

# Guidelines for Reporting Emissions from the Use of Materials Containing Organic Compounds – December 2016

---

Depending on the method of application, emissions from the use of materials containing organic compounds include volatile organic compound (VOC), particulate matter (PM for sprayed coating), and toxic air contaminants/ozone depleting compounds (TAC/ODC) found in either or both toxic VOC or toxic PM form. The user is encouraged to use specific information found in material safety data sheets (MSDS), safety data sheets (SDS), and/or technical data sheets (TDS) including: material VOC content, density, percent by weight of total solids, and percent by weight of individual toxic compounds. In the absence of specific data, certain default parameters are recommended for calculating VOC & PM (Including Toxic).

## VOC Emissions:

$$E_{\text{VOC}} = Q * EF * (1 - CE_{\text{overall}}) \quad \text{Eq (1)}$$

Where:

- $E_{\text{VOC}}$  = Emissions from the use of VOC materials (lbs)  
 $Q$  = Throughput (or quantity of materials in gallons or lbs)  
 $EF$  = Emission Factor, or material VOC content, including water and exempt compounds (lb/gal or lb/lb).

For liquid coatings, the default VOC contents are in Help & Support.

For powder coatings, the default VOC content is 0.01 lb. VOC/ lb. of powder.

$CE_{\text{overall}}$  = Overall Efficiency of the Control System (decimal) which is defined as:

$$CE_{\text{overall}} = CE_{\text{cap}} * CE_{\text{des}}$$

where,

$CE_{\text{cap}}$  = Capture Efficiency of Control System (fraction)

$CE_{\text{des}}$  = Destruction Efficiency of Control Equipment (fraction)

## VOC Control Efficiency:

<b>CONDENSER (&lt; 41 deg F)</b>	$CE_{\text{overall}}$	<b>= 75%</b>
<b>CARBON ADSORBER</b>	$CE_{\text{overall}}$	<b>= 95%</b>
<b>AFTERBURNER</b>	$CE_{\text{overall}}$	<b>= 98%</b>
<b>THERMAL OXIDIZER</b>	$CE_{\text{overall}}$	<b>= 99%</b>
<b>OPEN-AIR OR NO CONTROL EQUIPMENT</b>	$CE_{\text{overall}}$	<b>= 0%</b>

**PM Emissions from Spray Coating Operations (including powder coating):**

If the coating is atomized (sprayed), equation 1 can be modified for PM emissions as follows:

$E_{PM} = Q * EF * (1 - TE) * (1 - CE_{overall})$	<b>Eq. (2)</b>
---	----------------

where:

- $E_{PM}$  = Emissions of total particulate matter (lbs)
- $Q$  = Throughput (or quantity of coatings applied in gallons or pounds)
- $EF$  = Emission Factor, or coating solids content (lb/gal or lb/lb)
- $TE$  = Transfer efficiency (decimal)
- $CE_{overall}$  = Overall Efficiency of the Control System (decimal)

**Default Factors for PM:**

**Emission Factor (or solids content)**

<p><b>Liquid Coating EF = 3.0 lb/gallon of coating material or 0.375 lb/lb (or 37.5%)</b>                  Powder Coating EF = 0.99 lb/lb of powder (or 99% Solids and 1% VOCs)</p>
---

**Transfer Efficiency**

<b>AIR-ATOMIZED SPRAY</b>	<b>TE = 0.25</b>
<b>HVLP SPRAY</b>	<b>TE = 0.65</b>
<b>ELECTROSTATIC SPRAY</b>	<b>TE = 0.75</b>
<b>DIPPING, ROLLER, BRUSHES, SPONGES, etc.</b>	<b>TE = 1.00</b>

**PM Control Efficiency**

<b>CONVENTIONAL FILTERS</b>	<b>CE = 0.90</b>
<b>3-STAGE AEROSPACE NESHAP-COMPLAINT FILTERS:</b>	<b>CE = 0.95</b>
<b>HIGH EFFICIENCY PARTICLE ARRESTOR (HEPA):</b>	<b>CE = 0.9997</b>
<b>OPEN-AIR:</b>	<b>CE = 0.0</b>

***NOTE: Both equation (1) and (2) are applicable for estimating emissions of toxic air contaminants (TAC) and ozone depleting compounds (ODC), which can be part of either or both VOC and PM (namely toxic VOC and toxic PM). Information on MSDS/TDS may help the user in determining TAC/ODC emission factors in terms of lb/gallon of coating material or as a fraction (lb/lb) of coating material.***

**Determining Emission Factor (EF) for Toxic Solids, or Toxic Solids Content (TSC)** - Refer to the product MSDS or TDS to obtain the fraction of toxic chemical compound that contains toxin. To determine the TSC, multiply the fraction of total toxic compound solids by the fraction of toxin in the toxic compound. For liquid coatings, use the following two equations to calculate TSC expressed in lbs/gallon. For powder coatings, use only the first equation to calculate TSC expressed in lb/lb.

$$\text{TSC}_{\text{lb/lb of coating}} = \text{Weight of Total Toxic Compound Containing Solids} \times \text{Weight Fraction of Toxic Compound}$$

$$\text{TSC}_{\text{lb/gal of coating}} = \text{TSC}_{\text{lb/lb of coating}} \times \text{Coating Density}_{\text{lb coating/gal of liquid coating}}$$

**EXAMPLE**

Determine Lead and Hexavalent Chromium Toxic Solid Content (TSC) in pounds per gallon given in the MSDS for a coating containing Lead Chromate ( $\text{PbCrO}_4$ ) (CAS # 7758976).

(1) The MSDS indicates that the total toxic compound containing solids, or lead chromate content is 25% or 0.25 lbs/lb of coating. The density of the coating is stated to be 11.4 lbs/gal. Therefore the weight of lead chromate in the coating is  $(11.4 \text{ lbs/gal}) \times (0.25 \text{ lbs/lb}) = 2.85 \text{ lb/gal}$ .

**Hexavalent Chromium EF (lb/gal)**

(2) The ratio of the molecular weight (MW) of chromium to the molecular weight (MW) of lead chromate is  $(52/323.17) = 0.1609 \text{ lbs Cr+6/lb PbCrO}_4$

- The TSC is then  $(2.85 \text{ lbs PbCrO}_4/\text{gal coating}) \times (0.1609 \text{ lbs Cr+6/lb of PbCrO}_4) = 0.4586 \text{ lbs CR+6/gal coating}$ .

**Lead EF (lb/gal)**

(3) Since lead is also toxin in lead chromate, repeat only step 2 above for lead MW to Lead Chromate MW ratio.

(4) The ratio of the molecular weight (MW) of lead to the molecular weight (MW) of lead chromate is  $(207.19/323.19) = 0.6411 \text{ lbs Pb/lb PbCrO}_4$

- The TSC is then  $(2.85 \text{ lbs PbCrO}_4/\text{gal coating}) \times (0.6411 \text{ lbs Pb/lb of PbCrO}_4) = 1.83 \text{ lbs Pb/gal coating}$ .

*Default values of molecular weight ratios for several commonly found toxic compounds is on Pages 11 & 12 of Supplemental Instructions for AB2588 Facilities from AER Web-site and list of regular Toxic is in Rule 301 (e).*

## **DATA ENTRY EXAMPLE**

Company XYZ sprays coating onto aerospace parts with a special chromated primer inside a spray booth equipped with HEPA filters. The annual amount used is 30 gallons, per MSDS the VOC content is 2.62 lb/gal, the density is 9.4 lb/gal, solids content is 30%, and the hexavalent chromium (Cr<sup>6+</sup>) is 0.68 lb/gal.

### **Data Entry Steps:**

On the Process Reference screen, click on “Open” for process P1 for this spray booth:

A/N	Permit NO	Permit Device ID	Permit Device Description	AER Device ID	ES Name	Source Group	Emissions?	Equipment	ES Status
123459	T00119	D10	SPRAY BOOTH PAINT AND SOLVENT	ES12		Spray Coating/Spray Booth	Y	Spray Booth	Work in progress

  

Process ID	Source Group	Process Name	Process Status	Operation Type
P1	Spray Coating/Spray Booth		Work in progress	routine

Buttons: Add Process, OK

On the next screen, click on “Open” for process information:

[« Back to Emission Source Process Reference](#)

### Spray Coating/Spray Booth

Please provide specific information for every process associated with the organics used in spray coating/spray booth including usage, emission factor, and control efficiency (if any). You must select Material/Activity Code and throughput units before reporting emissions. Detailed instructions are available by clicking on Help icon in the tool bar.

**Step 1: Process** Optional: Mark as Completed

	AER Device ID	Permit Device ID	A/N	Process ID	Rule #	Material/Activity Code	Material Description	SCC
<a href="#">Open</a>	ES12	D10	123459	P1				

[Click here to delete](#) this process.

Fill out the process information in the following screen the click “Save”

**Edit Emission Process - Spray Coating/Spray Booth** ✕

AER Device ID	Permit Device ID	A/N	Process ID	Rule #	Material/Activity Code	Material Description	SCC
ES12	D10	123459	P1				

AER Device ID: ES12

PERMITTED

Process ID: P1

Process Comment:

SCC:

Equipment:

Material / Activity \*

Major Group:

Type of Operation:

Application Method:

Type of Material:

Material Description:  \*

Additional Rules:  [Remove](#) [Add Rule](#)

AER Device Name:

Permit Device ID: D10

Process Name:

In the following screen, click on “Open” under step 2 for throughput information.

[« Back to Emission Source Process Reference](#)

### Spray Coating/Spray Booth

Please provide specific information for every process associated with the organics used in spray coating/spray booth including usage, emission factor, and control efficiency (if any). You must select Material/Activity Code and throughput units before reporting emissions. Detailed instructions are available by clicking on Help icon in the tool bar.

**Step 1: Process**
Optional: Mark as Completed

	AER Device ID	Permit Device ID	A/N	Process ID	Rule #	Material/Activity Code	Material Description	SCC
<a href="#">Open</a>	ES12	D10	123459	P1	1124	Coating:Aerospace Assembly and Component Manufacturing Operations:HVLP Application:General Primer	Primer with toxics	

Click here to [delete](#) this process.

### Step 2: Throughput

Annual Throughput	
<a href="#">Open</a>	

### Step 3: Criteria Emissions (lbs)

	Pollutant	EF	Unit	EF Data Source	Overall CE	Emissions
<span style="background-color: #f4a460; padding: 2px 10px; border-radius: 3px; cursor: pointer;">Add New</span>						

Note that throughput types may be: Input (raw materials), Existing (already in the equipment), or Output (finished products). Click to **Save** the throughput data.

**Edit Throughput Information - Spray Coating/Spray Booth**
✕

AER Device ID	Permit Device ID	A/N	Process ID	Rule #	Material/Activity Code	Material Description	SCC
ES12	D10	123459	P1	1124	Coating:Aerospace Assembly and Component Manufacturing Operations:HVLP Application:General Primer	Primer with toxics	

**Annual Throughput**

Usage (Annual Throughput)  \*  \*

Throughput Type  \*

Usage Comment

Save
Cancel

**Reporting VOC Emissions:**

In the following screen, click on the “Add New” button under **Criteria Emissions (lbs)** and fill out the required fields.

Please provide specific information for every process associated with the organics used in spray coating/spray booth including usage, emission factor, and control efficiency (if any). You must select Material/Activity Code and throughput units before reporting emissions. Detailed instructions are available by clicking on Help icon in the tool bar.

**Step 1: Process** Optional: Mark as Completed

	AER Device ID	Permit Device ID	A/N	Process ID	Rule #	Material/Activity Code	Material Description	SCC
<a href="#">Open</a>	ES12	D10	123459	P1	1124	Coating:Aerospace Assembly and Component Manufacturing Operations:HVLP Application:General Primer	Primer with toxics	

[Click here to delete this process.](#)

**Step 2: Throughput**

	Annual Throughput
<a href="#">Open</a>	30.00 gal

**Step 3: Criteria Emissions (lbs)**

	Pollutant	EF	Unit	EF Data Source	Overall CE	Emissions
<a href="#">Add New</a>						

**Step 4: Toxic (TAC/ODC) Emissions (lbs)**

	TAC/ODC Group	CAS #	EF	Unit	EF Data Source	Overall CE	Emissions
<a href="#">Add New</a>							

In the following screen, select VOC from the Pollutant drop-down list and enter the emission factor. The overall control efficiency is zero because there is no add-on control system. Click “Save” to move on.

**Open Criteria Emission Information - Spray Coating/Spray Booth**

AER Device ID	Permit Device ID	A/N	Process ID	Rule #	Material/Activity Code	Material Description	SCC
ES12	D10	123459	P1	1124	Coating:Aerospace Assembly and Component Manufacturing Operations:HVLP Application:General Primer	Primer with toxics	

**Annual Throughput**  
30.00 gal

Pollutant:  \*

Emission Factor (EF):  \* lbs/gal

Overall Control Efficiency:

Emission Factor Comment:

Emission Factor Data Source:  \*

Emissions: 78.60 lbs

[Save](#) [Cancel](#)

**Reporting PM Emissions:**

The previous 2 steps can be repeated for other contaminants. Click on “Add New” button and select PM on Pollutant list and fill out the required information with default parameters as shown in the following screen. Click “Save” to move on.

**Open Criteria Emission Information - Spray Coating/Spray Booth**

AER Device ID	Permit Device ID	A/N	Process ID	Rule #	Material/Activity Code	Material Description	SCC
ES12	D10	123459	P1	1124	Coating:Aerospace Assembly and Component Manufacturing Operations:HVLP Application:General Primer	Primer with toxics	
<b>Annual Throughput</b>							
30.00 gal							
Pollutant	PM *						
PM Particulate Matter							
Solid Content	2.8500	* lbs/gal		<input type="checkbox"/> Use default			
Transfer Efficiency	0.65	*		<input checked="" type="checkbox"/> Use default			
Emission Factor (EF)	0.9975	* lbs/gal					
Overall Control Efficiency	0.99970	<input type="checkbox"/> Use default					
Emission Factor Comment	(density) 9.4 lb/gal x (solid portion) 0.30 = 2.85						
Emission Factor Data Source	MSDS *						
Emissions	0.01 lbs						

**Save** **Cancel**

The following screen shows the results of two pollutants: VOC and PM from spraying the primer. The procedures can be repeated for TAC/ODC as shown below by clicking on the TAC/ODC “Add New” button.

**Step 1: Process** Optional: Mark as Completed

AER Device ID	Permit Device ID	A/N	Process ID	Rule #	Material/Activity Code	Material Description	SCC
<a href="#">Open</a>	ES12	D10	P1	1124	Coating:Aerospace Assembly and Component Manufacturing Operations:HVLP Application:General Primer	Primer with toxics	

[Click here to delete this process.](#)

**Step 2: Throughput**

Annual Throughput	
<a href="#">Open</a>	30.00 gal

**Step 3: Criteria Emissions (lbs)**

Pollutant	EF	Unit	EF Data Source	Overall CE	Emissions	
<a href="#">Open</a>	VOC	2.6200	lbs / gal	MSDS	0.00000	78.60
<a href="#">Open</a>	PM	0.9975	lbs / gal	MSDS	0.99700	0.09

**Add New**

**Step 4: Toxic (TAC/ODC) Emissions (lbs)**

TAC/ODC Group	CAS #	EF	Unit	EF Data Source	Overall CE	Emissions
<b>Add New</b>						



**Reporting Toxic PM Emissions:**

The following screen is selected (click on the **Add New** button) for reporting hexavalent chromium (Cr+6) in the primer using default parameters. Click “Save” to finish.

Open Toxic (TAC/ODC) Emission Information - Spray Coating/Spray Booth							
AER Device ID	Permit Device ID	A/N	Process ID	Rule #	Material/Activity Code	Material Description	SCC
ES12	D10	123459	P1	1124	Coating:Aerospace Assembly and Component Manufacturing Operations:HVLP Application:General Primer	Primer with toxics	
<b>Annual Throughput</b>							
30.00 gal							
TAC/ODC Toxic Pollutants / Ozone Depleting Compounds							
Pollutant	13 - Chromium, hexavalent (and compounds)						
TAC Group	13 - Chromium, hexavalent (and compounds)						
CAS # (Pollutant)	18540299 - Chromium, hexavalent (and compounds)						
PM Particulate Matter							
Solid Content	0.6800					* lbs/gal	
Transfer Efficiency	0.65					* <input checked="" type="checkbox"/> Use default	
Emission Factor (EF)	2.38000e-1					* lbs/gal	
Overall Control Efficiency	0.99970					<input type="checkbox"/> Use default	
Emission Factor Comment							
Emission Factor Data Source	MSDS					*	
Emissions	2.142e-3 lbs						
						<b>Save</b>	<b>Cancel</b>