 \text{ lbs/hr} = 1.7 \text{ ton/yr}$$

Hydrogen Sulfide (H₂S) Calculation Summary

Company: Valero
Location: Port Arthur, Texas
Source: SRU 544 TGI
Test Date: 10/14/2009
Run #: 1
Start Time: 11:46
End Time: 12:46

Field Test Data:

Vm: 60.2 Liters
Yd: 0.994 dimensionless
Pbar: 29.76 inches Hg
DH: 0.1 inches H₂O
Tm: 93.8 degrees F

Start Meter Volume: 736.8 Liters
Final Meter Volume: 797.0 Liters

Laboratory Analysis for Hydrogen Sulfide (H₂S):

Sample

Normality of iodine (Ni): 0.00914 N
Normality of titrant (Nt): 0.01030 N
Volume of Iodine solution (Vit): 50.0 milliliters
Volume of titrant (Vtt): 43.70 milliliters
Volume of sample(Vm): 2.126 Ft³

Blank

Normality of iodine (Nib): 0.00914 N
Normality of titrant (Ntb): 0.01030 N
Volume of Iodine solution (Vitb): 50.0 milliliters
Volume of titrant (Vttb): 43.70 milliliters

Calculations:

Volume of sample at standard conditions on dry basis:

$$Vmstd = (17.647)(Vm)(Yd)(Pbar + (DH/13.6))/(Tm)$$

$$Vmstd \text{ (liters)} = Vmstd \times 28.32$$

Hydrogen sulfide concentration:

$$mg/dscm = (K((Vit \cdot Ni - Vtt \cdot Nt) - (Vitb \cdot Nib - Vttb \cdot Ntb))) / Vmstd \text{ (liters)}$$

$$lb/dscf = mg/dscm \times 6.242 \times 10^{-8}$$

$$ppmv = lb/dscf \times 385.26 / 34 \times 10^{-6}$$

English Units
(29.92 in. Hg, 68° F)

$$= 2.004 \text{ dscf}$$

$$= 56.756 \text{ liters}$$

$$= 0.00 \text{ mg/dscm H}_2\text{S}$$

$$= 0.00E+00 \text{ lb/dscf H}_2\text{S}$$

$$= 0.00 \text{ ppm H}_2\text{S}$$

H₂S DATA SHEET

USEPA METHOD 11

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
RUN NO: Run 1
TEST DATE: 10/14/2009

INPUT

H₂S AVERAGE READING (C): <0.10 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 1,112,770 dscfh

CALCULATIONS

H₂S CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{34.08 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.0088 \times 10^{-6} \text{ lbs/dscf}$$

H₂S EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 1,112,770 dscfh

STACK H₂S EMISSION RATE =

$$H_2S_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = <0.0098 \text{ lbs/hr}$$
$$= <0.043 \text{ ton/yr}$$

MONITOR DATA SUMMARY

COMPANY : Valero
SOURCE : SRU 544 TGI
REPETITION : 2
TEST DATE : 10/14/2009
START TIME : 14:03
END TIME : 15:03

GAS ANALYZER **O₂**

SPAN VALUE : 9.00 %
 AVERAGE CAL. BIAS (C_m): 4.574
 AVERAGE ZERO BIAS (C_o): 0.034

 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 4.50
% CORRECTED (C_{gas}): 1.01

GAS ANALYZER **NO_x**

SPAN VALUE : 80.0 ppm
 AVERAGE CAL. BIAS (C_m): 39.36
 AVERAGE ZERO BIAS (C_o): 0.26

 CALIBRATION GAS: EPA Protocol NO
 CALIBRATION PPM (C_{ma}): 40.0
PPM CORRECTED (C_{gas}): 8.5

GAS ANALYZER **CO**

SPAN VALUE : 1983 ppm
 AVERAGE CAL. BIAS (C_m): 1005.50
 AVERAGE ZERO BIAS (C_o): -1.13

 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 1000.0
PPM CORRECTED (C_{gas}): 205.7

GAS ANALYZER **SO₂**

SPAN VALUE : 300.0 ppm
 AVERAGE CAL. BIAS (C_m): 146.59
 AVERAGE ZERO BIAS (C_o): -1.73

 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 150.0
PPM CORRECTED (C_{gas}): 197.8
PPM @ 0% O₂: 207.9

GAS ANALYZER **CO₂**

SPAN VALUE : 10.00 %
 AVERAGE CAL. BIAS (C_m): 5.07
 AVERAGE ZERO BIAS (C_o): -0.04

 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 5.00
% CORRECTED (C_{gas}): 3.92

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
14:03	0					
14:04	1	8.8	208.1	191.3	1.05	3.95
14:05	2	9.0	207.5	185.3	1.01	3.94
14:06	3	8.8	207.0	168.9	0.93	3.97
14:07	4	8.5	202.0	234.6	1.12	3.93
14:08	5	9.6	198.1	242.4	1.35	3.93
14:09	6	9.8	197.5	139.9	0.97	4.05
14:10	7	9.0	199.2	136.9	0.86	4.06
14:11	8	8.2	203.0	213.0	0.98	3.96
14:12	9	8.8	208.1	258.2	1.11	3.90
14:13	10	9.2	206.9	188.6	0.98	3.95
14:14	11	8.8	203.8	173.7	0.95	3.97
14:15	12	8.9	197.6	250.1	1.24	3.92
14:16	13	9.6	194.5	192.1	1.13	3.97
14:17	14	9.1	199.5	125.2	0.87	4.05
14:18	15	8.0	207.5	201.7	0.86	3.99
14:19	16	8.3	216.2	281.9	1.21	3.88
14:20	17	9.0	219.2	207.0	1.01	3.94
14:21	18	8.5	212.8	167.2	0.86	3.98
14:22	19	8.2	204.2	269.0	1.18	3.92
14:23	20	9.1	196.7	258.0	1.21	3.94
14:24	21	9.0	189.9	165.1	0.89	4.04
14:25	22	8.3	188.5	187.8	0.96	4.00
14:26	23	8.4	190.1	230.8	1.20	3.92
14:27	24	8.9	190.6	188.9	1.03	3.97
14:28	25	8.3	188.5	162.8	0.94	4.01
14:29	26	7.8	182.0	231.6	1.43	3.88
14:30	27	8.6	181.9	229.8	1.37	3.90
14:31	28	8.5	184.0	163.2	0.99	4.00
14:32	29	7.6	186.5	235.4	1.14	3.95
14:33	30	8.6	185.6	281.8	1.57	3.88
14:34	31	9.1	188.2	176.9	1.02	4.02
14:35	32	8.4	187.5	140.2	0.88	4.04
14:36	33	7.8	184.3	255.3	1.18	3.93
14:37	34	8.6	184.4	255.1	1.26	3.92
14:38	35	8.6	188.0	167.6	0.83	4.02
14:39	36	7.6	192.6	221.1	0.98	3.97
14:40	37	8.2	193.5	319.7	1.32	3.90
14:41	38	8.9	194.3	209.3	1.02	3.99
14:42	39	8.5	189.4	159.7	0.91	4.02
14:43	40	8.2	185.7	234.1	1.11	3.96
14:44	41	8.7	187.5	207.9	1.05	3.96
14:45	42	8.2	192.8	173.5	0.81	4.00
14:46	43	7.5	195.5	248.3	1.06	3.91
14:47	44	8.5	196.4	289.8	1.41	3.87
14:48	45	9.2	187.3	191.9	1.02	3.99
14:49	46	9.0	177.3	155.9	0.95	4.04
14:50	47	8.7	179.9	176.0	0.99	4.00
14:51	48	8.5	188.8	176.8	0.97	3.98
14:52	49	8.3	195.8	191.9	0.90	3.97
14:53	50	8.0	199.0	234.2	1.04	3.92
14:54	51	8.8	195.9	248.1	1.10	3.91
14:55	52	8.8	189.1	167.2	0.90	3.98
14:56	53	8.3	186.5	214.4	1.07	3.96
14:57	54	9.0	182.6	257.8	1.24	3.94
14:58	55	9.5	186.2	174.9	1.00	4.02
14:59	56	8.9	189.3	143.1	0.93	4.04
15:00	57	8.6	188.9	197.1	1.03	3.98
15:01	58	8.8	188.0	188.6	0.97	3.98
15:02	59	8.5	188.3	161.3	0.87	4.00
15:03	60	7.8	192.0	253.9	1.03	3.93
Uncorrected Average =		8.610	193.86	205.89	1.054	3.965

Example Calculation =
$$C_{\text{gas}} = \left(\bar{C} - C_o \right) \frac{C_{\text{ma}}}{C_m - C_o}$$

ARI ENVIRONMENTAL, INC.
MOISTURE CALCULATION SUMMARY

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
TEST DATE: 10/14/2009
RUN NUMBER: 2

γ FACTOR:	0.999	STACK DIAM:	67.0 inches
BAROMETRIC:	29.76 in. Hg	METER VOLUME:	46.706 ft ³
STATIC PRES:	-0.75 in.H ₂ O	METER TEMP:	113.8 °F
STACK TEMP:	1100.9 °F	LIQUID COLL:	192.6 milliliters
SQ.RT ΔP:	0.3941 in.H ₂ O	CO₂:	3.92 % by volume
ΔH:	1.90 in.H ₂ O	O₂:	1.01 % by volume

ENGLISH UNITS
(29.92 in.Hg & 68 °F)

VOLUME OF SAMPLE

@ STANDARD CONDITIONS, DRY BASIS

$$V_{mstd} = \left(\frac{528}{29.92} \right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 42.910 \text{ dscf}$$

$\gamma = 0.999$

VOLUME OF WATER IN SAMPLE

@ STANDARD CONDITIONS

$$V_{wstd} = 0.04707 \times V_{lc} = 9.066 \text{ scf}$$

$V_{lc} = 192.6 \text{ mL}$

FRACTIONAL MOISTURE CONTENT OF STACK GAS AS MEASURED

$$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.174$$

FRACTIONAL MOISTURE CONTENT OF STACK GAS @ SATURATION

$$MF = \frac{10^{\left[8.361 - \left(\frac{1893.5}{T - 27.65} \right) \right] - 0.5}}{P} = 1.000$$

$T = 866.8 \text{ °K}$
 $P = 754.5 \text{ mmHg}$

FRACTIONAL MOISTURE CONTENT USED IN CALCULATIONS

$$B_{ws} = 0.174$$

ARI ENVIRONMENTAL, INC.
FLOW RATE CALCULATION SUMMARY

COMPANY: Valero
LOCATION: Port Arthur, Texas
RUN NUMBER: 2

SOURCE: SRU 544 TGI
TEST DATE: 10/14/2009

BAROMETRIC: 29.76 in. Hg	STACK DIAM: 67.0 inches
STATIC PRES: -0.75 in.H ₂ O	CO₂: 3.92 % by volume
STACK TEMP: 1100.9 °F	O₂: 1.01
SQ.RT ΔP: 0.3941 in.H ₂ O	

DRY MOLECULAR WEIGHT OF STACK GAS

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.67 \text{ lb/lb-mole}$$

MOLECULAR WEIGHT OF STACK GAS, wet basis

$$M_s = M_d(1 - B_{ws}) + 18B_{ws} = 26.81 \text{ lb/lb-mole}$$

PITOT TUBE COEFFICIENT

$$C_p \text{ (from calibration curve or geometric specifications)} = 0.84$$

AVERAGE VELOCITY HEAD OF STACK GAS, in. H₂O

$$\sqrt{\Delta P} = \frac{1}{n} \sum_{i=1}^n \sqrt{\Delta p_i} = 0.3941 \text{ in. H}_2\text{O}$$

AVERAGE ABSOLUTE STACK GAS TEMPERATURE

$$T_s = 1100.9 \text{ °F} + 460 = 1,561 \text{ °R}$$

ABSOLUTE STACK GAS PRESSURE

$$P_s = P_{bar} + \frac{P_{static}}{13.6} = 29.70 \text{ in.Hg}$$

STACK GAS VELOCITY

$$V_s = (85.49)(C_p)(\text{avg } \sqrt{\Delta P}) \sqrt{\frac{T_s}{(P_s)(M_s)}} = 39.63 \text{ ft/sec}$$

STACK GAS VOLUMETRIC FLOW RATE, actual

$$Q_s = 60 \times V_s \times A_s = 58,212 \text{ acfm}$$

$$\text{Stack Area} = 24.484 \text{ ft}^2$$

**STACK GAS VOLUMETRIC FLOW RATE,
standard conditions, wet basis**

$$Q_{stdw} = \left(\frac{528}{29.92} \right) (Q_s) \left(\frac{P_s}{T_s} \right) = \begin{matrix} 19,549 & \text{scfm, wb} \\ 1,172,952 & \text{scfh, wb} \end{matrix}$$

**STACK GAS VOLUMETRIC FLOW RATE,
standard conditions, dry basis**

$$Q_{std} = \left(\frac{528}{29.92} \right) (Q_s) \left(\frac{P_s}{T_s} \right) (1 - B_{ws}) = \begin{matrix} 16,139 & \text{dscfm} \\ 968,362 & \text{dscfh} \end{matrix}$$

SO₂ CALIBRATION CORRECTION DATA SHEET USEPA METHOD 6C

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
MONITOR ID: Bovar 721-ATM
RUN NO: 2
TEST DATE: 10/14/2009

INPUT

SO₂ AVERAGE CHART READING (C): 193.9 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): -1.7 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 150.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 146.6 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 968,362 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 193.9 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 197.8 \text{ ppmv db}$$

(corrected)

SO₂ CONC.(lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 32.86 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 968,362 dscfh

STACK SO₂ EMISSION RATE =

$$\boxed{\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 31.82 \text{ lbs/hr}$$

139.4 ton/yr

NO_x CALIBRATION CORRECTION DATA SHEET USEPA METHOD 7E

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
MONITOR ID: CAI 600C
RUN NO: 2
TEST DATE: 10/14/2009

INPUT

NO_x AVERAGE CHART READING (C): 8.61 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.3 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 40.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 39.4 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 968,362 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 8.61 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv} = \left(\overline{C} - C_o \right) \frac{C_{ma}}{C_m - C_o} = 8.54 \text{ ppmv db}$$

(corrected)

NO_x CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 1.019 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 968,362 dscfh

STACK NO_x EMISSION RATE =

$$\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.987 \text{ lbs/hr}$$

$$= 4.32 \text{ ton/yr}$$

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
MONITOR ID: Thermo Environmental Model 48i
RUN NO: 2
TEST DATE: 10/14/2009

INPUT

CO AVERAGE CHART READING (C): 205.9 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): -1.1 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 1000.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 1005.5 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 968,362 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 205.9 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv} = \left(\overline{C} - C_o \right) \frac{C_{ma}}{C_m - C_o} = 205.7 \text{ ppmv db}$$

(corrected)

CO CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = \left(C_{\text{gas,ppm}} \right) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 14.95 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 968,362 dscfh

STACK CO EMISSION RATE =

$$CO_{\text{pmr}} = \left(C_{\text{gas,lb/dscf}} \right) (Q_{\text{std}}) = 14.47 \text{ lbs/hr}$$

$$= 63.4 \text{ ton/yr}$$

Hydrogen Sulfide (H₂S) Calculation Summary

Company: Valero

Location: Port Arthur, Texas

Source: SRU 544 TGI

Test Date: 10/14/2009

Run # : 2

Start Time: 14:03

End Time: 15:03

Field Test Data:

Vm: 60.3 Liters
Yd: 0.994 dimensionless
Pbar: 29.76 inches Hg
DH: 0.1 inches H₂O
Tm: 91.8 degrees F

Start Meter Volume: 798.2 Liters
Final Meter Volume: 858.5 Liters

Laboratory Analysis for Hydrogen Sulfide (H₂S):

Sample

Normality of iodine (Ni): 0.00914 N
Normality of titrant (Nt): 0.01030 N
Volume of Iodine solution (Vit): 50.0 milliliters
Volume of titrant (Vtt): 43.70 milliliters
Volume of sample(Vm): 2.129 Ft³

Blank

Normality of iodine (Nib): 0.00914 N
Normality of titrant (Ntb): 0.01030 N
Volume of Iodine solution (Vib): 50.0 milliliters
Volume of titrant (Vtb): 43.70 milliliters

Calculations:

Volume of sample at standard conditions on dry basis:

$$Vmstd = (17.647)(Vm)(Yd)(Pbar + (DH/13.6))/(Tm)$$

English Units
(29.92 in. Hg, 68° F)

$$= 2.015 \text{ dscf}$$

$$Vmstd \text{ (liters)} = Vmstd \times 28.32$$

$$= 57.057 \text{ liters}$$

Hydrogen sulfide concentration:

$$mg/dscm = (K((Vit \cdot Ni - Vtt \cdot Nt) - (Vib \cdot Nib - Vtb \cdot Ntb))) / Vmstd \text{ (liters)}$$

$$= 0.00 \text{ mg/dscm H}_2\text{S}$$

$$lb/dscf = mg/dscm \times 6.242 \times 10^{-8}$$

$$= 0.00\text{E}+00 \text{ lb/dscf H}_2\text{S}$$

$$ppmv = lb/dscf \times 385.26 / 34 \times 10^{-6}$$

$$= 0.00 \text{ ppm H}_2\text{S}$$

H₂S DATA SHEET USEPA METHOD 11

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
RUN NO: 2
TEST DATE: 10/14/2009

INPUT

H₂S AVERAGE READING (C): <0.10 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 968,362 dscfh

CALCULATIONS

H₂S CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{34.08 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.0088 \times 10^{-6} \text{ lbs/dscf}$$

H₂S EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 968,362 dscfh

STACK H₂S EMISSION RATE =

$$H_2S_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = <0.0086 \text{ lbs/hr}$$
$$= <0.038 \text{ ton/yr}$$

MONITOR DATA SUMMARY

COMPANY : Valero
SOURCE : SRU 544 TGI
REPETITION : 3
TEST DATE : 10/14/2009
START TIME : 16:20
END TIME : 17:20

GAS ANALYZER **O₂**

SPAN VALUE : 9.00 %
 AVERAGE CAL. BIAS (C_m): 4.539
 AVERAGE ZERO BIAS (C_o): -0.011

 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 4.50
% CORRECTED (C_{gas}): 2.20

GAS ANALYZER **NO_x**

SPAN VALUE : 80.0 ppm
 AVERAGE CAL. BIAS (C_m): 38.27
 AVERAGE ZERO BIAS (C_o): 0.31

 CALIBRATION GAS: EPA Protocol NO
 CALIBRATION PPM (C_{ma}): 40.0
PPM CORRECTED (C_{gas}): 6.8

GAS ANALYZER **CO**

SPAN VALUE : 1983 ppm
 AVERAGE CAL. BIAS (C_m): 1004.00
 AVERAGE ZERO BIAS (C_o): -2.03

 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 1000.0
PPM CORRECTED (C_{gas}): 326.9

GAS ANALYZER **SO₂**

SPAN VALUE : 300.0 ppm
 AVERAGE CAL. BIAS (C_m): 146.41
 AVERAGE ZERO BIAS (C_o): -4.40

 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 150.0
PPM CORRECTED (C_{gas}): 155.3
PPM @ 0% O₂: 173.5

GAS ANALYZER **CO₂**

SPAN VALUE : 10.00 %
 AVERAGE CAL. BIAS (C_m): 5.06
 AVERAGE ZERO BIAS (C_o): -0.04

 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 5.00
% CORRECTED (C_{gas}): 3.78

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
16:20	0					
16:21	1	6.8	159.6	338.7	2.22	3.78
16:22	2	6.8	151.8	335.1	2.31	3.78
16:23	3	6.8	150.6	331.3	2.31	3.79
16:24	4	6.8	156.9	330.5	2.25	3.80
16:25	5	6.8	163.8	334.4	2.23	3.80
16:26	6	6.7	159.9	336.0	2.26	3.80
16:27	7	6.7	154.3	335.6	2.26	3.82
16:28	8	6.6	154.8	336.0	2.22	3.82
16:29	9	6.6	153.4	336.4	2.21	3.81
16:30	10	6.6	144.8	334.3	2.27	3.80
16:31	11	6.6	142.3	330.5	2.32	3.81
16:32	12	6.6	149.0	325.7	2.32	3.82
16:33	13	6.6	156.3	326.4	2.25	3.81
16:34	14	6.6	160.8	330.9	2.21	3.81
16:35	15	6.5	163.0	336.0	2.18	3.81
16:36	16	6.5	158.5	336.4	2.19	3.80
16:37	17	6.6	159.4	336.1	2.22	3.80
16:38	18	6.6	155.6	331.7	2.23	3.80
16:39	19	6.6	139.6	325.8	2.31	3.79
16:40	20	6.5	134.1	316.3	2.41	3.78
16:41	21	6.7	131.4	304.3	2.46	3.79
16:42	22	6.7	133.2	297.8	2.38	3.80
16:43	23	6.7	136.5	296.4	2.36	3.79
16:44	24	6.7	137.6	299.4	2.33	3.80
16:45	25	6.5	147.8	308.0	2.26	3.80
16:46	26	6.4	150.7	317.8	2.23	3.81
16:47	27	6.6	145.9	320.0	2.25	3.81
16:48	28	6.6	144.6	315.6	2.26	3.81
16:49	29	6.6	150.6	313.0	2.25	3.82
16:50	30	6.5	150.4	315.2	2.22	3.83
16:51	31	6.8	149.9	319.3	2.18	3.82
16:52	32	7.1	155.2	326.1	2.11	3.83
16:53	33	7.1	158.5	333.2	2.05	3.84
16:54	34	7.0	164.8	336.8	2.03	3.85
16:55	35	6.8	161.8	332.4	2.12	3.83
16:56	36	6.6	158.3	325.0	2.24	3.82
16:57	37	6.6	152.3	318.1	2.31	3.82
16:58	38	6.9	146.4	313.0	2.28	3.84
16:59	39	7.2	151.2	318.2	2.16	3.84
17:00	40	7.1	158.0	324.6	2.05	3.85
17:01	41	7.1	160.0	329.1	2.07	3.84
17:02	42	7.1	163.7	333.3	2.06	3.84
17:03	43	7.0	166.5	337.2	2.05	3.84
17:04	44	6.7	163.2	339.0	2.13	3.87
17:05	45	6.6	152.5	336.3	2.24	3.85
17:06	46	6.6	143.8	328.0	2.33	3.84
17:07	47	6.8	140.3	321.1	2.27	3.84
17:08	48	7.1	144.8	326.5	2.17	3.85
17:09	49	7.0	152.2	334.8	2.11	3.85
17:10	50	7.0	154.6	337.9	2.11	3.85
17:11	51	7.0	154.5	340.1	2.11	3.84
17:12	52	6.9	153.1	339.0	2.14	3.83
17:13	53	6.8	146.8	334.8	2.21	3.82
17:14	54	6.7	140.0	329.1	2.28	3.81
17:15	55	6.7	135.5	322.1	2.31	3.82
17:16	56	7.0	137.4	316.0	2.27	3.83
17:17	57	7.2	148.8	322.4	2.11	3.85
17:18	58	7.1	160.4	332.4	1.98	3.86
17:19	59	7.1	165.6	336.8	1.98	3.86
17:20	60	7.1	167.1	337.9	1.96	3.85
Uncorrected Average =		6.77	151.74	326.86	2.210	3.822

Example Calculation =
$$C_{\text{gas}} = \left(\bar{C} - C_o \right) \frac{C_{\text{ma}}}{C_m - C_o}$$

ARI ENVIRONMENTAL, INC.
MOISTURE CALCULATION SUMMARY

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
TEST DATE: 10/14/2009
RUN NUMBER: 3

γ FACTOR:	0.999	STACK DIAM:	67.0 inches
BAROMETRIC:	29.76 in. Hg	METER VOLUME:	46.255 ft ³
STATIC PRES:	-0.75 in.H ₂ O	METER TEMP:	105.1 °F
STACK TEMP:	827.8 °F	LIQUID COLL:	194.3 milliliters
SQ.RT ΔP:	0.3857 in.H ₂ O	CO₂:	3.78 % by volume
ΔH:	1.90 in.H ₂ O	O₂:	2.20 % by volume

ENGLISH UNITS
(29.92 in.Hg & °F)

VOLUME OF SAMPLE

@ STANDARD CONDITIONS, DRY BASIS

$$V_{mstd} = \left(\frac{528}{29.92} \right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 43.147 \text{ dscf}$$

$\gamma = 0.999$

VOLUME OF WATER IN SAMPLE

@ STANDARD CONDITIONS

$$V_{wstd} = 0.04707 \times V_{lc} = 9.146 \text{ scf}$$

$V_{lc} = 194.3 \text{ mL}$

FRACTIONAL MOISTURE CONTENT OF STACK GAS AS MEASURED

$$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.175$$

FRACTIONAL MOISTURE CONTENT OF STACK GAS @ SATURATION

$$MF = \frac{10^{\left[8.361 - \left(\frac{1893.5}{T - 27.65} \right) \right] - 0.5}}{P} = 1.000$$

$T = 715.1 \text{ °K}$
 $P = 754.5 \text{ mmHg}$

FRACTIONAL MOISTURE CONTENT USED IN CALCULATIONS

$$B_{ws} = 0.175$$

ARI ENVIRONMENTAL, INC.
FLOW RATE CALCULATION SUMMARY

COMPANY: Valero
LOCATION: Port Arthur, Texas
RUN NUMBER: 3

SOURCE: SRU 544 TGI
TEST DATE: 10/14/2009

BAROMETRIC: 29.76 in. Hg
STATIC PRES: -0.75 in.H₂O
STACK TEMP: 827.8 °F
SQ.RT ΔP: 0.3857 in.H₂O

STACK DIAM: 67.0 inches
CO₂: 3.78 % by volume
O₂: 2.20 % by volume

DRY MOLECULAR WEIGHT OF STACK GAS			
$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$	=	28.69	lb/lb-mole
MOLECULAR WEIGHT OF STACK GAS, wet basis			
$M_s = M_d(1 - B_{ws}) + 18B_{ws}$	=	26.82	lb/lb-mole
PITOT TUBE COEFFICIENT			
C_p (from calibration curve or geometric specifications)	=	0.84	
AVERAGE VELOCITY HEAD OF STACK GAS, in. H₂O			
$\overline{\sqrt{\Delta P}} = \frac{1}{n} \sum_{i=1}^n \sqrt{\Delta p_i}$	=	0.3857	in. H ₂ O
AVERAGE ABSOLUTE STACK GAS TEMPERATURE			
$T_s = 827.8 \text{ °F} + 460$	=	1,288	°R
ABSOLUTE STACK GAS PRESSURE			
$P_s = P_{bar} + \frac{P_{static}}{13.6}$	=	29.70	in.Hg
STACK GAS VELOCITY			
$V_s = (85.49)(C_p)(\text{avg}\sqrt{\Delta P}) \sqrt{\frac{T_s}{(P_s)(M_s)}}$	=	35.21	ft/sec
STACK GAS VOLUMETRIC FLOW RATE, actual			
$Q_s = 60 \times V_s \times A_s$	=	51,731	acfm
Stack Area = 24.484 ft ²			
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, wet basis			
$Q_{stdw} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)$	=	21,057 1,263,394	scfm, wb scfh, wb
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, dry basis			
$Q_{std} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)(1 - B_{ws})$	=	17,374 1,042,433	dscfm dscfh

SO₂ CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 6C

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
MONITOR ID: Bovar 721-ATM
RUN NO: 3
TEST DATE: 10/14/2009

INPUT

SO₂ AVERAGE CHART READING (C): 151.7 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): -4.4 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 150.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 146.4 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 1,042,433 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 151.7 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv (corrected)} = C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o} = 155.3 \text{ ppmv db}$$

SO₂ CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 25.80 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 1,042,433 dscfh

STACK SO₂ EMISSION RATE =

$$\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 26.89 \text{ lbs/hr} = 117.8 \text{ ton/yr}$$

NO_x CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 7E

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
MONITOR ID: CAI 600C
RUN NO: 3
TEST DATE: 10/14/2009

INPUT

NO_x AVERAGE CHART READING (C): 6.77 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.3 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 40.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 38.3 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 1,042,433 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 6.77 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv} = \left(\bar{C} - C_o \right) \frac{C_{ma}}{C_m - C_o} = 6.81 \text{ ppmv db}$$

(corrected)

NO_x CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 0.813 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 1,042,433 dscfh

STACK NO_x EMISSION RATE =

$$\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.847 \text{ lbs/hr}$$

= 3.71 ton/yr

**CO CALIBRATION CORRECTION DATA SHEET
USEPA METHOD 10**

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
MONITOR ID: Thermo Environmental Model 48i
RUN NO: 3
TEST DATE: 10/14/2009

INPUT

CO AVERAGE CHART READING (C): 326.9 ppmv
AVG PRE/POST ZERO DRIFT READING (C_o): -2.0 ppmv
CAL GAS CONCENTRATION (C_{ma}): 1000.0 ppmv
AVG CAL PRE/POST TEST READING (C_m): 1004.0 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 1,042,433 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 326.9 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv (corrected)} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 326.9 \text{ ppmv db}$$

CO CONC.(lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 / \text{lb - mole}} \right)} = 23.76 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 1,042,433 dscfh

STACK CO EMISSION RATE =

$$\boxed{CO_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = \begin{array}{ll} 24.77 & \text{lbs/hr} \\ 108.5 & \text{ton/yr} \end{array}$$

Hydrogen Sulfide (H₂S) Calculation Summary

Company: Valero
Location: Port Arthur, Texas
Source: SRU 544 TGI
Test Date: 10/14/2009
Run # : 3
Start Time: 16:20
End Time: 17:20

Field Test Data:

Vm: 60.4 Liters
Yd: 0.994 dimensionless
Pbar: 29.76 inches Hg
DH: 0.1 inches H₂O
Tm: 84.7 degrees F

Start Meter Volume: 859.2 Liters
Final Meter Volume: 919.6 Liters

Laboratory Analysis for Hydrogen Sulfide (H₂S):

Sample

Normality of iodine (Ni): 0.00914 N
Normality of titrant (Nt): 0.01030 N
Volume of Iodine solution (Vit): 50.0 milliliters
Volume of titrant (Vtt): 43.50 milliliters
Volume of sample(Vm): 2.133 Ft³

Blank

Normality of iodine (Nib): 0.00914 N
Normality of titrant (Ntb): 0.01030 N
Volume of Iodine solution (Vitb): 50.0 milliliters
Volume of titrant (Vttb): 43.70 milliliters

Calculations:

Volume of sample at standard conditions on dry basis:

$$Vmstd = (17.647)(Vm)(Yd)(Pbar + (DH/13.6)) / (Tm)$$

$$Vmstd \text{ (liters)} = Vmstd \times 28.32$$

Hydrogen sulfide concentration:

$$mg/dscm = (K((Vit \cdot Ni - Vtt \cdot Nt) - (Vitb \cdot Nib - Vttb \cdot Ntb))) / Vmstd \text{ (liters)}$$

$$lb/dscf = mg/dscm \times 6.242 \times 10^{-8}$$

$$ppmv = lb/dscf \times 385.26 / 34 \times 10^{-6}$$

English Units
(29.92 in. Hg, 68° F)

$$= 2.045 \text{ dscf}$$

$$= 57.903 \text{ liters}$$

$$= 0.61 \text{ mg/dscm H}_2\text{S}$$

$$= 3.79\text{E-}08 \text{ lb/dscf H}_2\text{S}$$

$$= 0.43 \text{ ppm H}_2\text{S}$$

H₂S DATA SHEET

USEPA METHOD 11

COMPANY: Valero
LOCATION: Port Arthur, Texas
SOURCE: SRU 544 TGI
RUN NO: 3
TEST DATE: 10/14/2009

INPUT

H₂S AVERAGE READING (C): 0.43 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 1,042,433 dscfh

CALCULATIONS

H₂S CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{34.08 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = 0.0379 \times 10^{-6} \text{ lbs/dscf}$$

H₂S EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 1,042,433 dscfh

STACK H₂S EMISSION RATE =

$$H_2S_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.0396 \text{ lbs/hr} = 0.173 \text{ ton/yr}$$

ARI ENVIRONMENTAL, INC.
INPUT DATA

Company: Valero
Location: Port Arthur, Texas
Source: SRU 544 TGI
Test Date: 10/14/2009
Pollutant: H₂S

Iodine: 0.0091 Normality
Thiosulfate: 0.0103 Normality
Blank Vol. 43.7 ml
P bar : 29.76 in Hg
Meter y: 0.994

RUN No.	Start Time	Initial Meter Volume	Final Meter Volume	Total Meter Volume	Initial Temp	Final Temp	Volume Titrated	Ref Method Conc.
1	11:46	736.8	797.0	60.2	93.8	93.8	43.70	0.00
2	14:03	798.2	858.5	60.3	91.8	91.8	43.70	0.00
3	16:20	859.2	919.6	60.4	84.7	84.7	43.50	0.43

Normality of Standard Sodium Thiosulfate =

$$N_s = \frac{2.039W}{V_s}$$

Ns=Normality of Sodium Thiosulfate
W=Weight of K₂Cr₂O₇
Vs=Volume of 0.1N Sodium Thiosulfate used to titrate

$$\begin{aligned} W &= \frac{2.039}{0.1030} \\ V_s &= 40.4 \end{aligned}$$

Normality Standard Iodine Solution =

$$N_I = \frac{N_t V_t}{V_I}$$

NI=Normality of Iodine Solution
Nt=Normality of standard Sodium Thiosulfate Soln.
Vt=Volume of Sodium Thiosulfate used for standarization of Iodine
VI=Volume of standard Iodine Soln. Used.

$$\begin{aligned} N_t &= 0.0102 \\ V_t &= 22.4 \\ V_I &= 25.0 \\ N_I &= 0.0091 \end{aligned}$$



Valero Port Arthur Refinery
Source: SRU 544 TGI Exhaust
Test Date: October 14, 2009

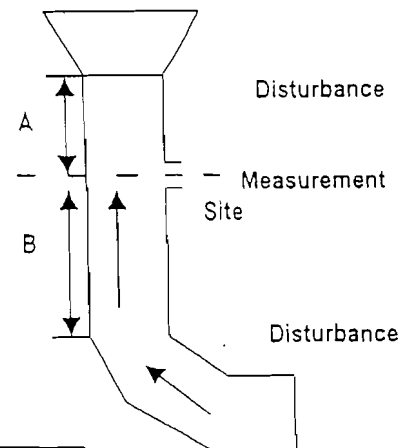
APPENDIX B

Field Data

TRAVERSE POINT LOCATION FOR CIRCULAR AND RECTANGULAR DUCTS

Plant: VALECO - PORT ARTHUR
 Date: 10-14-09
 Sampling Location: SRU 544
 Inside Of Far Wall To
 Outside Of Port (Distance C) 15"
 Inside Of Near Wall To
 Outside Of Port (Distance D) 8"
 Stack Id 67"
 Distance Upstream From Disturbance (A) 270'
 Distance Downstream From Disturbance (B) 582" (48.5')
 Calculator: DWM

	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5				90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50.0	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8



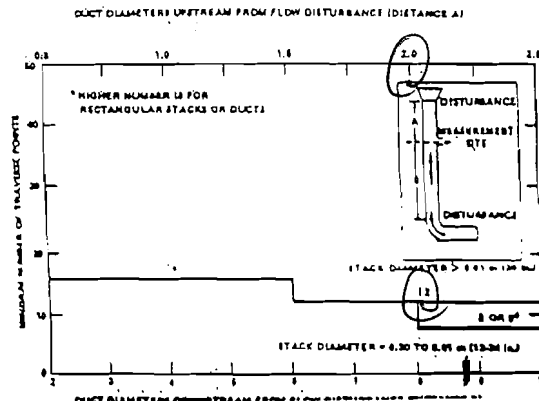
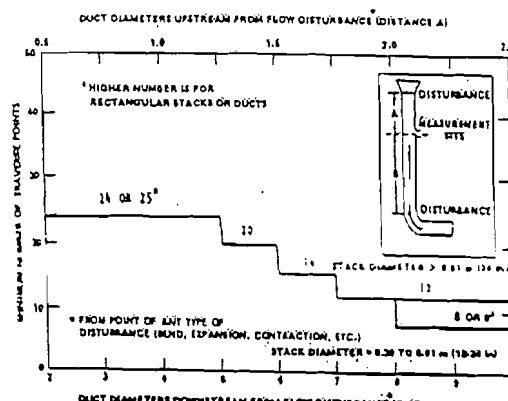
Rectangular Duct Equivalent Diameter Determination $\frac{2 \times L \times W}{L + W}$

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	52.3	42.6	37.7	34.6	32.5	30.9	29.7	28.7	27.9
5		85.4	67.7	54.2	45.0	39.1	34.6	31.2	28.9	27.1	25.5
6		95.6	80.6	65.8	55.6	48.9	43.8	40.0	37.5	35.4	33.2
7			89.5	77.4	64.4	54.4	47.8	43.0	40.0	37.5	35.4
8			96.8	85.4	75.0	63.4	53.5	46.9	42.5	40.0	37.5
9				91.8	82.3	73.1	62.5	54.4	48.9	45.0	42.5
10				97.4	88.2	79.9	71.7	61.8	54.4	48.9	45.0
11					93.3	85.4	78.0	70.4	61.2	54.4	48.9
12					97.9	90.1	83.1	76.4	69.4	60.7	54.4
13						94.3	87.5	81.2	75.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.8
15								95.1	89.1	83.5	78.2
16								98.4	92.5	87.1	82.0
17									95.6	90.3	85.4
18									98.6	93.3	88.4
19										96.1	91.3
20										98.7	94.0
21											96.5
22											98.9
23											
24											

Equivalent Diameters From Upstream Disturbance (B) 8.7
 Equivalent Diameters From Downstream Disturbance (A) 22

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 1 AND 2 (TO NEAREST 1/8 INCH)	DISTANCE D (PORT DEPTH)	TRAVERSE POINT LOCATION FROM OUTSIDE OF PORT (SUM OF COLUMNS 3 AND 4)
1	.044	67	3.0	8	11.0
2	.146	↓	9.75	↓	17.75
3	.296	↓	19.875	↓	27.875
4	.704	↓	47.125	↓	56.125
5	.854	↓	57.25	↓	66.25
6	.956	↓	64.0	↓	73.0
7					
8			RATA		
9					
10	.044		11.1		19.1
11	.050		32.5		41.5
12	.033		55.8		62.8
13					

For Stacks / Ducts 12 - 24 inches ID - No traverse Point shall be located within 0.5 inches of the Stack wall.
 For Stacks / Ducts > 24 inches ID - No traverse Point shall be located within 1.0 inch of the Stack wall



CEMS CALIBRATION DATA



Plant Vakro
 Location Port Arthur TX
 Source SRV 544 TGT
 Date 10-14-09
 Run Number 1
 Start Time 1146
 Stop Time 1246

Plant Rep. Robin Hill
 Team Leader Greg Burch
 CEM Operator Greg Burch

Analyzer Span Values (% or ppm)

CO ppm
 CO₂ %
 O₂ %
 THC ppm
 NO_x ppm
 SO₂ ppm

	CALIBRATION ERROR - 949 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors		
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Time	Pretest: 1118 hrs 1254 hrs		System Response	Time	System Response		Time	Drift (% of Span)
CO Zero	0.0	ALM1030472	0.4		1.9		0.4					Co=
CO Low		D.1.1 test										
CO Mid	6.00	ALM10303638	1028		1014		1008					Cm=
CO High	1983	1983 ppm	1933									
CO ₂ Zero	0.00	ALM1030472	0.04		-0.04		-0.04					Co=
CO ₂ Low		D.1.1 test										
CO ₂ Mid	5.00	ALM10308208	5.13		5.09		5.06					Cm=
CO ₂ High	10.00	23.0%	9.96									
O ₂ Zero	0.00	ALM1030472	0.09		0.08		0.06					Co=
O ₂ Low		D.1.1 test										
O ₂ Mid	4.50	ALM1035230	4.66		4.65		4.60					Cm=
O ₂ High	9.00	22.0	8.95									
THC Zero		ALM1030472										Co=
THC Low												
THC Mid												Cm=
THC High												
NO _x Zero	0.0	ALM1030472	0.0		0.3		0.3					Co=
NO _x Low		D.1.1 test										
NO _x Mid	40.0	ALM1031560	41.7		41.6		40.5					Cm=
NO _x High	80.0	2030 ppm	78.5									
SO ₂ Zero	0.0	ALM1030472	-0.4		3.1		0.0					Co=
SO ₂ Low		D.1.1 test										
SO ₂ Mid	150.0	ALM1043419	150.3		150.6		147.9					Cm=
SO ₂ High	300.0	1100 ppm	295.7									

300.0



FIELD DATA

PLANT VALERO
DATE 10-14-09
LOCATION PORT ARTHUR, TX
OPERATOR DWM
STACK NO. SRX 544
RUN NO. 1
SAMPLE BOX NO. APEX
METER BOX NO. 1901813
START TIME 1146

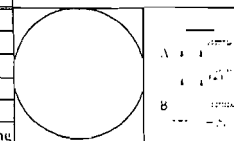
AMBIENT TEMPERATURE 94
BAROMETRIC PRESSURE 29.76
ASSUMED MOISTURE, % NA
PROBE LENGTH, in. 108"
NOZZLE DIAMETER, in. NA
STACK DIAMETER, in. 67"
MINUTES PER POINT 5
NUMBER OF POINTS 12
NUMBER OF PORTS 2

PROBE HEATER SETTING NA
HEATER BOX SETTING NA
METER H₂ 2.043
C_p FACTOR 0.84
Y_d FACTOR 0.999
PITOT/THERM # P118

WEIGHT OF PARTICULATE, mg

Filter No.	
Sample	
Final wt	
Tare wt	
Wt. gain	
TOTAL	mg

A= B=



CLOCK TIME	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H ₂ O)	STACK TEMP (T _s) °F	VELOCITY HEAD		PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H ₂ O		GAS SAMPLE VOLUME (V _m) ft ³	GAS SAMPLE TEMP AT DRY GAS METER		SAMPLE BOX TEMP. °F	COND. EXIT TEMP °F	SORBENT MODULE TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM in. Hg
					(ΔP _s)	(√ΔP _s)	ACTUAL	DESIRED		INLET (T _{m_{in}}) °F	OUTLET (T _{m_{out}}) °F					
1146	E-1	0	20.74	1193	.134		2.0	2.043	138.208	98	Avg				66	6
1151	2	5		1195	.165		1.9		141.96	100					59	6
1156	3	10		1201	.109		1.9		145.83	102					59	6
1201	4	15		1207	.110		1.9		149.72	105					59	6
1206	5	20		1185	.151		1.9		153.61	109					60	6
1211	6	25		1184	.065		1.9		157.50	111					60	6
1216	N-1	30		1190	.273		1.9		161.39	113					61	6
1221	2	35		1194	.296		1.9		165.28	115					61	6
1226	3	40		1192	.364		1.9		169.17	117					62	6
1231	4	45		1193	.346		1.9		173.06	118					63	6
1236	5	50		1177	.362		1.9		176.96	119					65	6
1241	6	55		1175	.230		1.9	↓	180.85	120	↓				65	6
1246		60					—	—	184.756	—	—				—	—
AVERAGE																
			20.74	1191.3			0.4513	1.9	46.548	110.6					61.7	6

VOLUME OR WEIGHT OF LIQUID WATER COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)				SILICA GEL WEIGHT
	#1	#2	#3	#4	
FINAL	217ml	121ml	2ml		216.0
INITIAL	100ml	100ml	0ml		265.7g
LIQUID COLLECTED	117ml	21ml	2ml		10.3
TOTAL	COLLECTED (specify ml or g)				156.3

ORSAT DATA	TIME	CO ₂	O ₂
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average			

LEAK CHECK	
SYSTEM PRE: <u>0.003</u>	CFM @ 15" Hg
POST: <u>0.001</u>	CFM @ 15" Hg
PITOT PRE: <u>✓</u>	@ > 3" H ₂ O
POST: <u>✓</u>	@ > 3" H ₂ O

ARI ENVIRONMENTAL, INC.
USEPA METHOD 11 FIELD DATA SHEET

Sample Data

Client: VALECO Meter y: 0.994
 Location: PORT ARTHUR, TX Bar. Pressure: 29.76 in. Hg
 Source: SKU 544 Meter No.: 8003207
 Date: 10-14-09 Pretest Leak Rate: 0.1 in H₂O / min
 Operator: DMM Post Test Leak Rate: 0.1 in H₂O / min
 Run No.: M11-1 < 0.4" H₂O / min

Clock Time	Elapsed Time	Gas Volume (Liters)	Meter Temp. (Deg F)		Impinger Exit (Deg F)
			Inlet	Outlet	
1146	0	736.8	93		FULL
1151	5	741.6	95		ICED
1156	10	746.7	91		
1201	15	751.8	92		
1206	20	756.9	94		
1211	25	761.9	94		
1216	30	766.9	93		
1221	35	771.9	94		
1226	40	776.9	93		
1231	45	781.9	95		
1236	50	787.0	96		
1241	55	792.0	96		
1246	60	797.0	93.8		
		<u>60.2</u>			

Analytical Data

Analyst: GD Iodine Normality: 0.00914 N
 Purge Start Time: 1320 Thiosulfate Normality: 0.0103 N
 Purge Stop Time: 1335 Blank Volume Thiosulfate: 43.7 mL
 Purge Rate: 1 Lpm Blank Volume Iodine: 50.0 mL
 Absorb Start Time: 1340 Sample Iodine Volume: 43.7 mL 50.0
 Absorb Stop Time: 1410 Sample Titrant Volume: 43.7 mL

CEMS CALIBRATION DATA



Plant Valero
 Location Bert Arthur TX
 Source SRV544 TGI
 Date 10-14-09
 Run Number 2
 Start Time 1803
 Stop Time 1503

Plant Rep. Robin Hill
 Team Leader Greg Burch
 CEM Operator Greg Burch

Analyzer Span Values (% or ppm)

CO ppm
 CO₂ %
 O₂ %
 THC ppm
 NO_x ppm
 SO₂ ppm

	CALIBRATION ERROR - 949 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Time	Pretest: 1254 hrs		1510 hrs		Drift (% of Span)	
					System Response	Time	System Response	Time		
CO Zero	0.0				0.4		-2.6			Co=
CO Low										
CO Mid	1000				1008		1003			Cm=
CO High	1983									
CO ₂ Zero	0.00				-0.04		-0.05			Co=
CO ₂ Low										
CO ₂ Mid	5.00				5.06		5.07			Cm=
CO ₂ High	10.00									
O ₂ Zero	0.00				0.06		0.01			Co=
O ₂ Low										
O ₂ Mid	4.50				4.60		4.53			Cm=
O ₂ High	9.00									
THC Zero										Co=
THC Low										
THC Mid										Cm=
THC High										
NO _x Zero	0.0				0.3		0.2			Co=
NO _x Low										
NO _x Mid	40.0				40.5		38.3			Cm=
NO _x High	80.0									
SO ₂ Zero	0.0				0.0		-3.4			Co=
SO ₂ Low										
SO ₂ Mid	150.0				147.4		145.7			Cm=
SO ₂ High	300.0									

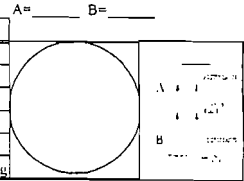


FIELD DATA

PLANT VALERO AMBIENT TEMPERATURE 93
 DATE 10-14-09 BAROMETRIC PRESSURE 29.76
 LOCATION PORT ARTHUR, TX ASSUMED MOISTURE, % NA
 OPERATOR DWM PROBE LENGTH, in. 108"
 STACK NO. SRU 544 NOZZLE DIAMETER, in. NA
 RUN NO. 2 STACK DIAMETER, in. 67"
 SAMPLE BOX NO. APX MINUTES PER POINT 5
 METER BOX NO. 1901013 NUMBER OF POINTS 12
 START TIME 1403 NUMBER OF PORTS 2

PROBE HEATER SETTING NA
 HEATER BOX SETTING NA
 METER H₂ 2.043
 C_p FACTOR 0.84
 Y_d FACTOR 0.959
 PITOT/THERM # P118

WEIGHT OF PARTICULATE, mg	
Filter No.	
Sample	
Final wt	
Tare wt	
Wt. gain	
TOTAL	



CLOCK TIME	TRAVERSE POINT NUMBER	SAMPLING TIME (t) min.	STATIC PRESSURE (in. H ₂ O)	STACK TEMP (T _s) °F	VELOCITY HEAD		PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H ₂ O		GAS SAMPLE VOLUME (V _m) ft ³	GAS SAMPLE TEMP AT DRY GAS METER		SAMPLE BOX TEMP. °F	COND. EXIT TEMP °F	SORBENT MODULE TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM in. Hg
					(ΔP _s)	(√ΔP _s)	ACTUAL	DESIRED		INLET (T _{inlet}) °F	OUTLET (T _{outlet}) °F					
1403	1	0	-0.75	1097	.125		1.9	2.043	186.995	107	AVG				59	6
1406	2	5		1102	.160		1.9		190.80	106					60	6
1413	3	10		1115	.168		1.9		194.69	110					60	6
1418	4	15		1117	.302		1.9		198.58	111					61	6
1423	5	20		1106	.263		1.9		202.47	112					61	6
1428	6	25		1094	.193		1.9		206.36	114					60	6
1433	1	30		1095	.107		1.9		210.25	115					61	6
1438	2	35		1101	.100		1.9		214.16	116					62	6
1443	3	40		1119	.134		1.9		218.07	118					63	6
1448	4	45		1108	.127		1.9		221.99	118					65	6
1453	5	50		1094	.116		1.9		225.89	119					65	6
1458	6	55		1063	.086		1.9		229.78	119					66	6
1503		60							233.701							
AVERAGE																
				1100.9		0.3941	1.9		46.706	113.8					61.9	6

VOLUME OR WEIGHT OF LIQUID		IMPINGER VOLUME (ml) OR WEIGHT (g)				SILICA GEL WEIGHT
WATER COLLECTED		#1	#2	#3	#4	
FINAL	221ml	124ml	3ml			208.3
INITIAL	100ml	100ml	0ml			257.2g
LIQUID COLLECTED	121ml	24ml	3ml			
TOTAL	COLLECTED (specify ml or g)					

ORSAT DATA	TIME	CO ₂	O ₂
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average			

LEAK CHECK	
SYSTEM PRE: 0.008	CFM@15"Hg
POST: 0.005	CFM@15"Hg
PITOT PRE: ✓	@ > 3"H ₂ O
POST: ✓	@ > 3"H ₂ O

ARI ENVIRONMENTAL, INC.
USEPA METHOD 11 FIELD DATA SHEET

Sample Data

Client: VALERO
Location: Perry Arthur
Source: SRU 544
Date: 10-14-09
Operator: grom
Run No.: M11-2

Meter y: 8.994
Bar. Pressure: 29.76 in. Hg
Meter No.: 8003207
Pretest Leak Rate: 0.1 in H₂O / min
Post Test Leak Rate: 0.1 in H₂O / min
< 0.4" H₂O / min

Clock Time	Elapsed Time	Gas Volume (Liters)	Meter Temp. (Deg F)		Impinger Exit (Deg F)
			Inlet	Outlet	
1357 1403	0	78.2	92	avg	Full
1359 1408	5	803.0	91		1CED
1404 1413	10	808.0	91		
1409 1416	15	813.1	92		
1414 1423	20	816.2	92		
1419 1428	25	823.3	92		
1424 1433	30	828.4	92		
1429 1436	35	833.4	92		
1434 1443	40	838.4	92		
1439 1448	45	843.4	91		
1444 1453	50	848.4	92		
1449 1458	55	853.5	93	↓	↓
1454 1503	60	858.5			
		<u>60.3</u>			

Analytical Data

Analyst: GD
Purge Start Time: 1515
Purge Stop Time: 1530
Purge Rate: 1 Lpm
Absorb Start Time: 1533
Absorb Stop Time: 1604

Iodine Normality: 0.00914 N
Thiosulfate Normality: 0.0103 N
Blank Volume Thiosulfate: 43.7 mL
Blank Volume Iodine: 50.0 mL
Sample Iodine Volume: 50.0 mL
Sample Titrant Volume: 43.7 mL

CEMS CALIBRATION DATA



Plant Valero
 Location Port Arthur, TX
 Source SRU 544 T6I
 Date 10-14-09
 Run Number 3
 Start Time 1620
 Stop Time 1720

Plant Rep. Robin Hill
 Team Leader Greg Burch
 CEM Operator Greg Burch

Analyzer Span Values (% or ppm)

CO ppm
 CO₂ %
 O₂ %
 THC ppm
 NO_x ppm
 SO₂ ppm

	CALIBRATION ERROR - <u>949</u> hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Time	Pretest: <u>1510</u> hrs	Time	System Response	Time	Drift (% of Span)	
CO Zero	<u>0.0</u>				<u>-2.6</u>		<u>-1.4</u>			Co=
CO Low	<u>5000</u>									
CO Mid	<u>1000</u>				<u>1003</u>		<u>1005</u>			Cm=
CO High	<u>1983</u>									
CO ₂ Zero	<u>0.00</u>				<u>-0.05</u>		<u>-0.03</u>			Co=
CO ₂ Low										
CO ₂ Mid	<u>5.00</u>				<u>5.07</u>		<u>5.06</u>			Cm=
CO ₂ High	<u>10.00</u>									
O ₂ Zero	<u>0.00</u>				<u>0.01</u>		<u>+0.07</u>			Co=
O ₂ Low										
O ₂ Mid	<u>4.50</u>				<u>4.55</u>		<u>4.53</u>			Cm=
O ₂ High	<u>9.00</u>									
THC Zero										Co=
THC Low										
THC Mid										Cm=
THC High										
NO _x Zero	<u>0.0</u>				<u>0.2</u>		<u>0.4</u>			Co=
NO _x Low										
NO _x Mid	<u>40.0</u>				<u>38.3</u>		<u>38.3</u>			Cm=
NO _x High	<u>80.0</u>									
SO ₂ Zero	<u>0.0</u>				<u>-3.4</u>		<u>34.3-5.4</u>			Co=
SO ₂ Low										
SO ₂ Mid	<u>150.0</u>				<u>145.7</u>		<u>147.1</u>			Cm=
SO ₂ High	<u>300.0</u>									



FIELD DATA

PLANT Valero AMBIENT TEMPERATURE 88 PROBE HEATER SETTING NA
DATE 10-14-09 BAROMETRIC PRESSURE 29.76 HEATER BOX SETTING NA
LOCATION PORT ARTHUR, TX ASSUMED MOISTURE, % NA METER H₂ 2.043
OPERATOR DJMM PROBE LENGTH, in. 106" C_p FACTOR 0.84
STACK NO. 32U 544 NOZZLE DIAMETER, in. NA Y_d FACTOR 0.999
RUN NO. 3 STACK DIAMETER, in. 67" PITOT/THERM # 9118
SAMPLE BOX NO. APEX MINUTES PER POINT 5
METER BOX NO. 1401013 NUMBER OF POINTS 12
START TIME 1620 NUMBER OF PORTS 2

WEIGHT OF PARTICULATE, mg
Filter No. _____
Sample _____
Final wt _____
Tare wt _____
Wt. gain _____
TOTAL _____ mg

CROSS SECTION
A= _____ B= _____

CLOCK TIME	TRAVERSE POINT NUMBER	SAMPLING TIME (t) min.	STATIC PRESSURE (in. H ₂ O)	STACK TEMP (T _s) °F	VELOCITY HEAD		PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H ₂ O		GAS SAMPLE VOLUME (Vol) ft ³	GAS SAMPLE TEMP AT DRY GAS METER		SAMPLE BOX TEMP. °F	COND. EXIT TEMP °F	SORBENT MODULE TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM in. Hg
					(ΔP _s)	(V/ΔP _s)	ACTUAL	DESIRED		INLET (T _{in}) °F	OUTLET (T _{out}) °F					
1620	N-1	0	0.25	827	.131		1.9	2.043	239.519	98	AVG				67	5
1625	2	5		831	.151		1.9		243.37	100					59	5
1630	3	10		836	.175		1.9		247.23	101					59	5
1635	4	15		828	.172		1.9		251.09	102					60	5
1640	5	20		810	.167		1.9		254.94	103					62	5
1645	6	25		780	.139		1.9		258.80	105					63	5
1650	E-1	30		850	.132		1.9		262.66	107					63	5
1655	2	35		853	.159		1.9		266.51	109					63	5
1700	3	40		851	.173		1.9		270.36	108					63	5
1705	4	45		839	.153		1.9		274.23	109					65	5
1710	5	50		826	.165		1.9		278.08	109					66	5
1715	6	55		803	.083		1.9	↓	281.92	112	↓				67	5
1720		60			0.000		—	—	285.774	—	—				—	—
AVERAGE				827.8	0.3857		1.9		46.255	105.1					63.1	5

VOLUME OR WEIGHT OF LIQUID WATER COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)				SILICA GEL WEIGHT
	#1	#2	#3	#4	
FINAL	200ml	117ml	140ml		276.5g
INITIAL	100ml	100ml	100ml		263.8g
LIQUID COLLECTED	100ml	17ml	40ml		12.7g
TOTAL	COLLECTED (specify ml or g)				

ORSAT DATA	TIME	CO ₂	O ₂
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average			

LEAK CHECK	
SYSTEM PRE: 0.004	CFM@15"Hg
POST: 0.002	CFM@15"Hg
PITOT PRE: ✓	@ > 3"H ₂ O
POST: ✓	@ > 3"H ₂ O

ARI ENVIRONMENTAL, INC.
USEPA METHOD 11 FIELD DATA SHEET

Sample Data

Client: VALECO Meter y: 0.994
 Location: PORT ARTHUR, TX Bar. Pressure: 29.76 in. Hg
 Source: STU 544 Meter No.: 8003207
 Date: 10-14-05 Pretest Leak Rate: 0.05 in H₂O / min
 Operator: KWM Post Test Leak Rate: 0.10 in H₂O / min
 Run No.: M11-3 < 0.4" H₂O / min

Clock Time	Elapsed Time	Gas Volume (Liters)	Meter Temp. (Deg F)		Impinger Exit (Deg F)
			Inlet	Outlet	
1620	0	859.2	87	AVG	Full
1625	5	864.3	85		iced
1630	10	869.3	85		
1635	15	874.3	85		
1640	20	879.4	85		
1645	25	884.4	85		
1650	30	889.4	84		
1655	35	894.4	84		
1700	40	899.5	84		
1705	45	904.5	84		
1710	50	909.5	84		
1715	55	914.5 burn	84		
1720	60	919.6			
		60.4			

Analytical Data

Analyst: SS Iodine Normality: 0.00514 N
 Purge Start Time: 1728 Thiosulfate Normality: 0.0103 N
 Purge Stop Time: 1743 Blank Volume Thiosulfate: 43.7 mL
 Purge Rate: 1 Lpm Blank Volume Iodine: 50.0 mL
 Absorb Start Time: 1747 Sample Iodine Volume: 50.0 mL
 Absorb Stop Time: 1017 Sample Titrant Volume: 43.5 mL

VELOCITY TRAVERSE AND CYCLONIC FLOW VERIFICATION



Valero Port Arthur Refinery
Source: SRU 544 TGI Exhaust
Test Date: October 14, 2009

APPENDIX C

ARI Reference Method Monitoring Data

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 9:41:00	1.37	4.29	233.9	0.0	6.2	
10/14/09 9:41:15	1.40	4.29	233.5	0.0	7.8	
10/14/09 9:41:30	1.40	4.29	232.1	0.0	9.3	
10/14/09 9:41:45	1.41	4.28	206.8	0.1	10.7	
10/14/09 9:42:00	1.46	4.27	119.3	0.0	10.8	
10/14/09 9:42:15	1.51	4.25	67.6	0.1	10.8	
10/14/09 9:42:30	3.59	3.58	51.7	0.0	6.3	
10/14/09 9:42:45	9.38	2.28	44.6	0.0	3.3	
10/14/09 9:43:00	13.84	1.47	35.6	0.0	0.4	
10/14/09 9:43:15	15.49	1.15	25.5	0.0	0.3	
10/14/09 9:43:30	16.06	1.01	10.7	0.0	-1.1	
10/14/09 9:43:45	16.91	0.80	-8.2	0.0	0.4	
10/14/09 9:44:00	15.98	0.57	-10.3	0.0	0.4	
10/14/09 9:44:15	8.30	0.33	-10.2	0.0	-1.2	
10/14/09 9:44:30	2.32	0.17	-10.3	0.0	-2.6	
10/14/09 9:44:45	0.44	0.13	-10.3	0.0	-4.1	
10/14/09 9:45:00	0.16	0.12	-10.5	0.0	-4.0	
10/14/09 9:45:15	0.13	0.12	-10.8	0.0	-4.1	
10/14/09 9:45:30	0.12	0.12	-10.6	0.0	-4.1	
10/14/09 9:45:45	0.11	0.12	-0.5	0.0	-4.1	
10/14/09 9:46:00	0.11	0.12	-0.6	0.0	-4.0	
10/14/09 9:46:15	0.11	0.12	-0.6	0.0	-5.5	
10/14/09 9:46:30	0.11	0.12	-0.5	0.0	-5.6	
10/14/09 9:46:45	0.11	0.12	-0.3	0.0	-4.1	
10/14/09 9:47:00	0.10	0.12	-0.5	0.0	-4.1	
10/14/09 9:47:15	0.10	0.12	-0.5	0.0	-4.0	
10/14/09 9:47:30	0.09	0.12	-0.5	0.0	-4.1	
10/14/09 9:47:45	0.09	0.12	-0.6	0.0	-5.5	
10/14/09 9:48:00	0.09	0.12	-0.8	0.1	-5.6	
10/14/09 9:48:15	0.09	0.11	-0.5	0.1	-5.5	
10/14/09 9:48:30	0.09	0.12	-0.5	0.1	-5.5	
10/14/09 9:48:45	0.09	0.12	-0.6	0.1	-5.6	
10/14/09 9:49:00	0.09	0.04	-0.6	0.1	0.5	Calibration Error
10/14/09 9:49:15	0.10	0.05	-0.6	0.1	0.4	O ₂ CE Zero = 0.09
10/14/09 9:49:30	0.09	0.04	-0.6	0.1	0.5	CO ₂ CE Zero = 0.04
10/14/09 9:49:45	0.08	0.04	-0.5	0.0	0.5	NO _x CE Zero = 0.0
10/14/09 9:50:00	0.09	0.04	0.1	0.0	0.4	SO ₂ CE Zero = -0.4
10/14/09 9:50:15	0.28	0.08	-0.3	0.0	1.8	CO CE Zero = 0.4
10/14/09 9:50:30	3.17	0.13	-0.5	0.0	1.9	
10/14/09 9:50:45	6.70	0.08	-0.6	0.1	0.4	
10/14/09 9:51:00	8.34	0.05	-0.6	0.1	0.5	
10/14/09 9:51:15	8.89	0.05	-0.5	0.0	0.4	
10/14/09 9:51:30	9.02	0.05	-0.2	0.1	0.4	
10/14/09 9:51:45	9.06	0.05	-0.3	0.1	0.4	
10/14/09 9:52:00	9.06	0.05	-0.8	0.0	0.3	
10/14/09 9:52:15	9.00	0.05	-0.5	0.0	0.4	
10/14/09 9:52:30	9.01	0.05	-0.6	0.0	0.5	
10/14/09 9:52:45	9.01	0.05	-0.5	0.0	0.5	
10/14/09 9:53:00	9.01	0.05	-0.5	0.0	0.4	
10/14/09 9:53:15	9.02	0.05	-0.5	0.0	0.4	
10/14/09 9:53:30	9.02	0.05	-0.9	0.0	0.4	
10/14/09 9:53:45	9.02	0.05	-0.5	0.0	0.4	
10/14/09 9:54:00	9.02	0.05	-0.5	0.0	0.5	
10/14/09 9:54:15	9.02	0.05	-0.5	0.0	0.4	
10/14/09 9:54:30	8.40	0.05	-0.5	0.0	0.4	
10/14/09 9:54:45	5.94	0.05	-0.5	0.0	0.4	
10/14/09 9:55:00	4.88	0.04	-0.5	0.0	0.3	
10/14/09 9:55:15	4.72	0.04	-0.3	0.0	0.4	
10/14/09 9:55:30	4.70	0.04	-0.5	0.0	0.4	
10/14/09 9:55:45	4.69	0.04	-0.6	0.1	0.4	
10/14/09 9:56:00	4.70	0.04	-0.8	0.1	0.4	
10/14/09 9:56:15	4.70	0.04	-0.5	0.0	0.4	
10/14/09 9:56:30	4.70	0.04	-0.9	0.0	0.4	
10/14/09 9:56:45	4.70	0.04	-0.6	0.1	0.4	
10/14/09 9:57:00	4.76	0.04	-0.6	0.0	0.4	
10/14/09 9:57:15	6.42	0.04	-0.6	0.0	0.4	
10/14/09 9:57:30	8.25	0.04	-0.6	0.0	0.3	
10/14/09 9:57:45	8.82	0.04	-0.2	0.0	0.4	
10/14/09 9:58:00	8.92	0.04	-0.5	0.0	0.4	
10/14/09 9:58:15	8.94	0.04	-0.6	0.1	0.4	
10/14/09 9:58:30	8.96	0.04	-0.8	0.1	0.4	
10/14/09 9:58:45	8.97	0.04	-0.3	0.1	0.4	
10/14/09 9:59:00	9.00	0.04	-0.5	0.1	0.4	
10/14/09 9:59:15	8.99	0.04	-0.5	0.0	0.3	
10/14/09 9:59:30	9.01	0.04	-0.6	0.0	0.4	
10/14/09 9:59:45	9.00	0.04	-0.5	0.0	0.4	
10/14/09 10:00:00	9.00	0.04	-0.3	0.0	0.4	
10/14/09 10:00:15	9.00	0.04	-0.2	0.0	0.5	
10/14/09 10:00:30	9.00	0.04	-0.3	0.0	0.4	
10/14/09 10:00:45	8.94	0.04	-0.2	0.0	0.5	Calibration Error
10/14/09 10:01:00	8.95	0.04	0.0	0.0	0.5	O ₂ CE Span = 8.95
10/14/09 10:01:15	8.94	0.04	-0.2	0.0	0.4	
10/14/09 10:01:30	8.95	0.04	-0.5	0.1	0.5	
10/14/09 10:01:45	8.94	0.04	-0.8	0.1	0.5	
10/14/09 10:02:00	8.95	0.04	-0.6	0.1	0.5	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 10:02:15	8.95	0.04	-0.2	0.1	0.4	
10/14/09 10:02:30	8.95	0.04	-0.5	0.0	0.5	
10/14/09 10:02:45	8.95	0.04	-0.5	0.1	0.4	
10/14/09 10:03:00	8.95	0.04	-0.6	0.1	0.5	
10/14/09 10:03:15	8.95	0.04	-0.6	0.1	0.4	
10/14/09 10:03:30	8.95	0.04	-0.5	0.0	0.5	
10/14/09 10:03:45	8.95	0.04	-0.5	0.0	0.4	
10/14/09 10:04:00	8.95	0.04	-0.6	0.0	0.4	
10/14/09 10:04:15	8.81	0.04	-0.5	0.0	0.4	
10/14/09 10:04:30	6.71	0.04	-0.6	0.1	0.4	
10/14/09 10:04:45	5.02	0.04	-0.5	0.1	0.4	
10/14/09 10:05:00	4.70	0.04	-0.5	0.1	0.4	
10/14/09 10:05:15	4.66	0.04	-0.5	0.0	0.3	Calibration Error
10/14/09 10:05:30	4.65	0.04	-0.2	0.1	0.4	O ₂ CE Mid = 4.66
10/14/09 10:05:45	4.66	0.04	-0.8	0.0	0.4	
10/14/09 10:06:00	4.66	0.04	-0.3	0.0	0.4	
10/14/09 10:06:15	4.65	0.04	-0.8	0.1	0.5	
10/14/09 10:06:30	4.65	0.04	25.9	0.1	0.4	
10/14/09 10:06:45	4.66	0.04	72.1	0.1	12.4	
10/14/09 10:07:00	4.72	0.65	129.8	0.1	45.3	
10/14/09 10:07:15	4.32	2.35	216.8	0.1	48.4	
10/14/09 10:07:30	2.69	3.62	245.6	0.1	31.8	
10/14/09 10:07:45	1.64	4.05	254.6	0.1	21.2	
10/14/09 10:08:00	1.35	4.14	259.1	1.0	12.4	
10/14/09 10:08:15	1.29	4.15	262.8	5.8	10.7	
10/14/09 10:08:30	1.29	4.15	265.1	8.1	10.7	
10/14/09 10:08:45	1.30	4.15	199.6	7.2	10.8	
10/14/09 10:09:00	1.27	4.16	29.5	0.3	7.7	
10/14/09 10:09:15	1.67	3.91	2.1	0.3	6.3	
10/14/09 10:09:30	3.13	4.49	0.3	0.2	1.9	
10/14/09 10:09:45	1.70	6.10	0.3	0.2	0.3	
10/14/09 10:10:00	0.57	4.31	-0.2	0.2	-1.1	
10/14/09 10:10:15	0.24	1.93	0.4	0.3	-1.0	
10/14/09 10:10:30	0.11	0.45	0.6	0.3	-1.0	
10/14/09 10:10:45	0.07	0.12	-0.6	0.4	-1.1	
10/14/09 10:11:00	0.08	0.14	-0.2	0.2	-1.0	
10/14/09 10:11:15	0.12	2.78	-0.3	0.1	-2.6	
10/14/09 10:11:30	0.11	5.86	-0.5	0.1	-2.5	
10/14/09 10:11:45	0.08	8.04	-0.6	0.1	-2.5	
10/14/09 10:12:00	0.05	9.11	-0.5	0.1	-2.6	
10/14/09 10:12:15	0.04	9.36	-0.5	0.1	-2.5	
10/14/09 10:12:30	0.04	9.40	-0.3	0.1	-2.5	
10/14/09 10:12:45	0.04	9.42	-0.5	0.1	-2.6	
10/14/09 10:13:00	0.04	9.43	-0.5	0.1	-2.6	
10/14/09 10:13:15	0.04	9.43	-0.5	0.1	-2.5	
10/14/09 10:13:30	0.04	9.44	-0.2	0.1	-2.6	
10/14/09 10:13:45	0.04	9.90	-0.2	0.1	-2.6	
10/14/09 10:14:00	0.03	9.91	-0.5	0.1	-2.6	
10/14/09 10:14:15	0.04	9.98	-0.5	0.1	-2.6	
10/14/09 10:14:30	0.04	9.98	-0.6	0.1	-2.5	
10/14/09 10:14:45	0.04	9.98	-0.6	0.1	-2.5	
10/14/09 10:15:00	0.04	9.98	-0.3	0.1	-2.6	
10/14/09 10:15:15	0.03	9.98	-0.2	0.1	-2.6	
10/14/09 10:15:30	0.03	9.61	-0.3	0.1	-2.5	
10/14/09 10:15:45	0.04	7.51	-0.3	0.1	-2.6	
10/14/09 10:16:00	0.04	5.89	-0.6	0.1	-2.6	
10/14/09 10:16:15	0.04	5.34	-0.6	0.2	-2.6	
10/14/09 10:16:30	0.04	5.28	-0.3	0.1	-2.5	
10/14/09 10:16:45	0.04	5.27	-0.6	0.1	-2.5	
10/14/09 10:17:00	0.04	5.27	-0.5	0.1	-2.6	
10/14/09 10:17:15	0.04	5.28	-0.6	0.1	-2.6	
10/14/09 10:17:30	0.04	5.28	-0.6	0.1	-2.5	
10/14/09 10:17:45	0.04	5.30	-0.6	0.1	-2.5	
10/14/09 10:18:00	0.04	5.30	-1.0	0.1	-1.1	
10/14/09 10:18:15	0.05	3.84	-0.6	0.1	-1.1	
10/14/09 10:18:30	0.05	1.62	-0.6	0.1	-1.1	
10/14/09 10:18:45	0.05	0.35	-0.6	0.1	-1.1	
10/14/09 10:19:00	0.06	0.10	-0.6	0.1	-1.0	
10/14/09 10:19:15	0.06	0.06	-0.5	0.1	-1.0	
10/14/09 10:19:30	0.05	0.06	-0.6	0.1	-1.0	
10/14/09 10:19:45	0.04	0.05	-0.6	0.1	-1.1	
10/14/09 10:20:00	0.05	-0.02	-0.6	0.1	-1.1	
10/14/09 10:20:15	0.05	-0.04	-0.6	0.4	-1.1	
10/14/09 10:20:30	0.05	-0.04	-0.6	0.3	-1.1	
10/14/09 10:20:45	0.05	-0.01	-0.5	0.1	-1.1	
10/14/09 10:21:00	0.07	0.43	-0.2	0.1	-1.1	
10/14/09 10:21:15	0.07	0.80	-0.5	0.1	-1.1	
10/14/09 10:21:30	0.05	0.91	-0.8	0.1	-1.1	
10/14/09 10:21:45	0.05	0.94	-0.6	0.1	-1.1	
10/14/09 10:22:00	0.04	0.95	-0.6	0.1	-1.1	
10/14/09 10:22:15	0.05	0.96	-0.6	0.2	-1.1	
10/14/09 10:22:30	0.05	0.97	-0.6	0.1	-1.1	
10/14/09 10:22:45	0.03	3.82	-0.6	0.2	-2.6	
10/14/09 10:23:00	0.03	6.94	-0.6	0.1	-2.7	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 10:23:15	0.03	8.86	-0.2	0.1	-2.7	
10/14/09 10:23:30	0.02	9.61	-0.8	0.1	-2.6	
10/14/09 10:23:45	0.02	9.75	-0.6	0.2	-2.7	
10/14/09 10:24:00	0.02	9.77	-0.6	0.1	-2.6	
10/14/09 10:24:15	0.03	9.78	-0.6	0.1	-2.6	
10/14/09 10:24:30	0.02	9.78	-0.8	0.1	-2.6	
10/14/09 10:24:45	0.02	9.78	-0.6	0.1	-2.7	
10/14/09 10:25:00	0.02	9.78	-0.6	0.1	-2.6	
10/14/09 10:25:15	0.02	9.95	-0.8	0.1	-2.6	
10/14/09 10:25:30	0.01	9.95	-0.6	0.1	-2.6	Calibration Error
10/14/09 10:25:45	0.02	9.95	-0.8	0.1	-2.6	CO ₂ CE Span = 9.96
10/14/09 10:26:00	0.03	9.96	-0.3	0.1	-2.6	
10/14/09 10:26:15	0.02	9.96	-0.5	0.1	-2.6	
10/14/09 10:26:30	0.02	9.96	-0.5	0.1	-2.6	
10/14/09 10:26:45	0.02	9.95	-0.5	0.1	-2.6	
10/14/09 10:27:00	0.02	9.96	-0.2	0.1	-2.6	
10/14/09 10:27:15	0.02	9.96	-0.6	0.1	-2.6	
10/14/09 10:27:30	0.03	9.14	-0.3	0.1	-2.5	
10/14/09 10:27:45	0.03	7.03	-0.2	0.1	-2.5	
10/14/09 10:28:00	0.03	5.58	-0.8	0.1	-2.5	
10/14/09 10:28:15	0.03	5.21	-0.3	0.1	-2.6	
10/14/09 10:28:30	0.04	5.18	-0.4	0.1	-2.5	Calibration Error
10/14/09 10:28:45	0.03	5.18	-0.3	0.1	-2.6	CO ₂ CE Mid = 5.18
10/14/09 10:29:00	0.03	5.18	-0.5	0.1	-2.5	
10/14/09 10:29:15	0.03	5.18	-0.5	0.1	-2.6	
10/14/09 10:29:30	0.04	5.18	-0.5	0.1	-2.6	
10/14/09 10:29:45	0.03	5.18	-0.5	0.1	-2.5	
10/14/09 10:30:00	0.03	5.18	152.0	0.4	-2.5	
10/14/09 10:30:15	0.04	5.18	503.5	0.3	-2.5	
10/14/09 10:30:30	0.15	4.58	490.3	0.2	-1.0	
10/14/09 10:30:45	0.37	2.23	477.0	0.2	-1.0	
10/14/09 10:31:00	0.22	0.56	494.1	0.1	-1.1	
10/14/09 10:31:15	0.09	0.06	498.9	0.1	-1.0	
10/14/09 10:31:30	0.05	0.00	499.2	0.2	-1.0	
10/14/09 10:31:45	0.04	-0.02	498.4	0.1	-1.1	
10/14/09 10:32:00	0.05	-0.02	498.9	0.1	-1.1	
10/14/09 10:32:15	0.05	-0.02	499.2	0.1	-1.0	
10/14/09 10:32:30	0.04	-0.03	499.0	0.1	-1.0	
10/14/09 10:32:45	0.05	-0.03	499.0	0.1	-1.0	
10/14/09 10:33:00	0.05	-0.03	499.6	0.2	-1.1	
10/14/09 10:33:15	0.04	-0.03	499.0	0.1	-1.0	
10/14/09 10:33:30	0.04	-0.03	499.3	0.1	-1.1	
10/14/09 10:33:45	0.05	-0.03	499.3	0.1	-1.1	
10/14/09 10:34:00	0.04	-0.03	299.9	0.2	-1.1	
10/14/09 10:34:15	0.04	-0.03	300.0	0.1	-1.0	
10/14/09 10:34:30	0.04	-0.03	299.9	0.1	-1.0	
10/14/09 10:34:45	0.05	-0.04	300.0	0.1	-0.9	
10/14/09 10:35:00	0.04	-0.04	299.9	0.1	-1.1	
10/14/09 10:35:15	0.04	-0.04	299.9	0.2	-1.0	
10/14/09 10:35:30	0.05	-0.04	291.1	0.1	-1.0	
10/14/09 10:35:45	0.04	-0.04	176.1	0.1	-1.1	
10/14/09 10:36:00	0.04	-0.04	160.0	0.1	-1.1	
10/14/09 10:36:15	0.05	-0.04	159.5	0.1	-1.1	
10/14/09 10:36:30	0.05	-0.04	159.5	0.1	-1.0	
10/14/09 10:36:45	0.03	-0.05	159.0	0.1	-1.1	
10/14/09 10:37:00	0.04	-0.05	159.0	0.1	-1.0	
10/14/09 10:37:15	0.04	-0.05	159.0	0.1	-1.0	
10/14/09 10:37:30	0.04	-0.05	159.2	0.1	-1.0	
10/14/09 10:37:45	0.04	-0.05	245.9	0.2	-1.0	
10/14/09 10:38:00	0.04	-0.05	297.6	0.1	-1.0	
10/14/09 10:38:15	0.04	-0.05	301.1	0.1	-1.0	
10/14/09 10:38:30	0.03	-0.05	301.4	0.1	-1.0	
10/14/09 10:38:45	0.04	-0.05	301.5	0.1	-1.0	
10/14/09 10:39:00	0.04	-0.05	295.0	0.1	-1.1	
10/14/09 10:39:15	0.03	-0.05	294.3	0.1	-1.1	
10/14/09 10:39:30	0.04	-0.06	294.3	0.2	-1.0	
10/14/09 10:39:45	0.03	-0.06	294.3	0.2	-1.0	
10/14/09 10:40:00	0.03	-0.06	294.1	0.2	-1.1	
10/14/09 10:40:15	0.04	-0.06	294.0	0.1	-1.1	
10/14/09 10:40:30	0.04	-0.06	295.6	0.2	-1.0	Calibration Error
10/14/09 10:40:45	0.03	-0.06	295.7	0.1	-1.1	SO ₂ CE Span = 295.7
10/14/09 10:41:00	0.04	-0.05	295.7	0.2	-1.1	
10/14/09 10:41:15	0.03	-0.06	295.8	0.1	-1.1	
10/14/09 10:41:30	0.03	-0.06	295.7	0.1	-1.0	
10/14/09 10:41:45	0.03	-0.05	218.3	0.1	-1.1	
10/14/09 10:42:00	0.03	-0.05	156.8	0.1	-1.0	
10/14/09 10:42:15	0.04	-0.05	151.0	0.1	-1.1	
10/14/09 10:42:30	0.04	-0.05	150.9	0.1	-1.1	Calibration Error
10/14/09 10:42:45	0.03	-0.05	150.4	0.1	-1.1	SO ₂ CE Mid = 150.3
10/14/09 10:43:00	0.03	-0.05	150.4	0.1	-1.1	
10/14/09 10:43:15	0.03	-0.05	150.2	0.1	-1.0	
10/14/09 10:43:30	0.03	-0.05	150.0	0.1	-1.0	
10/14/09 10:43:45	0.04	-0.05	152.8	0.1	-1.0	
10/14/09 10:44:00	0.03	-0.05	75.0	9.4	-1.0	

Valero Refinery - Port Arthur, Texas
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Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 10:44:15	0.05	-0.05	3.3	46.3	-1.0	
10/14/09 10:44:30	0.33	0.02	-4.3	56.2	-1.0	
10/14/09 10:44:45	0.32	0.01	-4.7	59.9	-1.0	
10/14/09 10:45:00	0.15	-0.04	-4.7	92.8	-1.1	
10/14/09 10:45:15	0.08	-0.05	-5.1	90.1	-1.0	
10/14/09 10:45:30	0.05	-0.05	-5.4	84.7	-1.0	
10/14/09 10:45:45	0.04	-0.05	-5.9	81.9	-1.0	
10/14/09 10:46:00	0.04	-0.05	-5.6	79.7	-1.0	
10/14/09 10:46:15	0.04	-0.06	-5.8	77.7	-1.1	
10/14/09 10:46:30	0.03	-0.06	-5.8	76.1	-1.1	
10/14/09 10:46:45	0.04	-0.06	-6.0	74.6	-1.0	
10/14/09 10:47:00	0.04	-0.06	-6.0	73.6	-1.0	
10/14/09 10:47:15	0.03	-0.06	-5.9	72.7	-1.1	
10/14/09 10:47:30	0.04	-0.06	-6.0	72.0	-1.0	
10/14/09 10:47:45	0.04	-0.06	-5.9	71.3	-1.0	
10/14/09 10:48:00	0.03	-0.06	-5.9	70.8	-1.1	
10/14/09 10:48:15	0.04	-0.06	-6.0	59.8	-1.1	
10/14/09 10:48:30	0.03	-0.06	-6.0	70.1	-1.0	
10/14/09 10:48:45	0.03	-0.06	-6.2	69.9	-1.0	
10/14/09 10:49:00	0.04	-0.06	-6.2	70.0	-1.0	
10/14/09 10:49:15	0.03	-0.06	-6.3	79.5	-1.0	
10/14/09 10:49:30						
10/14/09 10:49:45	0.04	-0.05	-0.5	80.1	-1.0	
10/14/09 10:50:00	0.03	-0.05	-0.7	80.7	-1.0	
10/14/09 10:50:15	0.04	-0.06	-0.6	81.6	-1.1	
10/14/09 10:50:30	0.04	-0.06	-0.8	82.2	-1.0	
10/14/09 10:50:45	0.03	-0.06	-0.4	82.8	-1.0	
10/14/09 10:51:00	0.04	-0.05	-0.6	83.6	-1.1	
10/14/09 10:51:15	0.03	-0.06	-0.7	84.3	-1.1	
10/14/09 10:51:30	0.04	-0.06	-0.8	84.8	-1.0	
10/14/09 10:51:45	0.04	-0.06	-1.0	85.2	-1.0	
10/14/09 10:52:00	0.03	-0.06	-0.8	85.5	-1.0	
10/14/09 10:52:15	0.04	-0.06	-1.0	79.3	-1.0	
10/14/09 10:52:30	0.04	-0.06	-1.1	79.3	-1.0	
10/14/09 10:52:45	0.03	-0.06	-1.2	79.4	-1.0	
10/14/09 10:53:00	0.04	-0.06	-1.3	79.4	-1.0	
10/14/09 10:53:15	0.03	-0.06	-1.2	79.3	-1.0	
10/14/09 10:53:30	0.03	-0.06	-1.4	79.3	-1.1	
10/14/09 10:53:45	0.03	-0.06	-1.8	79.2	-1.0	
10/14/09 10:54:00	0.03	-0.06	-1.7	60.2	-1.1	
10/14/09 10:54:15	0.03	-0.06	-1.5	43.1	-1.1	
10/14/09 10:54:30	0.03	-0.06	-1.7	43.0	-1.1	
10/14/09 10:54:45	0.03	-0.06	-1.7	42.9	-1.1	
10/14/09 10:55:00	0.03	-0.06	-1.7	42.9	-1.1	
10/14/09 10:55:15	0.03	-0.06	-1.9	42.8	-1.0	
10/14/09 10:55:30	0.03	-0.06	-1.8	42.8	-1.0	
10/14/09 10:55:45	0.03	-0.06	-1.9	42.8	-1.0	
10/14/09 10:56:00	0.03	-0.06	-2.1	43.2	-1.0	
10/14/09 10:56:15	0.03	-0.06	-2.6	43.4	-1.0	
10/14/09 10:56:30	0.03	-0.06	-2.8	75.9	-1.0	
10/14/09 10:56:45	0.03	-0.06	-2.6	78.5	-1.0	
10/14/09 10:57:00	0.03	-0.06	-3.4	79.6	-1.1	
10/14/09 10:57:15	0.03	-0.06	-4.3	79.7	-1.1	
10/14/09 10:57:30	0.03	-0.06	-6.4	79.7	-1.1	
10/14/09 10:57:45	0.03	-0.06	-10.2	78.2	-1.1	
10/14/09 10:58:00	0.03	-0.06	-3.8	78.1	-1.1	
10/14/09 10:58:15	0.03	-0.06	-4.6	78.0	-1.1	
10/14/09 10:58:30	0.03	-0.06	-6.7	78.2	-1.1	
						Calibration Error
10/14/09 10:58:45	0.03	-0.06	-6.1	78.5	-1.1	NO _x CE Span = 78.5
10/14/09 10:59:00	0.02	-0.06	-4.9	78.5	-1.1	
10/14/09 10:59:15	0.03	-0.06	-4.0	78.5	-1.1	
10/14/09 10:59:30	0.03	-0.06	-10.1	78.4	-1.0	
10/14/09 10:59:45	0.03	-0.06	-11.0	42.8	-1.1	
10/14/09 11:00:00	0.03	-0.06	-3.1	42.0	-1.1	
10/14/09 11:00:15	0.03	-0.06	-2.9	42.0	-1.1	
10/14/09 11:00:30	0.03	-0.06	-2.5	41.9	-1.2	
						Calibration Error
10/14/09 11:00:45	0.03	-0.06	-2.3	41.8	-1.2	NO _x CE Mid = 41.7
10/14/09 11:01:00	0.02	-0.06	-2.3	41.7	-1.1	
10/14/09 11:01:15	0.03	-0.06	-2.2	41.7	-1.1	
10/14/09 11:01:30	0.03	-0.06	-2.1	41.7	-1.1	
10/14/09 11:01:45	0.02	-0.06	-2.2	41.5	-1.1	
10/14/09 11:02:00	0.03	-0.06	-1.7	41.7	-1.0	
10/14/09 11:02:15	0.03	-0.06	11.7	110.6	1.9	
10/14/09 11:02:30	0.02	-0.06	1.7	38.4	168.2	
10/14/09 11:02:45	1.80	-0.05	-0.4	40.9	284.0	
10/14/09 11:03:00	8.85	-0.05	-0.9	41.2	225.9	
10/14/09 11:03:15	16.13	-0.06	-1.2	41.9	141.9	
10/14/09 11:03:30	19.31	-0.06	-0.8	42.7	27.4	
10/14/09 11:03:45	19.92	-0.07	-1.1	43.4	7.9	
10/14/09 11:04:00	20.00	-0.07	-1.5	44.0	0.4	
10/14/09 11:04:15	20.02	-0.07	-1.0	44.4	0.4	
10/14/09 11:04:30	20.03	-0.07	-1.2	44.8	-1.2	
10/14/09 11:04:45	20.04	-0.07	-1.2	45.0	-1.0	
10/14/09 11:05:00	20.04	-0.07	-1.3	45.3	-1.1	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
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Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 11:05:15	20.04	-0.07	-1.3	45.5	0.4	
10/14/09 11:05:30	20.05	-0.07	-1.1	45.7	0.4	
10/14/09 11:05:45	20.05	-0.07	-1.3	45.9	0.4	
10/14/09 11:06:00	20.06	-0.07	-1.3	46.1	-1.1	
10/14/09 11:06:15	20.05	-0.07	-1.1	46.3	-1.1	
10/14/09 11:06:30	20.06	-0.07	-1.0	46.7	0.4	
10/14/09 11:06:45	20.06	-0.07	-1.1	46.8	0.4	
10/14/09 11:07:00	20.07	-0.07	-1.1	46.9	0.3	NO ₂ Converter Check
10/14/09 11:07:15	20.07	-0.06	-1.0	47.0	0.4	Cyl ALM055039
10/14/09 11:07:30	20.07	-0.06	-1.0	47.1	0.4	Conc = 51.6
10/14/09 11:07:45	20.07	-0.06	-1.1	47.2	-1.1	Response = 47.1
						Eff. = 91.21%
10/14/09 11:08:00	20.07	-0.06	-0.9	47.2	0.4	
10/14/09 11:08:15	20.07	-0.06	-1.1	47.3	0.5	
10/14/09 11:08:30	20.09	-0.06	1.8	70.1	111.2	
10/14/09 11:08:45	19.80	-0.06	29.9	40.9	311.6	
10/14/09 11:09:00	13.76	-0.01	56.4	16.8	848.9	
10/14/09 11:09:15	5.42	2.29	4.9	0.7	998.9	
10/14/09 11:09:30	4.24	4.01	-1.3	0.6	1333.0	
10/14/09 11:09:45	2.42	2.60	-1.6	0.5	1546.7	
10/14/09 11:10:00	0.86	0.81	-1.6	0.4	1886.1	
10/14/09 11:10:15	0.21	0.09	-1.7	0.4	1963.7	
10/14/09 11:10:30	0.09	-0.03	-1.6	0.4	2008.8	
10/14/09 11:10:45	0.07	-0.05	-1.6	0.3	2010.3	
10/14/09 11:11:00	0.07	-0.05	-1.6	0.3	2011.6	
10/14/09 11:11:15	0.07	-0.05	-1.6	0.3	1986.7	Calibration Error
10/14/09 11:11:30	0.06	-0.05	-1.6	0.3	1989.7	CO CE Span = 1988
10/14/09 11:11:45	0.07	-0.06	-1.7	0.3	1989.6	
10/14/09 11:12:00	0.06	-0.06	-1.2	0.3	1988.2	
10/14/09 11:12:15	0.06	-0.06	-1.4	0.3	1985.2	
10/14/09 11:12:30	0.05	-0.06	-1.4	0.5	1935.4	
10/14/09 11:12:45	0.06	-0.06	-1.7	0.3	1812.9	
10/14/09 11:13:00	0.06	-0.05	-1.4	0.3	1392.5	
10/14/09 11:13:15	0.06	-0.06	-1.5	0.3	1217.4	
10/14/09 11:13:30	0.06	-0.06	-1.2	0.3	1051.2	
10/14/09 11:13:45	0.05	-0.06	-1.5	0.3	1031.7	Calibration Error
10/14/09 11:14:00	0.05	-0.07	-1.5	0.3	1027.4	CO CE Mid = 1028
10/14/09 11:14:15	0.05	-0.06	-1.5	0.2	1027.3	
10/14/09 11:14:30	0.05	-0.06	-1.3	0.2	1027.4	
10/14/09 11:14:45	0.06	-0.07	-1.6	0.2	1028.8	
10/14/09 11:15:00	0.04	-0.07	56.6	12.5	997.5	
10/14/09 11:15:15	0.05	-0.05	107.3	12.2	878.3	Introduce mid O ₂
10/14/09 11:15:30	0.41	1.38	97.9	3.2	458.0	
10/14/09 11:15:45	1.13	3.12	77.2	6.1	276.6	
10/14/09 11:16:00	3.06	3.40	46.7	1.8	205.2	
10/14/09 11:16:15	6.87	2.29	22.3	0.4	259.9	
10/14/09 11:16:30	4.19	1.09	14.1	0.4	248.0	
10/14/09 11:16:45	3.46	0.27	10.3	0.3	172.6	
10/14/09 11:17:00	4.27	0.02	8.1	0.3	42.2	
10/14/09 11:17:15	4.54	-0.02	6.4	0.3	15.2	O ₂ Upscale RT = 105 Seconds
10/14/09 11:17:30	4.59	-0.03	5.2	0.3	3.4	
10/14/09 11:17:45	4.62	-0.03	4.3	0.3	3.4	
10/14/09 11:18:00	4.64	-0.04	3.6	0.3	1.9	System Bias
10/14/09 11:18:15	4.65	-0.04	3.3	0.3	1.9	O ₂ Bias 1 Mid = 4.65
10/14/09 11:18:30	4.65	-0.04	2.8	0.3	1.9	SO ₂ Bias 1 Zero = 3.1
10/14/09 11:18:45	4.65	-0.04	2.5	0.3	1.9	NO _x Bias 1 Zero = 0.3
						CO Bias 1 Zero = 1.9
10/14/09 11:19:00	4.65	-0.04	2.2	0.3	1.9	CO ₂ Bias 1 Zero = -0.04
10/14/09 11:19:15	4.66	-0.04	4.9	6.8	1.9	Introduce Mid CO ₂
10/14/09 11:19:30	4.65	-0.04	37.7	2.2	1.9	
10/14/09 11:19:45	4.45	0.50	16.8	1.2	15.3	
10/14/09 11:20:00	3.84	1.01	8.3	0.4	62.0	
10/14/09 11:20:15	2.93	1.70	5.1	0.4	67.9	
10/14/09 11:20:30	1.14	3.66	3.8	0.3	39.4	O ₂ Downscale RT = 105 Seconds
10/14/09 11:20:45	0.34	4.64	3.0	0.3	21.2	
10/14/09 11:21:00	0.15	4.80	2.5	0.3	3.4	CO ₂ Upscale RT = 135 Seconds
10/14/09 11:21:15	0.10	4.85	2.1	0.3	0.5	
10/14/09 11:21:30	0.10	4.97	1.8	0.3	0.4	
10/14/09 11:21:45	0.10	5.04	1.6	0.3	-1.1	
10/14/09 11:22:00	0.09	5.07	1.2	0.3	-1.1	System Bias
10/14/09 11:22:15	0.08	5.08	1.3	0.3	-1.1	CO ₂ Bias 1 Mid = 5.09
10/14/09 11:22:30	0.09	5.08	1.1	0.3	-1.1	
10/14/09 11:22:45	0.09	5.09	0.7	0.3	-1.0	
10/14/09 11:23:00	0.09	5.09	0.8	0.2	-1.1	
10/14/09 11:23:15	0.07	5.10	0.7	0.3	-1.1	
10/14/09 11:23:30	0.08	5.10	0.8	0.2	-1.1	
10/14/09 11:23:45	0.08	5.10	0.5	0.2	-1.1	Introduce Mid SO ₂
10/14/09 11:24:00	0.08	5.11	0.4	0.2	-1.1	
10/14/09 11:24:15	0.07	5.11	5.5	6.3	-1.1	
10/14/09 11:24:30	0.08	5.11	24.3	1.0	-1.0	
10/14/09 11:24:45	0.14	5.04	64.7	0.2	0.4	
10/14/09 11:25:00	0.30	4.56	115.6	0.2	0.4	
10/14/09 11:25:15	0.19	2.41	131.6	0.2	0.4	
10/14/09 11:25:30	0.12	0.68	137.0	0.2	0.4	
10/14/09 11:25:45	0.10	0.13	139.1	0.2	0.5	CO ₂ Downscale RT = 120 Seconds
10/14/09 11:26:00	0.08	0.03	141.6	0.2	0.4	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 11:26:15	0.08	0.01	144.5	0.2	0.4	SO ₂ Upscale RT = 150 Seconds
10/14/09 11:26:30	0.08	0.00	146.5	0.2	0.5	
10/14/09 11:26:45	0.08	-0.01	147.7	0.2	0.5	
10/14/09 11:27:00	0.08	-0.02	148.3	0.2	0.4	
10/14/09 11:27:15	0.07	-0.02	148.7	0.2	0.4	
10/14/09 11:27:30	0.07	-0.02	149.7	0.2	0.4	System Bias
10/14/09 11:27:45	0.08	-0.03	150.0	0.2	0.4	
10/14/09 11:28:00	0.08	-0.03	150.1	0.2	0.5	
10/14/09 11:28:15	0.08	-0.03	150.7	0.2	0.4	
10/14/09 11:28:30	0.07	-0.03	151.2	0.2	0.4	
10/14/09 11:28:45	0.08	-0.03	150.6	0.2	0.4	SO ₂ Bias 1 Mid = 150.6 O ₂ Bias 1 Zero = 0.08
10/14/09 11:29:00	0.08	-0.03	150.5	0.2	0.5	
10/14/09 11:29:15	0.08	-0.03	148.6	0.2	0.4	
10/14/09 11:29:30	0.07	-0.03	141.0	0.2	0.4	
10/14/09 11:29:45	0.07	-0.03	145.1	1.6	0.5	
10/14/09 11:30:00	0.08	-0.03	151.7	2.4	0.4	Introduce Mid NO _x
10/14/09 11:30:15	0.09	0.18	111.6	6.7	1.9	
10/14/09 11:30:30	0.32	0.95	45.9	29.6	1.9	
10/14/09 11:30:45	0.30	0.62	15.9	35.9	2.0	
10/14/09 11:31:00	0.14	0.13	6.2	36.8	1.9	
10/14/09 11:31:15	0.09	-0.01	2.5	36.9	1.8	SO ₂ Downscale RT = 105 Seconds
10/14/09 11:31:30	0.07	-0.03	-1.3	37.1	0.3	
10/14/09 11:31:45	0.08	-0.04	-3.6	37.3	0.4	
10/14/09 11:32:00	0.08	-0.04	-5.0	38.8	0.4	
10/14/09 11:32:15	0.08	-0.04	-5.6	43.0	0.4	
10/14/09 11:32:30	0.07	-0.04	-6.7	43.1	0.4	NO _x Upscale RT = 180 Seconds
10/14/09 11:32:45	0.07	-0.04	0.7	42.7	0.3	
10/14/09 11:33:00	0.08	-0.05	-6.9	42.5	0.4	
10/14/09 11:33:15	0.08	-0.05	-7.5	42.3	0.4	
10/14/09 11:33:30	0.07	-0.05	-7.8	42.2	0.4	
10/14/09 11:33:45	0.07	-0.05	-8.3	42.0	0.5	System Bias
10/14/09 11:34:00	0.07	-0.05	-8.7	42.0	0.4	
10/14/09 11:34:15	0.07	-0.05	-8.9	41.9	0.4	
10/14/09 11:34:30	0.08	-0.05	-8.7	41.7	0.4	
10/14/09 11:34:45	0.07	-0.05	-7.9	41.6	0.4	
10/14/09 11:35:00	0.07	-0.05	-8.2	41.5	0.3	NO _x Bias 1 Mid = 41.6
10/14/09 11:35:15	0.07	-0.05	-8.3	41.4	0.4	
10/14/09 11:35:30	0.08	-0.06	-7.6	41.3	0.4	
10/14/09 11:35:45	0.07	-0.06	-7.2	41.2	0.3	
10/14/09 11:36:00	0.07	-0.05	-7.7	41.1	0.4	
10/14/09 11:36:15	0.07	-0.06	-8.2	41.1	0.3	Introduce Mid CO
10/14/09 11:36:30	0.07	-0.06	7.4	21.8	0.4	
10/14/09 11:36:45	0.07	-0.05	29.0	110.6	0.4	
10/14/09 11:37:00	0.22	0.78	10.6	19.1	103.6	
10/14/09 11:37:15	0.38	0.97	-0.5	3.1	258.5	
10/14/09 11:37:30	0.22	0.32	-4.3	2.2	700.0	NO _x Downscale RT = 90 Seconds
10/14/09 11:37:45	0.11	0.02	-6.2	1.6	865.1	
10/14/09 11:38:00	0.07	-0.04	-7.2	1.2	994.5	
10/14/09 11:38:15	0.06	-0.05	-7.3	1.1	1006.6	
10/14/09 11:38:30	0.07	-0.05	-7.7	1.0	1012.6	
10/14/09 11:38:45	0.07	-0.05	-7.7	0.9	1012.4	CO Upscale RT = 135 Seconds
10/14/09 11:39:00	0.07	-0.05	-8.0	0.9	1014.0	
10/14/09 11:39:15	0.07	-0.05	-8.0	0.8	1015.5	
10/14/09 11:39:30	0.06	-0.05	-8.1	0.8	1014.0	
10/14/09 11:39:45	0.06	-0.05	-8.6	0.7	1012.5	
10/14/09 11:40:00	0.07	-0.05	-8.8	0.7	1012.5	System Bias CO Bias 1 Mid = 1014
10/14/09 11:40:15	0.07	-0.05	-8.8	0.7	1014.0	
10/14/09 11:40:30	0.06	-0.05	-8.5	0.6	1015.5	
10/14/09 11:40:45	0.06	-0.05	-8.1	0.6	1015.5	
10/14/09 11:41:00	0.06	-0.05	-8.5	0.6	1014.1	
10/14/09 11:41:15	0.06	-0.05	-8.3	0.5	994.6	Introduce Zero Gas
10/14/09 11:41:30	0.07	-0.05	-8.6	0.3	720.6	
10/14/09 11:41:45	0.07	-0.05	-8.5	0.3	493.9	
10/14/09 11:42:00	0.06	-0.05	-8.9	0.3	138.9	
10/14/09 11:42:15	0.07	-0.05	-8.9	0.3	57.4	
10/14/09 11:42:30	0.06	-0.05	-9.1	0.3	7.8	CO Downscale RT = 120 Seconds
10/14/09 11:42:45	0.07	-0.05	-8.9	0.3	3.4	
10/14/09 11:43:00	0.07	-0.05	-9.2	0.2	1.9	
10/14/09 11:43:15	0.07	-0.05	-9.1	0.3	1.8	
10/14/09 11:43:30	0.06	-0.05	-9.2	0.2	1.9	
10/14/09 11:43:45	0.06	-0.06	17.8	11.7	1.8	
10/14/09 11:44:00	0.06	-0.02	106.8	12.2	1.8	
10/14/09 11:44:15	0.34	1.45	139.2	12.2	3.4	
10/14/09 11:44:30	0.86	3.18	147.7	12.2	4.8	
10/14/09 11:44:45	1.17	4.06	151.6	12.1	6.3	
10/14/09 11:45:00	1.25	4.29	153.9	12.2	6.2	Begin Compliance Run 1
10/14/09 11:45:15	1.25	4.34	154.8	12.3	6.3	
10/14/09 11:45:30	1.23	4.35	155.2	12.0	6.3	
10/14/09 11:45:45	1.25	4.36	155.0	12.2	6.3	
10/14/09 11:46:00	1.25	4.36	154.9	12.3	6.3	
10/14/09 11:46:15	1.26	4.36	154.5	12.3	6.3	
10/14/09 11:46:30	1.24	4.36	154.6	12.2	6.2	
10/14/09 11:46:45	1.22	4.36	154.1	12.3	6.2	
10/14/09 11:47:00	1.21	4.36	153.7	12.2	6.3	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 11:47:15	1.22	4.36	153.0	12.5	6.3	
10/14/09 11:47:30	1.23	4.36	152.0	12.0	6.3	
10/14/09 11:47:45	1.24	4.36	151.4	12.0	6.2	
10/14/09 11:48:00	1.22	4.36	150.2	12.3	6.3	
10/14/09 11:48:15	1.23	4.35	149.5	12.2	6.3	
10/14/09 11:48:30	1.25	4.35	149.1	12.2	6.2	
10/14/09 11:48:45	1.26	4.35	148.8	12.1	7.7	
10/14/09 11:49:00	1.27	4.36	149.3	12.4	7.7	
10/14/09 11:49:15	1.28	4.37	149.7	12.3	7.7	
10/14/09 11:49:30	1.28	4.37	149.8	12.1	7.8	
10/14/09 11:49:45	1.26	4.37	150.9	12.3	7.7	
10/14/09 11:50:00	1.25	4.38	151.5	12.3	6.3	
10/14/09 11:50:15	1.24	4.38	152.3	12.3	6.2	
10/14/09 11:50:30	1.24	4.39	152.4	12.6	6.3	
10/14/09 11:50:45	1.25	4.39	153.3	12.4	6.3	
10/14/09 11:51:00	1.24	4.39	155.1	12.4	6.3	
10/14/09 11:51:15	1.22	4.39	155.3	12.4	6.3	
10/14/09 11:51:30	1.22	4.38	157.3	12.5	6.3	
10/14/09 11:51:45	1.22	4.38	155.3	12.5	4.9	
10/14/09 11:52:00	1.21	4.39	153.9	12.3	4.9	
10/14/09 11:52:15	1.21	4.39	152.6	12.3	4.9	
10/14/09 11:52:30	1.20	4.39	151.6	12.2	6.3	
10/14/09 11:52:45	1.23	4.38	150.1	12.1	6.3	Point 2
10/14/09 11:53:00	1.24	4.38	151.8	12.3	6.3	
10/14/09 11:53:15	1.25	4.39	150.7	12.3	6.3	
10/14/09 11:53:30	1.26	4.39	149.1	12.3	6.3	
10/14/09 11:53:45	1.26	4.40	148.3	12.4	6.3	
10/14/09 11:54:00	1.24	4.40	147.4	12.3	6.3	
10/14/09 11:54:15	1.26	4.40	146.8	12.2	6.3	
10/14/09 11:54:30	1.26	4.40	148.8	12.3	6.3	
10/14/09 11:54:45	1.25	4.41	154.7	12.2	6.3	
10/14/09 11:55:00	1.26	4.41	153.8	12.3	6.3	
10/14/09 11:55:15	1.25	4.41	151.3	12.4	6.3	
10/14/09 11:55:30	1.25	4.41	150.3	12.5	6.2	
10/14/09 11:55:45	1.23	4.42	154.6	12.5	4.8	
10/14/09 11:56:00	1.20	4.43	153.0	12.3	4.8	
10/14/09 11:56:15	1.17	4.44	153.3	12.2	4.8	
10/14/09 11:56:30	1.15	4.44	153.2	12.3	3.4	
10/14/09 11:56:45	1.18	4.43	154.7	12.3	4.9	
10/14/09 11:57:00	1.17	4.43	154.6	12.3	4.9	
10/14/09 11:57:15	1.18	4.42	154.6	12.3	4.9	
10/14/09 11:57:30	1.18	4.42	154.6	12.3	4.9	
10/14/09 11:57:45	1.19	4.41	153.9	12.2	4.8	
10/14/09 11:58:00	1.19	4.41	153.8	12.2	4.8	
10/14/09 11:58:15	1.19	4.41	154.3	12.1	4.9	
10/14/09 11:58:30	1.21	4.40	154.2	12.2	4.9	
10/14/09 11:58:45	1.22	4.40	153.5	12.1	4.8	
10/14/09 11:59:00	1.22	4.40	153.1	12.2	4.9	
10/14/09 11:59:15	1.21	4.40	152.5	12.2	6.3	
10/14/09 11:59:30	1.22	4.40	151.9	12.2	6.3	
10/14/09 11:59:45	1.23	4.40	151.3	12.1	6.3	Point 3
10/14/09 12:00:00	1.23	4.40	148.4	12.2	6.3	
10/14/09 12:00:15	1.20	4.40	146.9	12.2	6.2	
10/14/09 12:00:30	1.20	4.40	146.1	12.2	6.2	
10/14/09 12:00:45	1.19	4.40	145.8	12.2	6.2	
10/14/09 12:01:00	1.20	4.41	144.7	12.1	6.3	
10/14/09 12:01:15	1.20	4.42	143.2	12.3	6.3	
10/14/09 12:01:30	1.21	4.42	141.6	12.2	6.3	
10/14/09 12:01:45	1.20	4.41	140.3	12.0	6.3	
10/14/09 12:02:00	1.20	4.42	139.8	12.1	6.3	
10/14/09 12:02:15	1.21	4.42	139.8	12.4	6.3	
10/14/09 12:02:30	1.21	4.43	140.0	12.3	6.3	
10/14/09 12:02:45	1.22	4.43	139.5	12.3	6.3	
10/14/09 12:03:00	1.21	4.43	138.9	12.5	6.3	
10/14/09 12:03:15	1.23	4.42	139.2	12.4	6.3	
10/14/09 12:03:30	1.29	4.40	139.4	12.2	6.3	
10/14/09 12:03:45	1.30	4.40	140.0	12.3	6.3	
10/14/09 12:04:00	1.29	4.40	139.7	12.3	6.3	
10/14/09 12:04:15	1.28	4.40	139.9	12.2	6.3	
10/14/09 12:04:30	1.32	4.39	142.4	12.2	6.3	
10/14/09 12:04:45	1.32	4.39	143.9	12.5	6.4	
10/14/09 12:05:00	1.31	4.39	145.1	12.5	6.3	
10/14/09 12:05:15	1.31	4.40	145.6	12.5	6.3	
10/14/09 12:05:30	1.25	4.41	146.3	12.5	4.8	
10/14/09 12:05:45	1.24	4.42	147.1	12.4	4.9	
10/14/09 12:06:00	1.21	4.43	149.1	12.6	4.9	
10/14/09 12:06:15	1.18	4.43	148.3	12.5	4.9	
10/14/09 12:06:30	1.19	4.43	149.1	12.3	4.9	
10/14/09 12:06:45	1.19	4.43	153.6	12.3	4.9	
10/14/09 12:07:00	1.18	4.43	152.2	12.4	4.9	
10/14/09 12:07:15	1.17	4.44	148.5	12.4	4.9	
10/14/09 12:07:30	1.17	4.43	147.5	12.5	4.9	
10/14/09 12:07:45	1.18	4.43	147.6	12.2	3.4	
10/14/09 12:08:00	1.16	4.43	147.4	12.3	3.4	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 12:08:15	1.13	4.44	147.4	12.3	3.4	
10/14/09 12:08:30	1.12	4.43	147.3	12.1	4.9	
10/14/09 12:08:45	1.14	4.43	147.2	12.2	4.8	
10/14/09 12:09:00	1.16	4.43	148.3	12.0	4.9	
10/14/09 12:09:15	1.20	4.41	147.3	11.9	4.9	
10/14/09 12:09:30	1.21	4.41	146.3	12.0	6.3	
10/14/09 12:09:45	1.23	4.40	146.0	11.8	6.3	
10/14/09 12:10:00	1.25	4.40	145.3	12.0	7.8	
10/14/09 12:10:15	1.26	4.40	143.8	12.2	7.8	
10/14/09 12:10:30	1.27	4.39	143.6	12.1	7.7	
10/14/09 12:10:45	1.27	4.39	143.1	12.3	7.7	
10/14/09 12:11:00	1.25	4.40	143.8	12.3	7.8	
10/14/09 12:11:15	1.25	4.41	144.3	12.3	7.8	
10/14/09 12:11:30	1.25	4.42	145.4	12.4	7.7	
10/14/09 12:11:45	1.27	4.41	146.8	12.4	7.7	
10/14/09 12:12:00	1.26	4.42	147.6	12.5	6.2	
10/14/09 12:12:15	1.23	4.42	148.3	12.5	6.2	
10/14/09 12:12:30	1.21	4.42	148.4	12.5	6.3	
10/14/09 12:12:45	1.20	4.43	149.1	12.6	6.3	
10/14/09 12:13:00	1.19	4.44	149.8	12.6	4.9	
10/14/09 12:13:15	1.18	4.44	150.1	12.5	4.8	
10/14/09 12:13:30	1.16	4.45	150.3	12.5	4.9	
10/14/09 12:13:45	1.15	4.45	149.5	12.2	4.9	
10/14/09 12:14:00	1.14	4.44	149.8	12.3	3.4	
10/14/09 12:14:15	1.12	4.44	150.7	12.4	3.4	
10/14/09 12:14:30	1.13	4.44	151.8	12.5	3.4	
10/14/09 12:14:45	1.10	4.44	151.1	12.3	3.3	
10/14/09 12:15:00	1.10	4.44	151.0	12.4	3.4	
10/14/09 12:15:15	1.10	4.43	151.3	12.2	3.3	
10/14/09 12:15:30	1.11	4.42	150.7	12.1	3.4	
10/14/09 12:15:45	1.12	4.41	151.7	12.1	4.9	
10/14/09 12:16:00	1.14	4.40	151.9	12.2	4.9	
10/14/09 12:16:15	1.16	4.39	155.3	12.2	4.9	
10/14/09 12:16:30	1.17	4.38	149.2	12.1	4.8	
10/14/09 12:16:45	1.19	4.38	147.5	12.0	4.9	
10/14/09 12:17:00	1.21	4.37	146.9	12.0	6.3	
10/14/09 12:17:15	1.23	4.36	146.7	11.9	6.3	
10/14/09 12:17:30	1.25	4.35	146.7	12.0	7.7	
10/14/09 12:17:45	1.27	4.36	146.2	12.1	7.8	
10/14/09 12:18:00	1.28	4.36	146.0	12.2	7.8	
10/14/09 12:18:15	1.29	4.37	146.5	12.2	7.8	
10/14/09 12:18:30	1.27	4.39	147.2	12.2	7.8	
10/14/09 12:18:45	1.25	4.40	147.7	12.2	7.7	
10/14/09 12:19:00	1.24	4.40	149.5	12.6	6.2	
10/14/09 12:19:15	1.23	4.40	152.6	12.6	6.2	
10/14/09 12:19:30	1.20	4.41	151.2	12.4	4.9	
10/14/09 12:19:45	1.16	4.42	152.0	12.5	4.8	
10/14/09 12:20:00	1.15	4.43	152.5	12.3	4.8	
10/14/09 12:20:15	1.15	4.42	153.2	12.3	4.8	
10/14/09 12:20:30	1.14	4.41	153.0	12.3	3.4	
10/14/09 12:20:45	1.14	4.40	153.2	12.0	3.4	
10/14/09 12:21:00	1.15	4.39	153.4	12.0	4.8	
10/14/09 12:21:15	1.17	4.38	152.1	11.9	4.8	
10/14/09 12:21:30	1.17	4.38	150.4	12.0	4.9	
10/14/09 12:21:45	1.17	4.38	147.8	12.2	4.9	
10/14/09 12:22:00	1.17	4.37	145.1	12.0	4.9	
10/14/09 12:22:15	1.17	4.36	144.5	12.0	4.9	
10/14/09 12:22:30	1.17	4.36	143.3	12.1	4.9	
10/14/09 12:22:45	1.19	4.35	142.6	12.0	6.2	
10/14/09 12:23:00	1.20	4.35	142.9	12.1	6.3	
10/14/09 12:23:15	1.21	4.35	142.7	12.1	6.3	
10/14/09 12:23:30	1.21	4.35	143.4	11.8	6.3	
10/14/09 12:23:45	1.20	4.35	143.4	11.8	6.3	
10/14/09 12:24:00	1.20	4.34	142.4	11.9	6.3	
10/14/09 12:24:15	1.22	4.33	142.5	12.0	6.4	
10/14/09 12:24:30	1.23	4.33	143.6	12.0	6.3	
10/14/09 12:24:45	1.24	4.33	147.6	11.9	7.8	
10/14/09 12:25:00	1.24	4.34	145.3	12.0	7.8	
10/14/09 12:25:15	1.24	4.34	145.5	12.0	7.8	
10/14/09 12:25:30	1.27	4.34	148.3	12.3	7.7	
10/14/09 12:25:45	1.27	4.35	151.2	12.2	7.7	
10/14/09 12:26:00	1.26	4.36	147.0	12.3	7.8	
10/14/09 12:26:15	1.25	4.36	146.9	12.3	7.8	
10/14/09 12:26:30	1.25	4.36	151.5	12.4	7.8	
10/14/09 12:26:45	1.23	4.37	148.8	12.2	6.3	
10/14/09 12:27:00	1.23	4.37	149.1	12.3	6.3	
10/14/09 12:27:15	1.22	4.37	148.8	12.4	6.4	
10/14/09 12:27:30	1.23	4.37	148.8	12.5	6.3	
10/14/09 12:27:45	1.22	4.38	148.1	12.4	5.0	
10/14/09 12:28:00	1.21	4.38	146.3	12.4	4.9	
10/14/09 12:28:15	1.18	4.39	146.7	12.4	4.8	
10/14/09 12:28:30	1.15	4.39	147.7	12.3	4.8	
10/14/09 12:28:45	1.14	4.39	147.8	12.1	4.9	
10/14/09 12:29:00	1.14	4.39	147.8	12.0	4.9	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 12:29:15	1.15	4.38	147.9	11.9	3.4	
10/14/09 12:29:30	1.17	4.37	147.1	11.8	4.9	
10/14/09 12:29:45	1.17	4.37	148.6	11.9	4.8	
10/14/09 12:30:00	1.19	4.36	151.7	11.7	4.9	
10/14/09 12:30:15	1.19	4.35	151.2	11.9	4.8	
10/14/09 12:30:30	1.20	4.35	151.9	11.8	4.9	
10/14/09 12:30:45	1.21	4.34	150.8	12.0	4.9	
10/14/09 12:31:00	1.20	4.35	153.6	12.0	4.9	
10/14/09 12:31:15	1.18	4.35	151.6	12.0	4.8	
10/14/09 12:31:30	1.16	4.35	153.1	11.8	4.8	
10/14/09 12:31:45	1.16	4.35	148.8	11.7	4.9	
10/14/09 12:32:00	1.19	4.34	148.9	12.0	6.3	
10/14/09 12:32:15	1.22	4.34	152.7	12.0	6.3	
10/14/09 12:32:30	1.23	4.34	152.7	11.9	6.3	
10/14/09 12:32:45	1.22	4.35	154.4	11.7	6.3	
10/14/09 12:33:00	1.23	4.35	154.2	11.8	6.2	
10/14/09 12:33:15	1.24	4.35	153.2	11.7	6.3	
10/14/09 12:33:30	1.26	4.34	151.9	11.8	7.7	
10/14/09 12:33:45	1.25	4.35	150.0	11.9	7.8	
10/14/09 12:34:00	1.25	4.35	149.9	12.0	7.7	
10/14/09 12:34:15	1.26	4.36	150.4	12.1	7.8	
10/14/09 12:34:30	1.25	4.37	150.6	12.1	7.8	
10/14/09 12:34:45	1.25	4.38	150.4	12.0	7.7	
10/14/09 12:35:00	1.25	4.38	150.1	12.0	7.8	
10/14/09 12:35:15	1.25	4.38	151.1	12.1	7.8	
10/14/09 12:35:30	1.26	4.38	149.4	12.2	6.4	
10/14/09 12:35:45	1.25	4.38	147.9	12.1	6.4	
10/14/09 12:36:00	1.24	4.38	147.6	12.2	6.3	
10/14/09 12:36:15	1.21	4.39	147.7	11.9	6.3	
10/14/09 12:36:30	1.19	4.39	146.9	12.0	4.8	
10/14/09 12:36:45	1.17	4.39	146.5	11.9	4.8	
10/14/09 12:37:00	1.17	4.39	147.1	12.0	4.8	
10/14/09 12:37:15	1.17	4.39	146.8	12.1	4.9	
10/14/09 12:37:30	1.15	4.39	147.0	12.2	4.8	
10/14/09 12:37:45	1.13	4.39	147.3	12.1	3.4	
10/14/09 12:38:00	1.12	4.39	147.1	12.0	3.3	
10/14/09 12:38:15	1.12	4.40	148.7	12.1	3.3	
10/14/09 12:38:30	1.11	4.40	150.1	11.9	3.4	
10/14/09 12:38:45	1.11	4.39	150.3	11.9	3.4	
10/14/09 12:39:00	1.11	4.39	150.8	11.8	3.4	
10/14/09 12:39:15	1.12	4.39	147.3	11.8	3.4	
10/14/09 12:39:30	1.12	4.38	148.3	11.7	3.4	
10/14/09 12:39:45	1.12	4.37	151.3	11.8	3.4	
10/14/09 12:40:00	1.12	4.36	151.2	11.8	3.3	
10/14/09 12:40:15	1.12	4.37	152.6	11.6	3.4	
10/14/09 12:40:30	1.12	4.36	153.2	11.7	3.4	
10/14/09 12:40:45	1.13	4.35	152.9	11.6	4.9	
10/14/09 12:41:00	1.15	4.33	151.2	11.6	5.0	
10/14/09 12:41:15	1.16	4.32	151.3	11.5	6.4	
10/14/09 12:41:30	1.20	4.31	149.7	11.5	7.9	
10/14/09 12:41:45	1.24	4.31	148.2	11.6	7.8	
10/14/09 12:42:00	1.27	4.30	146.1	11.5	9.3	
10/14/09 12:42:15	1.30	4.31	145.8	11.5	9.2	
10/14/09 12:42:30	1.32	4.31	140.8	11.6	10.8	
10/14/09 12:42:45	1.34	4.32	138.6	11.5	12.4	
10/14/09 12:43:00	1.35	4.32	137.0	11.7	12.4	
10/14/09 12:43:15	1.35	4.33	135.9	11.9	12.4	
10/14/09 12:43:30	1.36	4.34	136.2	12.1	12.4	
10/14/09 12:43:45	1.35	4.35	136.0	12.0	10.8	
10/14/09 12:44:00	1.31	4.37	135.3	12.1	9.3	
10/14/09 12:44:15	1.28	4.38	136.2	12.1	7.8	
10/14/09 12:44:30	1.25	4.38	137.3	12.1	6.3	
10/14/09 12:44:45	1.22	4.38	140.1	12.2	6.3	
10/14/09 12:45:00	1.20	4.39	141.0	12.4	4.9	
10/14/09 12:45:15	1.18	4.39	142.3	12.3	4.9	
10/14/09 12:45:30	1.16	4.40	143.6	12.3	3.4	
10/14/09 12:45:45	1.15	4.40	145.0	12.2	3.4	End Run 1
10/14/09 12:46:00	1.13	4.40	146.1	12.2	3.4	
10/14/09 12:46:15	1.13	4.39	146.5	12.1	3.4	
10/14/09 12:46:30	1.13	4.39	147.1	12.2	3.4	
10/14/09 12:46:45	1.14	4.38	147.9	12.1	3.4	
10/14/09 12:47:00	1.14	4.38	148.0	11.9	3.4	
10/14/09 12:47:15	1.14	4.37	148.9	11.9	3.4	
10/14/09 12:47:30	1.16	4.37	148.5	12.2	5.0	
10/14/09 12:47:45	1.17	4.36	146.2	12.0	4.9	
10/14/09 12:48:00	1.17	4.36	145.0	12.0	4.9	
10/14/09 12:48:15	1.15	4.36	144.3	12.0	4.9	
10/14/09 12:48:30	1.14	4.37	143.9	11.9	3.4	
10/14/09 12:48:45	1.15	4.37	143.1	11.6	3.4	
10/14/09 12:49:00	1.16	4.36	141.7	11.9	4.9	
10/14/09 12:49:15	1.19	4.34	141.4	11.9	4.8	
10/14/09 12:49:30	1.21	4.33	141.0	11.8	6.3	
10/14/09 12:49:45	1.23	4.33	139.3	11.8	6.3	
10/14/09 12:50:00	1.22	4.34	138.3	10.7	6.3	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 12:50:15	1.22	4.34	116.7	21.0	7.8	
10/14/09 12:50:30	1.25	4.25	78.3	1.9	22.7	
10/14/09 12:50:45	1.34	2.65	56.7	1.2	28.7	
10/14/09 12:51:00	2.28	0.87	43.0	0.7	21.2	
10/14/09 12:51:15	3.86	0.17	32.8	0.6	13.9	
10/14/09 12:51:30	4.41	0.03	25.9	0.5	3.4	
10/14/09 12:51:45	4.50	0.00	20.3	0.5	1.9	
10/14/09 12:52:00	4.55	-0.01	16.6	0.4	0.4	
10/14/09 12:52:15	4.57	-0.02	13.2	0.4	0.4	
10/14/09 12:52:30	4.58	-0.02	10.3	0.4	0.4	
10/14/09 12:52:45	4.59	-0.02	7.8	0.4	0.4	
10/14/09 12:53:00	4.59	-0.03	5.6	0.3	0.4	
10/14/09 12:53:15	4.59	-0.03	4.1	0.3	0.4	
10/14/09 12:53:30	4.59	-0.03	2.6	0.3	0.4	
10/14/09 12:53:45	4.59	-0.03	1.8	0.3	0.4	
System Bias						
10/14/09 12:54:00	4.59	-0.04	1.2	0.3	0.4	O ₂ Bias 2 Mid = 4.60
10/14/09 12:54:15	4.60	-0.04	0.2	0.3	0.4	SO ₂ Bias 2 Zero = 0.0
10/14/09 12:54:30	4.60	-0.04	-0.6	0.3	0.3	NO _x Bias 2 Zero = 0.3
10/14/09 12:54:45	4.59	-0.04	-1.0	0.3	0.4	CO Bias 2 Zero = 0.4
10/14/09 12:55:00	4.59	-0.04	0.9	5.2	0.4	CO ₂ Bias 2 Zero = -0.04
10/14/09 12:55:15	4.60	-0.04	10.8	53.7	1.9	
10/14/09 12:55:30	4.27	0.62	7.5	5.4	4.7	
10/14/09 12:55:45	3.86	0.79	5.4	2.6	4.8	
10/14/09 12:56:00	2.39	2.12	3.4	1.6	1.9	
10/14/09 12:56:15	0.83	3.93	1.8	1.1	0.4	
10/14/09 12:56:30	0.24	4.69	0.8	0.9	-1.0	
10/14/09 12:56:45	0.11	4.75	-0.2	0.7	-1.2	
10/14/09 12:57:00	0.09	4.79	-0.8	0.6	-1.1	
10/14/09 12:57:15	0.08	4.93	-1.6	0.6	-1.2	
System Bias						
10/14/09 12:57:30	0.07	5.02	-2.2	0.5	-2.6	CO ₂ Bias 2 Mid = 5.06
10/14/09 12:57:45	0.06	5.06	-2.8	0.5	-2.6	
10/14/09 12:58:00	0.06	5.08	-2.8	0.5	-1.1	
10/14/09 12:58:15	0.07	5.08	-3.2	0.4	-1.1	
10/14/09 12:58:30	0.07	5.09	-3.8	0.4	-1.1	
10/14/09 12:58:45	0.06	5.09	-3.3	0.4	-1.0	
10/14/09 12:59:00	0.05	5.09	-1.7	0.4	-2.6	
10/14/09 12:59:15	0.06	5.10	-3.7	1.7	-2.6	
10/14/09 12:59:30	0.06	5.10	3.0	1.7	4.9	
10/14/09 12:59:45	0.08	5.07	7.3	0.6	12.4	
10/14/09 13:00:00	0.44	4.81	26.3	0.3	15.3	
10/14/09 13:00:15	0.43	3.57	51.1	0.3	12.3	
10/14/09 13:00:30	0.21	1.52	70.3	0.2	1.8	
10/14/09 13:00:45	0.10	0.35	83.9	0.2	0.4	
10/14/09 13:01:00	0.07	0.07	95.2	0.2	-1.1	
10/14/09 13:01:15	0.07	0.02	105.8	0.2	-1.1	
10/14/09 13:01:30	0.06	0.01	119.1	0.2	-1.1	
10/14/09 13:01:45	0.06	0.00	125.2	0.2	-1.0	
10/14/09 13:02:00	0.06	-0.01	128.9	0.2	-1.1	
10/14/09 13:02:15	0.07	-0.01	131.7	0.2	-1.0	
10/14/09 13:02:30	0.06	-0.02	134.6	0.2	-1.0	
10/14/09 13:02:45	0.06	-0.02	136.1	0.2	-1.2	
10/14/09 13:03:00	0.06	-0.02	137.8	0.2	-1.1	
10/14/09 13:03:15	0.06	-0.03	139.4	0.2	-1.1	
10/14/09 13:03:30	0.06	-0.03	140.2	0.2	-1.1	
10/14/09 13:03:45	0.06	-0.03	140.7	0.2	-1.1	
10/14/09 13:04:00	0.05	-0.03	141.0	0.2	-1.1	
10/14/09 13:04:15	0.05	-0.04	141.2	0.2	-1.1	
10/14/09 13:04:30	0.06	-0.04	142.1	0.2	-1.1	
10/14/09 13:04:45	0.06	-0.04	143.1	0.2	-1.1	
10/14/09 13:05:00	0.06	-0.04	143.7	0.2	-1.1	
10/14/09 13:05:15	0.05	-0.04	143.6	0.2	-1.1	
10/14/09 13:05:30	0.05	-0.04	144.2	0.2	-1.1	
10/14/09 13:05:45	0.06	-0.05	144.3	0.2	-1.0	
10/14/09 13:06:00	0.06	-0.05	143.8	0.2	-1.1	
10/14/09 13:06:15	0.06	-0.05	144.2	0.2	-1.1	
10/14/09 13:06:30	0.05	-0.05	143.4	0.2	-1.1	
10/14/09 13:06:45	0.05	-0.05	144.1	0.2	-1.1	
10/14/09 13:07:00	0.05	-0.05	143.9	0.2	-1.2	
10/14/09 13:07:15	0.06	-0.05	144.4	0.2	-1.2	
10/14/09 13:07:30	0.06	-0.05	148.6	0.2	-1.1	
10/14/09 13:07:45	0.05	-0.05	147.3	0.2	-1.2	
10/14/09 13:08:00	0.05	-0.05	148.1	0.2	-1.1	
System Bias						
10/14/09 13:08:15	0.05	-0.05	147.7	0.2	-1.2	SO ₂ Bias 2 Mid = 147.4
10/14/09 13:08:30	0.05	-0.05	147.7	0.2	-1.1	O ₂ Bias 2 Zero = 0.06
10/14/09 13:08:45	0.06	-0.05	147.3	0.2	-1.2	
10/14/09 13:09:00	0.06	-0.05	147.0	0.2	-1.1	
10/14/09 13:09:15	0.05	-0.05	146.9	0.2	-1.2	
10/14/09 13:09:30	0.05	-0.05	147.1	0.2	-1.2	
10/14/09 13:09:45	0.06	-0.05	146.3	0.9	-1.2	
10/14/09 13:10:00	0.06	-0.05	148.5	1.9	7.6	
10/14/09 13:10:15	0.07	0.06	132.6	5.2	16.8	
10/14/09 13:10:30	0.41	0.78	91.4	23.3	22.6	
10/14/09 13:10:45	0.41	0.55	66.3	27.3	16.7	
10/14/09 13:11:00	0.15	0.11	43.5	28.1	4.8	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 13:11:15	0.08	-0.02	32.7	27.9	0.3	
10/14/09 13:11:30	0.06	-0.04	25.0	27.7	-1.1	
10/14/09 13:11:45	0.06	-0.05	19.3	27.7	-1.1	
10/14/09 13:12:00	0.05	-0.05	14.6	31.3	-1.1	
10/14/09 13:12:15	0.05	-0.05	11.0	40.8	-1.1	
10/14/09 13:12:30	0.06	-0.05	8.3	42.0	-1.1	
10/14/09 13:12:45	0.06	-0.05	6.0	41.4	-1.1	
10/14/09 13:13:00	0.06	-0.05	4.0	41.1	-1.1	
System Bias						
10/14/09 13:13:15	0.05	-0.05	2.7	40.8	-1.1	NO_x Bias 2 Mid = 40.5
10/14/09 13:13:30	0.05	-0.05	1.4	40.6	-1.1	
10/14/09 13:13:45	0.05	-0.05	0.2	40.3	-1.1	
10/14/09 13:14:00	0.05	-0.05	-0.9	40.1	-1.0	
10/14/09 13:14:15	0.06	-0.06	-1.2	32.5	-1.2	
10/14/09 13:14:30	0.06	-0.06	8.3	95.6	15.3	
10/14/09 13:14:45	0.13	0.27	8.4	29.0	63.4	
10/14/09 13:15:00	0.48	0.76	4.9	4.0	341.5	
10/14/09 13:15:15	0.35	0.34	2.7	2.2	557.1	
10/14/09 13:15:30	0.14	0.02	1.1	1.6	888.9	
10/14/09 13:15:45	0.07	-0.04	0.1	1.3	964.9	
10/14/09 13:16:00	0.06	-0.06	-0.8	1.2	1004.8	
10/14/09 13:16:15	0.05	-0.06	-1.5	1.1	1008.1	
10/14/09 13:16:30	0.05	-0.06	-2.3	1.0	1009.5	
System Bias						
10/14/09 13:16:45	0.05	-0.06	-2.9	0.9	1009.5	CO Bias 2 Mid = 1008
10/14/09 13:17:00	0.05	-0.06	-3.4	0.9	1008.0	
10/14/09 13:17:15	0.05	-0.06	-3.8	0.8	1008.1	
10/14/09 13:17:30	0.05	-0.06	-4.0	0.8	1008.0	
10/14/09 13:17:45	0.05	-0.06	-4.5	0.7	1008.0	
10/14/09 13:18:00	0.05	-0.06	-4.8	3.8	1004.8	
10/14/09 13:18:15	0.06	-0.06	16.4	9.2	953.0	
10/14/09 13:18:30	0.12	0.35	51.8	9.3	661.0	
10/14/09 13:18:45	0.88	2.08	81.0	9.1	490.8	
10/14/09 13:19:00	1.59	3.36	103.2	9.0	258.5	
10/14/09 13:19:15	1.86	3.82	120.8	8.9	211.1	
10/14/09 13:19:30	1.90	3.90	133.9	8.9	182.9	
10/14/09 13:19:45	1.91	3.91	143.6	8.9	181.4	
10/14/09 13:20:00	1.93	3.91	150.4	8.8	179.9	
10/14/09 13:20:15	0.47	5.53	29.8	5.5	138.2	
10/14/09 13:20:30	0.47	5.53	29.8	5.5	138.2	
10/14/09 13:20:45	0.47	5.53	29.8	5.5	138.2	
10/14/09 13:21:00	0.47	5.53	29.8	5.5	138.2	
10/14/09 13:21:15	0.47	5.53	29.8	5.5	138.2	
10/14/09 13:21:30	0.47	5.53	29.8	5.5	138.2	
10/14/09 13:21:45	0.47	5.53	29.8	5.5	138.2	
10/14/09 14:00:15	0.51	1.80	197.9	9.2	137.5	
10/14/09 14:00:30	0.89	3.26	203.9	9.5	168.3	
10/14/09 14:00:45	1.05	3.84	205.9	9.5	178.6	
10/14/09 14:01:00	1.05	3.96	207.9	9.5	168.3	
10/14/09 14:01:15	1.01	3.99	208.0	9.6	146.6	
10/14/09 14:01:30	0.97	4.01	214.3	9.6	139.0	
10/14/09 14:01:45	0.95	4.02	213.0	9.4	131.6	
10/14/09 14:02:00	0.96	4.02	211.9	9.2	130.5	
10/14/09 14:02:15	0.98	4.01	212.1	9.1	140.4	
10/14/09 14:02:30	0.98	3.99	212.1	8.8	148.0	
10/14/09 14:02:45	0.96	3.99	210.6	8.6	168.3	
Begin Compliance Run 2						
10/14/09 14:03:00	0.98	3.97	208.6	8.8	178.6	
10/14/09 14:03:15	1.05	3.94	208.0	8.8	193.5	
10/14/09 14:03:30	1.09	3.93	207.5	8.8	195.1	
10/14/09 14:03:45	1.07	3.94	208.1	8.9	198.0	
10/14/09 14:04:00	1.03	3.94	207.4	8.9	197.9	
10/14/09 14:04:15	1.01	3.94	207.4	9.0	188.9	
10/14/09 14:04:30	1.00	3.94	207.7	8.9	181.5	
10/14/09 14:04:45	0.98	3.95	207.4	9.0	172.8	
10/14/09 14:05:00	0.95	3.96	207.2	9.0	169.8	
10/14/09 14:05:15	0.91	3.97	207.2	8.9	164.9	
10/14/09 14:05:30	0.90	3.98	207.1	8.7	163.5	
10/14/09 14:05:45	0.93	3.97	206.6	8.7	177.3	
10/14/09 14:06:00	0.97	3.96	205.0	8.4	190.4	
10/14/09 14:06:15	1.05	3.94	203.0	8.3	226.0	
10/14/09 14:06:30	1.15	3.93	200.8	8.6	246.7	
10/14/09 14:06:45	1.31	3.91	199.1	8.7	275.3	
10/14/09 14:07:00	1.45	3.90	198.8	9.2	279.7	
10/14/09 14:07:15	1.45	3.91	198.7	9.6	258.6	
10/14/09 14:07:30	1.34	3.94	197.8	9.7	237.8	
10/14/09 14:07:45	1.16	3.98	197.0	10.0	193.6	
10/14/09 14:08:00	1.05	4.01	197.0	9.9	172.8	
10/14/09 14:08:15	0.98	4.04	197.2	10.0	139.1	
10/14/09 14:08:30	0.95	4.06	197.9	9.8	129.1	
10/14/09 14:08:45	0.91	4.07	198.1	9.5	118.6	
10/14/09 14:09:00	0.87	4.08	199.6	9.2	121.6	
10/14/09 14:09:15	0.88	4.07	199.6	9.2	134.6	
10/14/09 14:09:30	0.86	4.05	198.9	8.9	140.5	
10/14/09 14:09:45	0.86	4.03	198.7	8.5	151.1	
10/14/09 14:10:00	0.93	3.99	200.1	8.3	163.5	
10/14/09 14:10:15	0.98	3.97	202.3	8.2	203.9	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 14:10:30	0.98	3.94	203.6	8.1	224.5	
10/14/09 14:10:45	1.02	3.93	205.9	8.2	260.1	
10/14/09 14:11:00	1.10	3.90	207.3	8.4	272.0	
10/14/09 14:11:15	1.13	3.89	207.9	8.5	272.0	
10/14/09 14:11:30	1.10	3.90	208.3	9.0	260.0	
10/14/09 14:11:45	1.10	3.91	208.8	9.2	228.9	
10/14/09 14:12:00	1.07	3.93	208.4	9.1	212.7	
10/14/09 14:12:15	0.99	3.95	207.4	9.2	187.4	
10/14/09 14:12:30	0.94	3.97	206.4	9.3	180.1	
10/14/09 14:12:45	0.92	3.98	205.2	9.4	174.2	
10/14/09 14:13:00	0.90	3.99	204.7	9.1	169.8	
10/14/09 14:13:15	0.92	3.98	205.0	9.1	163.4	
10/14/09 14:13:30	0.96	3.97	204.0	8.6	166.4	
10/14/09 14:13:45	1.03	3.95	201.7	8.5	195.1	
10/14/09 14:14:00	1.08	3.94	200.2	8.6	215.7	
10/14/09 14:14:15	1.20	3.92	198.3	8.8	258.5	
10/14/09 14:14:30	1.32	3.91	196.5	9.1	269.1	
10/14/09 14:14:45	1.36	3.91	195.3	9.2	257.1	
10/14/09 14:15:00	1.29	3.93	193.7	9.5	239.3	
10/14/09 14:15:15	1.16	3.96	193.1	9.5	199.4	
10/14/09 14:15:30	1.08	3.98	194.7	9.7	181.6	
10/14/09 14:15:45	1.00	4.01	196.6	9.7	148.1	
10/14/09 14:16:00	0.93	4.04	197.5	9.6	134.6	
10/14/09 14:16:15	0.87	4.06	198.1	9.2	118.7	
10/14/09 14:16:30	0.83	4.06	200.0	9.1	117.2	
10/14/09 14:16:45	0.83	4.05	202.3	8.6	130.5	
10/14/09 14:17:00	0.81	4.03	204.2	8.3	143.6	
10/14/09 14:17:15	0.83	4.00	206.4	8.0	190.3	
10/14/09 14:17:30	0.85	3.97	208.6	7.9	217.2	
10/14/09 14:17:45	0.92	3.94	210.7	7.9	255.7	
10/14/09 14:18:00	1.07	3.90	212.6	7.9	269.0	
10/14/09 14:18:15	1.17	3.88	214.6	8.1	285.6	
10/14/09 14:18:30	1.26	3.87	218.2	8.5	291.7	
10/14/09 14:18:45	1.34	3.87	219.3	8.7	281.1	
10/14/09 14:19:00	1.20	3.90	220.0	9.0	261.5	
10/14/09 14:19:15	1.04	3.93	220.0	9.0	212.7	
10/14/09 14:19:30	0.93	3.96	219.1	9.0	190.4	
10/14/09 14:19:45	0.86	3.98	217.6	9.0	163.4	
10/14/09 14:20:00	0.82	3.99	216.0	8.9	156.0	
10/14/09 14:20:15	0.82	3.99	213.1	8.9	156.0	
10/14/09 14:20:30	0.87	3.98	212.3	8.4	163.4	
10/14/09 14:20:45	0.91	3.97	209.7	7.9	193.5	
10/14/09 14:21:00	0.97	3.95	207.7	8.0	217.1	
10/14/09 14:21:15	1.09	3.93	205.2	8.0	267.6	
10/14/09 14:21:30	1.30	3.89	203.1	8.2	287.2	
10/14/09 14:21:45	1.36	3.89	200.9	8.7	304.0	
10/14/09 14:22:00	1.40	3.89	200.3	8.9	296.1	
10/14/09 14:22:15	1.31	3.92	202.3	8.9	267.6	
10/14/09 14:22:30	1.13	3.96	193.8	9.1	251.2	
10/14/09 14:22:45	0.99	4.00	190.2	9.3	217.1	
10/14/09 14:23:00	0.90	4.03	189.3	9.2	195.0	
10/14/09 14:23:15	0.90	4.04	189.8	9.0	160.5	
10/14/09 14:23:30	0.89	4.05	190.7	9.0	150.9	
10/14/09 14:23:45	0.88	4.05	190.0	8.8	154.0	
10/14/09 14:24:00	0.89	4.03	188.7	8.5	160.5	
10/14/09 14:24:15	0.91	4.01	189.0	8.2	181.5	
10/14/09 14:24:30	0.96	3.99	188.3	8.3	195.0	
10/14/09 14:24:45	1.07	3.95	187.9	8.2	214.1	
10/14/09 14:25:00	1.22	3.92	188.4	8.3	221.5	
10/14/09 14:25:15	1.24	3.92	190.1	8.3	233.4	
10/14/09 14:25:30	1.21	3.93	191.0	8.5	236.3	
10/14/09 14:25:45	1.15	3.93	190.9	8.7	231.9	
10/14/09 14:26:00	1.11	3.94	190.7	8.8	221.5	
10/14/09 14:26:15	1.05	3.96	190.4	8.9	193.6	
10/14/09 14:26:30	1.01	3.98	190.4	8.9	180.1	
10/14/09 14:26:45	0.97	3.99	190.7	8.8	160.5	
10/14/09 14:27:00	0.95	4.00	190.4	8.7	156.1	
10/14/09 14:27:15	0.94	4.02	189.8	8.6	159.0	
10/14/09 14:27:30	0.91	4.02	188.1	8.2	161.9	
10/14/09 14:27:45	0.95	3.99	185.6	7.9	174.2	
10/14/09 14:28:00	1.13	3.94	185.0	7.6	186.0	
10/14/09 14:28:15	1.36	3.89	182.5	7.6	220.1	
10/14/09 14:28:30	1.54	3.85	179.9	7.7	242.2	
10/14/09 14:28:45	1.70	3.82	180.7	8.4	278.2	
10/14/09 14:29:00	1.73	3.82	181.6	8.4	278.2	
10/14/09 14:29:15	1.54	3.87	182.4	8.6	242.3	
10/14/09 14:29:30	1.21	3.94	182.1	8.7	217.1	
10/14/09 14:29:45	1.02	3.98	181.7	8.6	181.7	
10/14/09 14:30:00	0.94	4.00	182.2	8.7	171.3	
10/14/09 14:30:15	0.98	4.00	183.1	8.6	160.5	
10/14/09 14:30:30	1.02	4.00	184.3	8.5	157.6	
10/14/09 14:30:45	1.02	3.99	186.4	8.3	163.5	
10/14/09 14:31:00	1.09	3.98	188.1	7.7	175.7	
10/14/09 14:31:15	1.05	3.97	187.2	7.4	221.5	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 14:31:30	1.10	3.95	186.1	7.6	251.2	
10/14/09 14:31:45	1.34	3.90	184.6	7.8	293.2	
10/14/09 14:32:00	1.61	3.86	184.3	8.0	302.5	
10/14/09 14:32:15	1.68	3.85	186.1	8.4	298.2	
10/14/09 14:32:30	1.60	3.88	185.0	8.8	282.6	
10/14/09 14:32:45	1.39	3.93	186.9	9.0	243.8	
10/14/09 14:33:00	1.20	3.97	187.7	9.0	220.0	
10/14/09 14:33:15	1.04	4.01	188.2	9.1	178.6	
10/14/09 14:33:30	0.96	4.04	188.6	9.2	163.4	
10/14/09 14:33:45	0.89	4.06	188.3	9.1	145.5	
10/14/09 14:34:00	0.83	4.06	188.0	8.8	137.5	
10/14/09 14:34:15	0.85	4.05	187.7	8.6	133.1	
10/14/09 14:34:30	0.90	4.03	187.3	8.2	139.0	
10/14/09 14:34:45	0.95	4.00	187.2	7.9	150.9	
10/14/09 14:35:00	1.01	3.97	185.9	7.5	193.5	
10/14/09 14:35:15	1.07	3.94	184.5	7.5	251.2	
10/14/09 14:35:30	1.24	3.90	183.9	7.8	276.7	
10/14/09 14:35:45	1.40	3.88	183.0	8.4	299.9	
10/14/09 14:36:00	1.50	3.87	183.6	8.5	294.6	
10/14/09 14:36:15	1.39	3.90	184.2	8.6	266.9	
10/14/09 14:36:30	1.17	3.94	184.0	8.7	239.3	
10/14/09 14:36:45	1.00	3.98	185.7	8.7	219.6	
10/14/09 14:37:00	0.87	4.01	186.5	8.8	198.0	
10/14/09 14:37:15	0.79	4.03	187.5	8.7	168.4	
10/14/09 14:37:30	0.80	4.04	188.6	8.5	153.9	
10/14/09 14:37:45	0.87	4.02	189.6	8.3	150.1	
10/14/09 14:38:00	0.90	4.00	190.8	7.8	164.9	
10/14/09 14:38:15	0.92	3.98	192.1	7.6	196.9	
10/14/09 14:38:30	1.01	3.96	193.7	7.4	242.2	
10/14/09 14:38:45	1.08	3.94	194.0	7.4	280.2	
10/14/09 14:39:00	1.16	3.92	192.9	7.7	335.7	
10/14/09 14:39:15	1.31	3.89	193.4	8.1	341.6	
10/14/09 14:39:30	1.44	3.89	193.7	8.4	317.5	
10/14/09 14:39:45	1.36	3.91	193.8	8.6	284.0	
10/14/09 14:40:00	1.21	3.94	196.3	8.8	248.1	
10/14/09 14:40:15	1.05	3.98	195.9	8.9	219.9	
10/14/09 14:40:30	0.94	4.01	193.4	8.9	192.0	
10/14/09 14:40:45	0.88	4.03	191.7	8.9	177.2	
10/14/09 14:41:00	0.90	4.03	191.0	8.7	156.0	
10/14/09 14:41:15	0.90	4.03	190.2	8.6	151.0	
10/14/09 14:41:30	0.92	4.02	188.9	8.4	160.5	
10/14/09 14:41:45	0.93	4.01	187.3	8.2	171.3	
10/14/09 14:42:00	0.96	3.99	186.1	8.0	206.8	
10/14/09 14:42:15	1.05	3.97	185.4	8.1	228.8	
10/14/09 14:42:30	1.19	3.94	185.7	8.4	251.2	
10/14/09 14:42:45	1.24	3.93	185.4	8.4	249.6	
10/14/09 14:43:00	1.15	3.94	185.7	8.7	229.0	
10/14/09 14:43:15	1.07	3.95	186.5	8.6	214.1	
10/14/09 14:43:30	1.02	3.96	188.5	8.7	196.5	
10/14/09 14:43:45	0.94	3.98	189.4	8.7	192.0	
10/14/09 14:44:00	0.83	4.00	191.5	8.5	177.2	
10/14/09 14:44:15	0.81	4.01	192.4	8.5	169.8	
10/14/09 14:44:30	0.81	4.00	193.4	8.0	168.3	
10/14/09 14:44:45	0.81	3.99	193.7	7.7	178.6	
10/14/09 14:45:00	0.86	3.96	194.5	7.6	211.2	
10/14/09 14:45:15	0.96	3.93	195.8	7.4	228.9	
10/14/09 14:45:30	1.13	3.90	196.0	7.6	267.5	
10/14/09 14:45:45	1.27	3.87	195.6	7.6	285.5	
10/14/09 14:46:00	1.43	3.85	195.9	8.1	308.3	
10/14/09 14:46:15	1.46	3.86	195.3	8.4	306.8	
10/14/09 14:46:30	1.44	3.87	196.2	8.8	282.5	
10/14/09 14:46:45	1.29	3.91	198.0	8.9	261.5	
10/14/09 14:47:00	1.13	3.95	193.0	9.1	220.0	
10/14/09 14:47:15	1.03	3.98	187.6	9.2	202.3	
10/14/09 14:47:30	0.97	4.00	184.4	9.2	177.1	
10/14/09 14:47:45	0.95	4.02	184.5	9.3	168.2	
10/14/09 14:48:00	0.95	4.03	179.5	9.1	156.0	
10/14/09 14:48:15	0.96	4.04	177.6	9.1	152.4	
10/14/09 14:48:30	0.96	4.04	176.1	8.9	156.1	
10/14/09 14:48:45	0.96	4.03	176.2	8.8	159.0	
10/14/09 14:49:00	0.97	4.02	177.7	8.7	171.3	
10/14/09 14:49:15	0.98	4.01	178.7	8.7	175.7	
10/14/09 14:49:30	1.01	3.99	181.5	8.7	178.6	
10/14/09 14:49:45	1.00	3.99	181.8	8.8	178.6	
10/14/09 14:50:00	1.00	3.98	184.7	8.5	171.3	
10/14/09 14:50:15	0.98	3.98	185.3	8.6	169.8	
10/14/09 14:50:30	0.97	3.98	190.8	8.5	178.7	
10/14/09 14:50:45	0.94	3.98	194.3	8.4	187.4	
10/14/09 14:51:00	0.89	3.98	194.0	8.4	197.9	
10/14/09 14:51:15	0.86	3.99	196.3	8.5	196.5	
10/14/09 14:51:30	0.90	3.97	196.1	8.3	187.5	
10/14/09 14:51:45	0.94	3.96	196.6	8.0	185.9	
10/14/09 14:52:00	0.96	3.94	198.3	8.0	197.9	
10/14/09 14:52:15	1.00	3.92	198.4	8.0	215.6	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 14:52:30	1.06	3.91	200.6	7.8	252.6	
10/14/09 14:52:45	1.13	3.89	198.9	8.2	270.5	
10/14/09 14:53:00	1.17	3.89	199.6	8.7	288.8	
10/14/09 14:53:15	1.16	3.90	196.6	8.7	275.2	
10/14/09 14:53:30	1.08	3.92	194.2	8.9	225.9	
10/14/09 14:53:45	0.97	3.95	193.0	9.0	202.4	
10/14/09 14:54:00	0.91	3.97	191.7	9.0	174.2	
10/14/09 14:54:15	0.88	3.98	189.0	8.8	166.3	
10/14/09 14:54:30	0.89	3.99	187.3	8.6	161.9	
10/14/09 14:54:45	0.89	4.00	188.4	8.6	166.4	
10/14/09 14:55:00	0.94	3.99	188.8	8.3	184.4	
10/14/09 14:55:15	1.01	3.97	186.1	8.2	197.9	
10/14/09 14:55:30	1.08	3.95	183.9	8.3	230.3	
10/14/09 14:55:45	1.23	3.93	187.2	8.3	245.1	
10/14/09 14:56:00	1.26	3.92	183.7	8.7	267.6	
10/14/09 14:56:15	1.26	3.93	181.8	9.0	270.4	
10/14/09 14:56:30	1.25	3.94	181.9	9.0	254.1	
10/14/09 14:56:45	1.17	3.97	182.9	9.3	239.2	
10/14/09 14:57:00	1.06	3.99	187.9	9.4	205.3	
10/14/09 14:57:15	1.01	4.01	186.4	9.6	188.8	
10/14/09 14:57:30	0.98	4.03	185.7	9.5	158.9	
10/14/09 14:57:45	0.96	4.04	184.9	9.3	146.5	
10/14/09 14:58:00	0.93	4.05	185.6	9.2	136.0	
10/14/09 14:58:15	0.92	4.05	189.2	9.0	136.0	
10/14/09 14:58:30	0.93	4.04	191.5	8.8	146.6	
10/14/09 14:58:45	0.94	4.03	190.9	8.5	153.9	
10/14/09 14:59:00	0.98	4.00	189.3	8.6	177.1	
10/14/09 14:59:15	1.06	3.98	189.5	8.6	192.0	
10/14/09 14:59:30	1.07	3.96	188.7	8.7	209.7	
10/14/09 14:59:45	1.02	3.96	188.1	8.7	209.6	
10/14/09 15:00:00	1.04	3.96	189.6	8.8	197.9	
10/14/09 15:00:15	1.01	3.97	188.6	8.8	193.5	
10/14/09 15:00:30	0.95	3.98	187.0	8.8	184.4	
10/14/09 15:00:45	0.89	4.00	187.0	8.9	178.5	
10/14/09 15:01:00	0.87	4.00	186.5	8.8	163.4	
10/14/09 15:01:15	0.88	4.00	189.1	8.6	156.0	
10/14/09 15:01:30	0.86	4.00	189.3	8.4	157.4	
10/14/09 15:01:45	0.86	3.99	188.5	8.1	168.2	
10/14/09 15:02:00	0.89	3.96	189.7	7.8	211.0	
10/14/09 15:02:15	0.96	3.94	191.3	7.7	236.2	
10/14/09 15:02:30	1.05	3.92	190.2	7.7	276.6	
10/14/09 15:02:45	1.20	3.89	196.9	7.8	291.6	
10/14/09 15:03:00	1.40	3.86	197.1	8.3	308.3	End Run 2
10/14/09 15:03:15	1.48	3.87	193.7	8.5	308.3	
10/14/09 15:03:30	1.44	3.88	192.9	8.9	288.6	
10/14/09 15:03:45	1.31	3.92	197.6	9.2	270.4	
10/14/09 15:04:00	1.12	3.96	195.6	9.3	224.4	
10/14/09 15:04:15	1.01	3.99	195.3	9.4	200.8	
10/14/09 15:04:30	0.96	4.02	194.3	9.5	166.3	
10/14/09 15:04:45	0.92	4.03	194.0	9.4	155.9	
10/14/09 15:05:00	0.92	4.04	197.2	9.3	146.5	
10/14/09 15:05:15	0.94	4.05	195.5	9.0	146.5	
10/14/09 15:05:30	0.95	4.04	193.9	9.1	153.8	
10/14/09 15:05:45	0.97	4.03	195.2	8.8	161.8	
10/14/09 15:06:00	1.00	4.01	194.4	8.8	177.1	
10/14/09 15:06:15	1.02	4.00	194.6	8.9	184.4	
10/14/09 15:06:30	1.04	3.99	192.7	8.9	193.5	
10/14/09 15:06:45	1.04	3.99	192.7	9.0	194.9	
10/14/09 15:07:00	1.02	3.99	171.7	6.0	185.9	
10/14/09 15:07:15	0.98	4.00	164.9	5.5	177.1	
10/14/09 15:07:30	0.97	3.80	177.8	0.7	125.9	
10/14/09 15:07:45	1.01	2.10	176.5	0.5	88.9	
10/14/09 15:08:00	0.58	0.64	166.6	5.4	27.2	
10/14/09 15:08:15	0.15	0.09	156.6	0.5	10.7	
10/14/09 15:08:30	0.05	0.04	152.1	0.3	-1.1	
10/14/09 15:08:45	0.04	0.11	149.8	0.3	-1.1	
10/14/09 15:09:00	0.03	0.02	149.4	0.3	-1.1	
10/14/09 15:09:15	0.03	-0.03	146.8	0.3	-1.1	
10/14/09 15:09:30	0.01	-0.04	145.7	0.3	-1.1	
10/14/09 15:09:45	0.02	-0.05	147.6	0.3	-1.1	
10/14/09 15:10:00	0.02	-0.05	149.2	0.3	-2.6	
10/14/09 15:10:15	0.01	-0.05	146.2	0.3	-2.6	
10/14/09 15:10:30	0.02	-0.05	145.3	0.2	-2.5	
10/14/09 15:10:45	0.02	-0.06	145.5	0.2	-2.5	System Bias
10/14/09 15:11:00	0.01	-0.06	146.1	0.2	-2.6	SO ₂ Bias 3 Mid = 145.7
10/14/09 15:11:15	0.02	-0.05	146.0	0.2	-2.6	O ₂ Bias 3 Zero = 0.01
10/14/09 15:11:30	0.01	-0.05	145.4	3.6	-1.1	
10/14/09 15:11:45	0.01	-0.06	148.4	1.2	13.8	
10/14/09 15:12:00	0.10	0.33	141.6	0.9	61.9	
10/14/09 15:12:15	0.63	1.34	116.2	0.4	69.3	
10/14/09 15:12:30	0.41	2.05	88.6	0.3	37.9	
10/14/09 15:12:45	0.14	3.69	69.0	0.3	18.3	
10/14/09 15:13:00	0.03	4.63	54.5	0.3	0.3	
10/14/09 15:13:15	0.01	4.80	42.1	0.3	-2.6	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 15:13:30	0.01	4.82	33.4	0.3	-2.6	
10/14/09 15:13:45	0.00	4.92	26.6	0.3	-2.6	
10/14/09 15:14:00	0.00	5.01	21.6	0.3	-2.6	
10/14/09 15:14:15	0.00	5.05	17.9	0.3	-4.0	
10/14/09 15:14:30	0.00	5.06	13.8	0.2	-2.6	
10/14/09 15:14:45	0.00	5.07	10.6	0.2	-2.7	System Bias
10/14/09 15:15:00	0.00	5.07	8.0	0.2	-2.7	CO ₂ Bias 3 Mid = 5.07
10/14/09 15:15:15	0.00	5.08	6.1	0.2	-2.6	
10/14/09 15:15:30	0.01	5.08	12.5	4.1	3.3	
10/14/09 15:15:45	0.00	5.09	12.8	0.6	18.2	
10/14/09 15:16:00	0.18	4.87	11.5	0.3	43.9	
10/14/09 15:16:15	0.59	4.31	9.5	0.2	39.4	
10/14/09 15:16:30	2.25	2.11	7.5	0.2	15.3	
10/14/09 15:16:45	3.85	0.50	5.5	0.2	4.8	
10/14/09 15:17:00	4.35	0.09	3.8	0.2	-1.1	
10/14/09 15:17:15	4.46	0.01	2.3	0.2	-1.1	
10/14/09 15:17:30	4.52	-0.01	1.1	0.2	-2.6	
10/14/09 15:17:45	4.54	-0.03	-0.1	0.2	-2.6	
10/14/09 15:18:00	4.54	-0.03	-0.4	0.2	-2.6	
10/14/09 15:18:15	4.55	-0.04	-1.5	0.2	-2.7	
10/14/09 15:18:30	4.54	-0.04	-2.1	0.2	-2.6	
10/14/09 15:18:45	4.55	-0.05	-2.4	0.2	-2.6	System Bias
10/14/09 15:19:00	4.55	-0.04	-2.9	0.2	-2.7	O ₂ Bias 3 Mid = 4.55
10/14/09 15:19:15	4.54	-0.05	-3.3	0.2	-2.7	SO ₂ Bias 3 Zero = -3.4
10/14/09 15:19:30	4.55	-0.05	-3.7	0.2	-2.6	NO _x Bias 3 Zero = 0.2
10/14/09 15:19:45	4.56	-0.05	-3.9	0.2	-2.6	CO Bias 3 Zero = -2.6
10/14/09 15:20:00	4.55	-0.05	-4.2	0.3	-2.6	CO ₂ Bias 3 Zero = -0.05
10/14/09 15:20:15	4.56	-0.05	-4.3	1.4	-2.6	
10/14/09 15:20:30	4.56	-0.05	-1.2	1.4	10.7	
10/14/09 15:20:45	4.53	0.05	2.3	2.7	27.3	
10/14/09 15:21:00	4.00	0.81	2.7	20.8	42.3	
10/14/09 15:21:15	3.20	0.51	2.1	25.5	33.1	
10/14/09 15:21:30	1.32	0.10	1.7	26.3	7.7	
10/14/09 15:21:45	0.37	-0.02	0.2	26.7	1.9	
10/14/09 15:22:00	0.12	-0.04	-0.2	27.2	-1.1	
10/14/09 15:22:15	0.06	-0.06	-0.9	27.1	-2.6	
10/14/09 15:22:30	0.06	-0.05	-1.5	27.4	-2.6	
10/14/09 15:22:45	0.05	-0.06	-2.1	27.4	-2.6	
10/14/09 15:23:00	0.05	-0.05	-2.6	31.3	-2.5	
10/14/09 15:23:15	0.05	-0.06	-3.0	40.9	-2.6	
10/14/09 15:23:30	0.04	-0.06	-3.4	41.1	-2.5	
10/14/09 15:23:45	0.04	-0.06	-3.7	40.4	-2.5	
10/14/09 15:24:00	0.04	-0.06	-3.8	40.0	-2.6	
10/14/09 15:24:15	0.03	-0.06	-4.2	39.7	-2.5	
10/14/09 15:24:30	0.03	-0.07	-4.5	39.4	-2.5	
10/14/09 15:24:45	0.03	-0.07	-4.7	39.2	-2.5	
10/14/09 15:25:00	0.02	-0.07	-4.5	39.0	-2.6	
10/14/09 15:25:15	0.03	-0.07	-5.0	38.9	-2.6	
10/14/09 15:25:30	0.03	-0.07	-5.2	38.7	-2.6	
10/14/09 15:25:45	0.02	-0.07	-5.1	38.6	-2.5	
10/14/09 15:26:00	0.02	-0.07	-5.1	38.5	-2.5	
10/14/09 15:26:15	0.02	-0.07	-5.3	38.4	-2.6	System Bias
10/14/09 15:26:30	0.02	-0.07	-5.2	38.3	-2.6	NO _x Bias 3 Mid = 38.3
10/14/09 15:26:45	0.02	-0.07	-5.4	38.3	-2.6	
10/14/09 15:27:00	0.03	-0.07	-5.3	38.2	-2.6	
10/14/09 15:27:15	0.02	-0.07	-5.1	38.2	-2.6	
10/14/09 15:27:30	0.03	-0.08	-1.1	38.2	-2.6	
10/14/09 15:27:45	0.03	-0.07	-4.5	29.1	-1.1	
10/14/09 15:28:00	0.02	-0.06	0.1	88.3	34.6	
10/14/09 15:28:15	0.23	0.61	0.8	12.4	108.2	
10/14/09 15:28:30	0.49	0.64	0.4	2.8	432.4	
10/14/09 15:28:45	0.40	0.15	-0.3	1.9	636.7	
10/14/09 15:29:00	0.14	-0.04	-1.3	1.5	918.7	
10/14/09 15:29:15	0.06	-0.07	-1.4	1.4	972.2	
10/14/09 15:29:30	0.02	-0.07	0.9	1.3	997.5	
10/14/09 15:29:45	0.01	-0.07	-2.9	1.1	1000.4	
10/14/09 15:30:00	0.02	-0.08	-3.0	1.1	1002.0	
10/14/09 15:30:15	0.02	-0.07	-3.4	1.1	1002.0	
10/14/09 15:30:30	0.02	-0.07	0.0	1.1	1003.4	
10/14/09 15:30:45	0.01	-0.07	-4.3	1.0	1001.9	
10/14/09 15:31:00	0.02	-0.07	-4.8	1.0	1000.4	
10/14/09 15:31:15	0.01	-0.07	-4.8	1.0	1000.5	
10/14/09 15:31:30	0.01	-0.07	-4.9	0.9	1002.0	System Bias
10/14/09 15:31:45	0.01	-0.07	-4.8	0.9	1001.8	CO Bias 3 Mid = 1003
10/14/09 15:32:00	0.01	-0.07	-0.1	0.9	1001.9	
10/14/09 15:32:15	0.01	-0.07	-0.4	0.8	1003.3	
10/14/09 15:32:30	0.02	-0.07	0.4	0.8	1003.3	
10/14/09 15:32:45	0.01	-0.07	0.2	0.8	1003.3	
10/14/09 15:33:00	0.01	-0.07	-0.1	4.0	1000.4	
10/14/09 15:33:15	0.01	-0.07	8.1	8.5	973.7	
10/14/09 15:33:30	0.06	0.20	34.2	8.3	765.1	
10/14/09 15:33:45	0.74	2.01	64.6	8.2	624.9	
10/14/09 15:34:00	1.45	3.35	94.5	8.2	422.2	
10/14/09 15:34:15	1.70	3.71	115.6	8.3	376.8	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 15:34:30	1.78	3.77	135.3	8.2	352.0	
10/14/09 15:34:45	1.80	3.79	164.6	8.3	349.0	
10/14/09 15:35:00	1.80	3.79	175.4	8.3	344.5	
10/14/09 15:35:15	1.85	3.79	183.4	8.5	343.0	
10/14/09 16:13:45	2.12	3.81	175.3	6.8	343.1	
10/14/09 16:14:00	2.17	3.81	172.8	6.7	341.6	
10/14/09 16:14:15	2.20	3.80	170.0	6.7	340.1	
10/14/09 16:14:30	2.25	3.80	166.8	6.7	338.6	
10/14/09 16:14:45	2.27	3.79	164.7	6.8	337.1	
10/14/09 16:15:00	2.29	3.79	163.1	6.7	333.9	
10/14/09 16:15:15	2.29	3.79	160.2	6.8	332.4	
10/14/09 16:15:30	2.29	3.78	158.4	6.7	329.5	
10/14/09 16:15:45	2.30	3.78	157.3	6.7	328.0	
10/14/09 16:16:00	2.28	3.78	156.7	6.7	326.5	
10/14/09 16:16:15	2.28	3.79	157.0	6.7	326.4	
10/14/09 16:16:30	2.27	3.78	157.5	6.7	326.5	
10/14/09 16:16:45	2.27	3.78	157.7	6.8	328.0	
10/14/09 16:17:00	2.27	3.78	158.5	6.7	329.4	
10/14/09 16:17:15	2.26	3.78	160.0	6.8	330.9	
10/14/09 16:17:30	2.25	3.78	160.0	6.7	333.9	
10/14/09 16:17:45	2.23	3.79	160.7	6.7	333.9	
10/14/09 16:18:00	2.25	3.78	161.0	6.7	333.9	
10/14/09 16:18:15	2.25	3.79	161.2	6.7	335.7	
10/14/09 16:18:30	2.24	3.78	162.6	6.8	337.1	
10/14/09 16:18:45	2.23	3.79	166.8	6.8	337.1	
10/14/09 16:19:00	2.20	3.79	171.6	6.8	338.6	
10/14/09 16:19:15	2.21	3.79	174.6	6.8	340.2	
10/14/09 16:19:30	2.19	3.79	170.7	6.8	340.2	
10/14/09 16:19:45	2.18	3.79	167.8	6.8	340.2	Begin Compliance Run 3
10/14/09 16:20:00	2.20	3.78	165.1	6.8	338.7	
10/14/09 16:20:15	2.21	3.78	160.2	6.8	338.7	
10/14/09 16:20:30	2.24	3.78	157.5	6.8	338.6	
10/14/09 16:20:45	2.25	3.78	155.7	6.7	338.6	
10/14/09 16:21:00	2.28	3.79	154.1	6.8	337.2	
10/14/09 16:21:15	2.30	3.78	152.4	6.7	335.6	
10/14/09 16:21:30	2.33	3.78	151.0	6.7	333.8	
10/14/09 16:21:45	2.34	3.78	149.7	6.7	333.9	
10/14/09 16:22:00	2.34	3.78	148.7	6.8	332.3	
10/14/09 16:22:15	2.33	3.79	149.9	6.8	330.9	
10/14/09 16:22:30	2.29	3.80	151.2	6.8	330.9	
10/14/09 16:22:45	2.28	3.80	152.7	6.8	330.9	
10/14/09 16:23:00	2.27	3.80	154.3	6.8	330.8	
10/14/09 16:23:15	2.26	3.79	156.3	6.8	330.8	
10/14/09 16:23:30	2.25	3.80	157.9	6.8	329.4	
10/14/09 16:23:45	2.24	3.80	159.1	6.9	330.9	
10/14/09 16:24:00	2.24	3.80	160.2	6.8	332.3	
10/14/09 16:24:15	2.23	3.80	167.9	6.8	333.8	
10/14/09 16:24:30	2.23	3.80	164.2	6.8	335.7	
10/14/09 16:24:45	2.22	3.80	162.9	6.8	335.7	
10/14/09 16:25:00	2.24	3.80	162.3	6.8	335.6	
10/14/09 16:25:15	2.25	3.80	161.0	6.8	337.1	
10/14/09 16:25:30	2.25	3.80	159.4	6.7	335.7	
10/14/09 16:25:45	2.28	3.81	156.7	6.7	335.6	
10/14/09 16:26:00	2.27	3.81	154.8	6.7	335.6	
10/14/09 16:26:15	2.27	3.82	155.1	6.7	335.6	
10/14/09 16:26:30	2.25	3.83	153.3	6.7	335.6	
10/14/09 16:26:45	2.24	3.83	154.1	6.7	335.6	
10/14/09 16:27:00	2.24	3.82	158.3	6.7	335.7	
10/14/09 16:27:15	2.21	3.82	158.1	6.6	335.7	
10/14/09 16:27:30	2.22	3.82	151.7	6.6	335.6	
10/14/09 16:27:45	2.21	3.81	151.1	6.6	337.1	
10/14/09 16:28:00	2.20	3.81	149.1	6.5	337.1	
10/14/09 16:28:15	2.19	3.80	156.1	6.6	337.1	
10/14/09 16:28:30	2.21	3.80	155.2	6.6	335.7	
10/14/09 16:28:45	2.22	3.81	153.3	6.6	335.6	
10/14/09 16:29:00	2.23	3.81	149.2	6.6	335.7	
10/14/09 16:29:15	2.25	3.80	144.8	6.6	333.8	
10/14/09 16:29:30	2.28	3.80	143.0	6.5	333.8	
10/14/09 16:29:45	2.31	3.81	142.3	6.6	333.8	
10/14/09 16:30:00	2.32	3.81	145.6	6.5	332.4	
10/14/09 16:30:15	2.31	3.81	140.9	6.6	332.4	
10/14/09 16:30:30	2.31	3.81	140.3	6.5	329.4	
10/14/09 16:30:45	2.32	3.82	142.3	6.6	327.9	
10/14/09 16:31:00	2.34	3.83	150.2	6.6	326.5	
10/14/09 16:31:15	2.34	3.82	149.3	6.6	326.5	
10/14/09 16:31:30	2.31	3.83	148.5	6.6	325.0	
10/14/09 16:31:45	2.31	3.82	148.1	6.6	325.0	
10/14/09 16:32:00	2.28	3.82	152.5	6.6	325.0	
10/14/09 16:32:15	2.26	3.81	156.9	6.6	325.0	
10/14/09 16:32:30	2.25	3.82	157.6	6.5	327.9	
10/14/09 16:32:45	2.23	3.81	158.1	6.6	327.9	
10/14/09 16:33:00	2.22	3.81	159.0	6.6	327.9	
10/14/09 16:33:15	2.22	3.82	159.8	6.6	329.4	
10/14/09 16:33:30	2.22	3.81	161.5	6.6	332.3	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 16:33:45	2.19	3.82	162.7	6.5	333.9	
10/14/09 16:34:00	2.18	3.82	162.6	6.6	335.7	
10/14/09 16:34:15	2.18	3.82	162.5	6.5	337.1	
10/14/09 16:34:30	2.18	3.81	163.0	6.5	335.6	
10/14/09 16:34:45	2.19	3.81	163.9	6.5	335.6	
10/14/09 16:35:00	2.18	3.81	163.4	6.5	335.7	
10/14/09 16:35:15	2.19	3.81	156.6	6.5	335.6	
10/14/09 16:35:30	2.19	3.81	158.5	6.5	337.1	
10/14/09 16:35:45	2.21	3.79	155.7	6.5	337.1	
10/14/09 16:36:00	2.22	3.80	158.5	6.5	335.7	
10/14/09 16:36:15	2.21	3.80	160.3	6.6	335.7	
10/14/09 16:36:30	2.23	3.80	159.7	6.6	337.2	
10/14/09 16:36:45	2.22	3.80	158.9	6.6	335.7	
10/14/09 16:37:00	2.21	3.80	158.1	6.6	333.9	
10/14/09 16:37:15	2.22	3.80	156.0	6.6	332.4	
10/14/09 16:37:30	2.22	3.79	154.9	6.6	331.0	
10/14/09 16:37:45	2.25	3.79	153.6	6.6	329.4	
10/14/09 16:38:00	2.26	3.79	142.3	6.6	328.0	
10/14/09 16:38:15	2.30	3.78	140.0	6.6	326.4	
10/14/09 16:38:30	2.33	3.78	137.6	6.6	325.0	
10/14/09 16:38:45	2.35	3.78	138.5	6.6	323.6	
10/14/09 16:39:00	2.37	3.79	136.6	6.4	320.4	
10/14/09 16:39:15	2.36	3.80	133.1	6.5	317.4	
10/14/09 16:39:30	2.43	3.77	134.9	6.6	314.4	
10/14/09 16:39:45	2.50	3.77	131.7	6.5	313.0	
10/14/09 16:40:00	2.41	3.79	131.3	6.7	308.3	
10/14/09 16:40:15	2.40	3.79	130.7	6.7	305.3	
10/14/09 16:40:30	2.51	3.79	131.3	6.7	302.4	
10/14/09 16:40:45	2.51	3.78	132.3	6.7	301.0	
10/14/09 16:41:00	2.45	3.79	132.8	6.7	299.5	
10/14/09 16:41:15	2.38	3.80	132.7	6.6	299.5	
10/14/09 16:41:30	2.35	3.81	133.1	6.6	296.1	
10/14/09 16:41:45	2.36	3.80	134.4	6.7	296.1	
10/14/09 16:42:00	2.41	3.78	138.0	6.7	294.5	
10/14/09 16:42:15	2.40	3.79	138.3	6.7	296.1	
10/14/09 16:42:30	2.34	3.80	134.6	6.7	297.6	
10/14/09 16:42:45	2.31	3.81	134.9	6.7	297.5	
10/14/09 16:43:00	2.32	3.81	135.4	6.7	299.4	
10/14/09 16:43:15	2.29	3.81	136.7	6.7	299.5	
10/14/09 16:43:30	2.32	3.80	138.0	6.7	299.4	
10/14/09 16:43:45	2.41	3.77	140.4	6.6	299.4	
10/14/09 16:44:00	2.39	3.78	142.3	6.6	303.9	
10/14/09 16:44:15	2.30	3.80	148.4	6.5	305.3	
10/14/09 16:44:30	2.19	3.81	149.0	6.5	309.7	
10/14/09 16:44:45	2.17	3.82	151.6	6.5	313.0	
10/14/09 16:45:00	2.19	3.81	153.7	6.3	316.0	
10/14/09 16:45:15	2.18	3.82	154.2	6.3	317.4	
10/14/09 16:45:30	2.23	3.81	147.6	6.4	318.9	
10/14/09 16:45:45	2.32	3.80	147.6	6.4	318.9	
10/14/09 16:46:00	2.29	3.81	147.1	6.5	320.3	
10/14/09 16:46:15	2.26	3.81	146.4	6.6	320.4	
10/14/09 16:46:30	2.23	3.81	145.4	6.6	320.4	
10/14/09 16:46:45	2.23	3.82	144.7	6.6	318.9	
10/14/09 16:47:00	2.26	3.81	144.1	6.7	317.4	
10/14/09 16:47:15	2.26	3.81	145.1	6.6	316.0	
10/14/09 16:47:30	2.26	3.81	143.8	6.6	314.5	
10/14/09 16:47:45	2.27	3.80	145.2	6.7	314.4	
10/14/09 16:48:00	2.26	3.81	144.3	6.6	313.0	
10/14/09 16:48:15	2.26	3.81	151.9	6.6	313.0	
10/14/09 16:48:30	2.25	3.82	153.8	6.6	313.0	
10/14/09 16:48:45	2.23	3.83	152.4	6.6	313.0	
10/14/09 16:49:00	2.23	3.83	152.5	6.5	314.4	
10/14/09 16:49:15	2.21	3.83	147.6	6.6	314.5	
10/14/09 16:49:30	2.22	3.83	152.7	6.5	315.9	
10/14/09 16:49:45	2.21	3.83	148.8	6.5	315.9	
10/14/09 16:50:00	2.20	3.82	149.2	6.7	317.4	
10/14/09 16:50:15	2.18	3.82	149.4	6.8	317.4	
10/14/09 16:50:30	2.16	3.83	149.8	6.8	320.5	
10/14/09 16:50:45	2.16	3.82	151.1	7.0	321.9	
10/14/09 16:51:00	2.15	3.82	159.1	7.1	321.8	
10/14/09 16:51:15	2.13	3.83	156.8	7.0	323.6	
10/14/09 16:51:30	2.10	3.83	152.0	7.1	327.9	
10/14/09 16:51:45	2.07	3.83	153.0	7.1	330.9	
10/14/09 16:52:00	2.06	3.83	153.6	7.1	332.4	
10/14/09 16:52:15	2.05	3.84	154.8	7.1	332.4	
10/14/09 16:52:30	2.05	3.84	156.6	7.1	333.9	
10/14/09 16:52:45	2.04	3.84	168.8	7.1	333.9	
10/14/09 16:53:00	2.03	3.84	168.2	7.1	337.2	
10/14/09 16:53:15	2.02	3.85	165.3	7.1	337.2	
10/14/09 16:53:30	2.01	3.85	163.3	7.0	337.2	
10/14/09 16:53:45	2.04	3.84	162.3	7.0	335.7	
10/14/09 16:54:00	2.06	3.84	162.7	6.9	333.8	
10/14/09 16:54:15	2.11	3.83	162.5	6.7	332.4	
10/14/09 16:54:30	2.15	3.83	161.6	6.8	332.4	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 16:54:45	2.16	3.82	160.4	6.7	330.9	
10/14/09 16:55:00	2.20	3.82	158.7	6.6	328.0	
10/14/09 16:55:15	2.22	3.82	161.3	6.6	326.5	
10/14/09 16:55:30	2.25	3.82	155.7	6.6	323.6	
10/14/09 16:55:45	2.28	3.82	157.5	6.6	321.9	
10/14/09 16:56:00	2.29	3.82	156.3	6.6	320.3	
10/14/09 16:56:15	2.32	3.82	154.0	6.6	318.9	
10/14/09 16:56:30	2.31	3.82	147.9	6.6	317.4	
10/14/09 16:56:45	2.31	3.82	150.8	6.7	315.9	
10/14/09 16:57:00	2.31	3.83	148.1	6.7	313.0	
10/14/09 16:57:15	2.30	3.84	145.8	6.8	313.0	
10/14/09 16:57:30	2.27	3.84	145.5	6.9	313.0	
10/14/09 16:57:45	2.24	3.84	146.3	7.1	313.0	
10/14/09 16:58:00	2.22	3.84	147.7	7.2	316.0	
10/14/09 16:58:15	2.18	3.85	149.7	7.2	317.4	
10/14/09 16:58:30	2.13	3.84	151.7	7.2	318.9	
10/14/09 16:58:45	2.10	3.85	155.8	7.2	320.4	
10/14/09 16:59:00	2.06	3.85	155.8	7.1	323.5	
10/14/09 16:59:15	2.05	3.85	156.6	7.1	325.0	
10/14/09 16:59:30	2.05	3.85	159.5	7.1	325.0	
10/14/09 16:59:45	2.06	3.85	160.0	7.1	325.1	
10/14/09 17:00:00	2.08	3.84	159.0	7.1	326.5	
10/14/09 17:00:15	2.08	3.84	159.5	7.0	328.0	
10/14/09 17:00:30	2.08	3.84	160.7	7.1	330.9	
10/14/09 17:00:45	2.05	3.85	160.7	7.1	331.0	
10/14/09 17:01:00	2.06	3.84	161.7	7.1	330.9	
10/14/09 17:01:15	2.06	3.85	163.3	7.1	332.4	
10/14/09 17:01:30	2.05	3.84	164.4	7.1	333.9	
10/14/09 17:01:45	2.05	3.84	165.3	7.0	335.7	
10/14/09 17:02:00	2.04	3.84	168.3	7.0	337.3	
10/14/09 17:02:15	2.04	3.84	166.6	7.0	337.2	
10/14/09 17:02:30	2.06	3.85	165.7	7.0	337.2	
10/14/09 17:02:45	2.07	3.85	165.3	6.9	337.3	
10/14/09 17:03:00	2.09	3.86	165.1	6.8	337.2	
10/14/09 17:03:15	2.10	3.86	164.4	6.8	338.6	
10/14/09 17:03:30	2.14	3.87	162.4	6.6	340.1	
10/14/09 17:03:45	2.17	3.86	160.7	6.7	340.1	
10/14/09 17:04:00	2.20	3.86	156.6	6.7	338.6	
10/14/09 17:04:15	2.23	3.86	154.0	6.6	337.2	
10/14/09 17:04:30	2.24	3.85	151.0	6.6	335.7	
10/14/09 17:04:45	2.29	3.84	148.1	6.5	333.9	
10/14/09 17:05:00	2.33	3.84	145.3	6.5	330.9	
10/14/09 17:05:15	2.33	3.84	143.7	6.6	329.4	
10/14/09 17:05:30	2.34	3.84	144.1	6.6	326.5	
10/14/09 17:05:45	2.33	3.83	142.2	6.8	325.0	
10/14/09 17:06:00	2.30	3.85	141.7	6.8	321.8	
10/14/09 17:06:15	2.27	3.84	140.4	6.7	321.9	
10/14/09 17:06:30	2.26	3.84	139.3	6.8	320.4	
10/14/09 17:06:45	2.24	3.84	139.6	7.0	320.4	
10/14/09 17:07:00	2.21	3.85	145.0	7.0	321.9	
10/14/09 17:07:15	2.18	3.85	142.5	7.1	323.6	
10/14/09 17:07:30	2.15	3.86	144.6	7.1	329.5	
10/14/09 17:07:45	2.12	3.86	147.1	7.1	330.9	
10/14/09 17:08:00	2.10	3.85	153.6	7.1	333.9	
10/14/09 17:08:15	2.10	3.86	153.5	7.1	333.9	
10/14/09 17:08:30	2.11	3.85	150.0	6.9	335.7	
10/14/09 17:08:45	2.11	3.84	151.5	7.0	335.6	
10/14/09 17:09:00	2.12	3.85	151.1	7.0	337.2	
10/14/09 17:09:15	2.12	3.85	156.3	7.0	337.2	
10/14/09 17:09:30	2.09	3.86	156.5	7.0	338.6	
10/14/09 17:09:45	2.10	3.85	154.5	7.0	338.6	
10/14/09 17:10:00	2.10	3.85	154.8	7.0	340.1	
10/14/09 17:10:15	2.11	3.85	153.4	7.0	340.1	
10/14/09 17:10:30	2.12	3.84	154.9	7.0	340.1	
10/14/09 17:10:45	2.12	3.84	154.9	7.0	340.0	
10/14/09 17:11:00	2.13	3.84	154.3	7.0	340.1	
10/14/09 17:11:15	2.12	3.84	154.7	7.0	340.1	
10/14/09 17:11:30	2.14	3.83	152.5	6.9	338.7	
10/14/09 17:11:45	2.17	3.82	150.8	6.9	337.2	
10/14/09 17:12:00	2.18	3.82	149.2	6.9	337.1	
10/14/09 17:12:15	2.20	3.82	148.5	6.8	335.7	
10/14/09 17:12:30	2.21	3.81	145.7	6.8	333.9	
10/14/09 17:12:45	2.23	3.81	143.7	6.7	332.5	
10/14/09 17:13:00	2.26	3.81	141.5	6.7	331.0	
10/14/09 17:13:15	2.28	3.81	139.3	6.7	329.5	
10/14/09 17:13:30	2.30	3.81	143.0	6.7	328.0	
10/14/09 17:13:45	2.31	3.81	136.2	6.7	328.0	
10/14/09 17:14:00	2.32	3.82	135.2	6.7	325.1	
10/14/09 17:14:15	2.31	3.82	135.5	6.7	323.7	
10/14/09 17:14:30	2.31	3.81	135.8	6.7	320.5	
10/14/09 17:14:45	2.32	3.83	135.4	6.7	319.0	
10/14/09 17:15:00	2.30	3.82	134.1	6.8	316.1	
10/14/09 17:15:15	2.30	3.82	135.5	6.9	316.0	
10/14/09 17:15:30	2.26	3.83	140.2	7.0	316.1	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 17:15:45	2.23	3.84	139.9	7.2	316.0	
10/14/09 17:16:00	2.19	3.83	143.7	7.2	319.0	
10/14/09 17:16:15	2.14	3.85	147.4	7.2	320.4	
10/14/09 17:16:30	2.08	3.85	150.8	7.2	323.6	
10/14/09 17:16:45	2.03	3.85	153.2	7.1	326.5	
10/14/09 17:17:00	2.00	3.86	159.6	7.1	330.9	
10/14/09 17:17:15	1.97	3.86	160.1	7.1	332.4	
10/14/09 17:17:30	1.97	3.85	160.7	7.1	332.4	
10/14/09 17:17:45	1.98	3.87	161.3	7.2	333.9	
10/14/09 17:18:00	1.98	3.86	162.5	7.1	335.7	
10/14/09 17:18:15	1.98	3.86	163.5	7.1	335.7	
10/14/09 17:18:30	1.97	3.87	164.3	7.1	337.1	
10/14/09 17:18:45	1.97	3.86	172.1	7.1	338.7	
10/14/09 17:19:00	1.96	3.85	170.4	7.1	338.6	
10/14/09 17:19:15	1.95	3.86	165.0	7.1	338.6	
10/14/09 17:19:30	1.96	3.85	165.1	7.2	337.2	
10/14/09 17:19:45	1.95	3.84	168.0	7.1	337.2	
10/14/09 17:20:00	1.97	3.83	163.6	7.1	337.2	End Run 3
10/14/09 17:20:15	2.01	3.83	163.9	7.1	335.8	
10/14/09 17:20:30	2.04	3.83	163.6	7.1	335.7	
10/14/09 17:20:45	2.09	3.82	161.2	7.1	335.7	
10/14/09 17:21:00	2.11	3.83	157.5	7.1	337.2	
10/14/09 17:21:15	2.12	3.83	155.1	6.9	337.2	
10/14/09 17:21:30	2.14	3.83	152.6	6.8	337.2	
10/14/09 17:21:45	2.18	3.83	149.8	6.8	337.2	
10/14/09 17:22:00	2.23	3.82	147.1	6.8	337.2	
10/14/09 17:22:15	2.25	3.83	147.7	6.8	337.2	
10/14/09 17:22:30	2.27	3.83	145.3	6.9	334.0	
10/14/09 17:22:45	2.28	3.84	142.2	7.0	333.9	
10/14/09 17:23:00	2.26	3.83	141.9	7.0	334.0	
10/14/09 17:23:15	2.24	3.83	142.7	7.0	333.9	
10/14/09 17:23:30	2.21	3.85	142.4	7.1	332.4	
10/14/09 17:23:45	2.19	3.85	143.0	7.1	332.4	
10/14/09 17:24:00	2.18	3.85	145.8	7.2	330.9	
10/14/09 17:24:15	2.14	3.84	148.6	7.2	332.5	
10/14/09 17:24:30	2.12	3.85	148.2	7.2	332.4	
10/14/09 17:24:45	2.11	3.84	148.6	4.9	332.4	
10/14/09 17:25:00	2.08	3.84	121.7	15.6	396.7	
10/14/09 17:25:15	2.06	3.68	96.1	1.3	496.9	
10/14/09 17:25:30	1.90	1.97	77.0	0.9	778.8	
10/14/09 17:25:45	1.02	0.45	59.7	0.6	891.8	
10/14/09 17:26:00	0.24	0.05	46.9	0.5	990.1	
10/14/09 17:26:15	0.03	-0.02	37.9	0.5	999.1	
10/14/09 17:26:30	-0.01	-0.04	30.8	0.4	1003.5	
10/14/09 17:26:45	-0.01	-0.05	24.3	0.4	1003.4	
10/14/09 17:27:00	-0.01	-0.05	19.8	0.3	1004.9	
10/14/09 17:27:15	-0.02	-0.06	16.5	0.3	1004.9	System Bias
10/14/09 17:27:30	-0.01	-0.05	13.4	0.3	1006.7	CO Bias 4 Mid = 1005
10/14/09 17:27:45	-0.02	-0.06	10.9	0.3	1006.7	
10/14/09 17:28:00	-0.02	-0.06	8.6	0.3	1004.9	
10/14/09 17:28:15	-0.02	-0.06	7.1	0.3	1003.4	
10/14/09 17:28:30	-0.02	-0.06	5.4	4.2	1002.0	
10/14/09 17:28:45	-0.02	-0.06	6.9	3.6	973.8	
10/14/09 17:29:00	0.06	0.24	8.7	7.1	820.5	
10/14/09 17:29:15	0.49	0.83	7.7	23.0	667.0	
10/14/09 17:29:30	0.27	0.35	6.2	25.1	293.1	
10/14/09 17:29:45	0.04	0.02	4.9	25.8	156.2	
10/14/09 17:30:00	-0.01	-0.04	4.0	26.4	25.9	
10/14/09 17:30:15	0.00	-0.06	2.9	26.7	9.3	
10/14/09 17:30:30	-0.02	-0.06	2.4	26.7	1.9	
10/14/09 17:30:45	-0.01	-0.06	1.3	26.7	0.4	
10/14/09 17:31:00	-0.01	-0.06	0.3	26.7	0.4	
10/14/09 17:31:15	-0.02	-0.06	-0.3	32.9	0.3	
10/14/09 17:31:30	0.00	-0.06	-1.4	41.3	-1.1	
10/14/09 17:31:45	-0.01	-0.06	-1.9	41.2	-1.0	
10/14/09 17:32:00	-0.02	-0.07	-2.2	40.6	-1.1	
10/14/09 17:32:15	-0.01	-0.07	-2.8	40.2	-1.1	
10/14/09 17:32:30	-0.02	-0.07	-3.3	39.9	-1.1	
10/14/09 17:32:45	-0.02	-0.07	-3.6	39.6	-1.1	
10/14/09 17:33:00	-0.02	-0.07	-3.9	39.4	-1.1	
10/14/09 17:33:15	-0.02	-0.07	-4.1	39.2	-1.1	
10/14/09 17:33:30	-0.02	-0.07	-4.4	39.5	-1.0	
10/14/09 17:33:45	-0.02	-0.07	-4.7	39.0	-1.1	
10/14/09 17:34:00	-0.01	-0.07	-4.7	38.7	-1.1	
10/14/09 17:34:15	-0.01	-0.07	-5.0	38.5	-1.1	
10/14/09 17:34:30	-0.03	-0.08	-5.3	38.4	-1.0	System Bias
10/14/09 17:34:45	-0.01	-0.08	-5.3	38.3	-1.1	NO _x Bias 4 Mid = 38.3
10/14/09 17:35:00	-0.02	-0.08	-5.3	38.2	-1.1	SO ₂ Bias 4 Zero = -5.4
10/14/09 17:35:15	-0.02	-0.08	-5.6	38.2	-1.1	
10/14/09 17:35:30	-0.02	-0.08	-6.0	25.6	-1.0	
10/14/09 17:35:45	-0.02	-0.08	-1.9	50.3	-1.0	
10/14/09 17:36:00	1.26	-0.07	-5.8	44.9	4.9	
10/14/09 17:36:15	6.02	-0.06	1.8	6.4	12.4	
10/14/09 17:36:30	4.23	-0.06	31.4	3.3	18.4	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 17:36:45	1.52	-0.02	73.9	2.5	15.4	
10/14/09 17:37:00	0.51	-0.04	100.2	2.0	3.4	
10/14/09 17:37:15	0.11	-0.07	109.7	1.6	0.4	
10/14/09 17:37:30	0.01	-0.07	116.8	1.4	-1.0	
10/14/09 17:37:45	-0.01	-0.08	121.3	1.2	-1.1	
10/14/09 17:38:00	-0.01	-0.08	122.3	1.2	-1.0	
10/14/09 17:38:15	-0.02	-0.07	124.6	1.0	-1.0	
10/14/09 17:38:30	-0.01	-0.08	126.9	1.0	-1.1	
10/14/09 17:38:45	-0.02	-0.07	129.7	0.9	-1.0	
10/14/09 17:39:00	-0.02	-0.07	131.1	0.8	-1.1	
10/14/09 17:39:15	-0.02	-0.07	132.4	0.8	-2.5	
10/14/09 17:39:30	-0.02	-0.07	135.0	0.7	-1.1	
10/14/09 17:39:45	-0.02	-0.07	139.7	0.7	-1.1	
10/14/09 17:40:00	-0.02	-0.07	136.8	0.7	-1.0	
10/14/09 17:40:15	-0.01	-0.07	136.2	0.7	-1.1	
10/14/09 17:40:30	-0.01	-0.07	139.7	0.7	-1.1	
10/14/09 17:40:45	-0.02	-0.07	149.5	0.7	-1.1	
10/14/09 17:41:00	-0.01	-0.07	149.1	0.7	-2.5	
10/14/09 17:41:15	-0.02	-0.07	147.5	0.7	-2.5	
10/14/09 17:41:30	-0.01	-0.07	146.3	0.6	-2.6	
10/14/09 17:41:45	-0.02	-0.07	143.1	0.6	-1.0	
10/14/09 17:42:00	-0.02	-0.07	144.6	0.7	-1.1	
10/14/09 17:42:15	-0.02	-0.07	143.9	0.6	-1.1	
10/14/09 17:42:30	-0.02	-0.07	142.9	0.6	-2.5	
10/14/09 17:42:45	-0.02	-0.07	141.7	0.6	-2.6	
10/14/09 17:43:00	-0.03	-0.07	146.1	1.9	-2.6	
10/14/09 17:43:15	-0.02	-0.08	129.5	2.2	-2.6	
10/14/09 17:43:30	1.06	-0.07	125.5	2.2	-1.1	
10/14/09 17:43:45	5.72	-0.05	28.5	0.9	-1.1	
10/14/09 17:44:00	4.07	1.12	78.3	0.7	-2.6	
10/14/09 17:44:15	1.23	3.44	64.2	0.7	-2.5	
10/14/09 17:44:30	0.25	4.51	49.7	0.6	-2.5	
10/14/09 17:44:45	0.03	4.65	39.2	0.6	-2.5	
10/14/09 17:45:00	-0.01	4.64	31.4	0.6	-2.5	
10/14/09 17:45:15	-0.02	4.84	29.3	0.6	-2.6	
10/14/09 17:45:30	-0.03	4.97	26.1	0.6	-2.5	
10/14/09 17:45:45	-0.02	5.03	23.2	0.6	-2.5	
10/14/09 17:46:00	-0.03	5.04	20.5	0.6	-2.5	
System Bias						
10/14/09 17:46:15	-0.02	5.05	18.5	0.6	-2.6	CO₂ Bias 4 Mid = 5.06
10/14/09 17:46:30	-0.02	5.05	16.1	0.6	-2.6	
10/14/09 17:46:45	-0.03	5.06	14.8	0.6	-2.5	
10/14/09 17:47:00	-0.02	5.07	13.2	0.5	-2.6	
10/14/09 17:47:15	-0.02	5.07	11.5	0.5	-2.5	
10/14/09 17:47:30	-0.03	5.07	10.3	0.5	-2.5	
10/14/09 17:47:45	-0.03	5.07	10.0	0.5	-2.5	
10/14/09 17:48:00	-0.03	5.08	8.6	0.5	-2.6	
10/14/09 17:48:15	0.03	5.03	8.2	1.6	-2.6	
10/14/09 17:48:30	4.39	3.70	7.4	0.5	-2.6	
10/14/09 17:48:45	5.82	3.17	7.0	0.5	-2.6	
10/14/09 17:49:00	4.04	1.64	6.2	0.5	-2.6	
10/14/09 17:49:15	4.21	0.40	5.6	0.5	-2.5	
10/14/09 17:49:30	4.37	0.07	5.2	0.5	-2.6	
10/14/09 17:49:45	4.47	0.01	5.2	0.5	-2.6	
10/14/09 17:50:00	4.51	-0.01	4.9	0.4	-2.6	
System Bias						
10/14/09 17:50:15	4.52	-0.02	4.7	0.4	-2.6	O₂ Bias 4 Mid = 4.53
10/14/09 17:50:30	4.53	-0.03	4.4	0.4	-1.0	
10/14/09 17:50:45	4.53	-0.03	4.1	0.4	-1.0	NO_x Bias 4 Zero = 0.4 CO Bias 4 Zero = -1.4
10/14/09 17:51:00	4.53	-0.04	3.8	0.4	-1.1	
10/14/09 17:51:15	4.53	-0.04	3.5	0.4	-1.1	CO₂ Bias 4 Zero = -0.03
10/14/09 17:51:30	4.53	-0.04	4.0	0.4	-2.6	
10/14/09 17:51:45	4.54	-0.04	62.1	1.4	-2.5	
10/14/09 17:52:00	4.53	-0.05	165.0	0.5	-1.1	
10/14/09 17:52:15	4.81	-0.04	255.8	0.3	-1.1	
10/14/09 17:52:30	4.87	0.00	282.2	0.3	-2.6	
10/14/09 17:52:45	2.29	-0.01	284.5	0.3	-2.5	
10/14/09 17:53:00	0.57	-0.05	292.6	0.2	-2.6	
10/14/09 17:53:15	0.09	-0.07	292.7	0.2	-2.6	
10/14/09 17:53:30	0.00	-0.07	293.9	0.2	-2.6	
10/14/09 17:53:45	-0.02	-0.07	195.8	0.2	-2.6	
10/14/09 17:54:00	-0.03	-0.07	148.8	0.2	-2.5	
10/14/09 17:54:15	-0.02	-0.08	146.1	0.2	-2.6	
10/14/09 17:54:30	-0.03	-0.08	145.9	0.2	-2.5	
10/14/09 17:54:45	-0.02	-0.08	146.2	0.2	-2.5	
10/14/09 17:55:00	-0.03	-0.08	153.4	0.2	-2.5	
10/14/09 17:55:15	-0.03	-0.08	152.6	0.2	-2.5	
10/14/09 17:55:30	-0.04	-0.08	146.6	0.2	-2.5	
10/14/09 17:55:45	-0.03	-0.08	146.4	0.2	-2.5	
10/14/09 17:56:00	-0.04	-0.08	154.0	0.2	-2.5	
10/14/09 17:56:15	-0.03	-0.08	152.7	0.2	-2.6	
10/14/09 17:56:30	-0.04	-0.08	152.8	0.2	-2.5	
10/14/09 17:56:45	-0.03	-0.08	148.0	0.2	-2.6	
10/14/09 17:57:00	-0.04	-0.07	147.6	0.2	-2.5	
10/14/09 17:57:15	-0.03	-0.07	147.2	0.2	-2.6	
10/14/09 17:57:30	-0.04	-0.07	147.0	0.2	-2.5	

Valero Refinery - Port Arthur, Texas
SRU 544 TGI Exhaust Stack
ARI Reference Method Monitoring Data

Date/Time	O ₂ % db by vol.	CO ₂ % db by vol.	SO ₂ ppmv db	NO _x ppmv db	CO ppmv db	Comments
10/14/09 17:57:45	-0.03	-0.07	147.9	0.2	-2.5	System Bias
10/14/09 17:58:00	-0.04	-0.07	147.2	0.2	-2.5	SO ₂ Bias 4 Mid = 147.1
10/14/09 17:58:15	-0.03	-0.07	147.1	0.2	-2.5	O ₂ Bias 4 Zero = -0.04
10/14/09 17:58:30	-0.04	-0.07	147.1	0.2	-2.5	
10/14/09 17:58:45	-0.03	-0.07	146.9	0.2	-2.5	
10/14/09 17:59:00	-0.04	-0.07	146.9	0.2	-2.6	
10/14/09 17:59:15	-0.03	-0.07	153.1	0.2	-2.6	
10/14/09 17:59:30	-0.04	-0.07	153.4	0.2	-2.6	
10/14/09 17:59:45	-0.03	-0.07	152.2	0.2	-2.5	
10/14/09 18:00:00	-0.04	-0.07	149.8	0.2	-2.6	
10/14/09 18:00:15	-0.04	-0.07	147.6	0.1	-2.5	
10/14/09 18:00:30	-0.04	-0.07	147.1	0.2	-2.6	
10/14/09 18:00:45	-0.04	-0.07	147.0	0.2	-2.5	
10/14/09 18:01:00	-0.04	-0.07	146.8	0.2	-2.5	
10/14/09 18:01:15	-0.04	-0.07	146.6	0.2	-2.5	
10/14/09 18:01:30	-0.04	-0.07	146.7	0.2	-2.5	
10/14/09 18:01:45	-0.04	-0.07	147.0	0.1	-2.5	
10/14/09 18:02:00	-0.04	-0.07	147.0	0.2	-2.5	



Valero Port Arthur Refinery
Source: SRU 544 TGI Exhaust
Test Date: October 14, 2009

APPENDIX D

Calibration Data

CEMS CALIBRATION DATA

Plant Name	Valero
Sampling Location	SRU 544 TGI
Date	10/14/2009
Run Number	1
Start Time	10/14/09 11:46
Stop Time	10/14/09 12:46

Plant Rep.	Robin Hill
Team Leader	Greg Burch
CEM Operator	Greg Burch

Analyzer Span Values (% or ppm)		
CO	1.983	ppm
CO ₂	10.00	%
O ₂	9.00	%
THC		ppm
NO _x	80.0	ppm
SO ₂	300.0	ppm

	CALIBRATION ERROR - 9:49 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 11:18		Posttest: 12:54 hrs		Drift (% of Span)	
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)		
CO Zero	0.0	ALM030472	0.4	0	1.9	0	0.4	0.0	-0.1	Co=
CO Low		Diluted from								1.13
CO Mid	1,000	EB0003638	1,028	1	1,014	-1	1,008	-1.0	-0.3	Cm=
CO High	1,983	1983 ppm	1,988	0						1,011.02
CO ₂ Zero	0.00	ALM030472	0.04	0.4	-0.04	-0.8	-0.04	-0.8	0.0	Co=
CO ₂ Low		Diluted from								-0.039
CO ₂ Mid	5.00	ALM038208	5.18	1.8	5.09	-0.9	5.06	-1.2	-0.3	Cm=
CO ₂ High	10.00	23.0 %	9.96	-0.4						5.073
O ₂ Zero	0.00	ALM030472	0.09	1.0	0.1	-0.1	0.1	-0.4	-0.3	Co=
O ₂ Low		Diluted from								0.067
O ₂ Mid	4.50	ALM035230	4.66	1.7	4.65	-0.1	4.60	-0.7	-0.6	Cm=
O ₂ High	9.00	22.0 %	8.95	-0.6						4.622
NO _x Zero	0.0	ALM030472	0.0	0.1	0.3	0.3	0.3	0.3	0.0	Co=
NO _x Low		Diluted from								0.28
NO _x Mid	40.0	ALM031560	41.7	2.1	41.6	-0.2	40.5	-1.6	-1.4	Cm=
NO _x High	80.0	2030 ppm	78.5	-1.9						41.01
SO ₂ Zero	0.0	ALM030472	-0.4	-0.1	3.1	1.2	0.0	0.1	-1.0	Co=
SO ₂ Low		Diluted from								1.51
SO ₂ Mid	150.0	ALM043469	150.3	0.1	150.6	0.1	147.4	-0.9	-1.1	Cm=
SO ₂ High	300.0	1100 ppm	295.7	-1.4						149.04

CEMS CALIBRATION DATA

Plant Name	Valero
Sampling Location	SRU 544 TGI
Date	10/14/2009
Run Number	2
Start Time	10/14/09 14:03
Stop Time	10/14/09 15:03

Plant Rep.	Robin Hill
Team Leader	Greg Burch
CEM Operator	Greg Burch

Analyzer Span Values (% or ppm)

CO	1,983	ppm
CO ₂	10.00	%
O ₂	9.00	%
THC		ppm
NO _x	80	ppm
SO ₂	300	ppm

	CALIBRATION ERROR - 9:49 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 12:54		Posttest: 15:10 hrs			
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0	ALM030472	0.4	0	0.4	0	-2.6	-0.2	-0.2	Co=
CO Low		Diluted from								-1.13
CO Mid	1,000	EB0003638	1,028	1	1,008	-1	1,003	-1.3	-0.3	Cm=
CO High	1,983	1983 ppm	1,988	0						1,005.50
CO ₂ Zero	0.00	ALM030472	0.04	0.4	-0.04	-0.8	-0.05	-0.9	-0.1	Co=
CO ₂ Low		Diluted from								-0.043
CO ₂ Mid	5.00	ALM038208	5.18	1.8	5.06	-1.2	5.07	-1.1	0.1	Cm=
CO ₂ High	10.00	23.0 %	9.96	-0.4						5.067
O ₂ Zero	0.00	ALM030472	0.09	1.0	0.06	-0.4	0.01	-0.9	-0.5	Co=
O ₂ Low		Diluted from								0.034
O ₂ Mid	4.50	ALM035230	4.66	1.7	4.60	-0.7	4.55	-1.2	-0.5	Cm=
O ₂ High	9.00	22.0 %	8.95	-0.6						4.574
NO _x Zero	0.0	ALM030472	0.0	0.0	0.3	0.4	0.2	0.3	-0.1	Co=
NO _x Low		Diluted from								0.26
NO _x Mid	40.0	ALM031560	41.7	2.1	40.5	-1.6	38.3	-4.3	-2.8	Cm=
NO _x High	80.0	2030 ppm	78.5	-1.9						39.36
SO ₂ Zero	0.0	ALM030472	-0.4	-0.1	0.0	0.1	-3.4	-1.0	-1.1	Co=
SO ₂ Low		Diluted from								-1.73
SO ₂ Mid	150.0	ALM043469	150.3	0.1	147.4	-0.9	145.7	-1.5	-0.6	Cm=
SO ₂ High	300.0	1100 ppm	295.7	-1.4						146.59

CEMS CALIBRATION DATA

Plant Name	Valero
Sampling Location	SRU 544 TGI
Date	10/14/2009
Run Number	3
Start Time	10/14/09 16:20
Stop Time	10/14/09 17:20

Plant Rep.	Robin Hill
Team Leader	Greg Burch
CEM Operator	Greg Burch

Analyzer Span Values (% or ppm)		
CO	1983	ppm
CO ₂	10.00	%
O ₂	9.00	%
THC		ppm
NO _x	80	ppm
SO ₂	300	ppm

	CALIBRATION ERROR - 9:49 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 15:10		Posttest: 17:27 hrs			
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0	ALM030472	0.4	0	-2.6	0	-1.4	-0.1	0.1	Co=
CO Low		Diluted from								-2.03
CO Mid	1,000	EB0003638	1,028	1	1,003	-1	1,005	-1.1	0.1	Cm=
CO High	1,983	1983 ppm	1,988	0						1004.00
CO ₂ Zero	0.00	ALM030472	0.04	0.45	-0.05	-0.9	-0.03	-0.7	0.2	Co=
CO ₂ Low		Diluted from								-0.038
CO ₂ Mid	5.00	ALM038208	5.18	1.80	5.07	-1.1	5.06	-1.2	-0.2	Cm=
CO ₂ High	10.00	23.0 %	9.96	-0.44						5.065
O ₂ Zero	0.00	ALM030472	0.09	1.00	0.01	-0.9	-0.04	-1.4	-0.5	Co=
O ₂ Low		Diluted from								-0.011
O ₂ Mid	4.50	ALM035230	4.66	1.75	4.55	-1.2	4.53	-1.5	-0.3	Cm=
O ₂ High	9.00	22.0 %	8.95	-0.59						4.539
NO _x Zero	0.0	ALM030472	0.0	0.0	0.2	0.3	0.4	0.5	0.2	Co=
NO _x Low		Diluted from								0.31
NO _x Mid	40.0	ALM031560	41.7	2.1	38.3	-4.3	38.3	-4.3	0.0	Cm=
NO _x High	80.0	2030 ppm	78.5	-1.9						38.27
SO ₂ Zero	0.0	ALM030472	-0.4	-0.1	-3.4	-1.0	-5.4	-1.7	-0.6	Co=
SO ₂ Low		Diluted from								-4.40
SO ₂ Mid	150.0	ALM043469	150.3	0.1	145.7	-1.5	147.1	-1.1	0.4	Cm=
SO ₂ High	300.0	1100 ppm	295.7	-1.4						146.41

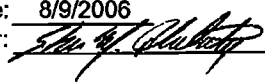
Interference Response

Analyzer Type: Oxygen (O₂)
 Manufacturer: Servomex
 Detector Type: Paramagnetic
 Model No.: 1440
 Serial No.: 1420C/2765
 Calibration Span (%): 11.27

Test Gas	Test Gas Conc.	High Standard			Zero			Maximum % Interference
		O ₂ without interferent	O ₂ with interferent	% Interference	Zero without interferent	Zero with interferent	% Interference	
NH ₃	10 ppm	11.27	11.27	0.00	0.03	0.01	0.18	0.18
SO ₂	20 ppm	11.25	11.25	0.00	0.01	0.01	0.00	0.00
CH ₄	50 ppm	11.24	11.25	0.09	0.02	0.04	-0.18	0.18
CO	50 ppm	11.23	11.24	0.09	0.00	0.01	-0.09	0.09
CO ₂	5%	11.23	11.26	0.27	0.00	-0.01	0.09	0.27
CO ₂	12.55%	11.25	11.27	0.18	0.03	-0.02	0.44	0.44
NO ₂	15 ppm	11.22	11.24	0.18	0.01	0.00	0.09	0.18
NO _x	15 ppm	11.22	11.25	0.27	0.01	0.01	0.00	0.27
H ₂	1,020 ppm	11.24	11.23	-0.09	0.02	0.01	0.09	0.09
HCl	10 ppm	11.29	11.31	0.18	0.00	-0.01	0.09	0.18

Sum of the highest absolute value obtained with and without the pollutant present: 1.88 %
 Allowable interference response: 2.5 %

Certification Date: 8/9/2006

Operator: 

Interference Response

Analyzer Type: Carbon Dioxide (CO₂)
 Manufacturer: Servomex
 Detector Type: NDIR
 Model No.: 1440
 Serial No.: 1415C
 Calibration Span (%): 11.41

Test Gas	Test Gas Conc.	High Standard			Zero			Maximum % Interference
		CO ₂ without interferent	CO ₂ with interferent	% Interference	Zero without interferent	Zero with interferent	% Interference	
NH ₃	10 ppm	11.41	11.39	-0.18	0.01	0.01	0.00	0.18
SO ₂	20 ppm	11.37	11.37	0.00	0.01	0.01	0.00	0.00
CH ₄	50 ppm	11.37	11.37	0.00	0.01	0.01	0.00	0.00
CO	50 ppm	11.41	11.41	0.00	0.01	0.01	0.00	0.00
NO ₂	15 ppm	11.37	11.37	0.00	0.01	0.01	0.00	0.00
NO _x	15 ppm	11.37	11.37	0.00	0.01	0.01	0.00	0.00
H ₂	1,020 ppm	11.37	11.37	0.00	0.01	0.01	0.00	0.00
HCl	10 ppm	11.41	11.38	-0.26	0.01	0.01	0.00	0.26

Sum of the highest absolute value obtained with and without the pollutant present: 0.44 %
 Allowable interference response: 2.5 %

Certification Date: 8/9/2006

Operator: *Alan J. Nadeau*

Interference Response

Analyzer Type: Sulfur Dioxide (SO₂)
 Manufacturer: Bovar Engineered Products (Western Research)
 Detector Type: Pulsed Fluorescence
 Model No.: 721-ATM
 Serial No.: 92-721ATM-7947-1-1
 Calibration Span (%): 100

Test Gas	Test Gas Conc.	High Standard			Zero			Maximum % Interference
		SO ₂ without interferent	SO ₂ with interferent	% Interference	Zero without interferent	Zero with interferent	% Interference	
NH ₃	10 ppm	100.1	100.1	0.0	0.1	0.1	0.0	0.0
CH ₄	50 ppm	102.6	103.1	0.5	0.1	0.3	0.2	0.5
CO	50 ppm	100.5	100.5	0.0	0.3	0.3	0.0	0.0
CO ₂	5%	100.9	101.1	0.2	0.1	0.1	0.0	0.2
CO ₂	12.55%	100.9	101.2	0.3	0.1	0.2	0.1	0.3
NO ₂	15 ppm	101.6	102.2	0.6	0.3	0.5	0.2	0.6
NO _x	15 ppm	101.4	101.4	0.0	0.3	0.3	0.0	0.0
H ₂	1020 ppm	100.6	100.6	0.0	0.4	0.4	0.0	0.0
HCl	10 ppm	100.8	100.6	-0.2	0.1	0.3	0.2	0.2

Sum of the highest absolute value obtained with and without the pollutant present: 1.80 %
 Allowable interference response: 2.5 %

Certification Date: 8/9/2006

Operator: 

Interference Response

Analyzer Type: Carbon Monoxide (CO)
 Manufacturer: Thermo Environmental Instruments Inc.
 Detector Type: Non-Dispersive Infrared (NDIR)
 Model No.: 48H
 Serial No.: 000632
 Calibration Span (ppm): 100

Test Gas	Test Gas Conc.	High Standard			Zero			Maximum % Interference
		CO without interferent	CO with interferent	% Interference	Zero without interferent	Zero with interferent	% Interference	
NH ₃	10 ppm	101.5	101.7	0.2	1.6	1.5	-0.1	0.2
SO ₂	20 ppm	101.5	101.6	0.1	1.6	1.9	0.3	0.3
CH ₄	50 ppm	101.5	101.6	0.1	1.6	1.8	0.2	0.2
CO ₂	5%	101.5	101.4	-0.1	1.6	1.6	0.0	0.1
CO ₂	12.55%	101.5	101.1	-0.4	1.6	1.4	-0.2	0.4
NO ₂	15 ppm	101.5	101.6	0.1	1.6	1.6	0.0	0.1
NO _x	15 ppm	101.5	101.8	0.3	1.6	1.9	0.3	0.3
H ₂	1,020 ppm	101.5	101.7	0.2	1.6	1.8	0.2	0.2
HCl	10 ppm	101.5	101.6	0.1	1.6	1.8	0.2	0.2

Sum of the highest absolute value obtained with and without the pollutant present: 2.0 %
 Allowable Interference response: 2.5 %

Certification Date: 8-9-06
 Operator: [Signature]



Model 600 HCLD NO Interference Data

Interference Response

Date of Test 7/26/2006

Analyzer Type NO

Model No. 600-HCLD

Serial No. S050301

Calibration Span 3000ppm

Test Gas Type		Concentration		Analyzer Response	
		(ppm)		Wet	Dry
H2O		2.5%		0	0
CO2		5%		0	0
CO2		15%		0	0
CO		50		0	0
CH4		50		0	0
SO2		N/A		N/A	N/A
NH3		15		0	0
NO		N/A		N/A	N/A
N2O		9		0	0
NO2		N/A		N/A	N/A

**AIR LIQUIDE**Air Liquide America
Specialty Gases LLC**SCOTT™****RATA CLASS***Dual-Analyzed Calibration Standard*

9810 BAY AREA BLVD, PASADENA, TX 77507

Phone: 281-474-5800

Fax: 281-474-5857

CERTIFICATE OF ACCURACY: EPA Protocol GasAssay LaboratorySCOTT SPECIALTY GASES
9810 BAY AREA BLVD
PASADENA, TX 77507P.O. No.: 03-118-08
Project No.: 04-70072-009CustomerARI ENVIRONMENTAL, INC.

1710 C PRESTON RD
PASADENA TX 77503**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: ALM035230 Certification Date: 30Dec2008 Exp. Date: 30Dec2011
Cylinder Pressure***: 2000 PSIGCOMPONENTCERTIFIED CONCENTRATION (Moles)ANALYTICALACCURACY**TRACEABILITY

OXYGEN

22.0 %

+/- 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

<u>TYPE/SRM NO.</u>	<u>EXPIRATION DATE</u>	<u>CYLINDER NUMBER</u>	<u>CONCENTRATION</u>	<u>COMPONENT</u>
NTRM 2350	01Apr2012	A6820	23.51 %	OXYGEN

INSTRUMENTATIONINSTRUMENT/MODEL/SERIAL#

SERVOMEX/MODEL 244A/701/716

DATE LAST CALIBRATED

15Dec2008

ANALYTICAL PRINCIPLE

PARAMAGNETIC

ANALYZER READINGS

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

First Triad Analysis

Second Triad Analysis

Calibration Curve

OXYGEN

Date: 30Dec2008	Response Unit: VOLTS	
Z1 = 0.00000	R1 = 0.99040	T1 = 0.92640
R2 = 0.99110	Z2 = 0.00030	T2 = 0.92710
Z3 = 0.00030	T3 = 0.92690	R3 = 0.99110
Avg. Concentration:	21.95	%

Concentration = A + Bx + Cx ² + Dx ³ + Ex ⁴	
r = 0.9999972	
Constants:	A = -0.00524423
B = 23.70794974	C =
D =	E =

APPROVED BY:

DAVID KELLY



Scott Specialty Gases
Air Liquide America Specialty Gases LLC

RATA CLASS

Dual-Analyzed Calibration Standard

9810 BAY AREA BLVD, PASADENA, TX 77507

Phone: 281-474-5800

Fax: 281-474-5857

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
9810 BAY AREA BLVD
PASADENA, TX 77507

P.O. No.: 03-059-08
Project No.: 04-66017-002

Customer

ARI ENVIRONMENTAL, INC.
GREG BURCH
1710 C PRESTON RD
PASADENA TX 77503

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: ALM043469 Certification Date: 29Jul2008 Exp. Date: 29Jul2011
Cylinder Pressure***: 1895 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
SULFUR DIOXIDE *	1,100	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.

* This Protocol has been certified using corrected NIST SO2 standard values, per EPA guidance dated 7/24/96 and will not correlate with uncorrected Prot

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1662	15May2010	KAL003254	975.0 PPM	SULFUR DIOXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR/1602651	21Jul2008	FTIR

ANALYZER READINGS

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

First Triad Analysis

Second Triad Analysis

Calibration Curve

SULFUR DIOXIDE *

Date: 22Jul2008	Response Unit: PPM		
Z1=0.25744	R1=977.6995	T1=1103.684	
R2=978.4381	Z2=0.35805	T2=1104.053	
Z3=1.47046	T3=1104.767	R3=979.1856	
Avg. Concentration:	1100.	PPM	

Date: 29Jul2008	Response Unit: PPM		
Z1=-0.08693	R1=976.9042	T1=1104.954	
R2=978.8980	Z2=0.00750	T2=1105.427	
Z3=1.06221	T3=1105.731	R3=979.3055	
Avg. Concentration:	1102.	PPM	

Concentration = A + Bx + Cx2 + Dx3 + Ex4			
r = 9.99997E-1			
Constants:			
A = 0.00000E+0			
B = 9.97408E-1	C = 4.00000E-6		
D = 0.00000E+0	E = 0.00000E+0		

APPROVED BY: _____

Ramien JR



Scott Specialty Gases
Air Liquide America Specialty Gases LLC

RATA CLASS

Dual-Analyzed Calibration Standard

9810 BAY AREA BLVD, PASADENA, TX 77507

Phone: 281-474-5800

Fax: 281-474-5857

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
9810 BAY AREA BLVD
PASADENA, TX 77507

P.O. No.: 03-051-08
Project No.: 04-64798-003

Customer

ARI ENVIRONMENTAL, INC.
GREG BURCH
1710 C PRESTON RD
PASADENA TX 77503

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: ALM031560 Certification Date: 10Jun2008 Exp. Date: 10Jun2010
Cylinder Pressure***: 1924 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
NITRIC OXIDE	2,030	PPM	+/- 1%	Direct NIST and NMI
NITROGEN - OXYGEN FREE		BALANCE		
TOTAL OXIDES OF NITROGEN	2,030.	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 2631	01May2011	ALM048055	2780. PPM	NITRIC OXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR//1602651	02Jun2008	FTIR

ANALYZER READINGS

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

First Triad Analysis

Second Triad Analysis

Calibration Curve

NITRIC OXIDE

Date: 03Jun2008	Response Unit: PPM		
Z1 = 0.28839	R1 = 2767.274	T1 = 2018.455	
R2 = 2767.716	Z2 = 1.84806	T2 = 2020.058	
Z3 = 2.53291	T3 = 2020.176	R3 = 2769.794	
Avg. Concentration:	2028.	PPM	

Date: 10Jun2008	Response Unit: PPM		
Z1 = -0.15791	R1 = 2765.545	T1 = 2014.465	
R2 = 2770.065	Z2 = 1.75697	T2 = 2015.392	
Z3 = 2.57324	T3 = 2015.463	R3 = 2770.419	
Avg. Concentration:	2023.	PPM	

Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r = 9.99995E-1	
Constants:	A = 0.00000E+0
B = 3.83017E-1	C = 2.50000E-5
D = 0.00000E+0	E = 0.00000E+0

APPROVED BY:

Peter Brandon



Scott Specialty Gases



AIR LIQUIDE

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11426 FAIRMONT PKWY, LA PORTE, TX 77571 Phone: 800-248-1427 Fax: 281-474-8419

RATA CLASS*Dual-Analyzed Calibration Standard***CERTIFICATE OF ACCURACY: EPA Protocol Gas****Assay Laboratory**AIR LIQUIDE AMERICA SPECIALTY GASES LLC
11426 FAIRMONT PKWY
LA PORTE, TX 77571P.O. No.: 03-051-08
Project No.: 04 -64806 -001**Customer**ARI ENVIRONMENTAL, INC.
GREG BURCH
1710 C PRESTON RD
PASADENA TX 77503**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: ALM038208
Cylinder Pressure*:** 1924 PSIG**Certification Date:** 06Jun2008**Exp. Date:** 06Jun2011

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ACCURACY**	TRACEABILITY
CARBON DIOXIDE	23.0 %	+/- 1%	Direct NIST and VSL
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 2300	02Jan2012	K092652	23.01 %	CARBON DIOXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR//1602651	21May2008	FTIR

ANALYZER READINGS

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

First Triad Analysis**CARBON DIOXIDE**Date: 06Jun2008 Response Unit: %
Z1=0.00241 R1=23.04902 T1=22.96516
R2=23.05442 Z2=0.01765 T2=23.00141
Z3=0.02220 T3=23.01244 R3=23.06920
Avg. Concentration: 22.95 %**Second Triad Analysis****Calibration Curve**Concentration=A+Bx+Cx2+Dx3+Ex4
r=9.99997E-1
Constants: A=0.00000E+0
B=9.03559E-1 C=1.13550E-2
D=0.00000E+0 E=0.00000E+0**QUALITY ASSURANCE**APPROVED BY: Ramien JR
(signature on file)



COASTAL SPECIALTY GAS
25 NORTH FOURTH STREET
BEAUMONT, TX 77071
409-838-3757

Customer: Coastal Welding Protocol: Reference # Lot#
Cylinder Number: EB0003638 G1 27913
Cylinder Pressure: 1900 PSIG
Last Analysis Date: 2/5/2007
Expiration Date: 2/5/2010

DO NOT USE THIS CYLINDER WHEN THE PRESSURE
FALLS BELOW 150 PSIG

REPLICATE RESPONSES

Component: Carbon Monoxide Date: 1/29/2007 Date: 2/5/2007
Mean Conc: 1983 ppm +/- 1% rel 1982 1983
1982 1982
1982 1984
BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

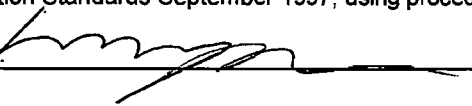
Component: Carbon Monoxide
Reference Standard: GMIS
Cylinder #: CC38906
Concentration: 2483 ppm
Exp. Date: 7/11/2007

CERTIFICATION INSTRUMENTS

Component: Carbon Monoxide
Make/Model: Horiba VIA-510
Serial Number: 42321590022
Measurement Principle: NDIR
Last Calibration: 1/10/2007

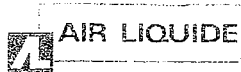
Notes:

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous
Calibration Standards September 1997, using procedure G1 and/or G2.

Analyst: 

Date: 2/5/2007

Manufactured By Specialty Gas Products, a Matheson Tri-Gas Company, Pasadena, Texas.



Air Liquide America
Specialty Gases LLC



COMPLIANCE CLASS

Dual-Analyzed Calibration Standard

500 WEAVER PARK RD, LONGMONT, CO 80501

Phone: 888-253-1635

Fax: 303-772-7673

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

P.O. No.: 03-048-09
AIR LIQUIDE AMERICA SPECIALTY GASES LLC Project No.: 08-75940-006
500 WEAVER PARK RD
LONGMONT, CO 80501

Customer

ARI ENVIRONMENTAL, INC.
03-048-09
1710 C PRESTON RD
PASADENA TX 77503

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: ALM055039 Certification Date: 22May2009 Exp. Date: 20Nov2009
Cylinder Pressure***: 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
NITROGEN DIOXIDE	51.6	PPM	+/- 2%	NMI and NIST
AIR		BALANCE		

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

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

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NMI PRM	15Dec2009	767376	50.00 PPM	NITROGEN DIOXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
HORIBA/CLA-220/D000423P	27Apr2009	CHEMILUMINESCENCE

APPROVED BY: _____

JW
JON WITZAK

**AIR LIQUIDE**Air Liquide America
Specialty Gases LLC

SCOTT

RATA CLASS*Dual-Analyzed Calibration Standard*

9810 BAY AREA BLVD, PASADENA, TX 77507

Phone: 281-474-5800

Fax: 281-474-5857

CERTIFICATE OF ACCURACY: EPA Protocol GasAssay Laboratory

AIR LIQUIDE AMERICA SPECIALTY GASES LLC Project No.: 04-72137-006
 9810 BAY AREA BLVD
 PASADENA, TX 77507

P.O. No.: 03-029-09

Customer

ARI ENVIRONMENTAL, INC.

1710 C PRESTON RD
 PASADENA TX 77503

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: ALM013030 Certification Date: 26Mar2009 Exp. Date: 26Mar2012
 Cylinder Pressure***: 1950 PSIG

COMPONENTCERTIFIED CONCENTRATION (Moles)ANALYTICALACCURACY**TRACEABILITY

OXYGEN

7.57 %

+/- 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	01Apr2012	A6820	23.51 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#
 SERVOMEX/MODEL 244A/701/716

DATE LAST CALIBRATED
 23Mar2009

ANALYTICAL PRINCIPLE
 PARAMAGNETIC

ANALYZER READINGS

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

First Triad Analysis

Second Triad Analysis

Calibration Curve

OXYGEN

Date: 26Mar2009 Response Unit: VOLTS

Z1=0.00000	R1=0.99000	T1=0.31950
R2=0.98970	Z2=0.00000	T2=0.31910
Z3=0.00000	T3=0.31900	R3=0.98950
Avg. Concentration: 7.567 %		

Concentration = $A + Bx + Cx^2 + Dx^3 + Ex^4$
 $r = 0.9999978$
 Constants: $A = -0.00703813$
 $B = 23.71576885$ $C =$
 $D =$ $E =$

APPROVED BY:

DAVID KELLY

USEPA Method 205 Dilution System Verification
15-second data

Date/Time	O ₂ % db by vol.	Comments
10/12/09 15:07:15	7.69	
10/12/09 15:07:30	7.69	
10/12/09 15:07:45	7.04	
10/12/09 15:08:00	3.16	
10/12/09 15:08:15	0.69	
10/12/09 15:08:30	0.18	
10/12/09 15:08:45	0.05	
10/12/09 15:09:00	0.04	Calibration Error
10/12/09 15:09:15	0.00	O ₂ CE Zero = 0.00
10/12/09 15:09:30	0.00	
10/12/09 15:09:45	0.00	
10/12/09 15:10:00	0.00	
10/12/09 15:10:15	0.00	
10/12/09 15:10:30	-0.01	
10/12/09 15:10:45	0.91	
10/12/09 15:11:00	8.58	
10/12/09 15:11:15	15.16	
10/12/09 15:11:30	17.45	
10/12/09 15:11:45	17.89	
10/12/09 15:12:00	18.03	
10/12/09 15:12:15	18.03	
10/12/09 15:12:30	18.04	
10/12/09 15:12:45	18.04	
10/12/09 15:13:00	18.04	
10/12/09 15:13:15	18.04	
10/12/09 15:13:30	18.04	
10/12/09 15:13:45	17.55	
10/12/09 15:14:00	13.05	
10/12/09 15:14:15	9.84	
10/12/09 15:14:30	9.21	
10/12/09 15:14:45	9.13	
10/12/09 15:15:00	9.13	
10/12/09 15:15:15	9.13	
10/12/09 15:15:30	9.12	
10/12/09 15:15:45	9.13	
10/12/09 15:16:00	9.38	
10/12/09 15:16:15	13.18	
10/12/09 15:16:30	16.76	
10/12/09 15:16:45	17.84	
10/12/09 15:17:00	18.03	
10/12/09 15:17:15	17.98	
10/12/09 15:17:30	17.99	
10/12/09 15:17:45	17.97	
10/12/09 15:18:00	17.92	
10/12/09 15:18:15	17.95	Calibration Error
10/12/09 15:18:30	17.95	O ₂ CE Span = 17.95
10/12/09 15:18:45	17.94	
10/12/09 15:19:00	17.95	
10/12/09 15:19:15	17.95	
10/12/09 15:19:30	17.95	
10/12/09 15:19:45	17.72	
10/12/09 15:20:00	13.64	
10/12/09 15:20:15	10.00	
10/12/09 15:20:30	9.20	
10/12/09 15:20:45	9.09	Calibration Error
10/12/09 15:21:00	9.08	O ₂ CE Mid = 9.07
10/12/09 15:21:15	9.07	
10/12/09 15:21:30	9.07	
10/12/09 15:21:45	9.07	
10/12/09 15:22:00	9.07	
10/12/09 15:22:15	9.07	
10/12/09 15:22:30	9.01	
10/12/09 15:22:45	8.25	
10/12/09 15:23:00	7.72	
10/12/09 15:23:15	7.62	Target Concentration No. 1; Trial No. 1
10/12/09 15:23:30	7.60	Mid Level Trial 1 = 7.60
10/12/09 15:23:45	7.61	
10/12/09 15:24:00	7.60	
10/12/09 15:24:15	7.60	
10/12/09 15:24:30	7.60	
10/12/09 15:24:45	7.60	
10/12/09 15:25:00	7.71	
10/12/09 15:25:15	10.57	
10/12/09 15:25:30	13.76	
10/12/09 15:25:45	14.79	
10/12/09 15:26:00	14.97	Target Concentration No. 2; Trial No. 1
10/12/09 15:26:15	14.99	High Level Trial 1 = 15.00
10/12/09 15:26:30	15.00	
10/12/09 15:26:45	15.00	
10/12/09 15:27:00	15.00	
10/12/09 15:27:15	15.00	
10/12/09 15:27:30	15.00	
10/12/09 15:27:45	15.01	
10/12/09 15:28:00	15.44	
10/12/09 15:28:15	17.99	

USEPA Method 205 Dilution System Verification
15-second data

Date/Time	O ₂ % db by vol.	Comments
10/12/09 15:28:30	15.88	
10/12/09 15:28:45	10.22	
10/12/09 15:29:00	7.91	
10/12/09 15:29:15	7.57	
10/12/09 15:29:30	7.52	Mid-Level Concentration; Trial No. 1
10/12/09 15:29:45	7.52	Mid Std. Trial 1 = 7.52
10/12/09 15:30:00	7.52	
10/12/09 15:30:15	7.51	
10/12/09 15:30:30	7.52	
10/12/09 15:30:45	7.51	
10/12/09 15:31:00	7.51	
10/12/09 15:31:15	7.51	
10/12/09 15:31:30	7.51	
10/12/09 15:31:45	7.51	
10/12/09 15:32:00	7.51	
10/12/09 15:32:15	8.19	
10/12/09 15:32:30	11.84	
10/12/09 15:32:45	14.27	
10/12/09 15:33:00	14.90	
10/12/09 15:33:15	15.00	
10/12/09 15:33:30	15.01	
10/12/09 15:33:45	15.01	
10/12/09 15:34:00	15.01	Target Concentration No. 2; Trial No. 2
10/12/09 15:34:15	15.01	High Level Trial 2 = 15.01
10/12/09 15:34:30	15.01	
10/12/09 15:34:45	15.01	
10/12/09 15:35:00	15.01	
10/12/09 15:35:15	15.01	
10/12/09 15:35:30	15.01	
10/12/09 15:35:45	15.00	
10/12/09 15:36:00	15.01	
10/12/09 15:36:15	13.85	
10/12/09 15:36:30	9.62	
10/12/09 15:36:45	7.89	
10/12/09 15:37:00	7.63	
10/12/09 15:37:15	7.60	Target Concentration No. 1; Trial No. 2
10/12/09 15:37:30	7.59	Mid Level Trial 2 = 7.59
10/12/09 15:37:45	7.59	
10/12/09 15:38:00	7.60	
10/12/09 15:38:15	7.60	
10/12/09 15:38:30	7.59	
10/12/09 15:38:45	7.60	
10/12/09 15:39:00	7.56	
10/12/09 15:39:15	7.52	Mid-Level Concentration; Trial No. 2
10/12/09 15:39:30	7.50	Mid Std. Trial 2 = 7.50
10/12/09 15:39:45	7.50	
10/12/09 15:40:00	7.50	
10/12/09 15:40:15	7.50	
10/12/09 15:40:30	7.51	
10/12/09 15:40:45	7.50	
10/12/09 15:41:00	7.50	
10/12/09 15:41:15	7.71	
10/12/09 15:41:30	8.33	
10/12/09 15:41:45	7.83	
10/12/09 15:42:00	7.63	Target Concentration No. 1; Trial No. 3
10/12/09 15:42:15	7.60	Mid Level Trial 3 = 7.60
10/12/09 15:42:30	7.60	
10/12/09 15:42:45	7.60	
10/12/09 15:43:00	7.60	
10/12/09 15:43:15	7.60	
10/12/09 15:43:30	7.60	
10/12/09 15:43:45	7.60	
10/12/09 15:44:00	8.97	
10/12/09 15:44:15	12.71	
10/12/09 15:44:30	14.52	
10/12/09 15:44:45	14.93	Target Concentration No. 2; Trial No. 3
10/12/09 15:45:00	14.98	High Level Trial 3 = 14.99
10/12/09 15:45:15	14.99	
10/12/09 15:45:30	15.00	
10/12/09 15:45:45	15.00	
10/12/09 15:46:00	15.00	
10/12/09 15:46:15	14.99	
10/12/09 15:46:30	13.59	
10/12/09 15:46:45	9.56	
10/12/09 15:47:00	7.83	
10/12/09 15:47:15	7.54	
10/12/09 15:47:30	7.51	Mid-Level Concentration; Trial No. 3
10/12/09 15:47:45	7.50	Mid Std. Trial 3 = 7.50
10/12/09 15:48:00	7.51	
10/12/09 15:48:15	7.50	
10/12/09 15:48:30	7.49	
10/12/09 15:48:45	7.49	
10/12/09 15:49:00	7.51	
10/12/09 15:49:15	7.50	
10/12/09 15:49:30	7.70	

**ARI REFERENCE METHOD CEMS DATA
USEPA METHOD 205
DILUTION SYSTEM VERIFICATION**

Company: Valero Refining
Location: Port Arthur, Texas
Source: SRU No. 544 TGI
Dilution System ID: 2431
Dilution Flow Rate: 5.0 Lpm
Verification date: 10/12/2009

Analyzer Info
Monitor type: O₂
Monitor Span: 18.00 %
Monitor Serial No.: X1440D1/4143

Initial Calibration Data

<u>Calibration Concentration</u>	<u>Calibration results</u>	<u>% Difference</u>
Zero: 0.00	Zero: 0.00	Zero: 0.01%
Low:	Low:	Low:
Mid: 9.00	Mid: 9.07	Mid: 0.41%
High: 18.00	High: 17.95	High: 0.29%

Dilution System Verification

Mid level gas type: <u>EPA Protocol 1</u>	High level dilution gas type: <u>O₂/N₂</u>
Mid level concentration: <u>7.57</u>	High level concentration: <u>22.00</u>
Mid level tank serial #: <u>ALM013030</u>	High level tank serial #: <u>ALM035230</u>
	Target concentration No. 1: <u>7.50</u>
	Target concentration No. 2: <u>15.00</u>

Dilution System Results

<u>Target Concentration No. 1</u>			<u>Target Concentration No. 2</u>		
	<u>Instrument Response</u>	<u>% difference from average*</u>		<u>Instrument Response</u>	<u>% difference from average*</u>
Trial No. 1:	<u>7.60</u>	<u>0.07</u>	Trial No. 1:	<u>15.00</u>	<u>0.01</u>
Trial No. 2:	<u>7.59</u>	<u>0.07</u>	Trial No. 2:	<u>15.01</u>	<u>0.06</u>
Trial No. 3:	<u>7.60</u>	<u>0.00</u>	Trial No. 3:	<u>14.99</u>	<u>0.05</u>
Average:	<u>7.599</u>		Average:	<u>14.999</u>	

% Difference from target concentration: 1.33% % Difference from target concentration: 0.01%

Mid Level Calibration Gas Results

<u>Instrument Response</u>	
Trial No. 1: <u>7.52</u>	Mid Level calibration gas concentration: <u>7.57%</u>
Trial No. 2: <u>7.50</u>	Average analyzer response: <u>7.51</u>
Trial No. 3: <u>7.50</u>	Percent difference: <u>0.84</u> *

* Must be less than 2 %

APEX INSTRUMENTS METHOD 5 PRE-TEST CONSOLE CALIBRATION
USING WET-TEST METER #11AE6
5-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	MC-522
Console Serial Number	0903012
DGM Model Number	S-110
DGM Serial Number	951580

Calibration Conditions			
Date	Time	11-Mar-09	8:00
Barometric Pressure		29.8	in Hg
Calibration Technician		EW	
Calibration Meter Gamma		0.9990	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K ₁	17.647	oR/in Hg

Calibration Data											
Run Time	Metering Console					Calibration Meter					
Elapsed (S)	DGM Orifice ΔH (P _m)	Volume Initial (V _{m1})	Volume Final (V _{m2})	Sample Volume (V _m)	Outlet Temp Initial (t _{m1})	Outlet Temp Final (t _{m2})	Volume Initial (V _{w1})	Volume Final (V _{w2})	Sample Volume (V _m)	Outlet Temp Initial (t _{w1})	Outlet Temp Final (t _{w2})
min	in H ₂ O	cubic feet	cubic feet	cubic feet	°F	°F	cubic feet	cubic feet	cubic feet	°F	°F
5.00	5.0	143.094	149.250	6.156	73	74	41.880	48.085	6.205	73.5	73.5
6.00	3.0	154.919	160.609	5.690	75	76	53.790	59.490	5.700	73.5	73.5
7.00	2.0	160.609	166.009	5.400	76	77	59.490	64.890	5.400	73.5	73.5
10.00	1.0	166.009	171.440	5.431	77	78	64.890	70.310	5.420	73.5	73.5
15.00	0.5	149.250	154.919	5.669	74	75	48.085	53.790	5.705	73.5	73.5

Results								
Standardized Data				Dry Gas Meter				
Dry Gas Meter		Calibration Meter		Calibration Factor		Flowrate	ΔH @	
(V _{m1@std})	(Q _{m1@std})	(V _{w1@std})	(Q _{w1@std})	Value (Y)	Variation (ΔY)	Std & Corr (Q _{m1@std@corr})	0.75 SCFM (ΔH@)	Variation (ΔΔH@)
cubic feet	cfm	cubic feet	cfm			cfm	in H ₂ O	
6.143	1.229	6.110	1.222	0.995	-0.005	1.222	1.904	-0.032
5.629	0.938	5.613	0.935	0.997	-0.003	0.935	1.923	-0.013
5.319	0.760	5.318	0.760	1.000	0.000	0.760	1.931	-0.005
5.327	0.533	5.337	0.534	1.002	0.002	0.534	1.943	0.007
5.584	0.372	5.618	0.375	1.006	0.006	0.375	1.979	0.043
				1.000	Y Average		1.936	ΔH@ Average



Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.

Note: For ΔH_g, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H₂O

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 157, certified 05/26/2006 using Pt Tape S/N 20700139, which is traceable to the National Bureau of Standards (N.I.S.T.).

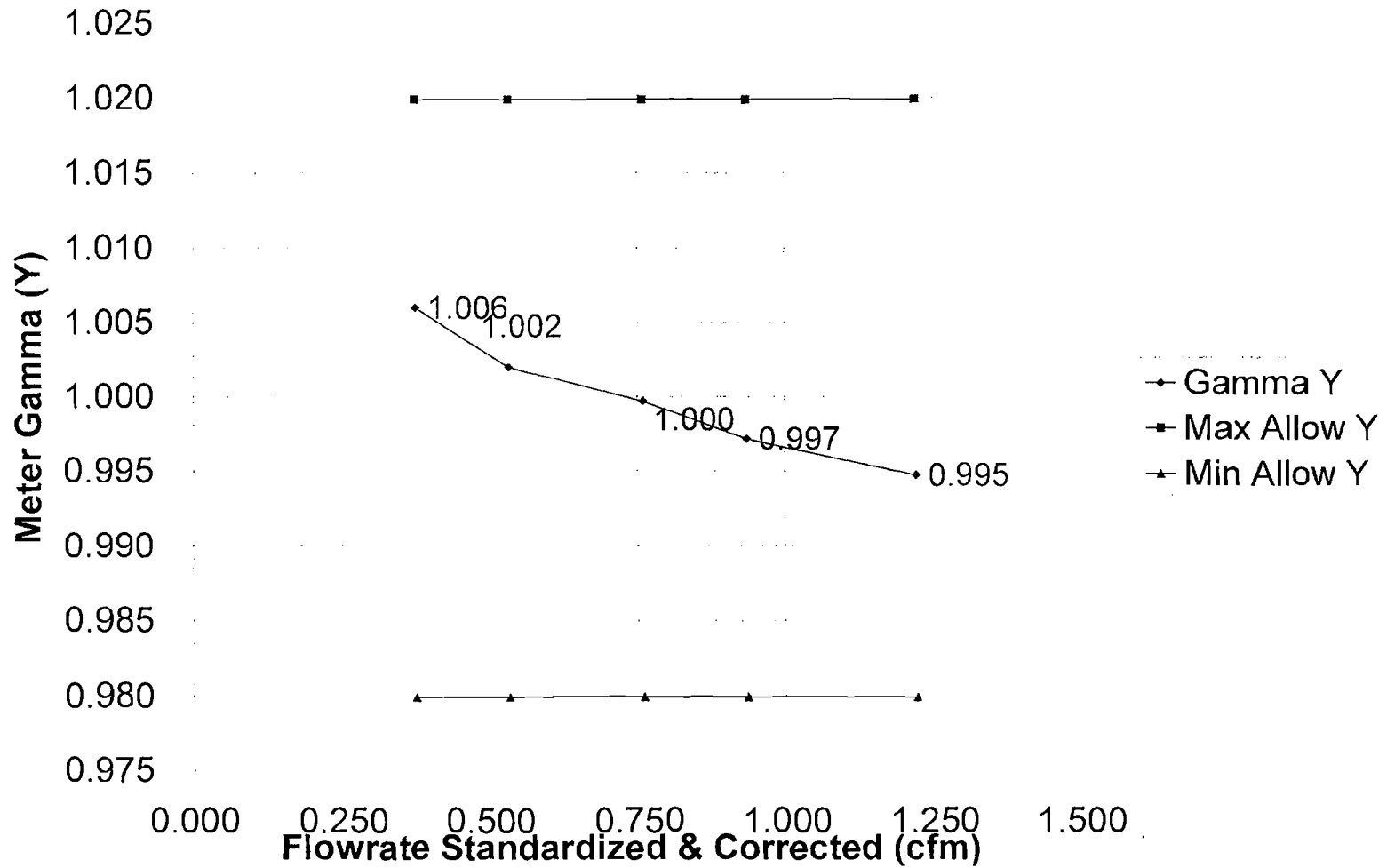
Signature E. W. Weber

Date 3/11/09

Calibration Date: 3-11-2009

Calibration Technician: EW

Meter Gamma vs Flowrate

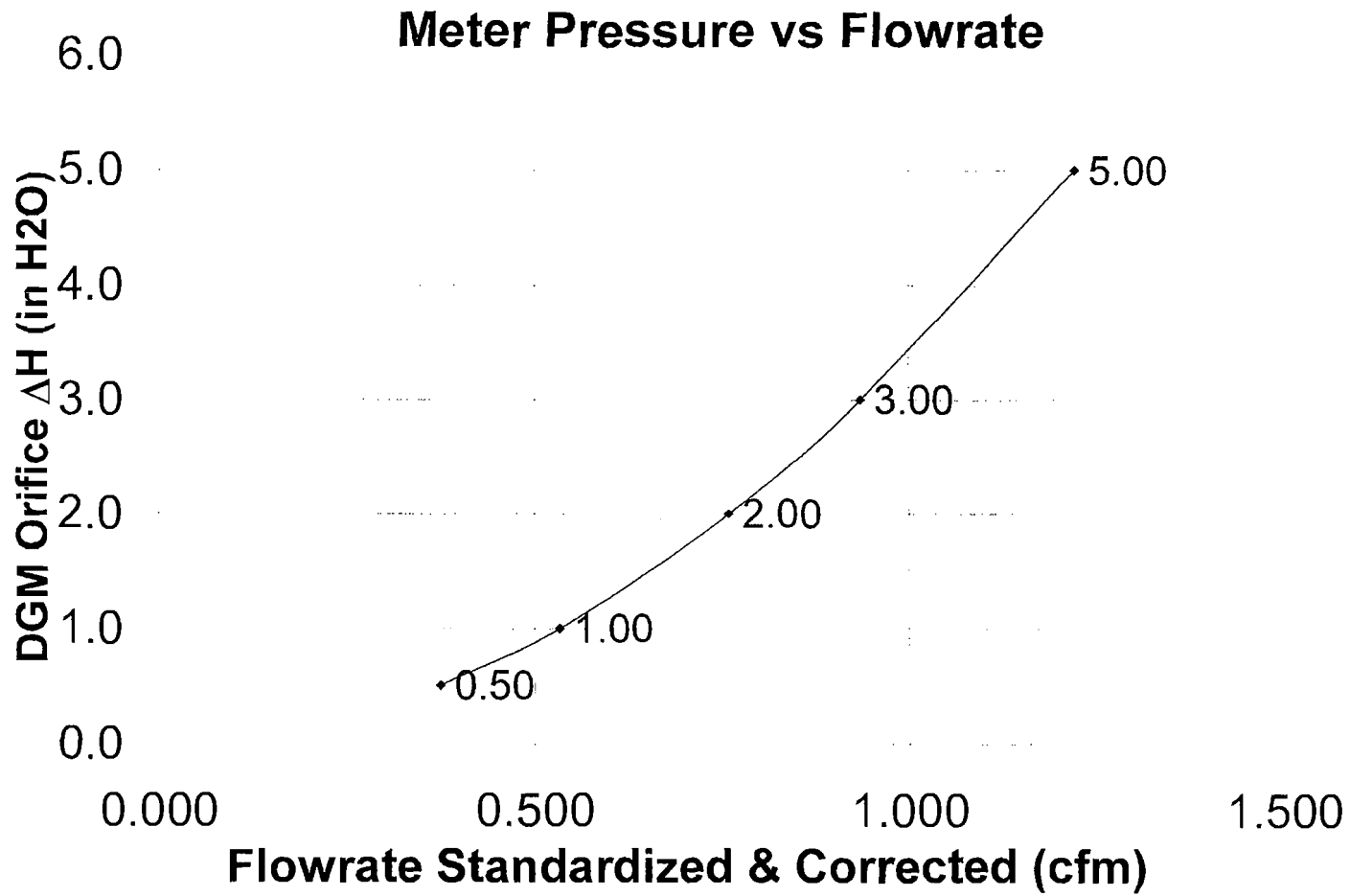


Console Serial: 0903012

Console Model: MC-522

Calibration Date: 3-11-2009

Calibration Technician: EW



Console Serial: 0903012

Console Model: MC-522

Temperature Sensor Calibration Data Sheet

Unit MC-522-O Serial # 0903012
 Date 3/11/2009 ThermoCouple No Model Altek Series 22 Type K
 Personnel EW Reference 105795
 Ambient temp _____ ASTM Mercury-In-Glass ID _____
 NIST Reference TC ID _____

Date	Reference Point Number	Source (specify)	Reference Thermometer Temperature F	Thermocouple Display Temperature F	Absolute Temperature Difference %
	1		100	99	0.2
	2		200	200	0.0
	3		300	301	-0.1
	1		500	498	0.2
	2		700	701	-0.1
	3		900	900	0.0
	1		1100	1101	-0.1
	2		1500	1500	0.0
	3		1900	1901	0.0
	1				
	2				
	3				
	1				
	2				
	3				
	1				
	2				
	3				
	1				
	2				
	3				
	1				
	2				
	3				
					0.007
					<1.5

Checked By *EW/ktc 3/11/09*
 (Personnel (Sign/Date))

Team Leader (Signature/Date) _____

POST TEST METER CALIBRATION DATA AND CALCULATION FORM

COMPANY: ARI Environmental

METER NUMBER: 1901013
BAROMETRIC PRESSURE: 29.74
DATE: 10/28/2009
CALIBRATED BY: ZRM
PRETEST Y FACTOR: 1.002

ROTAMETER SETTING	GILIBRATOR FLOWRATE	TIME	PK III INITIAL READING	PK III FINAL READING	PK III VOLUME (Vm) liters	CALCULATED GILIBRATOR VOLUME (Vw) liters	CALCULATED Y
liters/min	L/min	minutes	liters	liters	liters	liters	
0.689	0.689	10.0	0.0	6.657	6.66	6.89	1.035
0.689	0.689	10.0	0.0	6.762	6.76	6.89	1.019
0.689	0.689	10.0	0.0	6.840	6.84	6.89	1.007
						Average =	1.020

PRETEST Y FACTOR = 1.002
POSTTEST Y FACTOR = 1.020
DIFFERENCE, % = 1.8 (Must be < 5%)

BAROMETER CALIBRATION

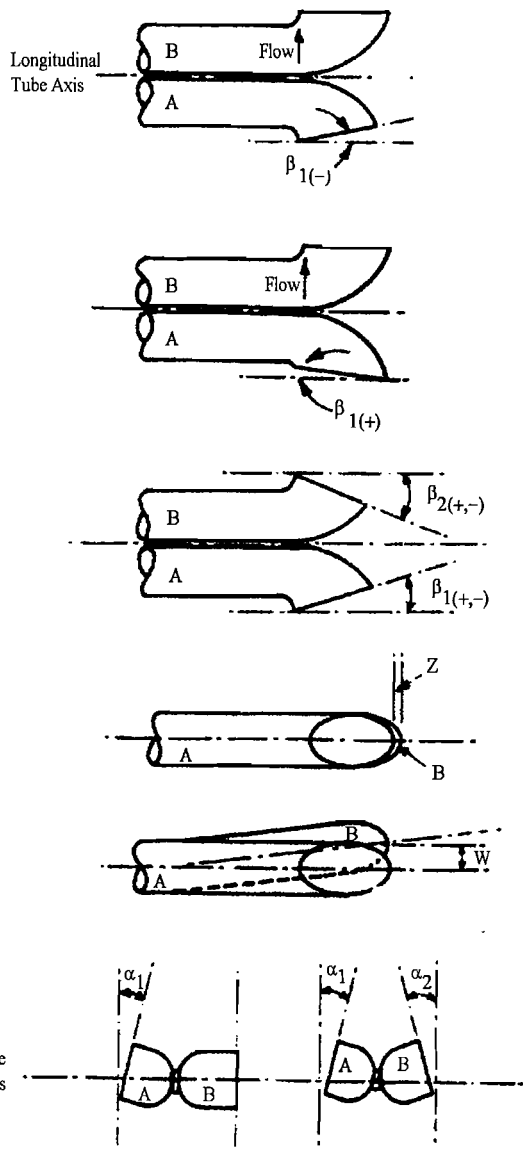
PRE-TEST

CALIBRATOR INITIALS	BAROMETER NUMBER	CALIBRATION DATE	BAROMETER READING (in. Hg)	REFERENCE READING (in Hg.)	DIFFERENCE (+/- 0.1 in Hg)
DWM	EB833-T7	3/27/2009	29.29	29.32	0.03

POST-TEST

CALIBRATOR INITIALS	BAROMETER NUMBER	CALIBRATION DATE	BAROMETER READING (in. Hg)	REFERENCE READING (in Hg.)	DIFFERENCE (+/- 0.1 in Hg)
ZRM	EB833-T7	10/28/2009	29.66	29.74	0.08

Pitot Tube Inspection Data

Client Name: VakroDate: 9/18/2009Date: 10/28/2009

y	level?	y
n	obstructions?	n
n	damaged?	n
0	$-10^\circ < \alpha_1 < +10^\circ$	0
0	$-10^\circ < \alpha_2 < +10^\circ$	0
1	$-5^\circ < \beta_1 < +5^\circ$	1
2	$-5^\circ < \beta_2 < +5^\circ$	2
1	γ	1
1	θ	1
0.630	A	0.63
0.315	$0.26775 < P_A < 0.3825$	0.315
0.315	$0.26775 < P_B < 0.3825$	0.315
0.255	$0.1875 \leq D_t \leq 0.375$	0.250
0.011	$A \tan \gamma < 0.125''$	0.011
0.01100	$A \tan \theta < 0.03125''$	0.01100
TRUE	$P_A = P_B \pm 0.063$	TRUE
PASS	PASS/FAIL	PASS

Comments:

Pitot tube/probe number P118 meets or exceeds all specifications and criteria and/or applicable design features (per 40CFR60 Appendix A; Method 2) and is hereby assigned a pitot tube calibration factor of 0.84.

Signature:

Date:

ARI Environmental Inc.
Thermocouple Calibration Data Form



Calibrator: ZRM ZRM
Thermocouple ID. P118 P118
 pretest **posttest**
Date: 9/18/2009 10/28/2009
Barometric: 29.88 29.74
Reference Thermometer = Mercury in glass

	Reference Point Number	Source	Reference Thermometer Temperature	Meter Readout Temperature	Difference (%)
Pre- Test	T.C	Ice Water	39.0	39.0	0.00
		Ambient	78.0	77.0	0.19
		Hot Water	143.0	143.0	0.00
Post- Test	T.C	Ice Water	42.0	42.0	0.00
		Ambient	77.0	76.0	0.19
		Hot Water	139.0	141.0	-0.33

$$a \text{ (temp. diff.)} = (\text{ref.temp} + 460) - (\text{Thermo. temp.} + 460) / (\text{ref. temp.} + 460) \times 100$$

Where $-1.5 < a < 1.5$

POST TEST METER CALIBRATION DATA AND CALCULATION FORM

COMPANY: ARI Environmental

METER NUMBER: 8003207

BAROMETRIC PRESSURE: 29.54

DATE: 10/28/2009

CALIBRATED BY: ZRM

PRETEST Y FACTOR: 0.994

ROTAMETER SETTING	GILIBRATOR FLOWRATE	TIME	PK III INITIAL READING	PK III FINAL READING	PK III VOLUME (Vm) liters	CALCULATED GILIBRATOR VOLUME (Vw) liters	CALCULATED Y
liters/min	L/min	minutes	liters	liters			
1.0	1.030	10.0	24.4	34.7	10.30	10.30	1.000
1.0	1.030	10.0	34.7	45.1	10.40	10.30	0.990
1.0	1.016	10.0	45.1	55.5	10.40	10.16	0.977
						Average =	0.989

PRETEST Y FACTOR = 0.994
POSTTEST Y FACTOR = 0.989
DIFFERENCE, % = -0.5 (Must be < 5%)



Valero Port Arthur Refinery
Source: SRU 544 TGI Exhaust
Test Date: October 14, 2009

APPENDIX E

Process Data

Performance Test and CEMS RATA Process Data File
SRU-544 SCOT II Tail Gas Incinerator
Valero Port Arthur Refinery

Run Start/Stop Date/Time	SCOT Recycle														
	Acid Gas Charge		SWAG Production		by Unit	Production by Train		Production by Unit		Tail Gas Incinerator		O2 Injection			
	400 MAG 36FC0409.PV	500 MAG 36FC0509.PV	300 SWAG 35FC9061.PV	8746 SWAG 38FI0702.PV	544 Recycle 36FI6140.PV	400 LT/D	500 LT/D	544 calc'd LT/D	% of Capacity	Firebox Temp 36TC0477.PV	Nat Gas Flow 36FI6228.PV	400 Train 36FC0412.PV	500 Train 36FC0512.PV		
	MSCFH	MSCFH	MSCFH	MSCFH	MSCFH	LT/D	LT/D	LT/D		DEGF	MSCFH	MSCFH	Ton/Day	MSCFH	Ton/Day
10/14/09 11:46 AM 10/14/09 12:46 PM	171.2	116.7	0.0	85.7	15.0	119.3	80.6	200	62%	1,320	20.58	17.1	17.3	10.0	10.2
10/14/09 2:03 PM 10/14/09 3:03 PM	169.9	124.7	0.0	85.0	15.1	118.4	86.3	205	64%	1,111	15.84	17.0	17.2	10.0	10.1
10/14/09 4:20 PM 10/14/09 5:20 PM	167.8	121.7	0.0	78.4	15.0	116.9	84.1	201	63%	902	14.98	17.1	17.3	10.1	10.2



Valero Port Arthur Refinery
Source: SRU 544 TGI Exhaust
Test Date: October 14, 2009

APPENDIX F

Test Program Qualifications

ARI Environmental's offices in Wauconda, Illinois and Pasadena, Texas specialize in conducting stack emission, fugitive leak detection, ambient air and in-plant OSHA type testing for industrial clients.

ARI is organized so that its facilities and resources meet the requirements of ASTM D7036, Standard Practice for Competence of Air Emission Testing Bodies. ARI's laboratories in Pasadena, Texas and Wauconda, Illinois hold TCEQ NELAP Certificate No. T104704428-8A-TX.

During the past 25 years, ARI personnel have conducted over 5,000 separate stack emission tests for a variety of industrial clients throughout North America for the determination of degree of source compliance and to yield emissions data and control equipment performance data for in-house engineering purposes.

ARI presently has over 80 trained personnel for conducting source emission sampling, fugitive leak detection monitoring, ambient air monitoring and OSHA sampling programs. All test programs are supervised and conducted by onsite Qualified Individuals (QI) and/or Qualified Source Testing Individuals (QSTI) pursuant to ASTM D7036.

The key personnel involved in the test program were as follows:

Greg Burch

Mr. Burch is ARI's Source Testing Division South Central Regional Manager and is responsible for planning and managing sampling programs, sample analysis, data reduction, QA/QC reviews, and reporting activity for the regional office. He is certified as a QSTI through the Source Evaluation Society. Mr. Burch has been involved with source testing since 1990. He has accumulated extensive experience in flow stream characterization for engineering purposes; emissions sampling for regulatory compliance demonstration and emissions sampling for system audit requirements of CEMS and PEMS.

Dustin Manthei

Mr. Manthei is a Source Sampling Field Technician. Mr. Manthei is well versed in the operation and maintenance of manual source sampling equipment and has performed these functions on numerous tests for various clients.

Mr. Manthei's responsibilities include field sampling, sample analysis, data reduction and interpretation, and maintenance and calibration of continuous and manual source sampling equipment.

Zack McCain

Mr. McCain is a Source Sampling Field Technician. Mr. McCain is well versed in the operation and maintenance of manual source sampling equipment and has performed these functions on numerous tests for various clients.

Mr. McCain's responsibilities include field sampling, sample analysis, data reduction and interpretation, and maintenance and calibration of continuous and manual source sampling equipment.

SOURCE EVALUATION SOCIETY



Qualified Source Test Individual

LET IT BE KNOWN THAT

GREG D. BURCH

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

BASIC KNOWLEDGE AND MANUAL PARTICULATE SAMPLING METHODS

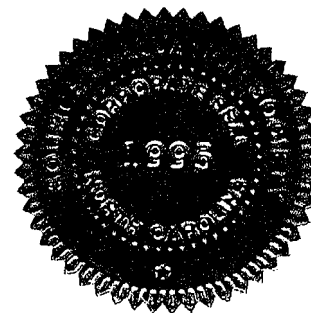
ISSUED THIS 20TH DAY OF APRIL 2006 AND EFFECTIVE UNTIL APRIL 19TH, 2011

Peter R. Westlin
QSTI Review Board

Leroy F. Owens
QSTI Review Board

Glenn C. England
QSTI Review Board

APPLICATION NO. 2006-027



SOURCE EVALUATION SOCIETY



Qualified Source Test Individual

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EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS SOURCE SAMPLING METHODS

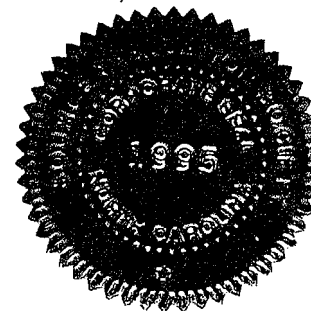
ISSUED THIS 8TH DAY OF JUNE 2006 AND EFFECTIVE UNTIL JUNE 7TH, 2011

Peter R. Westlin
QSTI Review Board

LeRoy F. Owens
QSTI Review Board

Glenn C. England
QSTI Review Board

APPLICATION NO. 2006-027



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ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

INSTRUMENTAL METHODS

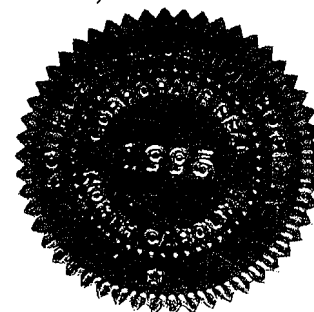
ISSUED THIS 8TH DAY OF JUNE 2006 AND EFFECTIVE UNTIL JUNE 7TH, 2011

Peter R. Westlin
QSTI Review Board

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QSTI Review Board

Glenn C. England
QSTI Review Board

APPLICATION NO. 2006-027



SOURCE EVALUATION SOCIETY



Qualified Source Testing Individual

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HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

HAZARDOUS METALS MEASUREMENT SAMPLING METHODS

ISSUED THIS 8TH DAY OF JULY 2009 AND EFFECTIVE UNTIL JULY 7TH 2014

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajlya-Mills, QSTI/QSTO Review Board

John R. Smith, QSTI/QSTO Review Board

APPLICATION
NO.
2006-027

