

**Section 44 - Batch Processing Operations.**

11/29/94

a. Applicability.

1. This Section applies to process vents associated with batch processing operations in the following affected manufacturing facilities with the corresponding primary Standard Industrial Classification ("SIC") Codes:
  - i. Plastic Materials & Resins (Standard Industrial Classification [SIC] 2821).
  - ii. Medical Chemicals & Botanical Products (SIC 2833).
  - iii. Gum & Wood Chemicals (SIC 2861).
  - iv. Cyclic Crudes & Intermediates (SIC 2865).
  - v. Industrial Organic Chemicals (SIC 2869).
  - vi. Agricultural Chemicals (SIC 2879).
2. The requirements of this Section do not apply to pharmaceutical industry operations covered under Section 35 of Regulation 24.
3. Except for the recordkeeping and reporting requirements listed in paragraphs (f) and (g) of this Section, the requirements of this Section do not apply to the following operations:
  - i. Combined process vents from each batch process train with an annual mass emission total of 4,540 kilograms (kg) (10,000 pounds [lb]) of volatile organic compounds (VOCs) or less; or
  - ii. Single unit operations which have annual mass emissions of 227 kg (500 lb) VOCs or less.
4. Existing sources affected by this Section shall comply with the provisions of this Section as soon as practicable, but no later than April 1, 1996. New, modified, or reconstructed sources affected by this Section shall comply with the provisions of this Section upon start up.
5. Any facility that becomes or is currently subject to the provisions of this Section by exceeding the applicability threshold in paragraph (a)(3) of this Section shall

remain subject to these provisions even if its emissions later fall below the applicability threshold.

6. Any facility that is currently subject to a state or federal rule promulgated pursuant to the Clean Air Act Amendments of 1977 by exceeding an applicability threshold is and shall remain subject to these provisions, even if its throughput or emissions later fall below the applicability threshold.

- b. Definitions. As used in this Section, all terms not defined herein shall have the meaning given them in the November 15, 1990 Clean Air Act Amendments (CAAA), or in Section 2 of Regulation 24.

"Aggregated" means the summation of all process vents within a process that contain VOCs.

"Annual mass emissions total" means the sum of all non-fugitive VOC emissions, evaluated before control, from a vent. Annual mass emissions may be calculated from an individual process vent or from groups of process vents by using the emission estimation equations contained in **Appendix "K"** of Regulation 24 and then multiplying this result by the expected duration and frequency of the emission or groups of emissions over the course of a year.

"Average flow rate" means the flow rate averaged over the amount of time that VOCs are emitted during emission events. For the evaluation of average flow rate from an aggregate of sources, the average flow rate is the weighted average of the average flow rates of the emission events and their annual venting time:

$$\text{Weighted Average Flow Rate} = \frac{\sum (\text{average Flow rate per emission event } i) (\text{annual duration of emission event } i)}{\sum (\text{annual duration of emission event } i)}$$

"Batch cycle" means a manufacturing event of an intermediate or product from start to finish in a batch process.

"Batch process" means a discontinuous process that involves the bulk movement of material through sequential manufacturing steps. Mass, temperature, concentration, and other properties of the material may vary with time and location in the process. Batch processes are typically characterized as "non-steady-state."

"Batch process train" means an equipment train that is used to produce a product or intermediate. A typical equipment train consists of equipment used for the synthesis, mixing, and purification of a material.

"Control device" means an air pollution abatement device, not a device such as a condenser that operates under reflux conditions, which is required for processing.

"Emissions before control" means the VOC emissions total prior to the application of a control device, or if no control device is used, the VOC emissions total. No credit for discharge of VOCs into wastewater shall be considered when the wastewater is further handled or processed with the potential for VOCs to be emitted to the atmosphere.

"Emission event" means a discrete venting episode that may be associated with a single unit of operation. For example, a displacement of vapor resulting from the charging of a vessel with VOCs will result in a discrete emission event that will last through the duration of the charge and will have an average flow rate equal to the rate of the charge. If the vessel is then heated, there will also be another discrete emission event resulting from the expulsion of vapor from the expansion caused by heating. Both emission events may occur in the same vessel or unit operation.

"Process" means, for the purpose of determining RACT applicability, any equipment within a contiguous area that is connected during the course of a year. "Connected" means a link between equipment, whether it is physical, such as a pipe, or whether it consists of a series of steps from which material is transferred from one unit operation to another unit operation.

"Process vent" means a point of emission from a piece of equipment within which a unit operation takes place. Typical process vents from batch processes include condenser vents, vacuum pumps, steam ejectors, and atmospheric vents from reactors and other process vessels. Relief valve discharges and equipment exhaust systems that discharge from unit operations would also be considered process vents.

"Semi-continuous operation" means an operation that is conducted in a steady-state mode but only for finite durations during the course of a year. For example, a steady-state distillation operation that functions for one month would be considered a semi-continuous operation.

"Single unit operation" means a discrete piece of equipment used in a processing step to prepare reactants, facilitate reactions, separate and purify products, or recycle materials.

"Volatility" means a physical property of materials which exhibits the following characteristics: low-volatility materials have a vapor pressure of less than or equal to 75 millimeters (mm) mercury (Hg) (3.0 inches [in] Hg) at 20 degrees Celsius (°C) (68 degrees Fahrenheit [°F]); moderate-volatility materials have a vapor pressure of greater than 75 mm Hg (3.0 in Hg) and less than or equal to 150 mm Hg (6.0 in Hg) at 20°C (68°F); and high-

volatility materials have a vapor pressure of greater than 150 mm Hg (6.0 in Hg) at 20°C (68°F). To evaluate VOC volatility for single unit operations that service numerous VOCs or for processes handling multiple VOCs, the weighted average volatility can be calculated using the total amount of each VOC used in a year, and the individual component vapor pressure, as shown in the following equation:

$$\text{Weighted Average Volatility} = \frac{\sum \left[ (\text{vapor pressure of VOC component } i) \frac{(\text{mass of VOC component } i)}{(\text{molecular weight of VOC component } i)} \right]}{\sum \left[ \frac{(\text{mass of VOC component } i)}{(\text{molecular weight of VOC component } i)} \right]}$$

- c. Standards. Individual vents with an actual average flow rate less than the flow rate calculated using the RACT applicability equations (FR) provided in paragraph (c)(3) of this Section, as a function of uncontrolled annual VOC emissions (AE), shall reduce VOC emissions by 90 percent. Vents in aggregate within a batch process having an actual weighted-average flow rate less than FR calculated using the RACT applicability equations in paragraph (c)(3) of this section, as a function of AE, shall reduce process VOC emissions by 90 percent.
1. Determination of Uncontrolled Annual VOC Emissions (AE). Determination of the uncontrolled annual VOC emissions (AE) may be achieved by developing engineering estimates of the uncontrolled emissions on a batch basis from a process vent, or from a group of process vents within a batch process train, and multiplying these estimates by the potential number of batch cycles per year. Engineering estimates shall follow the guidance provided in **Appendix "K"** of Regulation 24. Alternatively, if an emissions measurement is to be used to measure vent emissions, the measurement must conform with the requirements for measuring the inlet VOC mass flow rate, as described in paragraphs (d)(2)(ii) and (d)(2)(iii)(A,B) of this Section.
  2. Determination of Average Flow Rate. To obtain a value for the actual average flow rate of individual vents or the actual weighted-average flow rate of aggregated vents in a batch process, an owner or operator may measure the flow rates or may estimate the flow rates using the estimation guidelines provided in **Appendix "K"** of Regulation 24. If measurements are used to estimate the flow rates, the measurements must conform with the requirements for measuring the incoming volumetric flow rates, as described in paragraph (d)(2)(ii) of this Section. If flow rates are estimated using manifold design parameters, the owner or operator shall demonstrate that equipment design accurately reflects actual operating conditions.

3. RACT Applicability Equations. RACT applicability equations are specific to VOC volatility and are presented below:

$$\mathbf{FR = (0.07 * (AE)) - 1,621 \quad (Low Volatility)}$$

$$\mathbf{FR = (0.031 * (AE)) - 494 \quad (Moderate Volatility)}$$

$$\mathbf{FR = (0.013 * (AE)) - 301 \quad (High Volatility)}$$

where:

FR = Calculated Flow Rate (standard cubic feet per minute [scfm])

AE = Uncontrolled Annual VOC Emissions (pounds per year [lb/yr])

An owner or operator shall compare the calculated flow rate (FR) with the actual average flow rate or the actual weighted-average flow rate determined using the procedures described in paragraph (c)(2) of this Section, and if FR exceeds the actual average flow rate, the owner or operator shall reduce VOC emissions by 90 percent.

d. Performance Testing.

1. For the purpose of demonstrating compliance with the control requirements of this Section, unit operations shall be performed at full operating conditions and flow rates during any performance test.
2. The following methods in 40 Code of Federal Regulations (CFR) Part 60, **Appendix "A"** (July 1, 1992), shall be used to demonstrate that the process vent or vents comply with the control efficiency requirement listed in paragraph (c) of this Section.
  - i. Method 1 or 1A, as appropriate, for the selection of the sampling sites if the flow measuring device is a rotameter. No traverse is necessary when the flow measuring device is an ultrasonic probe. The control device inlet sampling sites for the determination of vent stream VOC composition reduction efficiency shall be located before and after the control device.
  - ii. Method 2, 2A, 2C, or 2D, as appropriate, for the determination of the gas stream volumetric flow rate; flow measurements shall be made continuously.
  - iii. Method 25A or Method 18, if applicable, for the determination of VOC concentration in the control device inlet and outlet.

- A. The sampling time for each run shall be the entire length of the batch cycle in which readings will be taken continuously, if Method 25A is used, or as often as is possible using Method 18, with a maximum of 1-minute intervals between measurements throughout the batch cycle.
- B. The VOC emission rate of the process vent at the inlet to the control device shall be determined by combining continuous concentration and flow rate measurements at simultaneous points throughout the batch cycle.
- C. The VOC emission rate of the process vent at the outlet of the control device shall be obtained by combining continuous concentration and flow rate measurements at simultaneous points throughout the batch cycle.
- D. The efficiency of the control device shall be determined by integrating the mass rates obtained using the procedures specified in paragraphs (d)(2)(iii)(B) and (d)(2)(iii)(C) of this Section, over the time of the batch cycle, and dividing the difference in the inlet and outlet mass flow totals by the inlet mass flow total.

e. Monitoring Requirements.

- 1. An owner or operator of an affected facility that uses an incinerator to seek compliance with the VOC control requirement specified under paragraph (c) of this Section shall install, calibrate, maintain, and operate, according to the manufacturer's specifications, a temperature monitoring device that is equipped with a continuous recorder and that has an accuracy of  $\pm 0.5^{\circ}\text{C}$ .
  - i. Where an incinerator other than a catalytic incinerator is used, a temperature monitoring device shall be installed in the firebox.
  - ii. Where a catalytic incinerator is used, temperature monitoring devices shall be installed in the gas stream immediately before and after the catalyst bed.
- 2. An owner or operator of an affected facility that uses a flare to seek compliance with the VOC control requirement specified under paragraph (c) of this Section shall install, calibrate, maintain, and operate, according to the

manufacturer's specifications, a heat sensing device, such as an ultraviolet sensor or thermocouple, at the pilot light to indicate the continuous presence of a flame.

3. An owner or operator of an affected facility that uses an absorber to seek compliance with the VOC control requirement specified under paragraph (c) of this Section shall install, calibrate, maintain, and operate, according to the manufacturer's specifications, at least one of the following devices:
  - i. A scrubbing liquid temperature monitoring device that has an accuracy of  $\pm 1$  percent of the temperature being monitored, expressed in  $^{\circ}\text{C}$ , or  $\pm 0.02$  specific gravity units, and that is equipped with a continuous recorder; or
  - ii. An organic monitoring device that indicates the concentration level of organic compounds exiting the recovery device based on a detection principle such as infrared photoionization or thermal conductivity, and that is equipped with a continuous recorder.
  
4. An owner or operator of an affected facility that uses a condenser or refrigeration system to seek compliance with the VOC control requirement specified under paragraph (c) of this Section shall install, calibrate, maintain, and operate, according to the manufacturer's specifications, at least one of the following devices:
  - i. A temperature monitoring device located at the condenser's vapor exit side that is equipped with a continuous recorder and that has an accuracy of  $\pm 1$  percent of the temperature being monitored, expressed in  $^{\circ}\text{C}$  or  $\pm 0.5^{\circ}\text{C}$ , whichever is greater; or
  - ii. An organic monitoring device that indicates the concentration level of organic compounds exiting the recovery device based on a detection principle such as infrared photoionization or thermal conductivity, and that is equipped with a continuous recorder.
  
5. An owner or operator of an affected facility that uses a carbon adsorber to seek compliance with the VOC control requirements specified under paragraph (c) of this Section shall install, calibrate, maintain, and operate, according to the manufacturer's specifications, at least one of the following devices:
  - i. An integrating stream flow monitoring device that has an accuracy of  $\pm 10$  percent, and a

carbon bed temperature monitoring device that has an accuracy of  $\pm 1$  percent of the temperature being monitored, expressed in  $^{\circ}\text{C}$  or  $\pm 0.5$   $^{\circ}\text{C}$ , whichever is greater, both equipped with a continuous recorder; or

- ii. An organic monitoring device that indicates the concentration level of organic compounds exiting the recovery device based on a detection principle such as infrared photoionization or thermal conductivity, and that is equipped with a continuous recorder.

f. Recordkeeping Requirements.

- 1. Each facility with a batch processing operation subject to this Section shall keep records for a minimum of five years of the following emission stream parameters for each process vent contained in the batch process:
  - i. The annual mass emission total, and documentation verifying these values. If emission estimation equations are used, the documentation shall be the calculations coupled with the number of emission events per year. If the annual mass emission total is obtained from measurement in accordance with the performance testing specifications under paragraph (d) of this Section, VOC emission results may be submitted.
  - ii. The average flow rate in scfm and documentation verifying these values.
- 2. Each facility with a batch processing operation subject to this Section shall keep records of the following parameters, which are required to be measured during the performance test described under paragraph (d) of this Section, and are required to be monitored under paragraph (e) of this Section:
  - i. Where an owner or operator subject to the provisions of this Section seeks to demonstrate compliance with paragraph (c) of this Section through the use of either a thermal or catalytic incinerator, records must be maintained on the average firebox temperature of the incinerator (or the average temperature upstream and downstream of the catalyst bed for a catalytic incinerator), measured continuously and averaged over the same time period of the performance testing.
  - ii. Where an owner or operator subject to the provisions of this Section seeks to demonstrate

compliance with paragraph (c) of this Section through the use of a smokeless flare, flare design (i.e., steam-assisted, air-assisted, or non-assisted), records must be maintained on all visible emission readings, heat-content determinations, flow rate measurements, and exit-velocity determinations made during the performance test; on the continuous flare pilot flame monitoring; and on all periods of operations during which the pilot flame is absent.

- iii. Where an owner or operator subject to the provisions of this Section seeks to demonstrate compliance with paragraph (c) of this Section, the following records must be maintained:
  - A. Where an absorber is the final control device, the exit specific gravity (or an alternative parameter that is a measure of the degree of absorbing liquid saturation, if approved by the Department), and the average exit temperature of the absorbing liquid, measured continuously and averaged over the same time period of the performance testing (both measured while the vent stream is routed normally).
  - B. Where a condenser is the control device, the average exit (product side) temperature, measured continuously and averaged over the same time period of the performance testing while the vent stream is routed normally.
  - C. Where a carbon adsorber is the control device, the total steam mass flow, measured continuously and averaged over the same time period of the performance testing (full carbon bed cycle); the temperature of the carbon bed after regeneration (and within 15 minutes of the completion of any cooling cycle(s); and the duration of the carbon bed steaming cycle (all measured while the vent stream is routed normally).
  - D. As an alternative to paragraphs (f)(2)(iii)(A), (f)(2)(iii)(B), and (f)(2)(iii)(C) of this Section, the concentration level or reading indicated by the organic monitoring device at the outlet of the absorber, condenser, or carbon absorber, measured continuously and

averaged over the same time period of the performance testing while the vent stream is routed normally.

- g. Reporting. An owner or operator of any facility containing sources subject to this Section shall comply with the reporting requirements provided in Section 5 of Regulation 24.
  
- h. Certification. An owner or operator of any facility containing sources subject to this Section shall submit to the Department an annual compliance certification based on a calendar year. The owner of operator of any new facility containing sources that become subject to this Section, shall submit an initial compliance certification immediately upon startup of the facility, and every year thereafter, an annual certification.
  - 1. The annual compliance certification shall provide, at a minimum, the following information:
    - i. The name and location of the facility.
    - ii. The address and telephone number of the person responsible for the facility.
    - iii. The identification of each batch process train and/or single unit operations.
  
  - 2. For each batch process train and single unit operation, the annual compliance certification shall also provide, at a minimum, the following information:
    - i. The applicable emission limit, equipment specification, or work practice.
    - ii. The method of compliance.
    - iii. For each batch process train and single unit operation, the annual emissions total.
    - iv. The control system(s) in use.
    - v. The design performance efficiency of the control system.
    - vi. A certification that each subject source at the facility is in compliance with the standard, equipment specification, or work practice.
    - vii. The time at which the facility's "day" begins if a time other than midnight local time is used to define a "day".