Bakery Ovens

Table I
Identification of Performance Standards
Source Category: Bakery Ovens

Regulated Component	**Pollutant**	**Rule/Measure/Date**				
		Bay Area AQMD Rule 8-42, Large Commercial Bread Bakeries, adopted 9/29/89, amended 6/1/94	San Diego Co. APCD Rule 67.24, Bakery Ovens, adopted 6/7/94, amended and effective 5/15/96	Sacramento Metropolitan AQMD Rule 458, Large Commercial Bread Bakeries, adopted 6/7/94, amended 9/5/96	South Coast AQMD Rule 1153, Commercial Bakery Ovens, adopted 1/4/91, amended 1/13/95	U.S. EPA, Alternative Control Technology for Bakery Oven Emissions (ACT), 12/92
		Performance Standard				
Control efficiency	VOC	New and modified ovens required to vent all emissions to approved emission control system capable of reducing emissions of precursor organic compounds by 90% on a mass basis. Existing ovens required to vent emissions to a control system that captures all emissions of precursor organic compounds from all oven stacks, and the collected emissions must be vented to an approved emission control device with a destruction efficiency of at least 90% on a mass basis.	No one shall operate a bakery oven subject to this rule unless uncontrolled VOC emissions are reduced by at least 90% by weight. A person may comply with the requirements of this rule by using an air pollution control system which has been installed with an Authority to Construct, includes an emission collection system which ducts exhaust gases from all stacks (except purge stacks, combustion stacks, and comfort hood vents) on all bakery ovens to VOC emission control devices, and has one or	All new and existing ovens shall vent emissions to a control system that has an emissions collection system that captures emissions from all oven stacks, and collected emissions shall be vented to an approved emission control device which has a control efficiency of at least 95% on a mass basis.	(x) No person shall operate an existing bakery oven unless VOC emissions are reduced by at least 70% by weight (as carbon) for an oven with base year average daily VOC emissions of 50 pounds or more, but less than 100 pounds (more than 9 and less than 19 tons per year). No person shall operate an existing bakery oven unless VOC emissions are reduced by at least 95% by weight (as carbon) for an oven with base year average daily VOC emissions of 100 pounds or more (19 tons per year). No person shall operate	

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		Performance Standard				
			more VOC emission control devices, each with reduction efficiency of at least 90% by weight.		a new bakery oven unless VOC emissions are reduced by at least 95% by weight (as carbon) if the uncontrolled average daily VOC emissions are 50 pounds or more (9 tons per year).	

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		Performance Standard									
Work practices	VOC		Daily recording of key system operating parameters of air pollution abatement equipment If claiming exemption, must have information available, such as production records, that would allow APCO to verify exemption.		Maintain records needed to determine VOC emissions for all bakery ovens including type of product, yeast percentage, and fermentation time. Maintain annual records based on calendar year production rates, by weight, of each bakery product. Maintain daily records of key system operating parameters of emission control device.	x	Maintain current list of products, baker's yeast percentage, fermentation time, spike baker's yeast percentage, and spiking time. Maintain daily records necessary to demonstrate continuous operation of the emissions control device.		If claiming exemption, keep daily record of operations including raw material processed, yeast percentage, fermentation time, and type of product.		

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Emissions determination	VOC		BAAQMD Source Test Procedure to measure emissions of organics Oven emissions for specific bakery products for which emission measurements are not available shall be calculated using emission factors in Table I. AIB formula used (see ACT, last column) (Technical Assessment Report, 7/27/90)		Use formula or Table 67.24 to determine VOC emission factors for each bakery product, and determine annual uncontrolled emission rates based on production rate. U.S. EPA formula used (see ACT, last column) (Board letter, 4/19/94). Table 67.24 appears to be based on AIB formula (see ACT). Use U.S. EPA test methods to determine VOC emission factors.	x	Control efficiency of emission control device determined by U.S. EPA methods Calculate VOC mass emission rate and percent control efficiency, both upstream and downstream of the emissions control device, based on respective VOC mass concentration and volumetric flow rate. To determine status for small bakeries exemption, use formula. U.S. EPA formula used (see ACT, last column) (Staff Report, 6/7/94).		Efficiency of emission control system by use of U.S. EPA, ARB, or SCAQMD approved methods. To determine eligibility for exemption low emission rates, use calculation procedures of Attachment A or test methods above. AIB formula used (see ACT, last column) (Staff Report, 11/19/90).		American Institute of Baking (AIB) study (1987) provided mathematical model for predicting ethanol emissions from bakeries, based on baker's percent of yeast and total fermentation time, including a correction for addition of spiking yeast. The formula can be used to estimate ethanol emission factors for each variety of bread. Ethanol emissions from an oven baking breads of those varieties for which the formula is applicable can be quantified by multiplying the product mix by the emission factors. U.S. EPA study (1992)

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						found that total VOC (rather than just ethanol) emissions, including small quantities of constituents such as acetaldehyde, from bakery ovens can be predicted by a formula based on baker's percent yeast, fermentation time, spike baker's yeast, and spiking time, giving a VOC emission factor. The VOC emission factor is multiplied by the tons per year bread production to give VOC emissions per year. Each variety of bread has a different emission factor.

Table II
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Exemptions	Low-emitting ovens that emit less than 150 pounds ethanol per operating day, averaged over 1 year (28 tons per year) Small bakeries with total production of bread, buns, and rolls less than 100,000 pounds per operating day, averaged over all operating days in the month Existing ovens operating prior to 1/1/88 that emit less than 250 pounds ethanol per operating day, averaged over a year (46 tons per year) Equipment used exclusively for baking of bakery products other than breads, buns, and rolls (e.g., muffins, croutons, breadsticks, and crackers).	Bakery ovens at stationary sources where combined rated heat input capacity of all bakery ovens is less than 2 million BTU per hour Bakery ovens at stationary sources where uncontrolled VOC emissions from all bakery ovens combined is less than 50 tons per year	Small bakeries that emit less than 100 pounds total VOC per day (18 tons per year)	Existing ovens that emit less than 50 pounds uncontrolled VOC per operating day (9 tons per year)	

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Applicability	Bread ovens at large commercial bread bakeries that emit precursor organic compounds	Bakery ovens which emit VOC during baking of yeast-leavened products	Bread ovens at large commercial bread bakeries that emit VOC	Commercial bakery ovens with rated heat input capacity of 2 million BTU per hour or more and with average daily emission of 50 pounds or more of VOC	
Comments	Thermal incineration and catalytic incineration are technically and technologically feasible and cost effective (Technical Assessment Report, 7/27/89)	Catalytic oxidizer most cost-effective (Socioeconomic Impact Assessment, 4/94)	Thermal incineration and catalytic incineration most technically feasible (Staff Report, 6/7/94)	Regenerative thermal oxidation and catalytic oxidation technologically and economically feasible (Staff Report, 11/19/90)	Direct flame thermal oxidation is technically feasible but relatively expensive Regenerative oxidation is feasible Catalytic oxidation is technically and economically feasible