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:

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

Where:

 E_{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_{overall} = Overall Efficiency of the Control System (decimal) which is defined as:

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

where,

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

CEdes = Destruction Efficiency of Control Equipment (fraction)

VOC Control Efficiency:

CONDENSER (< 41 deg F)	$CE_{overall}$	= 75%
CARBON ADSORBER	$CE_{overall}$	= 95%
AFTERBURNER	$CE_{overall}$	= 98%
THERMAL OXIDIZER	$CE_{overall}$	= 99%
OPEN-AIR OR NO CONTROL EQUIPMENT	$CE_{overall}$	= 0%
OPEN-AIR OR NO CONTROL EQUIPMENT	CEoverall	= 0%

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:

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

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)

Liquid Coating EF = 3.0 lb/gallon of coating material or 0.375 lb/lb (or 37.5%)

Powder Coating EF = 0.99 lb/lb of powder (or 99% Solids and 1% VOCs)

Transfer Efficiency

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

PM Control Efficiency

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

<u>NOTE</u>: 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.

 $TSC_{lb/lb \text{ of coating}} = Weight \text{ of Total Toxic Compound Containing Solids x Weight Fraction of Toxic Compound}$

 $TSC_{lb/gal \ of \ coating} = TSC_{lb/lb \ of \ coating} \ x \ Coating \ Density_{lb \ coating/gal \ of \ liquid \ coating}$

EXAMPLE

Determine Lead and Hexavalent Chromium Toxic Solid Content (TSC) in pounds per gallon given in the MSDS for a coating containing Lead Chromate (PbCrO₄) (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 lbs Cr+6/lb PbCrO₄
 - The TSC is then (2.85 lbs PbCrO₄/gal coating) x (0.1609 lbs Cr+6/lb of PbCrO₄) = 0.4586 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 lbs Pb/lb PbCrO4
 - The TSC is then (2.85 lbs PbCrO₄/gal coating) x (0.6411 lbs Pb/lb of PbCrO₄) = 1.83 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

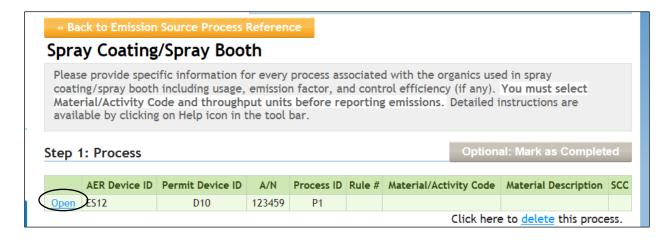
Company XYZ sprays coating onto aerospace parts with a special chromated primer inside a spray booth equipped with HEPA filters. The annual amount used is 30 gallons, per MSDS the VOC content is 2.62 lb/gal, the density is 9.4 lb/gal, solids content is 30%, and the hexavalent chromium (Cr^{6+}) is 0.68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

Data Entry Steps:

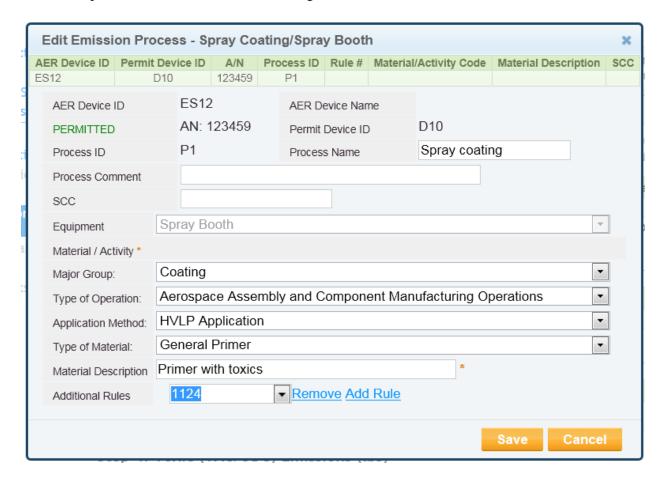
On the Process Reference screen, click on "Open" for process P1 for this spray booth:



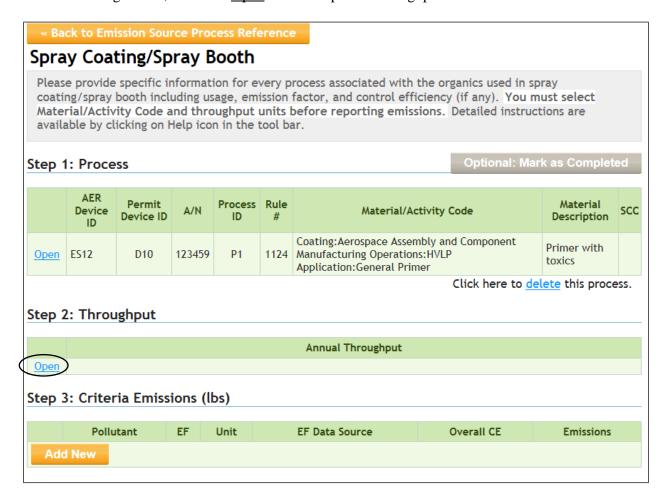
On the next screen, click on "Open" for process information:



Fill out the process information in the following screen the click "Save"



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

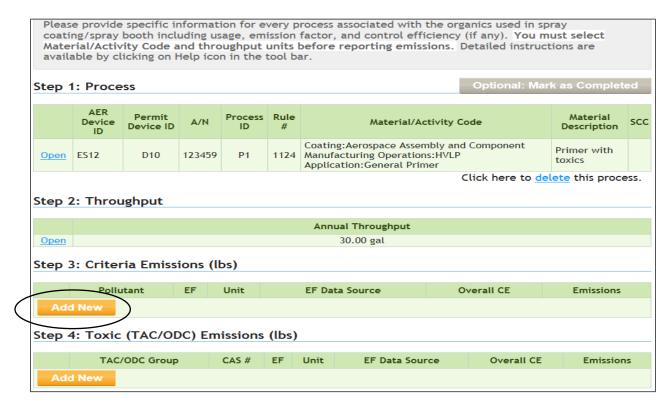


Note that throughput types may be: Input (raw materials), Existing (already in the equipment), or Output (finished products). Click to **Save** the throughput data.



Reporting VOC Emissions:

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

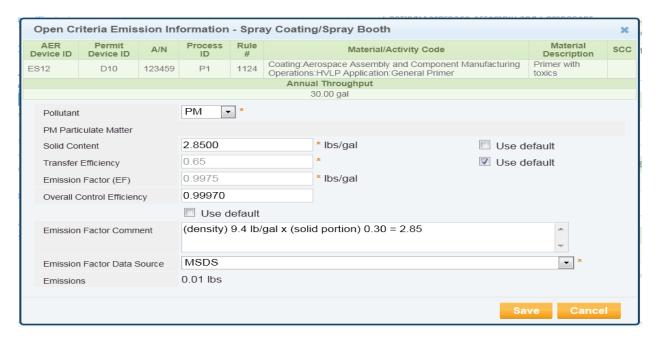


In the following screen, select VOC from the Pollutant drop-down list and enter the emission factor. The overall control efficiency is zero because there is no add-on control system. Click "Save" to move on.



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.



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.



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.

