Plating Emissions

December 2019

Table 1 lists uncontrolled emission factors for hexavalent chromium (Cr+6), nickel (Ni), cadmium (Cd) and total particulate matter (PM). The factors are provided in pounds per 1000 ampere-hours. **Table 2** lists the certified wetting-agent chemical fume suppressant with usage restrictions to meet 0.01 milligram per ampere-hour limit (or 0.000022 lb/1000 ampere-hr). **Table 3** lists emission factors for hexavalent chromium (Cr+6), nickel (Ni), cadmium (Cd) from heating. **Table 4** provides the control efficiencies for various add-on control devices. If your process is controlled with a combination of up to 3 control methods, you are allowed to apply the control efficiency (CE) additively **except for HEPA filter** as follows:

$$\text{Overall CE} = 1 - [(1\text{-}CE_1) \times (1\text{-}CE_2) \times (1\text{-}CE_3)]$$

The maximum control efficiency for any combination of control methods is 99.97%. If your process is controlled by more than 3 control methods, please contact the **Help Hotline** at (909) 396-3660 for assistance. The emission factors and control efficiencies given in Tables 1, 2, 3 and 4 are for reporting emissions under the consolidated Annual Emission Reporting program **only**. For permit applications, please consult with permit processing engineers for specific instructions regarding control methods and control efficiencies.

It is expected that many facilities have greater levels of control; therefore, facilities are encouraged to use emission factors specific to their operations. Please provide supporting documentation for your emission factors. **If any of your plating processes has a district-approved source test, then use the emission factors developed from the source tests for calculating emissions.**

Table 1. Uncontrolled Emission Factors for Plating Operations

Toxic Compound / Process	Emission Factor, (lb/1000 ampere-hr)	
	Toxic Metal	Total PM[5]
Hexavalent Chromium (Cr^{+6}) / Plating [1]	0.0097	0.020
Nickel (Ni) / Plating [2]	0.00051	0.0011
Cadmium (Cd) / Plating [3]	0.0057	0.012

Cadmium / Rotating Barrel Plating [4]	0.000020	0.000041

[1] Estimated from the equation,

$$EF = 0.505(w)(100-N)$$

where, EF = emission factor in mg/amp-hr,
w = weight fraction of hexavalent chromium in solution, and
N = plating efficiency in percent

The representative chrome plating bath contains a chromic acid of 32 to 34 oz/gal, which equates to a weight fraction of approximately 10.9%. The assumed plating efficiency is 20%. EF = 4.4 mg/amp-hr = 0.0097 lb/1000 amp-hr.

[2] SCAQMD and Metal Finishers Association of Southern California, 1998 (Source Test No. 98-109 through 111)

[3] AP-42 Table 12.20-4, July 1996.

[4] SCAQMD (Source Test No. 02-0192)

[5] Assumes that 48% of particulate matter consists of the toxic metal. The relationship is derived from Table 12.20-1 of AP-42 dated July 1996 for plating operations with add-on control equipment.

Table 2. Certified Wetting-Agent Chemical Fume Suppressants (non-PFOS), Companies, and Usage Restrictions for Hexavalent Chromium Electroplating and Chromic Acid Anodizing Operations

Product	**Company**	**Usage Limitations** (measured by Stalagmometer)	**Controlled Emission Factor (lb/1000 ampere-hr)**	
			Hexavalent Chromium[1]	**Total PM**[2]
Fumetrol 21 LF2	Atotech USA	Shall be used at or below 30 dynes/cm	0.000022	0.000045
HCA-8.4	Hunter Chemical LLC	Shall be used at or below 33 dynes/cm for Hard Chrome Plating	0.000022	0.000045

		Shall be used at or below 25 dynes/cm for Chromic Acid Anodizing and Decorative Chrome Plating		
Macuplex STR NPFX	MacDermid Enthone	Shall be used at or below 32 dynes/cm	0.000022	0.000045
Dicolloy CRPF	ProCom LLC	Shall be used at or below 32 dynes/cm	0.000022	0.000045

[1] Rule 1469(f) requires the owner or operator of a chromium electroplating or chromic acid anodizing tank currently using a wetting agent chemical fume suppressant to use a South Coast Air Quality Management District (South Coast AQMD) certified chemical fume suppressant. This table lists the certified non-PFOS chemical fume suppressants that have been tested and certified by South Coast AQMD and California Air Resources Board (CARB) to meet an emission limitation of 0.01 milligrams of Cr+6/ampere-hour (or 0.000022 lb/1000 ampere-hr) of applied current at the stated surface tension.

[2] Assumes that 48% of particulate matter consists of the toxic metal. The relationship is derived from Table 12.20-1 of AP-42 dated July 1996 for plating operations with add-on control equipment.

Table 3. Uncontrolled Emission of Hexavalent Chromium-Containing Tank from Heating

Temperature Range (F)	**Emission Factor**[1] (lb/hr-ft^2-%Cr+6)
193+	0.000004586
189-192	0.000004916
170-188	0.000001433
140-169	0.000001047

[1] Where Cr+6 emission factor in pound is based on hour of heating, square footage of tank surface area and percentage of Cr+6 in tank solution.

Table 4. Approved Control Efficiencies for Plating Operations

Control Method	Control Efficiency (%)
Mist eliminator	50%
Packed Bed Scrubber	70%
Mesh pad	95%
Chemical Fume Suppressants	95-99%
HEPA Filter and Certified Fume Suppressants or others[1]	99.97%

[1] Use 99.97% for any combination of HEPA filter and other control methods.