Santa Barbara County
Air Pollution Control District

Area Source Emission Inventory Methodology
Wine Fermentation and Aging
(Revised October 2017)

EMISSION INVENTORY SOURCE CATEGORY:

SIC = 2084 Manufacturing: Food and Kindred Products - Beverages
NAICS = 31213 Wineries

EMISSION INVENTORY CODES AND DESCRIPTION:

EIC	CES	DESCRIPTION
420-408-6090-0000	47068	Food & Agriculture – Wine Fermentation
420-410-6090-0000	60467	Food & Agriculture – Wine Aging

METHODOLOGY DESCRIPTION:

The fermentation of wine grapes results in emissions of ethanol. Ethanol is a reactive organic gas (ROG), and emissions are the result of both fermentation of crushed grapes (called "must") and the storage/aging of fermented juice. The reported volume of red and white wine fermentation and red and white wine stored/aged are submitted to the APCD annually as required by permit. Emissions from fermentation and storage/aging are determined using the following equations:

Wine Fermentation

$$E_F = [(G_{RF} * EF_{RF}) + (G_{WF} * EF_{WF})] / 2000$$

E_F = Fermentation Emissions (tons ROG/year)
G_{RF} = Volume of red wine fermented (gallons)
G_{WF} = Volume of white wine fermented (gallons)
EF_{RF} = Red wine fermentation emission factor (lb/gallon)
EF_{WF} = White Wine Fermentation Emission Factor (lb/gallon)

Wine Storage/Aging

$$E_A = [(G_{RA} * EF_{RA}) + (G_{WA} * EF_{WA})] / 2000$$

E_A = Storage/aging emissions (tons ROG per year)
G_{RA} = Volume of red wine stored/aged (gallons)
G_{WA} = Volume of white wine stored/aged (gallons)
EF_{RA} = Red wine storage/aging emission factor (lb/gallon)
EF_{WA} = White wine storage/aging emission factor (lb/gallon)

EMISSION FACTORS:

Activity	Red Wine (lb ROG/kgal)	White Wine (lb ROG/kgal)
Fermentation	6.2	2.5
Storage/Aging	27.83	25.83

ASSUMPTIONS:

1. Data provided through the annual reporting process is accurate and complete.
2. 100% of total organic gases (TOG) is reactive (i.e., the fraction of reactive organic gases, or FROG, is 1.0).

TEMPORAL ACTIVITY:

It is assumed that grape crush starts in mid-August and continues through mid-November with fermentation occurring during these months. Wine storage/aging is assumed to be uniform throughout the year.

CES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
47068	0%	0%	0%	0%	0%	0%	0%	16.67%	33.33%	33.33%	16.67%	0%
60467	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%

EMISSIONS EXAMPLE:

2016 Winery Process Rates and Emissions

Activity	Process Rate (kgal)	TOG (ton/yr)	ROG (ton/yr)
Fermentation	4963	9.36	9.36
Storage/Aging	2791	38.06	38.06