

Notice

This Engineering Guide was recently converted to a PC format and it has not been proof read by our engineering staff. Therefore, it is subject to change at a later date.

Ohio EPA

Division of Air Pollution Control

Engineering Section

Engineering Guide #45

Question:

In certain counties, the "potential to emit" must be calculated for a facility to determine the applicability of OAC rules 3745-21-07 and 3745-21-09. [See paragraph (A)(2)(c) of OAC rule 3745-21-07 and paragraph (A)(2) of OAC rule 3745-21-09]. In such cases, how should the potential to emit be calculated for surface coating lines? (This question was submitted by RAPA in January, 1980, for purposes of clarification).

Answer:

OAC rule 3745-21-01(B)(4) defines "potential to emit" as "the capability at maximum capacity to emit an organic compound taking into account the effectiveness of air pollution controls".

The term "organic compound" is defined in OAC rule 3745-21-01 (B)(3) as "any compound of carbon excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, ammonia carbonate, methane, ethane, 1,1,1-trichloroethane (methyl chloroform), methylene chloride, and trichlorotrifluoroethane". (Engineering Guide #4 explains that exempted organic compounds should not be included in any calculation of potential to emit).

Maximum capacity is not defined in the OAC. However, one can assume that the source would be operating at the maximum hourly capacity for 8760 hours per year unless the operating parameters are restricted under legally enforceable permit conditions. An example of this approach on the Federal level is 40 CFR §51.21 (4) in the Prevention of Significant Deterioration Rule (PSD).¹ Such an approach is also consistent with OEPA Engineering Guide #11, which states that the calculation of the maximum process weight rate is based on the "maximum capacity of the equipment unless (a) the company has provided written information proving the process unit is constrained by physical and/or operational limitations to operate less than its maximum equipment capacity or (b) the process unit's maximum process weight

rate is currently constrained to be less than its maximum equipment capacity by Special Terms and Conditions (STC's) on a currently valid permit to operate".

Therefore, to determine potential to emit, three pieces of information are needed: (1) the maximum usage of each coating, (2) the hours of operation of each surface coating line, and (3) the formulation of each coating.

The maximum coating usage or "maximum capacity" is difficult to determine for sources such as spray guns, flow coaters, etc. If the capacity of the equipment cannot be determined or is undefined, the next source of information would be the quantities specified on the permit application and confirmed through contact with the company. If the maximum coating usage will be restricted by means of STC's in a Permit to Operate or Variance, that value should be used in determining the potential to emit.

The hours of operation must be assumed to be 24 hrs/day, 365 days/year unless the hours of operation are restricted in the STC's of the permit. If a facility wishes to limit its potential to emit to less than 100 TPY through STC's limiting the hours of operation, the annual production, the annual throughput, or the source capacity, it may do so through the permit process.

The coating formulation should be obtained from the facility through its supplier or through Method 24 analysis. Any diluent being added to the coating formulation, should be included in the as-employed, final formulation.

Examples for the calculation of potential to emit are shown on the following pages for:

1. a coating with solids and VOC,
2. a coating with solids, VOC, and water;
3. a coating with solids, VOC, and an exempt organic compound; and
4. a coating that is employed in a coating line which utilizes control equipment.

These types of calculations must be performed for each coating employed in each coating line. The total VOC emissions from the facility include the VOC emissions from all coatings as well as all other VOC sources (storage tanks, clean-up operations, degreasers, boilers, etc.). To determine a facility's potential to emit, add all VOC emissions from all sources (including cleanup solvents). If

the facility's potential to emit is ≥ 100 TPY and the facility is located in one of the counties referenced in OAC rule 3745-21-07 (A)(2)(c) or 3745-21-09 (A)(2), the emission limitations and/or control requirements contained in those rules are applicable to the facility. ¹(4) 'Potential to emit' means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable. Secondary emissions do not count in determining the potential to emit of a stationary source."

EXAMPLE 1. Coating with solids and VOC

Capacity: 15 gal/hr (max.)
 Hours: 24 hrs/day, 356 days/yr
 Formulation (as-employed): 25% by volume solids
 75% by volume VOC

1. Determine the lbs VOC/gallon of coating. (NOTE: if the density of the VOC is unknown, then it is assumed to be 7.26 lbs/gal VOC. However, since the actual density can make a significant difference, one should always try to obtain the actual density from the facility).

$$\frac{.75 \text{ gal VOC}}{\text{gal coating}} \times \frac{7.36 \text{ lbs VOC}}{\text{gal VOC}} = \frac{5.52 \text{ lbs VOC}}{\text{gal coating}}$$

2. Determine hours/year.

$$\frac{24 \text{ hrs}}{\text{day}} \times \frac{365 \text{ days}}{\text{year}} = \frac{8760 \text{ hrs}}{\text{year}}$$

3. Determine gallons/year (max.).

$$\frac{15 \text{ gal coating}}{\text{hour}} \times \frac{8760 \text{ hr}}{\text{year}} = \frac{131,400 \text{ gal coating (max.)}}{\text{year}}$$

4. Determine potential to emit in TPY.

$$\frac{131,400 \text{ gal coating}}{\text{year}} \times \frac{5.52 \text{ lbs VOC}}{\text{gal coating}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} = \frac{362.66 \text{ tons}}{\text{year}}$$

= 362.66 TPY

EXAMPLE 2. Coating with solids, VOC, and water

Capacity: 57,000 gal/yr (max.)
Hours: 24 hrs/day, 365 days/yr
Formulation (as-employed): 44% by volume solids
56% by volume volatiles

- 11 % by volume of the volatiles
is water

- 89% by volume of the volatiles
is VOC

1. Determine the percent by volume of VOC and water in the coating.

$$\frac{.56 \text{ gal volatiles}}{\text{gal coating}} \times \frac{.11 \text{ gal water}}{\text{gal volatiles}} = \frac{0.62 \text{ gal water}}{\text{gal coating}}$$

$$\frac{.56 \text{ gal volatiles}}{\text{gal coating}} \times \frac{.89 \text{ gal VOC}}{\text{gal volatiles}} = \frac{.498 \text{ VOC}}{\text{gal coating}}$$

Restated, the formulation is: 44.0% by volume solids
49.8% by volume VOC
6.2% by volume water

2. Determine lbs VOC/gal coating.

$$\frac{.498 \text{ gal VOC}}{\text{gal coating}} \times \frac{7.36 \text{ lbs VOC}}{\text{gal VOC}} = \frac{3.66 \text{ lbs VOC}}{\text{gal coating}}$$

3. Determine potential to emit.

$$\frac{3.66 \text{ lbs VOC}}{\text{gal coating}} \times \frac{57,000 \text{ gal coating}}{\text{year}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} = 104.31 \text{ TPY}$$

EXAMPLE 3. Coating with solids, VOC, and an exempt organic compound

Capacity: 57,000 gal/yr (max.)
Hours: 24 hrs/day, 365 days/yr
Formulation (as-employed): 44% by volume solids
56% by volume volatiles

- 11% by volume of the volatile consists of exempt organic compounds
- 89% by volume of the volatiles is VOC

1. Determine the percent by volume of VOC and exempt solvent in the coating.

$$\frac{.56 \text{ gal volatiles}}{\text{gal coating}} \times \frac{.11 \text{ gal exempt organic compounds}}{\text{gal volatiles}} = \frac{0.62 \text{ gal exempt organic compounds}}{\text{gal coating}}$$

$$\frac{.56 \text{ gal volatiles}}{\text{gal coating}} \times \frac{.89 \text{ gal VOC}}{\text{gal volatiles}} = \frac{.498 \text{ gal VOC}}{\text{gal coating}}$$

Restated, the formulation is:

- 44.0% by volume solids
- 49.8% by volume VOC
- 6.2% by volume exempt organic compounds

2. Determine lbs VOC/gal coating.

$$\frac{.498 \text{ gal VOC}}{\text{gal coating}} \times \frac{7.36 \text{ lbs VOC}}{\text{gal VOC}} = \frac{3.66 \text{ lbs VOC}}{\text{gal coating}}$$

3. Determine potential to emit.

$$\frac{3.66 \text{ lbs VOC}}{\text{gal coating}} \times \frac{57,000 \text{ gal coating (max.)}}{\text{year}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} = 104.31 \text{ TPY}$$

As can be seen by comparison to Example 2, the exempt organic compounds are considered in the same manner as water.

EXAMPLE 4. Coating lines which utilize control equipment

Depending upon the coating formulation, calculate the uncontrolled VOC emissions as in Examples 1 though 3. If add-on control equipment is utilized, it must be accounted for in determining the potential to emit.

1. Determine the percent capture and percent control of the emissions. This normally would be done through testing of the control system.

capture efficiency: 85%
control efficiency: 94%

2. Determine the overall control efficiency.

$(\text{capture})(\text{control}) = \text{overall control efficiency}$
 $(.85)(.94) = .799 \text{ or } 79.9\%$

3. Determine potential to emit using the uncontrolled emissions from Example 2.

$(104.31 \text{ TPY}) \frac{(100\% - \% \text{ overall control efficiency})}{100\%}$

= potential to emit

$(104.31 \text{ TPY}) \frac{(100\% - 79.9\%)}{100\%} = 20.97 \text{ PTY}$

4. If there is downtime of the control equipment which occurs without simultaneous shutdown of the source, the resultant uncontrolled emission must be added to the potential to emit.

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