

BULK GASOLINE VAPOR PROCESSORS

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PROCESS DESCRIPTION:

Bulk fuel storage and dispensing facilities generate large volumes of gasoline vapor during the transport vehicle loading operations. These vapors are processed by a variety of control devices including chillers, condensers, carbon adsorption units, thermal oxidizers, and flares. The primary components of reformulated gasoline vapor are benzene, hexane, toluene, xylenes, and other nonmethane hydrocarbons. Since the vapor processors are designed to recover as much fuel as is economically possible, the actual composition of the released hydrocarbons may differ from gasoline vapor. In general, the larger organics compounds are recovered and the lighter ends are emitted.

Estimation techniques to evaluate bulk gasoline storage tank emissions are based upon procedures published by the EPA in Section 7.1 of AP-42 (9/97). These procedures do not include estimation techniques for vapor processors. The processors are connected only to the terminal loading racks. Vapors are generated during the loading of gasoline transport trucks and also during the loading of diesel transport trucks that were previously holding gasoline. TOG and ROG emissions are quantified by source testing the vapor processing equipment while monitoring the loading rack activity. Emission factors in units of lbs released/1000 gallons of fuel loaded are then developed. Speciation of the nonmethane hydrocarbons in the vapor processor exhaust allows for the determination of compound specific factors. The following estimation procedures are used by the District to calculate vapor processor emissions;

$$E_a = [42 \times (Q_g + Q_t + (Q_d \times 0.127)) / 1000] \times EF$$

$$E_h = E_a / H$$

Where:

E_a = Annual emissions of each listed substance, (lbs/year)

E_h = Maximum hourly emissions of each listed substance, (lbs/hour)

42 = Conversion Factor (gallons/barrel)

Qg = Annual loading rack throughput of gasoline, (barrels/year)

Qt = Annual loading rack throughput of transmix, (barrels/year)

Qd = Annual loading rack throughput of diesel, (barrels/year)

0.127 = Fraction of diesel & jet fuel loading resulting in gasoline vapor emissions

EF = Emission factor for each listed substance, (lbs/ 1000 gallons throughput)

EMISSIONS INFORMATION:

Emission factors from bulk gasoline vapor processors are developed using source test results combined with loading rack information gathered during the test period. ROG testing is performed annually on these sites and the most recent value should be used in estimating emissions. Site specific vapor processor speciation testing was performed for the Santa Fe Pacific Pipeline (6/90), ARCO (5/91), and Chevron (1/91) facilities during the initial implementation of the California Air Toxics program. Default TOG and ROG values for each site are based on the District Rule 61.2 emission limits and the previous speciation testing;

Facility:	Santa Fe Pacific	Chevron	Arco
Vapor Processor:	Holding tank & condenser with thermal oxidizer	Carbon Adsorption only	Condenser only
<u>Emission Factors</u>	<u>(lbs/1000 gal)</u>	<u>(lbs/1000 gal)</u>	<u>(lbs/1000 gal)</u>
TOG	0.29	0.29	0.29
ROG	0.29	0.29	0.29
Typical ROG Test Result	0.02	0.04	0.08
Benzene	0.000015	0.000045	0.000320
Ethyl Benzene	0.000015	0.000084	
Toluene	0.000015	0.000160	0.000180
Xylenes	0.000015	0.000017	0.000026
PAH's unspecified	nondetectable		

For reference, the default composition of reformulated gasoline and its associated vapor

is;

Gasoline Speciation Data	Weight % Vapor	Weight % Liquid
Benzene	0.4 %	1.0 %
Ethyl Benzene	0.1 %	1.6 %
Hexane, Isomers of	1.4 %	1.8 %
Toluene	1.1 %	8.0 %
Xylene, Isomers of	0.4 %	2.4 %
2,2,4-Trimethylpentane	0.7 %	0.8 %

ASSUMPTIONS / LIMITATIONS:

- Emission factors are quantified after controls and no additional efficiency should be used. Speciation of the hydrocarbon mixture released from each vapor processor may vary significantly between sites dependent upon the type of equipment used. In general, larger compounds are recovered and light ends are released.

- Gasoline vapor speciation is based on information in the EPA NESHAPS Document for the Gasoline Distribution Industry (vapor speciation for reformulated / oxygenated fuel). Gasoline liquid speciation is based on the CAPCOA Industry wide Risk Assessment Guidelines (liquid speciation). District speciation testing occurred before reformulated gasoline was widely distributed. New speciation values are not currently available.

- A portion of the diesel fuel throughput (12.7%) and all of the transit mix throughput are included with the gasoline throughput for emission estimation purposes. This assumes all diesel and transit mix shipped off site is processed through the loading rack.

- Where multiple facilities or loading racks share a single vapor processor, the total value for all fuel throughputs must be reported to correctly estimate emissions.

FORMS:

Use a separate vapor processor reporting form for each set of control equipment. Report only fuels dispensed through connected loading racks as throughput. Multiple control devices in series are considered a single vapor processing unit.