

## MEMORANDUM

TO: SIP Inventory Preparers and EPA Regions

FROM: Inventory Guidance and Evaluation Section

INFO: (919) 541-2825

DATE: March 10, 1992

SUBJECT: **VOC Emissions from Wineries**

*This technical memorandum was prepared by Radian Corporation under contract to the Office of Air Quality Planning and Standards, US Environmental Protection Agency (EPA Contract No. 68-D0-0125). The objective of this work assignment is to provide technical consulting to state and local agencies preparing 1990 base year SIP emission inventories. At this time, many of the methods and emission factors for source categories in AP-42 are being revised by EPA. The interim procedures outlined in this memorandum may not conform to future releases of EPA procedures and guidance. However, they are based on the best data available at this time.*

Several states have requested additional guidance in calculating emissions from wineries. This memorandum describes a method for calculating emissions from wineries based on AP-42 Section 6.5 and a simplified table of emission factors based on information in AP-42 Section 6.5 and "Characterization of Ethanol Emissions for Wineries" (Fielder, D. F., Bumala, P. A., 1982).

Although wine-making is not a commonplace industry, VOCs can be quite high and could be important in certain parts of the country. Calculations using the EPA's AP-42 equation and averaged fermentation parameters show that a winery emits 1 ton of VOCs for every 360,000 gallons of red wine or 1,140,000 gallons of white wine. This means that a winery producing more than 3,600,000 gallons of red wine, 11,400,000 gallons of white, or some combination of the two within this range of volumes would be emitting more than 10 tons of VOCs, and should be included as a point source when preparing SIP inventories. Large wineries can fall into this range.

An important point to consider before any intensive data gathering for this category is to define the wine-making fermentation season relative to the ozone season, since they may not be the same. VOC emissions from wineries are at a peak during the rapid fermentation immediately after pressing. This fermentation season begins as the grapes ripen, usually in mid-August, through the fall months. Overlap of the fermentation and ozone seasons will require an estimate of production during the time of overlap.

VOC emissions from wine-making are almost entirely ethanol, and are emitted primarily during the active fermentation process. The production of ethanol is dependant on fermentation temperature, duration of fermentation and volume and sugar content of fermenting juice. Sugar content is measured as degrees Brix (grams sugar/100 ml juice).

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The EPA's emission factor formula as described in AP-42 Section 6.5 uses fermentation temperature and sugar content as parameters.

$$EF = (0.136T - 5.91) + [(B - 20.4)(T - 15.21)(0.00085) + C]$$

where: EF = emission factor, pounds of ethanol lost per thousand gallons of wine made

T = fermentation temperature, degrees F

B = initial sugar content, degrees Brix

C = correction term, 0 (zero) for white wine or 2.4 lb/10<sup>3</sup> gal for red wine

Additional, but smaller sources of emissions, can be found in handling processes. Emission factors for these sources are:

Ethanol Fugitive Emission Factors  
Handling Processes

<u>Process</u>	<u>Ethanol</u>
Drag Screen	0.6 lbs ethanol/10 <sup>3</sup> gal wine
Pomace Press	0.03 lbs ethanol/10 <sup>3</sup> gal wine ( red only)
Wine Bottling	0.1 lbs ethanol/10 <sup>3</sup> gal wine (white)

From: Fielder, D. R., Bumala, P. A., 1982, "Characterization of Ethanol Emissions from Wineries"

Should detailed information not be available, inventory preparers can use a streamlined procedure. This procedure cannot be used for a point source. An explanation and documentation of data unavailability should be included in the inventory report.

- 1) Determine the volume of wine produced and the type (red or white).
- 2) If possible, estimate fermentation temperatures and sugar content from the ranges presented in Table 1. Use those numbers in the AP-42 Section 6.5 emission factor equation.
- 3) Otherwise, use the red/white emission factors presented in Table 1.

Table 1. Fermentation Parameter Ranges and Emission Factors\*

Wine Type	Temperature °F	Sugar Content °Brix	Emission Factors (includes handling losses)
White	45 - 60 °F	16 - 23	1.76 lb/10 <sup>3</sup> gal
Red	72 - 95 °F	16 - 23.5	5.52 lb/10 <sup>3</sup> gal

\* Temperature and sugar content values are from "Characterization of Ethanol Emissions for Wineries" (Fielder, D. F., Bumala, P. A., 1982). Emission factors have been calculated using emission factors from AP-42, Section 6.5 plus emission factors from handling losses. The emission factors are generalized. There is a great deal of variation in parameters and emissions. Actual emissions may be much higher or lower.