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## 40 C.F.R. § 63.1323

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### Batch process vents—methods and procedures for group determination.

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(a) *General requirements.* Except as provided in paragraph (a)(3) of this section and in § 63.1321(b)(1), the owner or operator of batch process vents at affected sources shall determine the group status of each batch process vent in accordance with the provisions of this section. This determination may be based on either organic HAP or TOC emissions.

(1) The procedures specified in paragraphs (b) through (g) of this section shall be followed to determine the group status of each batch process vent. This determination shall be made in accordance with either paragraph (a)(1)(i) or (a)(1)(ii) of this section.

(i) An owner or operator may choose to determine the group status of a batch process vent based on the expected mix of products. For each product, emission characteristics of the single highest-HAP recipe, as defined in paragraph (a)(1)(iii) of this section, for that product shall be used in the procedures in paragraphs (b) through (i) of this section.

(ii) An owner or operator may choose to determine the group status of a batch process vent based on annualized production of the single highest-HAP recipe, as defined in paragraph (a)(1)(iii) of this section, considering all products produced or processed in the batch unit operation. The annualized production of the highest-HAP recipe shall be based exclusively on the production of the single highest-HAP recipe of all products produced or processed in the batch unit operation for a 12 month period. The production level used may be the actual production rate. It is not necessary to assume a maximum production rate (i.e., 8,760 hours per year at maximum design production).

(iii) The single highest-HAP recipe for a product means the recipe of the product with the highest total mass of HAP charged to the reactor during the production of a single batch of product.

(2) The annual uncontrolled organic HAP or TOC emissions and annual average batch vent flow rate shall be determined at the exit from the batch unit operation. For the purposes of these determinations, the primary condenser operating as a reflux condenser on a reactor or distillation column, the primary condenser recovering monomer, reaction products, by-products, or solvent from a stripper operated in batch mode, and the primary condenser recovering monomer, reaction products, by-products, or solvent from a distillation operation operated in batch mode shall be considered part of the batch unit operation. All other devices that recover or oxidize organic HAP or TOC vapors shall be considered control devices as defined in § 63.1312.

(3) The owner or operator of a batch process vent complying with the flare provisions in § 63.1322(a)(1) or § 63.1322(b)(1) or routing the batch process vent to a control device to comply with the requirements in § 63.1322(a)(2) or § 63.1322(b)(2) is not required to perform the batch process vent group determination described in this section, but shall comply with all requirements applicable to Group 1 batch process vents for said batch process vent.

(b) *Determination of annual emissions.* The owner or operator shall calculate annual uncontrolled TOC or organic HAP emissions for each batch process vent using the methods described in paragraphs (b)(1) through (b)(8) of this section. To estimate emissions from a batch emissions episode, owners or operators may use either the emissions estimation equations in paragraphs (b)(1) through (b)(4) of this section, or direct measurement as specified in paragraph (b)(5) of this section. Engineering assessment may be used to estimate emissions from a batch emission episode only under the conditions described in paragraph (b)(6) of this section. In using the emissions estimation equations in paragraphs (b)(1) through (b)(4) of this section, individual component vapor pressure and molecular weight may be obtained from standard references. Methods to determine individual HAP partial pressures in multicomponent systems are described in paragraph (b)(9) of this section. Other variables in the emissions estimation equations may be obtained through direct measurement, as defined in paragraph (b)(5) of this section, through engineering assessment, as defined in paragraph (b)(6)(ii) of this section, by process knowledge, or by any other appropriate means. Assumptions used in determining these variables must be documented. Once emissions for the batch emission episode have been determined using either the emissions estimation equations, direct measurement, or engineering assessment, emissions from a batch cycle shall be calculated in accordance with paragraph (b)(7) of this section, and annual emissions from the batch process vent shall be calculated in accordance with paragraph (b)(8) of this section.

(1) TOC or organic HAP emissions from the purging of an empty vessel shall be calculated using Equation 2 of this subpart. Equation 2 of this subpart does not take into account evaporation of any residual liquid in the vessel.

$$E_{episode} = \frac{(V_{ves})(P)(MW_{wavg})}{RT} (1 - 0.37^m) \quad [\text{Eq. 2}]$$

Where:

$E_{episode}$  = Emissions, kg/episode.  $V_{ves}$  = Volume of vessel, m.  $P$  = TOC or total organic HAP partial pressure, kPa.  $MW_{wavg}$  = Weighted average molecular weight of TOC or organic HAP in vapor, determined in accordance with paragraph (b)(4)(i)(D) of this section, kg/kmol.  $R$  = Ideal gas constant, 8.314 m·kPa/kmol·K.  $T$  = Temperature of vessel vapor space, K.  $m$  = Number of volumes of purge gas used.

(2) TOC or organic HAP emissions from the purging of a filled vessel shall be calculated using Equation 3 of this subpart.

$$E_{episode} = \frac{(y)(V_{dr})(P^2)(MW_{wavg})}{RT \left( P - \sum_{i=1}^n P_i x_i \right)} (T_m) \quad [\text{Eq. 3}]$$

Where:

$E_{episode}$  = Emissions, kg/episode.  $y$  = Saturated mole fraction of all TOC or organic HAP in vapor phase.  $V_{dr}$  = Volumetric gas displacement rate, m<sup>3</sup>/min.  $P$  = Pressure in vessel vapor space, kPa.  $MW_{wavg}$  = Weighted average molecular weight of TOC or organic HAP in vapor, determined in accordance with paragraph (b)(4)(i)(D) of this section, kg/kmol.  $R$  = Ideal gas constant, 8.314 m·kPa/kmol·K.  $T$  = Temperature of vessel vapor space, K.  $P_i$  = Vapor pressure of TOC or individual organic HAP  $i$ , kPa.  $x_i$  = Mole fraction of TOC or organic HAP  $i$  in the liquid.  $n$  = Number of organic HAP in stream. Note: Summation not applicable if TOC emissions are being estimated.  $T_m$  =

Minutes/episode.

(3) Emissions from vapor displacement due to transfer of material into or out of a vessel shall be calculated using Equation 4 of this subpart.

$$E_{episode} = \frac{(y)(V)(P)(MW_{wavg})}{RT} \quad [Eq. 4]$$

where:

$E_{episode}$  = Emissions, kg/episode.  $y$  = Saturated mole fraction of all TOC or organic HAP in vapor phase.  $V$  = Volume of gas displaced from the vessel, m<sup>3</sup>.  $P$  = Pressure in vessel vapor space, kPa.  $MW_{wavg}$  = Weighted average molecular weight of TOC or organic HAP in vapor, determined in accordance with paragraph (b)(4)(i)(D) of this section, kg/kmol.  $R$  = Ideal gas constant, 8.314 m<sup>3</sup>δkPa/kmolδK.  $T$  = Temperature of vessel vapor space, K.

(4) Emissions caused by the heating of a vessel shall be calculated using the procedures in either paragraphs (b)(4)(i), (b)(4)(ii), or (b)(4)(iii) of this section, as appropriate.

(i) If the final temperature to which the vessel contents is heated is lower than 50 K below the boiling point of the HAP in the vessel, then emissions shall be calculated using the equations in paragraphs (b)(4)(i)(A) through (b)(4)(i)(D) of this section.

(A) Emissions caused by heating of a vessel shall be calculated using Equation 5 of this subpart. The assumptions made for this calculation are atmospheric pressure of 760 millimeters of mercury (mm Hg) and the displaced gas is always saturated with volatile organic compounds (VOC) vapor in equilibrium with the liquid mixture.

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