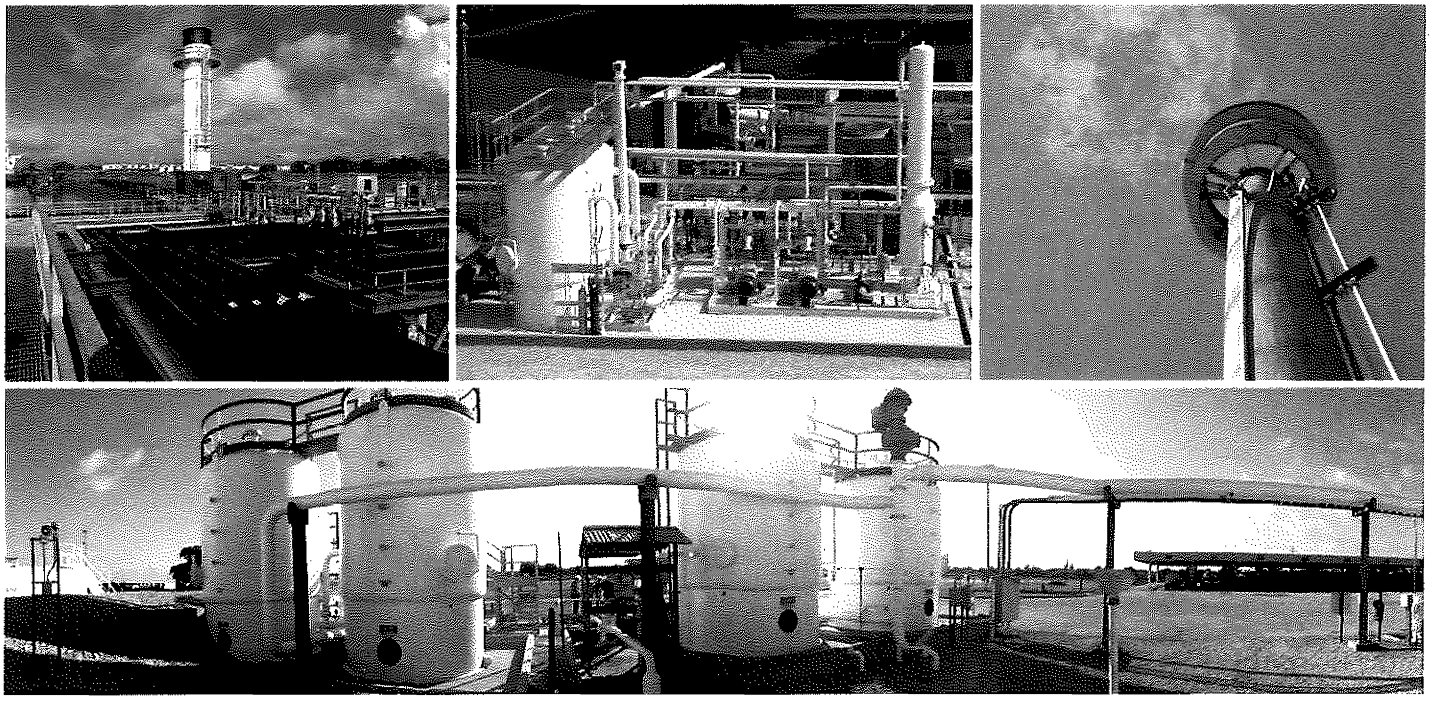
JOHN ZINK®AIR SOURCE TEST GROUP

VCU COMPLIANCE TEST REPORT



Prepared for:
CITGO Petroleum Corporation
Ferrysburg Terminal
524 Third Street
Ferrysburg, Ottawa County, Michigan 49409
Original Equipment Manufacturer: John Zink Company LLC
Original Equipment SO#: A008364

PREPARED BY J.N. THOMASON, QSTI
DATE
REVISION 1.0
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JOHN ZINK HAMWORTHY COMBUSTION

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1.0 INTRODUCTION

CITGO Petroleum Corporation ("CITGO") contracted John Zink Air Source Testing Group (JZASTG) to perform air emission testing services for one Vapor Combustion Unit (VCU) at the XYZ Terminal located in Ferrysburg, Ottawa County, Michigan. Concentrations of total volatile organic compounds (VOC, as total hydrocarbons [THC] measured on a propane detection basis), carbon monoxide (CO) and carbon dioxide (CO_2) were measured in the exhaust of the VCU. The total flow rate, temperature, pressure and inlet vapor hydrocarbons were simultaneously recorded upstream of the vapor combustion zone. The facility was monitored for VOC leaks immediately before the testing began using a portable hydrocarbon analyzer. The pressure of the vapor system was monitored in each loading bay.

The purpose of the test was to determine the compliance status of the VCU with respect to provisions found in the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Subpart XX ("Standards of Performance for Bulk Gasoline Terminals"), 40 CFR 63, Subpart BBBBBB ("National Emission Standards for Hazardous Air Pollutants for Source Categories: Gasoline Distribution Bulk Terminals, Bulk Plants, and Pipeline Facilities; and Gasoline Dispensing Facilities") and specific conditions found in Michigan Department of Environmental Quality – Air Quality Division Permit Number 201-03, State Registration Number B6258. Tests were completed while loading on bays 1 and 2. The emissions from these bays are controlled by the VCU identified in the permit as Emission Point Number EU-RACK serviced by stack SV-VCU.

This document presents the results for compliance testing of the VCU. Table 1-1 presents an executive summary of results. Section 2 provides a detailed summary of results as well as identification of the owner and contact, the physical location of the site, test contractor contact information and identification of specific test methods. Section 3 details Quality Assurance and Quality Control procedures and documentation. The appendices to this document provide raw field data, examples of calculations and formulae utilized to derive all results presented in this document, records of fuel loading, calibration certification documents and copies of relevant QA/QC procedures.

1.1 Test Objectives

- Determine if compliance with all federal and state permit limitations are met
- Quantify the total amount of VOC released to the atmosphere
- Verify that the vapor collection system is leak-free
- Validate the test matrix by loading at least 300,000 liters (~80,000 gallons) of gasoline in a minimum six-hour test period per 40 CFR 503(c)(1)
- Monitor the vapor collection system pressure during truck loading and record the highest instantaneous pressure for each loading bay per 40 CFR 60.503(d)(2)

1.2 Process Description and Operation

This facility owns and operates a John Zink Model ZCT-3-8-45-3-3/6-3/6-X-X VCU as an exhaust emission control device. The emissions from this unit are the subject of this report.

The fuels loading/distribution terminal has a total of 2 bays capable of loading gasoline blended with ethanol and petroleum distillates into tank trucks. A third bay is utilized exclusively for the off-loading of ethanol and is not subject to regulation. A field sketch of the loading rack detailing the number of loading arms at each bay and type of product loaded may be found in Appendix 1 of this report. As gasoline and/or other fuels are loaded into a tank truck the displaced vapors are pushed by air displaced during trailer loading through a closed venting system to the VCU. A knockout tank is associated with this system which captures any condensed liquid from the loading rack. After passing through a detonation arrestor to prevent backward flame propagation, vapors enter the burner area. There is no set pattern of loading (the trucks load on a first come, first served basis). However, the usual periods of heavy loading activity are in the early morning and late afternoon. The source test was timed to coincide with these periods.

Concentration measurements were made both upstream and downstream of the combustion zone. The upstream sample was obtained by extracting a small sample from the exhaust of a turbine meter temporarily installed on the vapor inlet line of the VCU. The downstream sample was obtained from a sample port approximately five feet below the combustor stack exit to atmosphere. This port was accessed via manlift. A field sketch of the unit may be found in Appendix A.

1.3 Complications during Sampling Event

No deviations from the published test methods or the accepted source test protocol were made during this sampling event. No adverse test conditions or environmental conditions which may have impacted results were encountered during the completion of this event. The test program was conducted according to the site-specific test plan using procedures deemed acceptable by the Michigan Department of Environmental Quality Air Quality Division and the United States Environmental Protection Agency.

Table 1: Executive Summary of Results

Terminal Owner:	CITGO Petroleum Corp
Terminal Name:	Ferrysburg
Location:	Ferrysburg, Michigan
Test Date:	06/27/18
Type of Vapor Control Unit:	Vapor Combustor
Vapor Control Make & Model:	John Zink ZCT-3-8-45-3-3/6-3/6-X-X
Number of Loading Bays:	2 gasoline, 1 offloading bay (ethanol)

Emission Test Methods		
Inlet Vapor Flow Rate	EPA Method 2A	
VOC Inlet Concentration	EPA Method 25B	
Exhaust Flow Rate	EPA Method 2B	
VOC Exhaust Concentration	EPA Method 25A	
CO_2 Exhaust Concentration	EPA Method 3A	
CO Exhaust Concentration	EPA Method 10	
NOx Exhaust Concentration	EPA Method 7E	
Vapor Leak Test	EPA Method 21	
Product Loading Data	**Observations**	**Criteria**
Start Test (time)	6:33	
End Test (time)	13:11	
Total Test Duration (hours)	6:37	≥ 6 hrs
Test Time (digital hours of active loading)	3.85	
Total Fuels Loaded (net gallons):	226,989	
Total Fuels Loaded (net liters):	859,247	
Total Gasolines Loaded (net gallons):	196,919	
Total Gasolines Loaded (net liters):	745,420	> 300,000 liters
% Non-gasoline/gasoline with ethanol Loaded	13.2%	
Emission Test Results	**Observations**	**Limits**
Vapor Control Leak Check	no leaks	no leaks
Maximum Loading Pressure (" H_2O)	17.4	< 18 " H20
Average Inlet Concentation (% as C_3H_8)	25.7	
Inlet Vapor VOC (lbs)	1007.88	
Average Exhaust Concentration (ppmv as C_3H_8)	23.9	
Total VOC Emissions (lbs):	6.42	
VOC Emission Rate (lbs/hr)*:	1.67	
VOC Emissions (mg/liter of gasoline loaded):	3.90	10
CO emissions (lbs/hour)*:	2.79	

**Hours of active loading*

2.0 SUMMARY

Detailed test results and summary information are presented and discussed in this section. The test matrix to evaluate compliance consisted of a period of greater than six hours (actual time of test 6:37, 6.62 digital hours) while the unit was operating at normal conditions. During the test period, quantities of VOC (as THC, propane detection basis) were measured from the inlet of the VCU using the procedures of USEPA Method 25B. Inlet volume was calculated using USEPA Method 2A (direct measurement of flow). Quantities of THC, CO and CO_2 were measured in the source exhaust using USEPA Methods 25A, 10 and 3A, respectively. Exhaust flow was calculated using the equations of USEPA Method 2B.

Test results are based on the one-minute interval averages recorded by the data-logging system. Five-minute averages of these measurements were calculated to determine VOC emissions. This is consistent with 60 CFR 60.503(c)(4). Table 2 presents these averages.

For the direct analysis of VCU inlet and exhaust stack gas, two extractive systems were used to obtain samples for the analyses of inlet and exhaust VOC and exhaust CO and CO_2. Each sample was extracted using a stainless steel/Teflon™ diaphragm pump. For the inlet sample a portion of the stream just past the turbine meter was extracted and directed to the test trailer via Teflon™ sample line. This line was not heated due to the risk of explosion given the high percent level concentrations of the sample (USEPA Method 25A, §5.2). The sample passes through a mole sieve dryer to remove water without effecting hydrocarbon concentration, then is routed through a rotameter for flow control and to the NDIR analyzer for measurement. The exhaust gas sample was continuously pulled through a heated Teflon sample line (maintained at 250 ± 20°F). A portion of the heated, unconditioned sample was delivered to the FID analyzer. The remainder of the sample was passed through a peristaltic condenser to remove moisture and then partitioned to the CO and CO_2 analyzers through a manifold and rotameters for flow control. All portions of the sample system are manufactured from inert material. A list of instruments utilized for this sampling event may be found in §2.5. A diagram of the sampling system is in §2.6.

The total quantity of gasoline vapors emitted from the VCU during the test period was found to be 6.42 pounds (291,206.3 mg) of VOC, measured and quantified on a propane detection basis. The total volume of gasoline loaded during test period was 196919 net gallons (745,420 liters). Therefore, the VCU emits VOC at an average rate of 3.90 mg/liters of gasoline loaded. The actual time of active loading was 3.85 digital hours. Using the total weight of VOC emitted and this time, a value of 1.67 pounds per hour of active loading is calculated. This corresponds to 0.03 pounds per 1000 gallons of gasoline loaded and can be extrapolated to 7.30 tons per year based on 8,760 hours of active loading. This assumes continuous loading which is a significant overestimation.

As specified in 40 CFR 60.503(b) and as referenced in 40 CFR 63.11092(a)(1)(i) the terminal's vapor collection system was monitored using USEPA Method 21 to identify any leaking components. A leak detection threshold of 500 ppm as methane was used to identify any leaking components. The survey included all valves, flanges, fittings, seals, check valves, etc. No leaks were detected during this survey.

The vapor collection system pressure was monitored at each loading bay during the sampling event. Data was recorded at five-minute intervals during loading with the highest instantaneous pressure noted. The highest instantaneous pressure recorded was 17.41" H_2O on Bay 1.

Table 2: Summary of Results

TABULAR SUMMARY
CITGO Petroleum Corp
Ferrysburg
6/27/2018

Technicians:	JNT, MSL, EDR, LB	
Turbine Meter:	GTS 8" s/n 81355	
Atmospheric Pressure:	29.10	in.Hg
Ambient CO_2 Conc.:	408.39	ppm

	Inlet Vapors							Combustor Exhaust					
Time	Turbine Meter		System	Inlet	Inlet Gas	Inlet Hydrocarbon (as C_3H_8)		Exhaust	Exhaust Concentrations				
Interval	Volume	Volume * Y	Pressure	Temp.	Volume			Volume	CO_2	CO	VOC (as C_3H_8)	VOC	CO
Ending		1.0030	(in. H_2O)	(°F)	(ft^3 @STP)	(Vol. %)	(lbs)	(ft^3 @STP)	(Vol. %)	(ppmv)	(ppmv)	(lbs)	(lbs)
Start Test @ 6:33	0	0											
6:37	0	0	0.02	66.9	0	42.60	0.00	0	0.138	4.27	23.21	0.00	0.00
6:42	575	576	0.89	66.6	563	44.09	28.42	87807	0.877	46.59	24.94	0.25	0.30
6:47	1230	1234	0.62	67.0	642	47.26	34.70	112706	0.836	51.08	21.21	0.27	0.42
6:52	1483	1488	0.58	66.6	248	49.58	14.06	100238	0.401	18.40	18.68	0.21	0.13
6:57	2075	2081	0.58	67.2	579	50.51	33.46	105265	0.863	50.16	22.07	0.27	0.38
7:02	2085	2091	0.02	67.2	10	47.91	0.55	10477	0.175	5.80	9.28	0.01	0.00
7:07	2085	2091	0.02	67.4	0	47.30	0.00	0	0.147	4.95	2.31	0.00	0.00
7:12	2085	2091	0.02	66.8	0	47.14	0.00	0	0.131	4.19	-0.18	0.00	0.00
7:17	2085	2091	0.02	66.4	0	47.07	0.00	0	0.131	4.20	-0.43	0.00	0.00
7:22	2085	2091	0.02	67.0	0	47.07	0.00	0	0.132	4.13	-0.99	0.00	0.00
7:27	2085	2091	0.02	68.2	0	47.15	0.00	0	0.132	4.04	-1.55	0.00	0.00
7:32	2085	2091	0.02	67.5	0	47.16	0.00	0	0.132	4.00	-1.32	0.00	0.00
7:37	2085	2091	0.02	68.8	0	47.12	0.00	0	0.132	4.16	-1.38	0.00	0.00
7:42	2085	2091	0.02	68.9	0	46.98	0.00	0	0.133	4.32	-4.24	0.00	0.00
7:47	2085	2091	0.02	69.1	0	47.02	0.00	0	0.133	4.35	-4.90	0.00	0.00
7:52	2111	2118	0.17	68.9	26	47.14	1.38	28559	0.167	5.59	-2.18	0.00	0.01
7:57	3213	3222	1.31	68.7	1076	28.58	35.21	112028	0.857	57.00	7.59	0.10	0.46
8:02	4006	4018	0.91	68.8	775	12.14	10.76	48285	0.616	60.04	11.73	0.06	0.21
8:07	5402	5419	2.07	69.5	1365	8.30	12.96	50715	0.687	78.59	52.05	0.30	0.29
8:12	6056	6074	0.67	69.2	637	4.18	3.05	32004	0.216	12.29	244.66	0.90	0.03
8:17	6979	7000	0.81	68.8	901	12.44	12.83	34812	0.913	64.25	292.05	1.16	0.16
8:22	7706	7730	0.80	69.1	709	30.21	24.53	90190	0.744	42.34	16.89	0.17	0.28
8:27	9008	9035	1.71	69.7	1271	38.58	56.13	94359	1.587	71.67	18.96	0.20	0.49
8:32	9643	9672	0.75	69.2	619	50.81	36.00	109564	0.892	49.24	18.87	0.24	0.39
8:37	11096	11129	2.16	70.1	1419	36.98	60.05	121172	1.331	52.60	11.19	0.16	0.46
8:42	12090	12126	1.30	71.4	967	26.52	29.34	97884	0.820	37.73	9.19	0.10	0.27
8:47	12977	13016	0.82	70.4	863	20.07	19.82	81308	0.674	45.14	4.19	0.04	0.27
8:52	13400	13440	0.42	70.6	411	17.50	8.23	47988	0.483	50.77	7.62	0.04	0.18
8:57	14481	14525	1.19	71.1	1052	31.81	38.30	71502	1.432	74.84	20.14	0.16	0.39
9:02	15995	16043	2.18	71.0	1477	33.01	55.78	117484	1.278	51.58	7.42	0.10	0.44
9:07	16746	16796	0.98	70.7	730	19.59	16.36	72209	0.630	36.69	4.94	0.04	0.19
9:12	17308	17359	0.48	70.5	546	12.09	7.56	53876	0.402	30.61	11.41	0.07	0.12
9:17	18329	18384	1.19	70.6	994	18.66	21.23	47391	1.179	56.68	101.63	0.55	0.20
9:22	19455	19514	1.21	71.3	1095	38.02	47.65	102126	1.253	60.57	14.67	0.17	0.45
9:27	20347	20408	0.74	71.5	865	39.42	39.05	85014	1.234	65.06	13.85	0.13	0.40
9:32	21036	21100	0.71	71.1	670	36.05	27.64	91685	0.824	45.30	8.15	0.09	0.30
9:37	21450	21515	0.37	70.9	402	35.18	16.18	67307	0.665	38.25	5.55	0.04	0.19
9:42	21475	21540	0.01	70.3	24	26.20	0.73	343	5.625	8.74	13.29	0.00	0.00
9:47	21475	21540	0.02	70.7	0	14.42	0.00	0	1.807	295.01	41.46	0.00	0.00
9:52	21475	21540	0.02	71.2	0	19.18	0.00	0	0.113	5.39	330.77	0.00	0.00
9:57	21707	21772	1.04	72.8	224	30.37	7.79	66786	0.344	8.25	6.60	0.05	0.04
10:02	22995	23064	1.59	73.2	1249	21.34	30.50	96690	0.861	47.10	8.14	0.09	0.33

	Inlet Vapors							Combustor Exhaust					
Time Interval Ending	Turbine Meter Volume	Turbine Meter Volume * Y 1.0030	System Pressure (in. H_2O)	Inlet Temp. (°F)	Inlet Gas Volume (ft^3 @STP)	Inlet Hydrocarbon (as C_3H_8) (Vol. %)	Inlet Hydrocarbon (as C_3H_8) (lbs)	Exhaust Volume (ft^3 @STP)	Exhaust Concentrations CO_2 (Vol. %)	Exhaust Concentrations CO (ppmv)	Exhaust Concentrations VOC (as C_3H_8) (ppmv)	Exhaust Concentrations VOC (lbs)	Exhaust Concentrations CO (lbs)
10:07	23531	23601	0.23	73.2	518	11.16	6.61	36128	0.512	67.19	6.48	0.03	0.18
10:12	23661	23732	0.01	73.0	126	8.45	1.21	12133	0.298	41.17	4.97	0.01	0.04
10:17	23661	23732	0.02	75.2	0	8.45	0.00	0	0.173	7.69	-2.38	0.00	0.00
10:22	23661	23732	0.02	76.5	0	8.17	0.00	0	0.134	6.41	-3.58	0.00	0.00
10:27	23661	23732	0.02	75.7	0	7.50	0.00	0	0.133	6.71	-3.69	0.00	0.00
10:32	23661	23732	0.02	75.8	0	7.57	0.00	0	0.133	6.98	-3.80	0.00	0.00
10:37	23661	23732	0.12	78.3	0	6.96	0.00	0	1.437	7.54	1.70	0.00	0.00
10:42	23710	23781	0.62	78.2	47	11.50	0.62	360	4.514	213.34	-4.71	0.00	0.01
10:47	23711	23782	1.30	78.3	1	24.56	0.03	481	0.102	171.34	326.59	0.02	0.01
10:52	24428	24501	1.15	78.8	687	13.40	10.54	30758	0.916	46.65	63.23	0.22	0.10
10:57	26205	26284	2.80	79.7	1708	29.62	57.89	101209	1.533	50.68	8.39	0.10	0.37
11:02	26846	26926	0.39	80.0	612	19.83	13.88	68051	0.569	49.64	4.19	0.03	0.25
11:07	26963	27044	0.36	80.1	112	24.58	3.15	43248	0.228	17.95	8.14	0.04	0.06
11:12	28156	28240	1.22	81.6	1137	27.54	35.84	80749	1.197	49.46	8.86	0.08	0.29
11:17	28735	28821	0.25	81.8	551	28.69	18.09	75792	0.659	45.42	8.91	0.08	0.25
11:22	28795	28882	0.20	81.7	58	27.28	1.80	25582	0.220	18.19	9.29	0.03	0.03
11:27	29338	29426	0.77	81.9	517	28.85	17.06	66831	0.704	32.39	9.87	0.08	0.16
11:32	30036	30126	0.31	81.7	664	34.89	26.51	96284	0.756	44.61	7.76	0.09	0.31
11:37	30972	31064	1.73	83.2	891	37.92	38.67	129531	0.815	36.98	17.53	0.26	0.35
11:42	32008	32104	0.89	84.5	982	25.69	28.89	106085	0.750	37.27	4.02	0.05	0.29
11:47	32540	32638	0.14	84.6	504	26.49	15.27	76194	0.560	43.37	5.14	0.04	0.24
11:52	32643	32741	-0.01	85.3	97	13.90	1.54	19672	0.242	26.16	5.38	0.01	0.04
11:57	32643	32741	-0.03	85.6	0	9.03	0.00	0	0.165	9.42	-1.64	0.00	0.00
12:02	32643	32741	-0.03	85.7	0	8.35	0.00	0	0.131	8.13	-3.22	0.00	0.00
12:07	32643	32741	-0.03	85.9	0	8.29	0.00	0	0.130	8.04	-3.44	0.00	0.00
12:12	32643	32741	0.00	86.0	0	8.35	0.00	0	0.130	8.02	-3.32	0.00	0.00
12:17	32643	32741	-0.03	85.7	0	8.87	0.00	0	0.130	8.05	-3.77	0.00	0.00
12:22	32643	32741	-0.02	85.8	0	8.55	0.00	0	0.130	8.03	-4.90	0.00	0.00
12:27	32643	32741	-0.03	86.6	0	8.57	0.00	0	0.130	8.06	-4.54	0.00	0.00
12:32	32643	32741	-0.03	88.2	0	8.75	0.00	0	0.129	8.10	-4.78	0.00	0.00
12:37	32643	32741	-0.03	88.7	0	8.57	0.00	0	0.129	8.03	-5.17	0.00	0.00
12:42	32643	32741	-0.03	88.1	0	8.27	0.00	0	0.129	7.94	-5.59	0.00	0.00
12:47	32643	32741	-0.03	86.8	0	8.75	0.00	0	0.130	7.86	-5.35	0.00	0.00
12:50	32643	32741	-0.03	86.25	0	8.93	0.00	0	0.130	7.89	-4.93	0.00	0.00
12:56	33367	33467	1.16	86.00	685	12.00	9.40	29631	0.851	39.41	59.78	0.20	0.08
13:01	34769	34873	1.44	85.93	1328	19.99	30.37	96736	0.859	39.91	2.88	0.03	0.28
13:06	35788	35895	0.60	86.22	962	19.49	21.47	84301	0.703	45.71	2.92	0.03	0.28
13:11	36282	36390	0.25	85.77	466	16.30	8.70	59283	0.420	38.25	5.10	0.03	0.16
13:16													
Totals	32643	32741			31622		1007.88	3206862				6.42	10.75
Averages			0.5	75.0		25.7			0.66	36.72	23.94		

SUMMARY OF RESULTS

TOTAL FUELS LOADED	***226989***
TOTAL GASOLINE LOADED	***196919 net gallons***
HYDROCARBON EMISSIONS	***3.904 mg/liter of gasoline loaded***
	0.03 lbs/1000 gallons of gasoline loaded
	1.67 lbs/hr VOC emission rate
CARBON MONOXIDE EMISSIONS	***6.54 mg/liter of gasoline loaded***
	0.05 lbs/1000 gallons of gasoline loaded

2.1 Owner Information

CITGO Petroleum Corporation
Mr. James La Porte
EHS & S Manager,
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2.2 Site Information

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2.3 Test Contractor Information

John Zink Air Source Test Group
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2.4 Test Participants

Name	Affiliation	Telephone Number
James La Porte	CITGO	734-233-5108
Mike Humphreys	CITGO	616-842-9040
Chris Robinson	MDEQ	616-356-0259
Jeremy Howe	MDEQ	231-878-6687
Tyler Salemasick	MDEQ	616-558-1281
Jeff Thomason	John Zink ASTG	918-234-2776
M. Sum Lee	John Zink ASTG	918-606-2580
Louis Beauregard	John Zink ASTG	918-402-3865
Dan Rainey	John Zink ASTG	908-346-9524

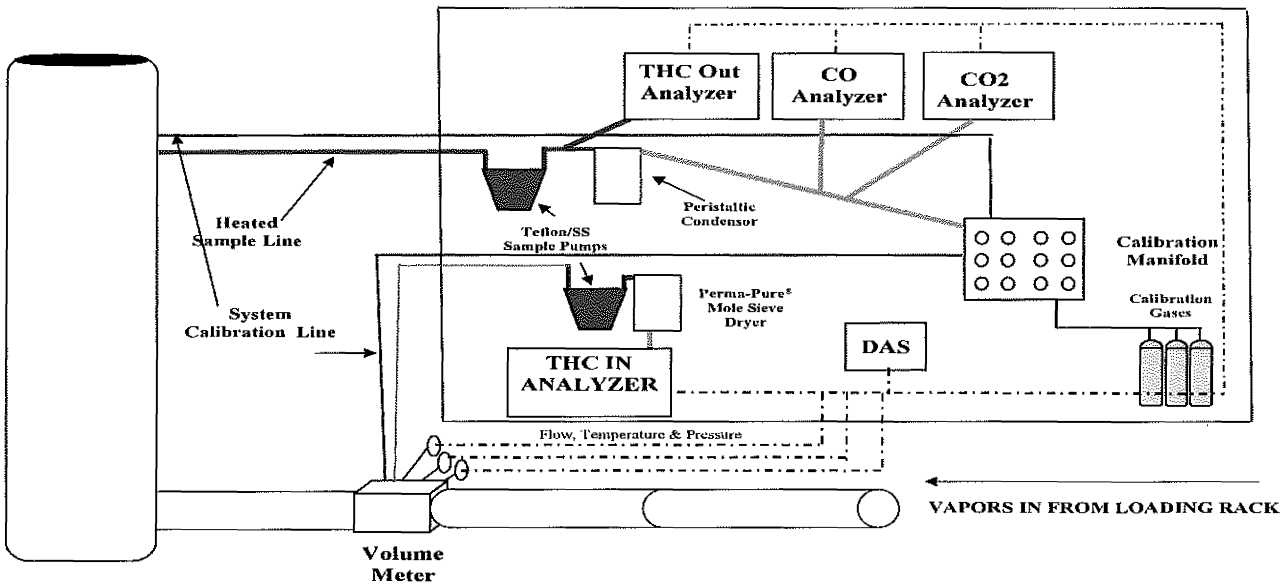
2.5 Test Methods

Parameter	Test Method	Measurement Technique	Modifications to Method
Inlet Flow Rate	USEPA Method 2A	Direct measurement of flow	None
Inlet VOC	USEPA Method 25B	Continuous Analyzer (NDIR)	None
Exhaust Flow Rate	USEPA Method 2B	Carbon Balance	None
Exhaust CO_2	USEPA Method 3A	Continuous Analyzer (NDIR)	None
Exhaust CO	USEPA Method 10	Continuous Analyzer (NDIR)	None
Exhaust VOC	USEPA Method 25A	Continuous Analyzer (FID)	None
VOC Leaks	USEPA Method 21	Portable Analyzer (CatOx)	None

2.5 List of Instruments

Parameter	Manufacturer	Model	Serial Number
Inlet Flow	Rockwell	GTS 8	81355
Inlet VOC	Infrared Industries	8400	5540
CO_2	Servomex	1440	01440D-5277
CO	Thermo Environmental	48i	1180730005
THC	Thermo Environmental	51i	11809200043
VOC Leaks	RKI	Eagle 2	EG2335

2.6 Sampling System Diagram



3.0 QUALITY ASSURANCE and QUALITY CONTROL

All sampling was performed following standard USEPA protocols as presented in 40 CFR 60, Appendix A. The test data was checked for completeness, thoroughly documented and subjected to a rigorous peer review process.

3.1 Equipment Calibration and Analytical Technique

All testing equipment used to conduct emission measurements are maintained according to the manufacturer's instructions to ensure proper operation. Calibration and quality assurance activities are completed on each measurement device according to procedures specified by the USEPA.

3.1.1 Inlet/Outlet THC Continuous Emission Monitors

Upon arrival at the site the inlet and outlet instruments were activated and allowed to warm up per the manufacturer's instructions. A four-point calibration error test was performed on each analyzer at the beginning of the day. Vendor-certified calibration gases containing propane were used for this calibration of the inlet analyzer. The inlet analyzer is designed to measure THC as its' carbon equivalent; therefore, the instrument readings are equivalent to the calibration gas concentrations. The outlet analyzer was calibrated with propane standards certified by the vendor to EPA Protocol G1 with results reported as VOC on that measurement basis.

Calibration error tests were performed on each analyzer by introducing the zero and calibration gases through the entire system to establish a linear response line as directed in USEPA Method 25A §8.4. The zero and high-level calibration gases were introduced in sequence with the analyzer being adjusted as necessary to record the proper values. The predicted values for the mid- and low-level gases were then calculated. These gases were then introduced successively to the measurement system. The predicted response was then compared to the actual response. The differences between the respective responses was less than 5% of the respective calibration gas values.

The inlet and outlet sampling systems were then evaluated for response time. For each system, the zero gas was introduced through the entire measurement system and allowed to stabilize. The high-level gas was then introduced. The time from the concentration change to the measurement system response equivalent to a 95% step change was recorded. This process was repeated three times and the results were averaged.

Following the completion of each test period, sample system drift was determined in the manner prescribed in USEPA Method 25A §8.4. 2. The zero- and mid-level calibration were introduced in sequence to the measurement system. The analyzer response was recorded. The results of these tests did not exceed 3% of span; therefore, no corrective action was required.

3.1.2 CO and CO_2 Continuous Emission Monitors

Non-dispersive infrared analyzers were used for CO and CO_2 concentration measurements in conformance with the specifications of USEPA Methods 10 and 3A, respectively. The CO analyzer uses gas filter correlation to eliminate interference from CO_2 or moisture. A calibration error test was performed on each monitor by routing low, high and mid-level calibration gases directly to each analyzer. The calibration error test for each met the requirements of the reference methods. After the calibration error test, a sampling system bias test was completed. The mid-level calibration gas was routed through the entire sampling system including calibration valve, sample line and moisture removal system. All sample system bias tests met the reference method requirements. The upscale and downscale response time of the sample system was determined during the initial bias test. The longest elapsed time was chosen and the response time for the system. No test period began until at least twice this response time had elapsed. Due to the continuous calculation of outlet flow required by USEPA Method 2B, no concentrations were corrected for bias. Sample system drift was determined at the end of each sample period. Drift is defined in USEPA Method 7E §3.1.6 (as referenced in Methods 10 and 3A) as the value derived by subtracting the pre-run bias concentration from the post-run bias concentration expressed as a percentage of calibration span. All sample system drift test results met the requirements of the test methods.

3.1.3 Volumetric Flow Rate

The turbine meter used for outlet flow rates was calibrated prior to testing in accordance with USEPA methodology. A post-test calibration check was also completed on the meter. Calibration documentation may be found in Appendix E. That documentation shows that the difference in pre- and post-test calibrations differed by less than 5% as specified in USEPA Method 2A, §10.1.8.

The temperature sensor used for this sampling event was checked at ambient temperature and compared to a reference thermometer. The sensor agreed within 2% of the reading of the reference thermometer and the data collected is valid in accordance with USEPA Method 2A, §10.2. The barometer utilized was calibrated against a mercury barometer prior to the field test.

3.1.4 Portable Hydrocarbon Analyzer (leak detector)

An RKI portable analyzer equipped with a catalytic oxidation detector was used to monitor the vapor collection system during tank truck loading. The analyzer was calibrated with a 500 ppmv certified methane standard. Leaks were defined as exceeding a threshold of 500 ppm methane. The monitoring includes all valves, flanges, seals, check valves, etc., and conformed to USEPA Method 21 procedures.

3.1.5 Pressure Monitoring of Vapor Collection System

The pressure at the vapor hose connection at each of the loading bays was monitored using a Dwyer digital manometer on Bay 2 and a SignalFire™ electronic pressure transducer. Each device had a calibrated range of greater than of 0-20" H_2O. The pressures were monitored every five minutes on multiple loads at each bay with the highest instantaneous pressure on each load being recorded. The documentation for this monitoring may be found in Appendix A of this report. Typically, monitoring continues until

a "worst case scenario" is noted. The facility is accepted as meeting the standard presented in 40 CFR 60.502(h) if the worst-case pressure is less than the citation.

3.1.6 Data Acquisition and Handling System

The electronic output signals of the continuous analyzers as well as the turbine meter volume, temperature and pressure and the output of the electronic pressure transducer were converted to a digital format and stored by a computerized data acquisition and handling system (IntelliLogger™ IL-80) with an interrogation frequency of one (1) second creating 10-second, 30-second and 60-second averages. The system translated this digital format into the proper units and stored them to disk. The system provides resolution of less than 0.5% of the calibration span of each analyzer. Logged data records are presented in Appendix D.

3.2 Fuel Loading Data

During the test, terminal personnel collected fuel loading data using bills of lading (BOL) generated by the site's automation system. Each load is documented by company and vehicle log in and the quantity and type of product(s) to be loaded. This information generates a BOL at the end of loading which documents gross and net gallons loaded. This information was provided to JZASTG as a record of volume to be utilized in the calculation of mass emissions in terms of the standard. To successfully obtain permission to load, each trailer must have a current certificate of leak tightness (per USEPA Method 27) on file at the facility. This documentation is available upon request.