Volatile Organic Compounds Emissions
Compliance Test
Romulus McGill Terminal Vapor Recovery Unit
Marathon Petroleum Company LP
Romulus Terminal Facility
Romulus, MI

I. INTRODUCTION AND SUMMARY

The Marathon Petroleum Company LP's Environmental Field Services Section conducted a performance test on the McGill Vapor Recovery Unit located at the Romulus Terminal Loading facility. This facility serves as a vapor recovery system for their bulk gasoline and diesel fuel loading. The testing was conducted on July 15, 2020.

The purpose of the testing was to determine the volatile organic compounds (VOC's) emissions rate from the McGill vapor recovery unit's exhaust outlet during truck loading procedures. The emission rate was compared to the regulatory emissions rate as specified by the Michigan Department of Environment, Great Lakes, and Energy for the bulk gasoline terminals.

Test methods followed those as detailed in the Code of Federal Regulations, CFR40, Part 60, Subpart XX and Part 63, Subpart R. Specific procedures used were EPA Methods 2A, 21, 25B and Subsection 60.503 (d).

The testing was conducted by Mr. Aaron Boyd of Refining Analytical and Development's Environmental Field Services Section. Mr. Victor Brzeg of MPLX Terminals LLC's Environmental Department coordinated the testing.

I. INTRODUCTION AND SUMMARY (cont.)

A total of 18 trucks were loaded during the testing period. A total of 170,614 gallons of accountable gasoline was recorded for measurement of VOC's emissions. The testing period met the 6 hour mininum as required in Subpart XX.

The test results are as follows:

Total mass of organic compounds emissions of VRU during the 6 hour test (mg as propane)	34,757
Emissions rate of total organic compounds, mg/liter of gasoline loaded (as propane)	0.09
Emissions rate of total organic compounds, mg/liter of total volume loaded (as propane)	0.06
54 mg/L equivalency concentration, gasoline throughput	1.95
54 mg/L equivalency concentration, total throughput	2.93

Volatile Organic Compounds Emissions
Compliance Test
Romulus McGill Terminal Vapor Recovery Unit
Marathon Petroleum Company LP
Romulus Terminal Facility
Romulus, MI

II. PROCESS DESCRIPTION

Marathon Petroleum Company LP's Romulus truck loading facility utilizes a McGill Vapor Recovery Unit to adsorb organic vapors emitted from the bottom tank during loading procedures. This process consists of two (2) carbon beds which continually cycle and regenerate every 30 minutes. The gas vapor, which adsorbs on the activated carbon after going through the absorbing tower, is vented to the atmosphere. After adsorption cycle is complete, the bed recycles under vacuum at 27.5 inches of water while the other bed is being utilized. During the recycle process in the carbon adsorber, a dry vacuum pump pulls the hydrocarbon from the carbon. The hydrocarbon vapors from the carbon adsorber are mixed with the vacuum pump seal fluid and are discharged to an absorber/separator.

The liquid hydrocarbons are condensed and separated from the seal fluid in the separator compartment and discharged back to a holding tank. Any remaining hydrocarbons pass through the packed absorber tower and are contacted by the fresh stream of gasoline which absorbs most of the remaining hydrocarbons. The small amount of hydrocarbon that is left then leaves the top of the absorber and is directed back to the carbon adsorber which starts the whole process again.

The VOC's sampling point is located at the exhaust of the turbine meter where the volume of exhaust air is measured.

III. SAMPLING AND ANALYSIS PROCEDURES

A volatile organic compounds emissions compliance test was conducted on the Romulus Terminal's McGill Vapor Recovery unit. The testing was conducted on July 15, 2020.

The test procedures used followed those as required in the Code of Federal Regulations, CFR40, Part 60, 2004, Subpart XX including EPA Methods 2A, 21 and 25B and Subsection 60.503 and CFR40, Part 63, Subpart R.

The vapor recovery unit emissions rate was determined by monitoring a number of parameters on the controlled system. These parameters included:

1. A complete leak check on the vapor recovery unit system including all of the connections and hoses at the loading bays.

2. An organic vapor leak check of each tank compartment of each truck loading gasoline during the loading process.

3. A determination of the vapor flow rate exhausted from the carbon bed adsorber beds.

4. A determination of the volume of fuel loaded during the test period.

5. A determination of the emissions rate of hydrocarbons during the test period.

III. SAMPLING AND ANALYSIS PROCEDURES(cont)

A. Vapor Recovery Unit Initial Leak Check

An initial organic vapor leak check on the vapor recovery unit was conducted during the loading process prior to testing on July 15, 2020. All connections and hose fittings were checked using EPA Method 21 procedures. A RKI Instruments, Gas Tracer, Organic Vapor Analyzer, was used to detect any leakage.

B. Tank Truck Compartment Leak Checks

During the loading process of each tank truck for gasoline, an organic leak check was conducted on each compartment. The leak check consisted of checking each dome and gasket and hose connection to vent line. Leaks were logged along with the load capacity to determine accountability of each load for determining emissions rate. Only test data obtained during the loading of leak free trucks were used in the final calculation of vapor recovery organic emissions rate.

C. Vapor Flow Rate

Carbon Beds

The vapor volume flow rate from the exhaust was determined by using an American Turbine Meter following EPA Method 2A. The meter was connected to a 8" line connecting the exhaust outlet. Readings were taken every 5 minutes.

D. Fuel Volume Determination

During each tanker loading process, the volume loaded was logged along with the tanker ID and purchaser. The data used in the determination of the volume of gasoline, for both accountable and total volumes came from Fuel Facs.

III. SAMPLING AND ANALYSIS PROCEDURES(cont)

E. Determination of Total Organic Concentrations

The total hydrocarbon sampling and analysis of both carbon beds were determined on site using an Infrared Industries IR208 NDIR Continuous Gas Monitoring Analyzer following EPA Method 25B. The sampling port was connected from the 10" tee leading to the turbine meter.

Zero gas and EPA Protocol 1 calibration standards in nitrogen were used in the calibration of the IR instrument. The zero gas and the low standard concentration gas was sent from the bottle to the three way valve and back through the sampling line for the leak check determination and efficiency of the sampling line.

A multi-gas cylinder consisting of propane and methane was used for analyzer verification purposes prior to and following the test and during each hourly drift check.

IV. TEST RESULTS

The results of the volatile organic compound emissions performance testing are summarized in Table IV-1.

The test results indicate an average emissions rate of 0.09 milligrams/liter of gasoline loaded for the test.

A total of 407,319 liters (107,614 gallons) of accountable gasoline was loaded into 18 separate during the 6 hour test period.

A summary of the emissions rate equations is presented in Appendix A. All performance test field and calculation summary data are presented in Appendix B. All fuel dispensing and truck tank data are presented in Appendix C. Instrument and test equipment calibration data are presented in Appendix D. EPA approval letter is presented in Appendix E.

Volatile Organic Compounds Emissions
Compliance Test
Romulus McGill Terminal Vapor Recovery Unit
Marathon Petroleum Company LP
Romulus Terminal Facility
Romulus, MI

SUMMARY OF PERFORMANCE TEST RESULTS

TABLE: IV-1
COMPANY: Marathon Petroleum Company LP, Romulus Terminal
SOURCE: McGill Vapor Recovery Unit
TEST DATE: July 15, 2020
TEST TIME: 0554-1227 Hrs

Total volume of accountable fuel loaded (diesel & gasoline), gallons	155,098
Total volume of accountable fuel loaded (diesel & gasoline), liters	587,046
Total volume of total gasoline loaded, gallons	107,614
Total volume of accountable gasoline loaded, gallons	107,614
Total volume of accountable gasoline loaded, liters	407,319
Average VOC PPM by volume concentration for McGill Unit (propane equivalent)	32.5
Total mass of emissions (as propane),mg	34,757
Emissions rate of VOC, total gasoline loaded, mg/l	0.09
Emissions rate of VOC, total volume loaded, mg/l	0.06
54 mg/L equivalency concentration, total gasoline	1.95
54 mg/L equivalency concentration, total throughput	2.93
Stack gas volumetric flow rate, scfm	57.4
Displacement volume (ft3)	20,640
Displacement volume (scf)	20,656
Total test period, minutes	360
Emissions rate of VOC, lb/hr	0.01
Emissions rate of VOC, tons/yr	0.04

Volatile Organic Compounds Emissions
Compliance Test
Romulus McGill Terminal Vapor Recovery Unit
Marathon Petroleum Company LP
Romulus Terminal Facility
Romulus, MI

APPENDIX A

Emissions Rate Calculation Equations

Volatile Organic Compounds Emissions
Compliance Test
Romulus McGill Terminal Vapor Recovery Unit
Marathon Petroleum Company LP
Romulus Terminal Facility
Romulus, MI

SUMMARY OF RELATIVE ACCURACY EQUATIONS

The total organic compounds mass emissions shall be calculated as follows:

$$E = \frac{\sum_{i=1}^{n} Mei}{L}$$

where:

E = Mass of total organic compounds emitted per volume of gasoline loaded, mg/liter
Mei = Mass of total organic compounds emitted during testing interval i, mg
L = Total volume of gasoline loaded, liters
n = Number of testing interval

Ves = Vs x 0.02832 x Cm x 17.64 x (Pb + Px/13.6)/Tg

where:

Ves = Exhaust standard gas volume, scm, @ 20°C and 760 mm Hg
Vs = Exhaust gas volume, cf
Cm = Meter coefficient
Pb = Barometric Pressure, "Hg.
Px = Meter Pressure, "H2O
Tg = Temperature of inlet gas, deg. R

The mass emitted during each testing interval shall be calculated as follows:

Mei = K Ves Ce

where:

M_{ei} = Mass of total organic compounds emitted during testing interval i, mg
V_{es} = Exhaust gas volume, m3, at standard conditions
C_e = Total organic compounds concentration (as measured) at the exhaust vent, ppmv
K = Density of calibration gas, mg/sm3, at standard conditions
= 1.83×10^6, for propane
s = Standard conditions, 20°C and 760 mm Hg

Volatile Organic Compounds Emissions
Compliance Test
Romulus McGill Terminal Vapor Recovery Unit
Marathon Petroleum Company LP
Romulus Terminal Facility
Romulus, MI

SUMMARY OF EMISSION RATE EQUATIONS

The mass concentration equivalent to 20 mg/l in percent:

$$\textbf{20 mg/l equiv} = \frac{\textbf{average conc,\% x 20}}{\textbf{Conc, mg/l total}}$$

where:

20 mg/l equiv.	=	20 milligrams/liter equivalent concentration
avg. conc, %	=	average concentration of vru outlet
20	=	20 mg/l applicable standard
Conc, mg/l total	=	Compliance test results for total volume