



Engineering Guide #45 – Calculating Potential to Emit for Coating Lines

This engineering guide describes the various methods that can be used to calculate the annual potential to emit so that applicability of specific portions of OAC rule 3745-21-09 can be determined.

Question:

In certain counties, the "potential to emit" must be calculated for a facility to determine the applicability of specific portions OAC rule 3745-21-09. [See paragraphs (A)(3) and (A)(6) of OAC rule 3745-21-09]. In such cases, how should the facility potential to emit be calculated for surface coating lines?

Answer:

Pursuant to OAC rule 3745-21-01(B)(15), "Potential to emit" means the maximum capacity of a facility or stationary source to emit an organic compound or VOC under its physical and operational design. Any physical or operational limitation on the capacity of the facility or stationary source to emit an organic compound or VOC, 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 or legally and practicably enforceable by the state.

Pursuant to OAC rule 3745-21-01 (B)(13), "Organic compound" means any chemical compound containing carbon excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, metallic carbonates, ammonium carbonate, methane (except methane from landfill gases), and ethane. As explained in Engineering Guide #4 the compounds in the preceding list should not be included in any calculation of potential to emit of organic compounds.

Pursuant to OAC rule 3745-21-01(B)(17), "Volatile organic compound" or "VOC" means any organic compound which participates in atmospheric photochemical reactions. See link below for excluded organic compounds:

http://www.epa.ohio.gov/portals/27/regs/3745-21/3745-21-01_Final.pdf

Maximum capacity is not defined in the OAC. However, U.S. EPA policy is to assume that the source would be operating at the maximum hourly capacity for 8,760 hours per year unless the operating parameters are restricted through federally enforceable or legally and practicably state enforceable permit conditions.

Therefore, to determine potential to emit for surface coating lines, 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. This is because there are a number of variables that effect the application rates of the coatings. The coating application rates, the frequency of coating application (intermittent/continuous), the size and complexity of the part coated, and the speed of the line all effect the true potential to emit of the line. The emissions capacity of the line should be based on the operating scenario that results in the most coating used over the same period of time. The scenario could be represented by the parts requiring the most coating at a less than maximum line speed or by the parts that do not use the most coating at the maximum speed of the line. Please note that the maximum speed of the line should not be the capacity of the conveyor, instead it should be the maximum practical speed for

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which acceptable parts can be painted, discounting for any gaps in painting between parts. If the capacity of the equipment cannot be determined or is undefined, the permit writers should rely on the maximum coating usage rates described in the permit application and confirmed through contact with the company. If the maximum coating usage will be restricted through federally enforceable or legally and practicably state enforceable permit provisions, then that usage value should be used in determining the potential to emit.

The hours of operation must be assumed to be 24 hours per day, 365 days per year unless the hours of operation are restricted through a federally enforceable or legally and practicably state enforceable permit. If a facility wishes to limit its potential to emit to less than 100 tons per year (to avoid the applicability of OAC rule 3745-21-09, for instance) through limiting the hours of operation, the annual production or the annual coating usage, 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 thinners, reducers or activators being added to the coating should be included in the as-employed, final formulation.

Many coating manufacturers have developed data sheets (technical, environmental, and/or material safety) that include the coating information necessary to perform the VOC emission calculations specified in OAC rule 3745-21-10 used along with facility coating usage data to determine the potential to emit for a surface coating line. An example environmental data sheet is included in the link below:

H:\Engineer\Engineering Guides_ Revisions\example environmental data sheet - SW.docx

Note that coating data sheets may represent VOC content as both total/material VOC and VOC content, less exempts and/or water. For potential to emit calculations, the total or material VOC content must be used.

VOC calculations must be performed for each coating line at the facility. The total VOC emissions from the facility include the VOC emissions from all coatings employed in the facility coating lines as well as all other VOC sources (ovens, flash off areas, drying areas, 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 solvent usage).

The emission limitations and/or control requirements contained in the rule paragraphs specified in OAC rules 3745-21-09(A)(3)(a), (A)(3)(b), or (A)(3)(c) are applicable to the facility if the following conditions are met:

- a. the facility's potential to emit is equal to or greater than 100 tons per year;
- b. the facility is located in one of the counties not referenced in OAC rule 3745-21-09(A)(1); and
- c. the facility was installed on or after the dates specified in OAC rules 3745-21-09(A)(3)(a)(i), (A)(3)(b)(i) or (A)(3)(c)(i).

The emission limitation(s) and/or control requirement(s) contained in the rule paragraph specified in OAC rule 3745-21-09(A)(6) is(are) applicable to the facility if the following conditions are met:

- a. the facility's combined, total potential to emit is equal to or greater than 100 tons per year on or after August 25, 2008 from all of the source categories specified in OAC rules 3745-21-09(A)(6)(b)(i) through (A)(6)(b)(iii); and
- b. the facility is located in one of the counties referenced in OAC rule 3745-21-09(A)(6)(a).

[Note: any affected facility source currently subject to OAC rule 3745-21-09(A)(6) that becomes subject to and complies with OAC rule 3745-21-26 is no longer subject to the requirements specified in OAC rule 3745-21-09(HH).]

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Other information related to potential to emit is provided in the links below:

http://ohioepa.custhelp.com/app/answers/detail/a_id/2398/kw/potential%20to%20emit/related/1

H:\Engineer\Engineering Guides_ Revisions\45-48 Rev\OEPA PTE.pdf

While not necessary for these simple calculations, a calculator is linked below:

H:\Engineer\Engineering Guides_ Revisions\45-48 Rev\BETA_Painting-coating_PTE_calculator.xlsx

Potential to Emit Calculations:

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

1. a coating with only solids and VOC;
2. a coating with only solids, VOC, and water OR a coating with solids, VOC, and water, and no exempt organic compounds;
3. a coating with only solids, VOC, and an exempt organic compound OR a coating with solids, VOC, and an exempt organic compound, and no water; and
4. a coating that is employed in a coating line which utilizes control equipment.

EXAMPLE 1. Coating with only solids and VOC

Capacity: 6.5 gallons/hour (max.)
Hours: 24 hours/day, 365 days/year
Formulation (as-employed): 47.7%, by weight, VOC;
52.3%, by weight, solids; and
8.09 pounds/gallon = density of coating.

1. Determine the pounds of VOC per gallon of coating.

$$8.09 \text{ pounds coating/gallon coating} \times 0.477 \text{ pound VOC/gallon coating} =$$
$$3.86 \text{ pounds VOC/gallon coating}$$

2. Determine hours per year.

$$24 \text{ hours/day} \times 365 \text{ days/year} = 8,760 \text{ hours/year}$$

3. Determine gallons per year (max.).

$$6.5 \text{ gallons coating/hour} \times 8,760 \text{ hours/year} =$$
$$56,940 \text{ gallons coating (max.)}/\text{year}$$

4. Determine potential to emit in tons per year.

$$56,940 \text{ gallons coating} \times 3.86 \text{ pounds VOC} \times 1 \text{ ton}/2,000 \text{ pounds} =$$

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109.89 tons/year

EXAMPLE 2. Coating with only solids, VOC, and water where none of the VOC are exempt

Capacity: 6.5 gallons/hour (max.)
Hours: 24 hours/day, 365 days/year
Formulation (as-employed): 52.3%, by weight, solids;
47.7%, by weight, volatile matter;
10.6 %, by weight, of the volatile matter is water; and
8.09 pounds/gallon = density of coating.

1. Determine pounds of VOC per gallon of coating.

First, determine the percent VOC by weight of the volatile material. Since the volatile material contains 0.106 lbs. of water per lb of volatile matter, and the volatile matter consists of only VOC and water, the remaining weight of a pound of volatile matter must be:

1.0 lb of water and VOC/lb of volatile matter – 0.106 lb of water/ lb of volatile matter =
0.894 lb VOC/1.0 lb of volatile matter

Then, calculate the VOC content of the coating in lb VOC/gallon coating:

(8.09 lbs. coating/gallon coating) x (0.477 lb volatile matter/lb coating) x (0.894 lb VOC/lb volatile matter) =
3.45 pounds VOC/gallon coating

2. Determine gallons per year (max.).

6.5 gallons coating/hour x 8,760 hours/year =
56,940 gallons coating (max.)/year

3. Determine potential to emit in tons per year.

3.45 pounds VOC/gallon coating x 56,940 gallons coating/year x 1 ton/2,000 pounds =
98.22 tons/year

EXAMPLE 3. Coating with only solids, and VOC where some of the VOC are exempt organic compounds

Capacity: 6.5 gallons/hour (max.)
Hours: 24 hours/day, 365 days/year
Formulation (as-employed): 52.3%, by weight, solids;
47.7%, by weight, volatile matter (consists of exempt and non-exempt VOCs);
10.6 %, by weight, of the volatile matter is exempt organic compounds; and
8.09 pounds/gallon = density of coating.

Calculating Potential to Emit for Coating Lines

1. Determine pounds of VOC per gallon of coating.

First, determine the percent VOC by weight of the volatile material. Since the volatile material contains 0.106 lbs. of exempt organic compounds per lb of volatile matter, and the volatile matter consists of only VOC and exempt organic compounds, the remaining weight of a pound of volatile matter must be:

1.0 lb of exempt organic compounds and VOC/lb of volatile matter – 0.106 lb of exempt organic compounds/ lb of volatile matter =

0.894 lb VOC/1.0 lb of volatile matter

Then, calculate the VOC content of the coating in lb VOC/gallon coating:

$(8.09 \text{ lbs. coating/gallon coating}) \times (0.477 \text{ lb volatile matter/lb coating}) \times (0.894 \text{ lb VOC/lb volatile matter}) =$

3.45 pounds VOC/gallon coating

2. Determine gallons per year (max.).

6.5 gallons coating/hour x 24 hours/day x 365 days/year =

56,940 gallons coating (max.)/year

3. Determine potential to emit in tons per year.

3.45 pounds VOC/gallon coating x 56,940 gallons coating/year x 1 ton/2,000 pounds =

98.22 tons/year

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 through 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 or based upon the specifications provided by the manufacturer of the control equipment.

capture efficiency: 85%

control efficiency: 94%

2. Determine annual potential to emit using the uncontrolled emissions from Examples 2 or 3.

$(85.41 \text{ tons VOC/year}) \times (0.85 \text{ capture efficiency}) \times (1 - 0.94 \text{ control efficiency}) = 4.36 \text{ tons VOC/year from control}$

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$(85.41 \text{ tons VOC/year}) \times (0.85 \text{ capture efficiency}) = 12.81 \text{ tons VOC/year uncontrolled (not captured)}$

$4.36 \text{ tons VOC/year controlled} + 12.81 \text{ tons VOC/year uncontrolled} = 17.17 \text{ tons VOC/year total}$

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

Contact:

For more information, contact Michael Hopkins at michael.hopkins@epa.ohio.gov or (614) 644-2270.

ENVIRONMENTAL DATA SHEET

(Certified Product Data Sheet)

Date of Preparation
Mar 24, 2016

13 00 [0965]

PRODUCT NUMBER

FPC135IH

PRODUCT NAME

AIC ADVANCED INDUSTRIAL COATINGS Acrylic Enamel, Red (for IH)

MANUFACTURER'S NAME

ACME Quality Paints
101 Prospect Avenue N.W.
Cleveland, OH 44115

This document includes all data required by 40 CFR 63.801(a) for a Certified Product Data Sheet under criteria specified in 40 CFR 63.805(a). All data given below are MAXIMUM THEORETICAL VALUES based on the product AS CURRENTLY FORMULATED. Variations may occur on individual batches due to adjustments made during production.

Product Weight

8.09 lb/gal

Specific Gravity

0.97

FLASH POINT

81 °F PMCC

Hazard Category (for SARA 311.312)

| Acute | Chronic | Fire |

Volatile Ingredients

Chemical / Compound	SARA 302 EHS	CERCLA	SARA 313 TC	HAPS 112	% by Weight	% by Volume
Med. Aliphatic Hydrocarbon Solvent 64742-88-7	N	N	N	N	2	3
Ethylbenzene 100-41-4	N	Y	Y	Y	2	3
Xylene 1330-20-7	N	Y	Y	Y	14	15
2-Butoxyethanol 111-76-2	N	N	***	N	1	1
Acetone 67-64-1	N	Y	N	N	10	12
Methyl n-Propyl Ketone 107-87-9	N	N	N	N	2	2
Methyl n-Amyl Ketone 110-43-0	N	N	N	N	6	7
n-Butyl Acetate 123-86-4	N	Y	N	N	8	9
2-Butoxyethyl Acetate 112-07-2	N	N	***	***	1	1

Regulated Compounds

	SARA 302 EHS	CERCLA	SARA 313 TC	HAPS 112	% by Weight	% by Volume
Cobalt Compound	N	N	Y	N	0.1	
*** Glycol Ethers (SARA)	N	N	Y	N	3	
*** Glycol Ethers (HAPS)	N	N	N	Y	2	

Volatile Organic Compounds (follows U.S. EPA VOC Data Sheet)

A. Coating Density		8.09 lb/gal	969 g/l
B. Total Volatiles		47.7 % by wt.	55.4 % by vol.
C. Federally exempt solvents:			
	Water	0.0 % by wt.	0.0 % by vol.
	Acetone	9.8 % by wt.	12.0 % by vol.
	t-Butyl Acetate	0.8 % by wt.	1.0 % by vol.
D. Organic Volatiles		37.1 % by wt.	42.4 % by vol.
E. Percent Non-Volatile		52.3 % by wt.	44.6 % by vol.
F. VOC Content	2.99 lb/gal	359 g/l	total
	1. 3.44 lb/gal	412 g/l	less exempt solvents
	2. 6.71 lb/gal	804 g/l	of solids
	0.70 lb/lb	0.70 kg/kg	of solids

Hazardous Air Pollutants (Clean Air Act, Section 112(b))

Volatile HAPS	1.41	lb/gal	0.169	kg/l
	3.17	lb/gal	0.380	kg/l of solids
	0.33	lb/lb	0.33	kg/kg of solids

Air Quality Data**Density of Organic Solvent Blend**

6.97 lb/gal

Photochemically Reactive

Yes

Maximum Incremental Reactivity (MIR) (per California Air Resources Board Aerosol Products Regulation, MIR Values 2010)

1.48

Maximum Incremental Reactivity (MIR) (per US EPA Aerosol Ctg Rule, MIR Values 2009)

1.52

Additional Regulatory Information**US EPA TSCA:**

Not Applicable

Relevant identified uses of the substance or mixture and uses advised against:

Not Applicable

Waste Disposal

Waste from this product may be hazardous as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Waste must be tested for ignitability to determine the applicable EPA hazardous waste numbers.

Addition of reducers or other additives to this product may substantially alter the above data. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information.

TITLE V

Calculating Potential to Emit

Under Ohio Environmental Protection Agency (Ohio EPA) **Title V Permit Rules**, "potential to emit" means the **maximum** capacity of a stationary source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restriction on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as a part of its design if the limitation is enforceable by the Administrator of the U.S. EPA. The term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in Title IV of the Clean Air Act or the regulations promulgated thereunder.

For potential to emit purposes, to take credit for air pollution control equipment or operational restrictions there must be federally enforceable limitations. What this means is that USEPA must be able to enforce the restrictions that are established with a State Implementation Plan (SIP)^{***} limitation (e.g., an emission limitation rule which USEPA has approved as part of Ohio's SIP), or federally enforceable limitations established in a permit to install (issued first as a draft, then issued final), or FESOP that both the public and USEPA had an opportunity for comment prior to final issuance. If there is no SIP emission limit or federally enforceable PTI or PTO restriction, then you must calculate the potential to emit for the emission based on the uncontrolled emission rate at maximum capacity.

"Any physical or operational limitation on the capacity of a source to emit an air pollutant"-Limitations on the capacity of a source to emit an air contaminant, or more importantly, what you are allowed to emit, are found in Ohio's SIP, 40 CFR, and Permits to Install. Typical emission limitations are in terms of lbs/hr, pounds of Volatile Organic Compounds per gallon (lbs VOC/gal), gallons per year (gal/yr), tpy, and physical limitations frequently specify required control equipment, such as incinerator, baghouse, or scrubber.

"Maximum capacity of a source to emit"- Unless there are enforceable restrictions, this is determined by combining a maximum hourly process rate or limitation (lbs/hr) with continuous operation (8760 hrs/yr). These assumptions to obtain a theoretical maximum are in most cases unrealistic, but they must be employed if nothing else limits the production rate.

To summarize determining potential to emit for an emission source, look first for established allowable limitations in OAC rules, PTIs, or 40 CFR, and expand them by 8760 hours of operation or an applicable use limitation. If there is no SIP emission limit or federally enforceable PTI restriction then you must calculate the potential to emit for the emission based on the uncontrolled emission rate at maximum capacity.

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