SECTION 4.11

GASOLINE CARGO TANK

(New June 2002)

EMISSION INVENTORY SOURCE CATEGORY
Petroleum Production and Marketing / Petroleum Marketing

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION
330-395-1100-0000 (89615) Gasoline Cargo Tanks - Pressure-Related Losses

330-396-1100-0000 (89623) Gasoline Cargo Tanks - Vapor Hose Losses

330-397-1100-0000 (89631) Gasoline Cargo Tanks - Product Hose Losses

METHODS AND SOURCES

These categories are used to report the total organic gas (TOG) emissions from gasoline cargo tanks. These emissions do not include the emissions from loading and unloading of gasoline cargo tank product; they are included in the gasoline terminal inventory and gasoline service station inventory. Emissions from gasoline cargo tanks include the fugitive emissions and emissions from maintenance. The emission points are from pressure-related fugitive emission from the cargo tank fittings and valves, wetted wall emissions from the product and vapor hoses after loading into the underground tank.

Pressure-related fugitive emissions are volatile organic vapors leaking from fittings, valves and other connecting points in the vapor collection system on a cargo tank. Pressure inside the cargo tank is caused by solar and reflective heat gains. These heat gains cause the vapor inside the cargo tank to expand and exert pressure to the tank walls, fittings and valves.

Emissions from the product hoses are a result of residual product clinging to the walls of the hoses. Residual liquid, inside the hose, vaporizes into the ambient air resulting in emissions.

Emissions from the vapor hose are a result of vapors trapped inside the hose after product delivery to the underground tank. Some vapors condense inside the hose. When the hose is disconnected from the underground tank and truck fittings, the vapors and condensed vapor inside the hose are emitted into the ambient air.

The current gasoline cargo tank trucks had their beginnings in the horse and buggy days delivering petroleum products to stores and farms. With the advent of the automobile, the delivery trucks hauled gasoline and other petroleum products to liveries and feed shops. Later, the gasoline service station opened to sell gasoline to motorists as they do today. Presently, gasoline delivery trucks or gasoline cargo tankers traverse the state delivering most of the 13.5 billion gallons of gasoline sold annually[2].

Gasoline cargo tank trucks are usually a truck and trailer combination, a tractor-trailer, or a truck called a bobtail. The truck/trailer combination and tractor-trailers are the trucks that deliver to service stations. Their delivery systems are gravity fed into the underground tanks. When these trucks deliver fuel, the fuel delivery line is attached to the tank and a vapor line is attached to another fitting on the underground tank. As fuel fills the underground tank, the displaced vapors are routed back to the cargo tank. Some of the displaced vapors are emitted through the underground tank vent. The empty cargo tank, with vapors, goes back to the terminal to be refilled and the vapors are processed at the terminal. The other gasoline cargo tank trucks, called bobtails, deliver products to smaller underground tanks and above ground tanks. These trucks generally do not have a vapor recovery system.

ASSUMPTIONS

The data in the report "Emissions from Gasoline Cargo Tanks, First Edition[1]" published June 2002 is accurate and represents the emissions generated from gasoline cargo tanks on trucks. The total highway gasoline sales from the California Department of Transportation represents all gasoline transported by gasoline cargo tankers in California. The data used from the "Travel and Related Factors in California[2]" (1997) derives each county's consumption of gasoline for the year 1997. The emissions are summarized in Table I.

TEMPORAL ACTIVITY

The temporal activity is uniform year round, with deliveries assumed to be continuous 24 hours per day, seven days per week and 52 weeks per year.

COMMENTS AND RECOMMENDATIONS

The data used to estimate the emissions from this category represents a work in progress. Further refinements of the wetted wall emissions are being quantified by mass balance testing and will be incorporated into the emission inventory in the future.

Emissions from bobtail cargo tankers need to be quantified.

CHANGES IN METHOD AND EMISSION ESTIMATES

This is a new method.

GROWTH PARAMETERS

The growth parameters were developed by Pechan and are based on gasoline and oil expenditures data (in billions of 1992 dollars).

SAMPLE CALCULATIONS

To estimate TOG emissions from gasoline cargo tanks in Orange County, the following method is used:

Pressure-Related Losses

Given:

Emission Factor for Pressure-Related losses is 0.5883 lb./1000 gallons[1]
1997 Gasoline sales for Orange County is 1,246,735,000 gallons
1997 Gasoline sales for California is 13,515,295,001 gallons

1,246,735 (1000 gallons) x 0.5883 lb/1000 gallons /2000 lb./ton = 366.73 tons/year

Vapor Hose Losses

Given:

Gasoline sales and county fraction same as above.
Emission factor for vapor hoses = 0.0237 lb./1000 gallons[1].

Process Rate for Orange County (1000 gallons) x Emission factor (lb./1000 gallons)/(2000 lb./ton) = Vapor Hose Losses (tons/year)

1,246,735 (1000 gallon) x 0.0237 lb./1000 gallons/2000 lb./ton = 14.77 tons/year

Product Hose losses

Given:

Gasoline sales and county fraction same as above.
Emission factor = 0.1333 lb./1000 gallons[1].

Process for Orange County x Emission factor (lb./1000 gallons)/(2000 lb./ton) = Product Hose Losses (tons/year)

1,246,735 (1000 gallons) x 0.1333 lb./1000 gallons/2000 lb./ton = 83.09 tons/year

REFERENCES

1. Fischer, Joseph, Emissions from Gasoline Cargo Tanks, First Edition, June 2002. First submitted as an AWMA Abstract May 2000.

2. California Department of Transportation, Travel and Related Factors in California (1997).

UPDATED BY

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TABLE I
1997 EMISSIONS FOR GASOLINE CARGO TANKS

				Pressure-Related Losses		Vapor Hose Losses		Product Hose Losses	
				EIC 330-395-1100-0000		EIC 330-396-1100-0000		EIC 330-397-1100-0000	
			PROCESS RATE	EMISSION FACTOR	TOG EMISSIONS	EMISSION FACTOR	TOG EMISSIONS	EMISSION FACTOR	TOG EMISSIONS
AB	DIS	CO	(gallons)	(lbs/1,000 gal)	(tons/year)	(lbs/1,000 gal)	(tons/year)	(lbs/1,000 gal)	(tons/year)
GBV	GBU	2	1,020,000	0.5883	0.30	0.0237	0.01	0.1333	0.07
GBV	GBU	14	12,436,000	0.5883	3.66	0.0237	0.15	0.1333	0.83
GBV	GBU	26	8,000,000	0.5883	2.35	0.0237	0.09	0.1333	0.53
LC	LAK	17	18,730,000	0.5883	5.51	0.0237	0.22	0.1333	1.25
LT	ED	9	2,962,860	0.5883	0.87	0.0237	0.04	0.1333	0.20
LT	PLA	31	5,302,093	0.5883	1.56	0.0237	0.06	0.1333	0.35
MC	AMA	3	12,714,000	0.5883	3.74	0.0237	0.15	0.1333	0.85
MC	CAL	5	13,743,000	0.5883	4.04	0.0237	0.16	0.1333	0.92
MC	ED	9	59,413,140	0.5883	17.48	0.0237	0.70	0.1333	3.96
MC	MPA	22	6,455,000	0.5883	1.90	0.0237	0.08	0.1333	0.43
MC	NSI	29	38,738,000	0.5883	11.39	0.0237	0.46	0.1333	2.58
MC	PLA	31	21,878,108	0.5883	6.44	0.0237	0.26	0.1333	1.46
MC	NSI	32	9,021,000	0.5883	2.65	0.0237	0.11	0.1333	0.60
MC	NSI	46	1,637,000	0.5883	0.48	0.0237	0.02	0.1333	0.11
MC	TUO	55	20,161,000	0.5883	5.93	0.0237	0.24	0.1333	1.34
MD	KER	15	45,305,578	0.5883	13.33	0.0237	0.54	0.1333	3.02
MD	AV	19	116,758,976	0.5883	34.34	0.0237	1.38	0.1333	7.78
MD	MOJ	33	1,094,352	0.5883	0.32	0.0237	0.01	0.1333	0.07
MD	SC	33	7,113,288	0.5883	2.09	0.0237	0.08	0.1333	0.47
MD	MOJ	36	144,539,137	0.5883	42.52	0.0237	1.71	0.1333	9.63
NC	NCU	8	8,357,000	0.5883	2.46	0.0237	0.10	0.1333	0.56
NC	NCU	12	50,633,000	0.5883	14.89	0.0237	0.60	0.1333	3.37
NC	MEN	23	37,897,000	0.5883	11.15	0.0237	0.45	0.1333	2.53
NC	NS	49	23,673,493	0.5883	6.96	0.0237	0.28	0.1333	1.58
NC	NCU	53	4,415,000	0.5883	1.30	0.0237	0.05	0.1333	0.29
NCC	MBU	27	149,558,000	0.5883	43.99	0.0237	1.77	0.1333	9.97
NCC	MBU	35	16,244,000	0.5883	4.78	0.0237	0.19	0.1333	1.08
NCC	MBU	44	101,902,000	0.5883	29.97	0.0237	1.21	0.1333	6.79
NEP	LAS	18	11,537,000	0.5883	3.39	0.0237	0.14	0.1333	0.77
NEP	MOD	25	4,226,000	0.5883	1.24	0.0237	0.05	0.1333	0.28
NEP	SIS	47	20,305,000	0.5883	5.97	0.0237	0.24	0.1333	1.35
SC	SC	19	3,543,397,024	0.5883	1042.29	0.0237	41.99	0.1333	236.17
SC	SC	30	1,246,735,000	0.5883	366.73	0.0237	14.77	0.1333	83.09
SC	SC	33	428,985,984	0.5883	126.19	0.0237	5.08	0.1333	28.59
SC	SC	36	476,066,863	0.5883	140.04	0.0237	5.64	0.1333	31.73
SCC	SLO	40	104,344,000	0.5883	30.69	0.0237	1.24	0.1333	6.95
SCC	SB	42	163,412,000	0.5883	48.07	0.0237	1.94	0.1333	10.89
SCC	VEN	56	295,425,000	0.5883	86.90	0.0237	3.50	0.1333	19.69
SD	SD	37	1,136,281,000	0.5883	334.24	0.0237	13.46	0.1333	75.73
SF	BA	1	610,461,000	0.5883	179.57	0.0237	7.23	0.1333	40.69
SF	BA	7	403,581,000	0.5883	118.71	0.0237	4.78	0.1333	26.90
SF	BA	21	122,557,000	0.5883	36.05	0.0237	1.45	0.1333	8.17
SF	BA	28	52,879,000	0.5883	15.55	0.0237	0.63	0.1333	3.52
SF	BA	38	381,425,000	0.5883	112.20	0.0237	4.52	0.1333	25.42
SF	BA	41	371,087,000	0.5883	109.16	0.0237	4.40	0.1333	24.73
SF	BA	43	816,048,000	0.5883	240.04	0.0237	9.67	0.1333	54.39
SF	BA	48	104,540,005	0.5883	30.75	0.0237	1.24	0.1333	6.97
SF	BA	49	169,264,507	0.5883	49.79	0.0237	2.01	0.1333	11.28
SJV	SJU	10	268,328,000	0.5883	78.93	0.0237	3.18	0.1333	17.88
SJV	SJU	15	195,553,422	0.5883	57.52	0.0237	2.32	0.1333	13.03
SJV	SJU	16	34,073,000	0.5883	10.02	0.0237	0.40	0.1333	2.27
SJV	SJU	20	37,451,000	0.5883	11.02	0.0237	0.44	0.1333	2.50
SJV	SJU	24	69,511,000	0.5883	20.45	0.0237	0.82	0.1333	4.63
SJV	SJU	39	202,140,000	0.5883	59.46	0.0237	2.40	0.1333	13.47
SJV	SJU	50	153,774,000	0.5883	45.23	0.0237	1.82	0.1333	10.25
SJV	SJU	54	108,878,000	0.5883	32.03	0.0237	1.29	0.1333	7.26
SS	IMP	13	45,752,000	0.5883	13.46	0.0237	0.54	0.1333	3.05
SS	SC	33	109,982,376	0.5883	32.35	0.0237	1.30	0.1333	7.33
SV	BUT	4	70,829,000	0.5883	20.83	0.0237	0.84	0.1333	4.72
SV	COL	6	9,494,000	0.5883	2.79	0.0237	0.11	0.1333	0.63
SV	GLE	11	10,337,000	0.5883	3.04	0.0237	0.12	0.1333	0.69
SV	PLA	31	84,442,800	0.5883	24.84	0.0237	1.00	0.1333	5.63
SV	SAC	34	465,152,000	0.5883	136.82	0.0237	5.51	0.1333	31.00
SV	SHA	45	65,798,000	0.5883	19.35	0.0237	0.78	0.1333	4.39
SV	YS	48	45,833,995	0.5883	13.48	0.0237	0.54	0.1333	3.05
SV	FR	51	26,829,000	0.5883	7.89	0.0237	0.32	0.1333	1.79
SV	TEH	52	21,705,000	0.5883	6.38	0.0237	0.26	0.1333	1.45
SV	YS	57	68,588,000	0.5883	20.18	0.0237	0.81	0.1333	4.57
SV	FR	58	18,584,000	0.5883	5.47	0.0237	0.22	0.1333	1.24
			13,515,295,001		3975.52		160.16		900.79