Blue Cube Operations LLC

Permit by Rule

Chillers, Tank, and Fugitives PBR

Trichloroethylene Plant, B-1500

May 2021

CONFIDENTIAL INFORMATION

Appendix C

Emission Calculations

Fugitive Emission Calculations

Basis of Calculation:
The emission factors and reduction factors are taken from TCEQ's Technical Guidance Document "Fugitive Guidance," (APDG 6422) dated June 2018.

EPN **B15FU2**
FIN **B15TCFU2**

PROCESS FUGITIVES

A stream is defined as a group of equipment with a common LDAR program and a defined composition. Many streams can be combined into a single FIN/EPN. Fugitive counts and streams represented below are to provide a worst case emission rate.

Fugitive Area Stream Descriptions and Links		
Stream Names	**Links to LDAR Programs**	**Links to Compositions & Emissions**
B15 FINISHED TRICHLOR	B15 FINISHED TRICHLOR	B15 FINISHED TRICHLOR

Speciated Fugitive Emission Summary

Pollutant	VOC?	Emissions		VOC Normalized Annual Emissions
		lb/hr	T/yr	T/yr**
Trichloroethylene	TRUE	0.0036	0.0159	0.0159
	Total Fugitive	0.0036	0.0159	0.0159
	Total VOC	0.0036	0.0159	0.0159

**VOC annual emission rates were normalized to 100% for streams with Total VOC weight percentages not equal to 100%.

EPN **B15FU2**
FIN **B15TCFU2**

B15 FINISHED TRICHLOR				**WORKSHEET CONTROLS**					
Uncontrolled SOCMI Factor			**Chemical Factors**		**TCEQ LDAR Program**				**HR/YR**
SOCMI Ethylene <11%			Not Applicable		28VHP				8760
Equipment	**Description**	**Component Count**	**SOCMI Factor, lb/hr**	**Chemical Factor, lb/hr**	**Monitoring Frequency**	**Red'n Factor**	**Service [1]**	**Emissions lb/hr**	**Emissions T/yr**
Valves	Accessible	6	0.0035		Valves Quarterly	97%	Light Liquid	0.0006	0.0028
Connectors	Accessible	24	0.0005		Connectors Annual	75%	Light Liquid	0.0030	0.0131
Total Emissions								**0.0036**	**0.0159**

1. Service Definitions

Gas/Vapor: Gas phase material and gas/liquid two phase material

Light Liquid: Liquid material with TVP > 0.044 psia at 68 F

Heavy Liquid: Liquid material with 0.044 > TVP > 0.0147 psia at 68 F (If not monitoring, Use SOCMI Non-Leaker Factors with "NONE" LDAR program)

Very Heavy Liquid: Liquid material with 0.0147 > TVP > 0.002 psia at 68 F (If not monitoring, Use SOCMI W/out Ethylene Factors with AVO LDAR program)

Non-emitting liquid: Liquid material with TVP < 0.002 psia at 68 F. No fugitive emissions estimated.

Speciated Emissions **B15 FINISHED TRICHLOR**

Pollutant	**Max % of Stream**	**Max Emissions lb/hr**	**Emissions T/yr**	**VOC Normalized Annual Emissions T/yr****
Trichloroethylene	100.00%	0.0036	0.0159	0.0159
Totals	100.00%	0.0036	0.0159	0.0159
Total VOC Normalized	100.00%	0.0036	0.0159	0.0159

**VOC annual emission rates were normalized to 100% for streams with Total VOC weight percentages not equal to 100%.

Blue Cube Operations, LLC- Freeport - Trichloroethylene Plant, B-1500

EPN: B15STPG

FIN: B15TCSTPG

Description: Tank Emissions from Propylene Glycol Storage Tank

Basis of Calculation:

Emissions were calculated in accordance with Environmental Protection Agency EPA AP-42 Liquid Storage Tank Calculations (AP-42, Chapter 7) and TCEQ's Estimating Short Term emissions rates from Tanks APDG 6250.

Summary of Emission Rates

EPN	FIN	Tank Description	Pollutant	Emission Rates	
				Max. Hourly (lb/hr)	Annual (tpy)
B15STPG	B15TCSTPG	Propylene Glycol Storage Tank	VOC	**0.02**	**0.09**

Maximum Hourly Calculations

$$L_{max} = (M_V * P_{va})/(R*T)*FR_M$$

L_{MAX} = Maximum short term hourly emission rate, lb/hr
M_V = Vapor Molecular Weight, lb/lb-mole
P_{VA} = Vapor Pressure of tank contents at worst case temperature, psia
FR_M = Maximum filling rate, gal/hr
R = Ideal gas constant ((Psia * gal)/(lbmol * R))
T = Temperature (Rankine) worst case liquid surface temperature. It is TCEQ practice to use either 95F (554.67R) or the actual temperature, whichever is higher.

Material Stored	Tank Type	M_V lb/lb-mol	P_{VA} (psi) @ 95 °F	R, Ideal gas constant ((Psia * gal)/(lbmol * R))	Temp. (T) °F	Temp. (T) °R	Max. Filling Rate [FR_M] (gal/hr)	Max. Hourly Emission Rate [L_{MAX}] (lb/hr) [1]
Propylene Glycol	Vertical Fixed Roof Tank	94.113	0.02	80.27	95.00	555.00	500	0.02
							Total VOC	**0.02**

Average Annual Calculations

Material Stored	Tank Type	Hours of Operation (hrs/yr)	Annual Throughput (gal/yr)[1]	Average Annual Emission Rates (tpy)[1]
Propylene Glycol	Vertical Fixed Roof Tank	8,760	4,380,000	**0.09**
			Total VOC	**0.09**

Footnotes:

[1] Annual emissions assume worst-case hourly rate occurs 8,760 hrs/year.

Emissions shown as 0.00 are <0.01 but > zero.