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Emission Test Report

for

Buckeye Terminals, LLC

at the

Woodhaven Terminal in Woodhaven, MI
John Zink Vapor Recovery Unit (VRU-1)

subject to
EPA Title 40 CFR Part 63, Subpart BBBBBB
MDEQ Permit No. 21-14A

Prepared for:

BUCKEYE TERMINALS, LLC

Test Date: May 10, 2017
Erthwrks Project No. 7653c

1.0 INTRODUCTION

1.1 Identification, location and dates of tests

One John Zink Vapor Recovery Unit (VRU) was tested for Buckeye Terminals, LLC at their Woodhaven Terminal in Woodhaven, MI. The emission testing was conducted on May 10, 2017.

Table 1: Facility Unit Information

Unit	Make	Model
VRU-1	John Zink	VRU

1.2 Purpose of Testing

The purpose of the test was to determine the emissions exhausted from the VRU associated with the truck loading rack and operations. The testing was conducted in accordance with the conditions in Title 40 Code of Federal Regulations (CFR) Part 63, Subpart BBBBBB and MDEQ Permit No. 21-14A.

Testing was conducted for the determination of Total Organic Compounds (TOC) mass emission rate per gasoline loaded to satisfy the GD GACT (Subpart BBBBBB) regulation and to satisfy the MDEQ Permit No. 21-14A.

1.3 Description of Source

Buckeye Terminals, LLC owns and operates the Woodhaven Terminal in Woodhaven, MI. This bulk fuel terminal is designed to receive, store, and deliver fuel to tank trucks. Within this facility, the Vapor Recovery Unit (VRU), in conjunction with all components of the vapor collection system, is in place in order to minimize the emissions of volatile organic compounds (VOC) during the loading of tank trucks.

The vapor recovery unit is a John Zink VRU and is equipped with two, identical adsorbers, each filled with activated carbon. One adsorber vessel is on-stream in the adsorption mode while the other is off-stream in the regeneration mode. Switching valves automatically alternate the adsorbers between adsorption and regeneration. One adsorber is always on-stream to assure uninterrupted vapor processing capability. The Buckeye Woodhaven terminal also uses a vacuum assist or VAVAC™ technology, which uses a vapor blower to maintain a controlled vacuum inside the vapor collection arm connected to the loading rack header, eliminating/reducing fugitive emissions

To process the hydrocarbon vapor-air mixture, the mixture first flows up through the on-stream adsorber vessel. There, the activated carbon adsorbs the hydrocarbon vapor, so clean air vents from the bed with minimal hydrocarbon content. The emissions are vented to the atmosphere from an exhaust stack approximately 25 feet above ground level (AGL).

Simultaneously, the second adsorber is being regenerated off-line. The carbon bed regeneration uses a combination of high vacuum and purge air stripping to remove previously adsorbed hydrocarbon vapor from the carbon and restore the carbon's ability to adsorb vapor during the next cycle.

Hydrocarbon vapor and condensate flow from the separator to an absorber column section that functions as the final recovery device. The hydrocarbon vapor flows up through the absorber packing where it is subsequently recovered by absorption into a liquid hydrocarbon absorbent.

1.4 Contact Information

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Facility Location:
Woodhaven, MI Loading Terminal
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2.0 SUMMARY OF RESULTS

Results of the stack testing on the VRU are summarized in Table 2. The sampling results indicate the facility is in compliance with the limits set forth in the 40 CFR 63 Subpart BBBBBB.

Table 2: Summary of Results

Regulation	Measured Results	Applicable Limit
Method 21—Vapor Leak	120 ppm	500 ppm Subpart BBBBBB
Rack Back Pressure	Highest Pressure: 3.0" H_2O	17.72" H_2O
TOC Emissions (Gasoline Loaded)	0.57 mg/L gasoline loaded	6 mg/L gasoline loaded
Volume Loaded	671,186 Liters of Gasoline	Minimum 300,000 Liters of Gasoline
Compliance Test Time	>6 hours	Minimum 6 hours

3.0 SOURCE DESCRIPTION

3.1 Description of the process

This bulk fuel terminal is designed to receive, store, and deliver fuel to tank trucks. These tank trucks then deliver the fuel to various service stations for consumer distribution. Within this facility, the Vapor Recovery Unit, in conjunction with all components of the vapor collection system, is in place in order to minimize the emissions of volatile organic compounds (VOC) during the loading of tank trucks.

As tank truck loading is being performed at the loading rack, gasoline products are transferred from the storage tanks into the tank trucks. The tank trucks are loaded with product at approximately 500-600 gallons per minute per loading arm. As gasoline product is loaded into the trucks, the head-space inside the tank trucks, which contains gasoline vapors, are vented into the vapor collection system. This system includes vapor hoses that connect the tank truck to the vapor collection system piping and the VAVAC™ system. The VAVAC™ keeps the vapor collection system from the tank trucks to the VRU under a vacuum. The piping then vents the vapors, through various valves and flame arrestors, to the Vapor Recovery Unit. At the VRU, the hydrocarbon vapors are recovered and returned to product.

3.2 Applicable permit and source designation

The Buckeye Terminals, LLC Facility Loading Terminal is subject to the regulations set forth in the Ohio EPA Permit No. P0107378, and the 40CFR63, Subpart BBBBBB.

3.3 Type and quantity of materials processed during tests

During the emission testing on May 10, 2017 of the Facility Loading Terminal, 177,328 gallons, or 671,186 liters of gasoline product was loaded during the six-hour test period. **US EPA Title 40 CFR, Part 60, Subpart XX §60.503(1)** requires a minimum of 300,000 liters of gasoline during a six-hour period.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Description of sampling and field procedures

Erthwrks LLC conducted the VRU emission test following all procedures set forth in the US EPA 40 CFR 63, Subpart BBBBBB. As specified by this performance standard, Erthwrks utilized the following methods for the emission rate determination:

EPA Method 2A for VRU exhaust flow rate
EPA Method 21 for VRU leak checks
EPA Method 25B for TOC exhaust concentration

Erthwrks LLC utilized a mobile laboratory on site to conduct the emission testing. The Method 21 leak determination was conducted utilizing an RKI Eagle™ portable gas detector. This test was conducted at the beginning of the test period when tank trucks began loading. This analyzer employs a strong sample pump and meets all quality assurance specifications required by the method. Vapor at all potential leak sources in the terminal's vapor collection system were monitored while trucks were being loaded.

The rack back pressure determination was conducted using Dwyer® Series 476A digital manometers. These manometers were installed between the truck and the vapor collection hose utilizing leak-tight adapting connections. Every loading position was tested at least once during the performance test as specified in **US EPA 40 CFR 60 Subpart XX §60.503 (d)(2)**.

Exhaust TOC concentration and flow rates were measured utilizing an American® turbine meter and an exhaust sample system designed to continuously monitor the gas TOC concentration downstream of the VRU exhaust. The exhaust flow rate determination was conducted following all procedures and quality assurance as specified by Method 2A. The calibrated turbine meter, also known as an inferential meter, utilizes a rotor in the gas stream that turns at a speed proportional to the flow rate of the gas. This gas flow and the meter's temperature and static pressure were monitored and recorded on Erthwrks' data logging

system. This data, along with the exhaust TOC concentration measured with an IR8400 NDIR Hydrocarbon Analyzer following all procedures set forth in Method 25B, allowed Erthwrks to determine the TOC mass flow rate from the VRU. Using this TOC concentration, the exhaust flow rate, the density factor for the calibration gas given in **US EPA 40 CFR 60 Subpart XX §60.503(c)(3)**, and the loading terminal bill of ladings, Erthwrks calculated the TOC emission rate in mg of total TOC per gallons of gasoline loaded.

For this project, Erthwrks used an NDIR Hydrocarbon Analyzer capable of providing a non-methane hydrocarbon results. It is these results that Erthwrks has defined as VOC. The VOC results are also provided in the summary of results in Appendix A.

4.2 Description of Analytical Procedures (QAQC)

The volatile organic compounds (VOC) concentration determination followed all QAQC procedures as specified in the US EPA 40 CFR 60 Appendix A, Method 25B. The calibration error (CE) test was conducted following the procedures specified in **EPA Method 25A §8.4.** In accordance with this requirement, a four-point analyzer calibration error test was conducted prior to exhaust sampling. This CE test was conducted by introducing the zero, low, mid, and high-level calibration gasses (as defined by EPA Method 25A §7.1.2-5 and the response was recorded. The results of the CE test are acceptable if the responses for the low and mid-level calibration gasses are within ±5.0% of the predicted responses. The sample system response time was also recorded.

After each compliance test run, the drift determination was conducted to validate the run data in accordance with **EPA Method 25A §8.6.2**. The run data is valid if the calculated drift is within ±3.0% of the span value (**EPA Method 25A §13.1.2**)

Table 3: Analytical Instrumentation

Effluent Tested	Analyzer Make/Model	Range utilized	Detection Principle
TOC	IR8400	2%	NDIR
Turbine Meter	American SN 122905	60,000 SCFH	NA

All supporting documentation used to quantify the results of this emission test is attached. The detailed results of emissions test are located in Appendix A. These detailed results include all the 5-min average results from Erthwrks' data logging system converted into the proper units and also includes the calculations for the formulation of the results. Erthwrks quality control documentation is found in Appendix B. This documentation demonstrates the gaseous analyzers meet all the QA/QC specifications of the method. Appendix C contains all example calculations used to formulate the emission test results. The Erthwrks Sample System Diagram and the field data sheets used are located in Appendix D. Appendix E contains the raw data log records. These records show the 1-min average record of all data collected on Erthwrks' data logging system while the 5-min average records are located in Appendix F. All calibrations and certifications can be found in

Appendix G. Appendix H contains the bill of ladings that document the total gasoline loaded during the testing period.

4.3 Discussion of sampling procedures or operational variances

There were no sampling procedures or operational variances during the testing event.

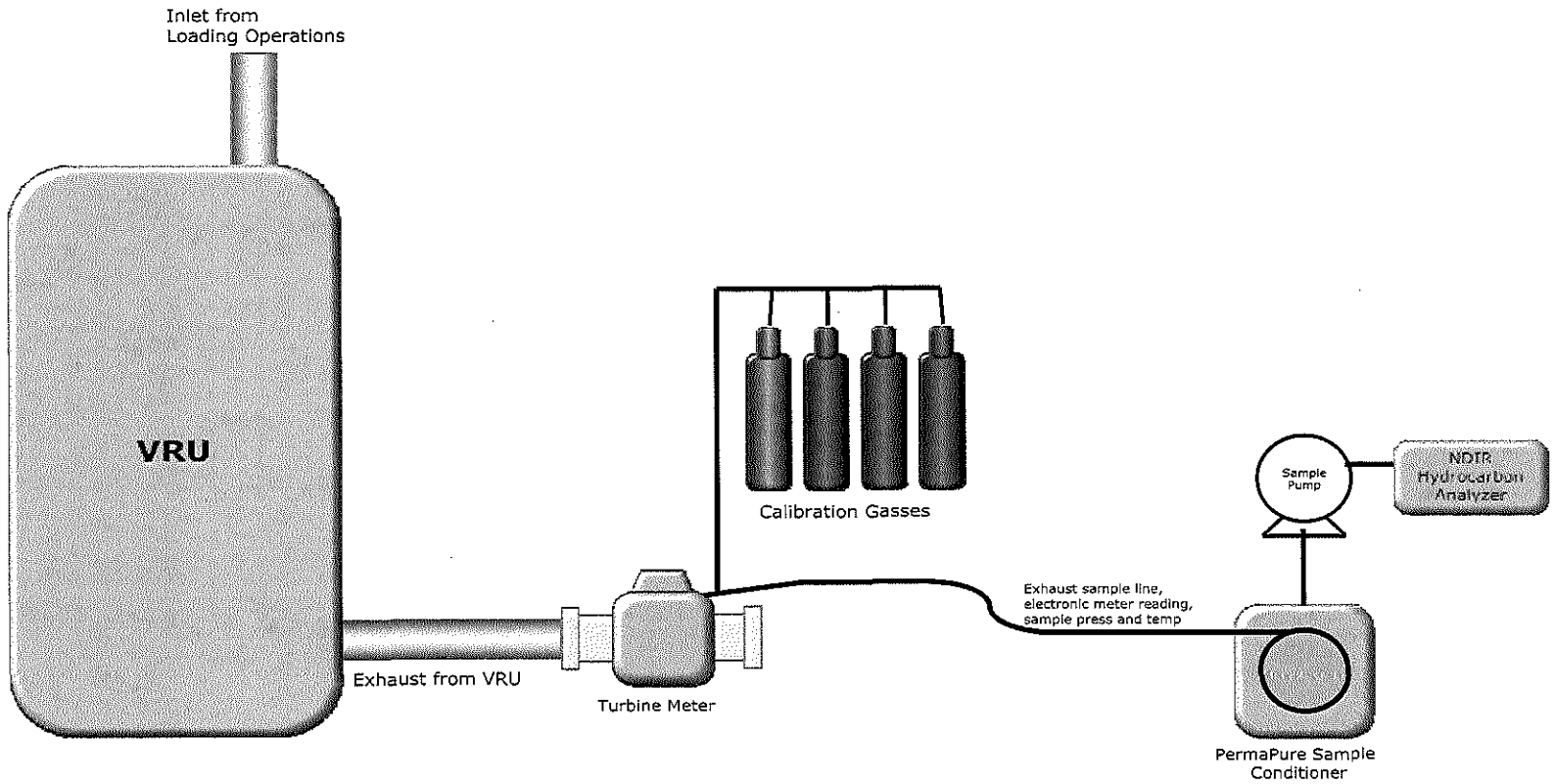

Figure 1: Sample System Diagram