



## Engineering Guide #48 – Determining Compliance for Coating Lines

*This engineering guide describes the various methods that can be used to calculate emission rates for comparison to emission limitations or control requirements found in OAC Chapter 3745-21.*

### Question:

How do you determine compliance for a surface coating line which is subject to the emission limitations or control requirements contained in OAC Chapter 3745-21?

### Answer:

OAC rule 3745-21-09(B)(1) contains references to the specific procedures to be used to determine compliance with the applicable surface coating regulations:

*“Except as otherwise provided by this rule, compliance with the limitations specified in paragraphs (C) to (K), (S), (U), (Y), (FF), (HH), (OO) and (PP) of this rule is based upon a weighted average by volume of all coating materials employed in the coating line or printing line in any one day. The VOC contents and densities of the coating materials subject to paragraphs (C) to (K), (S), (U), (Y), (FF), (HH), (OO) and (PP) of this rule shall be determined in accordance with paragraph (B) of rule 3745-21-10 of the Administrative Code. The VOC emission rate, capture efficiency and control efficiency for coating lines or printing lines subject to paragraphs (C) to (K), (S), (U), (Y), (FF), (HH), (NN) and (PP) of this rule shall be determined in accordance with paragraph (C) of rule 3745-21-10 of the administrative Code. The averaging of VOC emissions over two or more coating lines or printing lines in order to demonstrate compliance with an applicable emission limitation (i.e., cross-line averaging) is prohibited except as otherwise provided in this rule.”*

OAC rule 3745-21-09(B)(3) contains the recordkeeping procedures to be used to demonstrate the ongoing status of compliance with the applicable surface coating regulations:

*“Except as otherwise provided by this rule, the owner or operator of a coating line or printing line subject to paragraphs (C) to (K), (S), (U), (Y), (FF), (HH) or (NN) to (PP) of this rule, or subject to rule 3745-21-26 of the Administrative Code shall demonstrate the ongoing status of compliance with the applicable emissions limitations or control requirements by means of one of the recordkeeping and reporting requirement alternatives specified in paragraph (B)(3) of this rule.”*

The OAC rule 3745-21-09 paragraphs listed above identify the compliance options available for the various operations within the surface coating categories. OAC rules 3745-21-09(B)(6) and (B)(7) also specify compliance options for paragraphs (D), (E), (F)(1), (G), (I)(1), (I)(4), (J), (K)(1), (K)(6), (U), and (HH).

OAC rule 3745-21-09 regulates additional surface coating categories and facility-specific operations that were not covered in the original rules. In addition, in order to ensure compliance with the NAAQS, the Ohio EPA has also promulgated new regulations for surface coating categories in specific counties in the northeastern and southwestern portions of the State (OAC rules 3745-21-15, 3745-21-18, 3745-21-19, 3745-21-20, 3745-21-22, 3745-21-24, 3745-21-25, 3745-21-26, 3745-21-27, 3745-21-28, and 3745-21-29).

OAC rules 3745-21-15, 3745-21-18, 3745-21-19, 3745-21-20, 3745-21-22, 3745-21-24, 3745-21-25, 3745-21-26, 3745-21-27, 3745-21-28, and 3745-21-29 all contain specific requirements for demonstrating compliance

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with the applicable provisions of the rules or refer back to the appropriate provisions of OAC rule 3745-21-10 to address compliance.

Below is a table that lists each surface coating category contained in OAC Chapter 3745-21 as of June of 2017. Beside each category, the unit code(s) for the respective emission limitation or control requirement is(are) shown. The guide provides calculation examples, reference to the appropriate calculations or reference to the appropriate test procedures for the unit codes listed in the table.

OAC Rule	Surface Coating Category	Emission Limitations or Control Requirements – Unit Codes
3745-21-09(C)	Automobile and light-duty trucks	A, B, C, and F
3745-21-09(D)	Cans	A, B, C or G
3745-21-09(E)	Coils	A, B, or C
3745-21-09(F)	Paper	A, B, or C
3745-21-09(G)	Fabric	A, B, or C
3745-21-09(H)	Vinyl	A and D or B
3745-21-09(I)	Metal furniture	A, B, C or F
3745-21-09(J)	Magnet wire	A, B, or C
3745-21-09(K)	Large appliances	A, B, C or F
3745-21-09(S)	Alside Inc.	A
3745-21-09(U)	Miscellaneous metal parts and products	A, B, or C
3745-21-09(Y)	Rotogravure/flexographic printing	A, C, D, and E
3745-21-09(FF)	Steelcraft Manufacturing	A
3745-21-09(HH)	Automotive/transportation and business machine plastic parts	A or B and C
3745-21-09(NN)	Von Roll Isola USA, Inc.	C
3745-21-09(PP)	Formica Corporation	A or C
3745-21-15	Wood furniture manufacturing operations	B, C, G
3745-21-18	Commercial motor vehicle and mobile equipment refinishing operations	A
3745-21-19 (for any source located in Ashtabula, Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, or Summit County)	Aerospace manufacturing and rework facilities	A or C
3745-21-20	Shipbuilding and ship repair operations	A, B, C
3745-21-22 (for any source located in Ashtabula, Cuyahoga, Geauga, Lake, Lorain, Medina, Portage or Summit County)	Offset lithographic printing and letterpress printing facilities	C**
3745-21-24	Flat wood paneling coatings	A, B, C
3745-21-25	reinforced plastic composites production operations	C**
3745-21-26 (for any source located in Ashtabula, Cuyahoga, Geauga, Lake,	Miscellaneous metal and plastic parts	A, B, C

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Lorain, Medina, Portage or Summit County)		
3745-21-27 (for any source located in Ashtabula, Cuyahoga, Geauga, Lake, Lorain, Medina, Portage or Summit County)	Boat manufacturing	C**
3745-21-28	Miscellaneous industrial adhesives and sealants	A or C
3745-21-29 (for any source located in Ashtabula, Cuyahoga, Geauga, Lake, Lorain, Medina, Portage or Summit County)	Automobile and light-duty truck assembly coating operations, heavier vehicle assembly coating operations and cleaning operations associated with these coating operations	A, B, F

### Unit Codes:

A = pounds of VOC per gallon of coating, excluding water and exempt solvents\*

B = pounds of VOC per gallon of coating solids (if a control system is employed)

C = percent capture and percent control for add-on control equipment

D = percent VOC, by volume, of the volatile portion

E = percent VOC, by volume, excluding water and exempt solvents\*

F = pounds of VOC per gallon of coating, excluding water and exempt solvents\*, and the associated transfer efficiency (for an alternative emission limitation)

G = pounds of VOC per day (alternative daily emission limitation or “bubble”)

\*Organic compounds such as acetone, 1,1,1-trichloroethane (methylchloroform), methylene chloride and trichlorotrifluoroethane are excluded from the definition of VOC, and these compounds are identified as exempt solvents. These exempt solvents are handled in the same manner as water in determining compliance with the applicable coating emission limitations in OAC Chapter 3745-21.

\*\*This guide primarily focuses on the emission limitations and control requirements addressed by the unit codes listed above. Some of the rules listed in the table do specify other options and operational requirements for demonstrating compliance with the applicable rule provisions. The other compliance options may include monomer content restrictions, material usage restrictions or development of average pound per ton emission factors and meeting rolling, 12-month pound per ton emission limitations. Because the other compliance options are detailed in the rules, examples of those emission limitations and control requirements are not included as part of this guide.

Although the OAC Chapter 3745-21 rules listed above reference the compliance calculations in OAC rule 3745-21-10, it is helpful to see examples of these calculations in order to better understand them. As such, we have included many of the typical calculations later in this document. In addition, there are a number of tools available to assist those who are performing these calculations.

For all of these calculations, you must start with some basic data from the manufacturer. The coating manufacturers have developed data sheets (technical, environmental, and/or material safety) that should include the coating information necessary to perform the calculations specified in OAC rule 3745-21-10 or to determine if the coating is a compliant coating.

An example environmental data sheet is included at.

[H:\Engineer\Engineering Guides\\_Revisions\example environmental data sheet - SW.docx](H:\Engineer\Engineering Guides_Revisions\example environmental data sheet - SW.docx)

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Additional coating-related information has also been developed through OCAPP and DAPC to help calculate VOC/HAP/toxic air contaminant emissions from coating and painting operations. Links to these resources are provided below.

[http://ohioepa.custhelp.com/app/answers/detail/a\\_id/917/related/1](http://ohioepa.custhelp.com/app/answers/detail/a_id/917/related/1)

<http://www.epa.ohio.gov/Portals/41/sb/publications/VOC-Calculation.pdf>

<http://www.epa.ohio.gov/dapc/genpermit/miscmetal.aspx>

<http://epa.ohio.gov/Portals/41/sb/autobodydeminimispack.pdf>

<http://www.paintcenter.org/>

Note: The calculated values must represent each coating "as-employed" in order to account for all components of the coating. Data given on applications must be checked for accuracy. More often than not the information in the applications is incorrect (i.e., the numbers reflect "as-received" or a mixture of "as-received" and "as-employed"). If necessary, confirm the data by contacting the coating suppliers.

If the VOC content of every coating employed in a coating line is less than or equal to the coating content limitation, the source would be in compliance with the applicable rule, and the owner would be eligible to demonstrate ongoing compliance by maintaining the records and submitting the reports outlined in OAC rule 3745-21-09(B)(3)(f) and (B)(3)(g). However, it should be noted that the allowable limitations are based on a daily, volume-weighted average of all coatings employed in the coating line. Therefore, it is possible for a coating line to employ some coatings which exceed the allowable limitation on an individual basis yet still be in compliance with the rule. See example 8 below for a demonstration of how to compute this value. If the daily, volume-weighted average is greater than that allowed in the rule, the coating line is not in compliance.

### Calculation Examples:

Example 1 – Limitation in pounds of VOC per gallon of coating, excluding water and exempt solvents (A):

The coating content limitation which is common to most of the regulated surface coating operations is expressed as pounds VOC/gallon of coating, excluding water and exempt solvents. In order to make a compliance determination, this value must be calculated for each coating employed.

The following information is required for this calculation:

$D_C$  = density of coating (pounds coating/gallon coating)

$W_{VM}$  = fraction %, by weight, volatile matter in coating (pound of volatile matter/pound coating)

$W_W$  = fraction %, by weight, water in coating (pound of water/pound coating)

$W_{ES}$  = fraction %, by weight, exempt solvent in coating (pound of exempt solvent/pound coating)

$V_S$  = fraction %, by volume, solids in coating (gallon of solids/gallon coating)

$V_{VM}$  = fraction %, by volume, volatile matter in coating (gallon of volatile matter/gallon coating)

$V_W$  = fraction %, by volume, water in coating (gallon of water/gallon coating)

$V_{ES}$  = fraction %, by volume, exempt solvent in coating (gallon of exempt solvent/gallon coating)

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Where: fraction % is the percent expressed as a fraction (i.e., 98% is expressed as 0.98).

Category: Coil coating line (OAC rule 3745-21-09(E)); emission limitation of 2.6 pounds of VOC per gallon of coating, excluding water and exempt solvents.

$C_{VOC,2}$  = VOC content in pounds of VOC per gallon of coating, excluding water and exempt solvents.

$$C_{voc2} = \frac{(density\ of\ coating) \times (fraction\ \%,\ by\ weight,\ of\ VOC\ in\ coating)}{(fraction\ \%,\ by\ volume,\ solids\ in\ coating) + (fraction\ \%,\ by\ volume,\ VOC\ in\ coating)}$$

$$= \frac{\left(\frac{lbs\ coating}{gal\ coating}\right) \times \left(\frac{lbs\ VOC}{lb\ coating}\right)}{\left(\frac{gal\ solids}{gal\ coating}\right) + \left(\frac{gal\ VOC}{gal\ coating}\right)}$$

$$C_{voc2} = \frac{(Dc)(Wvoc)}{Vs + Vvoc}$$

Where:

$W_{VOC}$  [fraction %, by weight, of VOC in coating] =  $W_{VM} - W_W - W_{ES}$

$V_{VOC}$  [fraction %, by volume, of VOC in coating] =  $V_{VM} - V_W - V_{ES}$

Coating formulation:

$D_C$  = 8.09 pounds/gallon

$W_{VM}$  = 0.477 (47.7%)

$W_W$  = 0.098 (9.8%)

$W_{ES}$  = 0.008 (0.8%)

$V_S$  = 0.446 (44.6%)

$V_{VM}$  = 0.554 (55.4%)

$V_W$  = 0.12 (12.0%)

$V_{ES}$  = 0.01 (1.0%)

$$C_{voc2} = \frac{(8.09) \times (0.477 - 0.098 - 0.008)}{(0.446) + (0.554 - 0.12 - 0.01)}$$

= 3.45 pounds of VOC per gallon of coating, excluding water and exempt solvents

Therefore, this coating does not comply with the coating content limitation of 2.6 pounds of VOC per gallon of coating, excluding water and exempt solvents.

Example 2 – Limitation in pounds of VOC per gallon of coating solids (B):

Several of the rules in OAC Chapter 3745-21 provide the compliance option of utilizing add-on control equipment such as incineration, carbon adsorption, or condensing units. These rules specify alternate coating content

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limitations for controlled coating operations as well as capture and control efficiencies the control equipment must meet to be exempt from the coating content requirements. The alternate content limitations are expressed in pounds of VOC per gallon of coating solids, which must be demonstrated in accordance with OAC Rule 3745-21-10(B) as shown in this example. The required capture and control efficiencies that must be met to be exempt from the coating content requirements must be demonstrated in accordance with OAC rule 3745-21-10(C) as shown in Example 3 below.

Note that owners or operators of other types of surface coating lines may elect to install controls as a means of achieving compliance, even though such an alternative is not specified in the rule. This, however, would require a demonstration that the reduction achieved by the control equipment is sufficient to meet the allowable emission limitation for the coating line.

The following information is required for this calculation:

$D_c$  = density of coating (pounds coating/gallon coating)

$W_{VM}$  = fraction %, by weight, volatile matter in coating (pound of volatile matter/ pound coating)

$W_w$  = fraction %, by weight, water in coating (pound of water/pound coating)

$W_{ES}$  = fraction %, by weight, exempt solvent in coating (pound of exempt solvent/pound coating)

$V_s$  = fraction %, by volume, solids in coating (gallon of solids/gallon coating)

Where: fraction % is the percent expressed as a fraction (i.e., 98% is expressed as 0.98).

Category: Coil coating line (OAC rule 3745-21-09(E)); emission limitation of 4.0 pounds of VOC per gallon of solids (prime coat, topcoat or single coat line) if a control system is used.

$C_{voc,3}$  = VOC content in pounds of VOC per gallon of coating solids.

$$C_{voc3} = \frac{(density\ of\ coating) \times (fraction\ \%,\ by\ weight,\ of\ VOC\ in\ coating)}{fraction\ \%,\ by\ volume,\ of\ solids\ in\ coating} =$$

$$C_{voc3} = \frac{\left(\frac{lbs\ coating}{gal\ coating}\right) \times \left(\frac{lbs\ VOC}{lb\ coating}\right)}{\left(\frac{gal\ solids}{gal\ coating}\right)} =$$

$$C_{voc3} = \frac{(Dc)(Wvoc)}{Vs}$$

Where:

$W_{voc}$  [fraction %, by weight, of VOC in coating] =  $W_{VM} - W_w - W_{ES}$

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Coating formulation:

$D_c = 8.09$  pounds/gallon

$W_{VM} = 0.477$  (47.7%)

$W_w = 0.098$  (9.8%)

$W_{ES} = 0.008$  (0.8%)

$V_s = 0.446$  (44.6%)

$$C_{voc3} = \frac{(8.09) \times (0.477 - 0.098 - 0.008)}{0.446} = 6.72 \text{ pounds of VOC per gallon of solids}$$

Therefore, even if a control system is used, this coating does not comply with the coating content limitation of 4.0 pounds of VOC per gallon of solids. However, pursuant to OAC rule 3745-21-09(B)(6) and 3745-21-09(B)(7), this limitation would not apply to this source if the control system used complies with the capture and VOC reduction requirements of those rules

Example 3 – Percent capture and percent control limitations (C):

If the coil coating line using the coating in the above examples utilizes a capture and control system meeting the requirements of OAC rule 3745-21-09(B)(6), the coil coating would not need to meet the coating content limitations in OAC rule 3745-21-09(E). Specifically, OAC rule 3745-21-09(B)(6) requires that the control system achieve an overall reduction of 81%, by weight, in the overall VOC emissions and a control efficiency of not less than 90%, by weight. The testing requirements to demonstrate compliance with these limitations are outlined in OAC rule 3745-21-10(C)(3).

Example 4 – Limitation in percent VOC, by volume, of the volatile matter (D):

Vinyl coaters and rotogravure/flexographic printing presses have a control option specified in OAC rules 3745-21-09(H)(1)(b) and 3745-21-09(Y)(1)(a)(ii), respectively, which states that the VOC content of the coating cannot exceed 25% by volume of the volatile portion, as determined through the use of a Method 24 analysis or from data submitted from the coating supplier and the following calculation.

The following information is required for this calculation:

$V_{VM}$  = fraction %, by volume, volatile matter in coating (gallon of volatile matter/gallon coating)

$V_w$  = fraction %, by volume, water in coating (gallon of water/gallon coating)

$V_{ES}$  = fraction %, by volume, exempt solvent in coating (gallon of exempt solvent/gallon coating)

Where: fraction % is the percent expressed as a fraction (i.e., 98% is expressed as 0.98).

Category: Vinyl coating line (OAC rule 3745-21-09(H)(1)(b)); emission limitation of 25% VOC, by volume, of volatile matter of coating.

$C_{VOC,6}$  = VOC content in percent VOC, by volume, of the volatile matter of the coating.

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$$C_{voc6} = \frac{(100) \times (\text{fraction \%}, \text{by volume}, \text{of VOC in coating})}{\text{fraction \%}, \text{by volume}, \text{of volatile matter in coating}} =$$

$$C_{voc6} = \frac{(100) \times \left( \frac{\text{gal VOC}}{\text{gal coating}} \right)}{\left( \frac{\text{gal volatiles}}{\text{gal coating}} \right)} =$$

$$C_{voc6} = \frac{(100) \times (V_{voc})}{V_{vm}}$$

Where:

$$V_{VOC} [\text{fraction \%}, \text{by volume}, \text{of VOC in coating}] = V_{VM} - V_W - V_{ES}$$

Coating formulation:

$$V_{VM} = 0.554 \text{ (55.4\%)}$$

$$V_W = 0.12 \text{ (12.0\%)}$$

$$V_{ES} = 0.01 \text{ (1.0\%)}$$

$$\begin{aligned} C_{voc6} &= \frac{(100) \times (0.554 - 0.12 - 0.01)}{0.554} \\ &= 76.53 \text{ percent VOC, by volume, of the volatile matter in coating} \end{aligned}$$

This coating does not comply with the limitation of 25%, by volume of the volatile matter of the coating. However, pursuant to OAC rule 3745-21-09(H)(2), this limitation would not apply to this coating line if the control system used complies with the requirement to provide 75%, by weight, capture efficiency and 90%, by weight, control efficiency.

Example 5 – Limitation in percent VOC, by volume, excluding water and exempt solvents (E):

The flexographic, packaging rotogravure and publication printing industry also has the option of achieving compliance with OAC rule 3745-21-09 (Y)(1)(a)(i) through the use of high solids coatings. This rule limits the VOC content of high solids coatings to no more than 40% by volume of the coating, excluding water. Compliance is determined by means of a Method 24 analysis or from data submitted by the coating supplier.

The following information is required for this calculation:

$V_S$  = fraction %, by volume, solids in coating (gallon of solids/gallon coating)

$V_{VM}$  = fraction %, by volume, volatile matter in coating (gallon of volatile matter/gallon coating)

$V_W$  = fraction %, by volume, water in coating (gallon of water/gallon coating)

$V_{ES}$  = fraction %, by volume, exempt solvent in coating (gallon of exempt solvent/gallon coating)

Where: fraction % is the percent expressed as a fraction (i.e., 98% is expressed as 0.98).

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Category: flexographic printing line (OAC rule 3745-21-09(Y)); emission limitation of 40% VOC, by volume, of coating, excluding water and exempt solvents.

$C_{VOC,5}$  = VOC content in percentage VOC, by volume, of the coating, excluding water and exempt solvents.

$$C_{voc5} = \frac{(100) \times (\text{fraction \% , by volume, of VOC in coating})}{(\text{fraction \% , by volume, solids in coating}) + (\text{fraction \% , by volume, VOC in coating})}$$

$$C_{voc5} = \frac{(100) \times \left( \frac{\text{gal VOC}}{\text{gal coating}} \right)}{\left( \frac{\text{gal solids}}{\text{gal coating}} \right) + \left( \frac{\text{gal VOC}}{\text{gal coating}} \right)} =$$

$$C_{voc5} = \frac{(100)(V_{voc})}{V_s + V_{voc}}$$

Where:

$$V_{VOC} [\text{fraction \% , by volume, of VOC in coating}] = V_{VM} - V_W - V_{ES}$$

Coating formulation:

$$V_s = 0.446 \text{ (44.6\%)}$$

$$V_{VM} = 0.554 \text{ (55.4\%)}$$

$$V_W = 0.12 \text{ (12.0\%)}$$

$$V_{ES} = 0.01 \text{ (1.0\%)}$$

$$C_{voc5} = \frac{(100) \times (0.554 - 0.12 - 0.01)}{(0.446) + (0.554 - 0.12 - 0.01)}$$

$$= 48.74 \text{ percent VOC, by volume, of coating, excluding water and exempt solvents}$$

As with Examples 2 through 5, this coating does not comply with the limitation of 40%, by volume of coating, excluding water and exempt solvents. However, if the flexographic printer employs a capture system that achieves at least 65%, by weight capture efficiency and a control system that achieves 90%, by weight, control efficiency, the coating VOC limitations would not apply.

Example 6 – Alternative emission limitation (F):

The automobile and light-duty trucks, metal furniture, and large appliance coating categories (OAC rules 3745-21-09 (C) and/or 3745-21-29, 3745-21-09(I) and 3745-21-09(K), respectively) each have a provision for an alternative emission limitation which accounts for higher coating transfer efficiencies (TE). The emission limitations expressed in the rules are based on TEs recognized for those industries, and the specific baseline TEs are given in the rules. Theoretically, as the TE increases more solids will be applied to the substrate (i.e., less overspray), thereby requiring

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less coating to be used. The case-by-case equivalency demonstration of an alternative emission limitation must be made on a pounds of VOC per gallon of solids basis.

The following calculations are used to determine the equivalency of an alternative emission limitation based upon transfer efficiency.

Category: Automobile and light-duty truck coating line (OAC rule 3745-21-09(C)); emission limitation of 2.8 pounds of VOC per gallon of coating, excluding water and exempt solvents for topcoat; 15.1 pounds of VOC per gallon of deposited solids.

Coating formulation (topcoat):

$D_c = 8.09$  pounds/gallon

$W_{VM} = 0.477$  (47.7%)

$W_W = 0.098$  (9.8%)

$W_{ES} = 0.008$  (0.8%)

$V_S = 0.446$  (44.6%)

$V_{VM} = 0.554$  (55.4%)

$V_W = 0.12$  (12.0%)

$V_{ES} = 0.01$  (1.0%)

TE = 50%

Step 1: Determine the pounds of VOC per gallon of coating, excluding water and exempt solvents, using the equation in Example 1:

$C_{VOC,2}$  = VOC content in pounds of VOC per gallon of coating, excluding water and exempt solvents.

$$C_{voc2} = \frac{(Dc)(Wvoc)}{V_S + V_{voc}} =$$
$$C_{voc2} = \frac{(8.09) \times (0.477 - 0.098 - 0.008)}{(0.446) + (0.554 - 0.12 - 0.01)}$$
$$= 3.45 \text{ pounds of VOC per gallon of coating, excluding water and exempt solvents}$$

The coating does not comply with the pounds of VOC per gallon of coating, excluding water and exempt solvents limitation in OAC rule 3745-21-09(C)(1)(c).

Step 2: Determine the pounds of VOC per gallon of coating solids using the equation in Example 2:

$C_{VOC,3}$  = VOC content in pounds of VOC per gallon of coating solids.

$$C_{voc3} = \frac{(Dc)(Wvoc)}{V_S} =$$
$$C_{voc3} = \frac{(8.09) \times (0.477 - 0.098 - 0.008)}{0.446} = 6.72 \text{ pounds of VOC per gallon of solids}$$

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Step 3: Determine the pounds of VOC per gallon of coating solids deposited:

$$\frac{\left(\frac{6.72 \text{ lbs VOC}}{\text{gal solids}}\right)}{0.50 \text{ transfer efficiency}} = \frac{13.44 \text{ lbs VOC}}{\text{gal solids applied}}$$

Therefore, the coating complies with the alternative emission limitation of 15.1 pounds of VOC per gallon of deposited solids.

Example 7 – Alternative daily emission limitation or bubble (G):

OAC rule 3745-21-09(D), for can coating, is the only rule that specifically provides for a facility bubble. The equations used in that calculation are outlined in OAC rules 3745-21-09(D)(3)(b) and 3745-21-09(D)(3)(c). However, no example of these calculations are covered by this engineering guide.

Note that bubble variances are available to all existing surface coating operations pursuant to OAC rule 3745-31-09 (C)(2)(d).

Example 8 – Daily, volume-weighted average of VOC emissions from a coating line:

Category: Miscellaneous metal parts; extreme performance coating emission limitation of 3.5 pounds of VOC per gallon of coating, excluding water and exempt solvents.

Coating usage and formulations:

Coating Used	Pounds of VOC per gallon of coating, excluding water and exempt solvents	Gallons of coating used per day	Volume fraction of solids	Volume fraction of VOC
A	2.5	20	70%	20%
B	4.3	15	40%	50%
C	3.5	45	50%	40%
D	3.0	17	60%	30%

$(C_{VOC2})_A$  = daily, volume-weighted VOC content in pounds of VOC per gallon of coating, excluding water and exempt solvents

$$(C_{VOC2})_A = \frac{\sum_{i=1}^n (C_{voc2i})(L_{ci})(V_{si} + V_{voci})}{\sum_{i=1}^n (L_{ci})(V_{si} + V_{voci})}$$

Where:

$C_{VOC,2i}$  = VOC content of each coating, in pounds of VOC per gallon of coating, excluding water and exempt solvents

$L_{ci}$  = volume of each coating used during the day (24-hour period), in gallons

$V_{si}$  = volume fraction of solids per gallon of coating for each coating

$V_{VOCI}$  = volume fraction of VOC per gallon of each coating

$i$  = each specific coating used during the day

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n = total number of coatings employed during the day

A = subscript indicating that the VOC content is a weighted average

$$\begin{aligned} & (C_{voc}^2)A \\ &= \frac{[(2.5)(20)(0.70 + 0.20) + (4.3)(15)(0.40 + 0.50) + (3.5)(45)(0.50 + 0.40) + (3.0)(17)(0.60 + 0.30)]}{[(20)(0.70 + 0.20) + (15)(0.40 + 0.50) + (45)(0.50 + 0.40) + (17)(0.60 + 0.30)]} \\ &= 3.33 \text{ pounds of VOC per gallon, excluding water and exempt solvents} \end{aligned}$$

Therefore, the coating line is in compliance on a daily, volume-weighted average basis for this day.

Note: The gallons of coating used per day values should represent the real usage for a day and not simply an average daily usage based on the annual usage divided by the number of operating days in a year.

### Contact:

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

# ENVIRONMENTAL DATA SHEET

(Certified Product Data Sheet)

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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)**

<b>A. Coating Density</b>		8.09 lb/gal	969 g/l
<b>B. Total Volatiles</b>		47.7 % by wt.	55.4 % by vol.
<b>C. Federally exempt solvents:</b>			
	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.
<b>D. Organic Volatiles</b>		37.1 % by wt.	42.4 % by vol.
<b>E. Percent Non-Volatile</b>		52.3 % by wt.	44.6 % by vol.
<b>F. VOC Content</b>	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))**

<b>Volatile HAPS</b>	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.