

## EMISSIONS AVERAGING PROCEDURE

(Adopted June 19, 1996)

Ref: Regulation 8, Rule 32: Wood Products Coating, Section 307: Alternate Compliance

## 6.1 Introduction

The procedure set forth in this section provides for a method of averaging emissions on a grams VOC per gram coating solid basis (or pounds VOC per pound coating solid basis). This basis eliminates bias due to relative film thickness' of different coating technologies and those due to coatings containing water or exempt solvents. Low solids coatings and solvents used in the manufacturing process may be included in the average, but are calculated on the basis of grams VOC per gram coating or solvent material (or pounds VOC per pound coating or solvent material).

Emissions are quantified for all coatings to be averaged from the amount of coating solids used for each coating in grams (or pounds) multiplied by the VOC content in grams VOC per gram coating solid (or pounds VOC per pound coating solid). Information on the solid content and the VOC content is obtained from the coating manufacturer, and is required to be provided.

Emissions from all coatings are compared to the emissions that would result from using all compliant coatings. The emissions from compliant coatings are based on the equivalent grams (or pounds) of coating solids used, and VOC content of compliant coatings translated into grams VOC per gram coating solid (or pounds VOC per pound coating solid). This equivalency assumes a 1200 gram/liter (or 10.0 pounds/gallon) density for coating solids and a 880 gram/liter (or 7.33 pounds/gallon) density for coating solvent. Emissions of coatings used must be no greater than emissions from compliant coatings. Emission reductions from solvent usage directly related to the manufacturing process are based on the density of solvent used prior to the reduction.

For wood coating facilities, the EPA requires that emissions from coatings used, when averaged, be 10% less than emissions from compliant coatings. This is stated in the EPA document: "Control of Volatile Organic Compound Emissions from Wood Furniture Manufacturing Operations", and is considered "quid pro quo" for the flexibility in choice of coatings inherent in an averaging provision. The EPA provisions are applicable to facilities with actual or potential emissions of 25 Tons VOC/year or greater.

## 6.2 Compliance Calculation

$$E_{CT} + E_{SS} + E_{PC} + E_{HS} + E_F + E_{LS} + E_{WC} + E_S \leq .9 [ L_{CT} (Q_{CT1} + Q_{CT2} + \dots Q_{CTn}) + \\ L_{SS} (Q_{SS1} + Q_{SS2} + \dots Q_{SSn}) + \\ L_{PC} (Q_{PC1} + Q_{PC2} + \dots Q_{PCn}) + \\ L_{HS} (Q_{HS1} + Q_{HS2} + \dots Q_{HSn}) + \\ L_F (Q_{F1} + Q_{F2} + \dots Q_{Fn}) + \\ (480 \text{ g/l or } 4.0 \text{ lb/gal})(Q_{LS1} + Q_{LS2} + \dots Q_{LSn}) + \\ (480 \text{ g/l or } 4.0 \text{ lb/gal})(Q_{WC1} + Q_{WC2} + \dots Q_{WCn}) \\ + \\ (S_1 \text{ g/l or lb/gal})(Q_{S1}) + (S_2)(Q_{S2}) \\ + \dots (S_n)(Q_{Sn}) ]$$

where:

E = VOC emissions in grams or pounds for all coatings and solvents used

Q = quantity of each high solids coating used, expressed in grams (or pounds) of coating solids; or quantity of each low solids stain, washcoat or solvent in liters (or gallons)

- K = grams VOC per gram solid (or pounds VOC per pound solid) for each high solids coating used; or grams VOC per liter of coating or solvent (or pounds VOC per gallon of coating or solvent) for each low solids stain, washcoat or solvent used
- L = emission limit from Section 8-32-302, 303 or 304, expressed in grams (or pounds) VOC per gram (or pound) coating solid for high solids coatings and grams (or pounds) VOC per liter (or gallon) of low solids coating or solvent
- S = solvent VOC in grams per liter (or pounds per gallon) of material for solvents used as part of the manufacturing process prior to averaging.
- CT = clear topcoats
- SS = sanding sealers
- PC = pigmented coatings
- HS = high solids stains
- F = fillers
- LS = low solids stains
- WC = washcoats
- S = solvents

For any category of coating,

$$E = \sum_{i=1}^n (Q_i)(K_i) \quad n = 1, 2, 3 \dots$$

Note: The .9 multiplier (above) is only applicable to facilities with actual or potential emissions of at least 25 Tons/year.

### 6.3 Regulation 8, Rule 32 Equivalency Factors

#### Volatile Organic Compound Content (VOC)

grams VOC/liter	pounds VOC/gallon	grams VOC/gram coating solid
275	2.3	.33
500	4.2	.96
550	4.6	1.22
600	5.0	1.57
700	5.8	2.85

Note: Grams VOC/liter of coating and pounds VOC/gallon of coating is minus water and exempt solvent. The calculations and analytical procedures for quantifying VOC content of coatings are found in the Manual of Procedures, Volume III, Laboratory Policies and Procedures; Methods 21, 22, 31, and 41.

### 6.4 Sample Calculations

1) A facility wishes to average high VOC low solids stain, low VOC low solids stain, low VOC sanding sealer, and a high VOC clear topcoat. The operator obtains the VOC content of each coating expressed as grams VOC/gram coating solid from the manufacturer and estimates the relative usage for each of these products. The operator also uses some high solids stain and some low VOC topcoat, but the VOC contents of these coatings are at their respective limits, so they are not included in averaging. The facility has actual and potential emissions of less than 25 Tons/year.

Product	VOC (pounds/gallon)	VOC (pounds/pound solid)	estimated usage
Clear Topcoat	6.10 lb/gal	3.59 lbs/lb solid	65 gallons/mo.
Sanding Sealer	3.20 lb/gal	0.60 lbs/lb solid	155 gallons/mo.
Stain 1	5.83 lb/gal	not applicable	20 gallons/mo.
Stain 2	1.67 lb/gal	not applicable	75 gallons/mo.

The topcoat contains no water or exempt solvents, and 1.70 pounds solids/gallon.

The sanding sealer contains 25% exempt solvent by volume, so the actual amount of VOC in a gallon of sealer is 2.4 lb. This is because:

$$\text{VOC (lb/gal less water and exempt)} = \text{VOC (lb)} / [1 \text{ gal} - \text{H}_2\text{O (gal)} - \text{VOC}_{\text{exempt}} \text{ (gal)}]$$

The sanding sealer contains 4.0 pounds solids/gallon. The operator calculates usage (Q) in terms of coating solids for the sanding sealer and topcoat:

$$Q_{\text{CT}} = 65 \text{ gallons} * 1.70 \text{ pounds solids/gallon} = 110.5 \text{ pounds solids/mo.}$$

$$Q_{\text{SS}} = 155 \text{ gallons} * 4.0 \text{ pounds solids/gallon} = 620.0 \text{ pounds solids/mo.}$$

The operator uses the summation equation to calculate total emissions from the use of these coatings:

$$E_{\text{CT}} = 3.59 \text{ lb VOC/lb solid} * 110.5 \text{ lbs solids} = 396.69 \text{ lbs VOC}$$

$$E_{\text{SS}} = 0.60 \text{ lb VOC/lb solid} * 620.0 \text{ lbs solids} = 372 \text{ lbs VOC}$$

$$E_{\text{LS}} = (5.83 \text{ lb/gal} * 20 \text{ gal}) + (1.67 \text{ lb/gal} * 75 \text{ gal}) = 241.85 \text{ lbs VOC}$$

Using the equivalency table, the pounds of coating solids for the high solids coatings, the gallons of product for the low solids stain and the equation, above:

$$\begin{aligned} (396.69 + 372 + 241.85) &\leq (L_{\text{CT}} * Q_{\text{CT}}) + (L_{\text{SS}} * Q_{\text{SS}}) + (L_{\text{LS}} * Q_{\text{LS}}) \\ &\leq (1.22 * 110.5) + (1.22 * 620.0) + (4.0 * 95) \\ 1010.54 \text{ lbs VOC} &\leq (134.81 + 756.4 + 380) = 1271.21 \text{ lbs VOC} \end{aligned}$$

The inequality is true, so the facility is in compliance.

2) A facility wishes to average high VOC low solids stain, a low VOC solvent wash, a high VOC sanding sealer, a waterborne low VOC clear topcoat and a low VOC pigmented coating. The operator obtains the VOC contents expressed as grams VOC/grams solid for the coatings and the VOC content of the stain and solvent expressed as grams VOC/liter and estimates the usage of each of these products. The facility has emissions of greater than 25 Tons/year.

Product	VOC (grams/liter)	VOC (grams/gram solid)	estimated usage
Clear Topcoat	255 g/l	0.30 g/g solid	1180 liters/mo.
Sanding Sealer	676 g/l	2.45 g/g solid	680 liters/mo.
Pigmented Coating	420 g/l	0.40 g/g solid	110 liters/mo.
Low Solids Stain	700 g/l	not applicable	570 liters/mo.
Solvent	400 g/l	not applicable	340 liters/mo.

The topcoat contains water, and has 360 grams solids/liter. The sanding sealer contains 276 grams solids/liter. The pigmented coating has 1050 grams solids/liter. The solvent wash was reformulated from a methyl ethyl ketone wash at 805 g/l.

The operator calculates usage (Q) in terms of coating solids for the topcoat, sanding sealer and pigmented coating.

$$Q_{\text{CT}} = 1180 \text{ liters} * 360 \text{ grams solids/liter} = 424,800 \text{ grams solids/mo.}$$

$$Q_{\text{SS}} = 680 \text{ liters} * 276 \text{ grams solids/liter} = 187,680 \text{ grams solids/mo.}$$

$$Q_{\text{PC}} = 110 \text{ liters} * 1050 \text{ grams solids/liter} = 115,500 \text{ grams solids/mo.}$$

The operator uses the summation equation to calculate total emissions from the use of these coatings and solvent:

$$E_{\text{CT}} = 0.30 \text{ g VOC/g solid} * 424,800 \text{ g solids} = 127,440 \text{ grams VOC}$$

$$E_{\text{SS}} = 2.45 \text{ g VOC/g solid} * 187,680 \text{ g solids} = 459,816 \text{ grams VOC}$$

$$E_{\text{PC}} = 0.40 \text{ g VOC/g solid} * 115,500 \text{ g solids} = 46,200 \text{ grams VOC}$$

$$E_{\text{LS}} = 700 \text{ g VOC/liter} * 570 \text{ liters} = 399,000 \text{ grams VOC}$$

$$E_{\text{S}} = 400 \text{ g VOC/liter} * 340 \text{ liters} = 136,000 \text{ grams VOC}$$