



State of Oregon
Department of
Environmental
Quality

Department of Environmental Quality
Air Quality Program

GENERAL
AIR CONTAMINANT DISCHARGE PERMIT
ASSESSMENT REPORT

HARD CHROMIUM ELECTROPLATING

SOURCE DESCRIPTION AND QUALIFICATION

1. This General Permit is designed to regulate air contaminant emissions from hard chromium electroplating tanks.
2. The facilities assigned to this General Permit have no other air pollution sources which require regulation beyond that specified in this permit, or have other pollution sources that also qualify for General Permits. Facilities eligible for assignment to this permit have not experienced recurring or serious compliance problems.

ASSESSMENT OF EMISSIONS

3. Facilities assigned to this General Permit are sources of hexavalent chromium emissions.
4. DEQ has assessed the level of emissions of all air pollutants from these facilities and determined that facilities complying with the operational limits and monitoring requirements of this permit have emission levels below the established levels of concern stated in Tables 2 and 3 of OAR 340-200-0020.

SPECIFIC AIR PROGRAM APPLICABILITY

5. This permit incorporates the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations in 40 CFR Part 63, Subpart N (Hard and Decorative Chromium Electroplating and Chromium Anodizing) for hard chromium electroplating. EPA promulgated the NESHAP on January 25, 1995, and several amendments and/or corrections since initial promulgation. The NESHAP, including amendments and corrections through July 1, 2005, were adopted as state rules in OAR 340-244-0510.

NESHAP APPLICABILITY

6. The NESHAP applies to each chromium electroplating or chromium anodizing tank at facilities performing hard chromium electroplating, decorative chromium electroplating, or chromium anodizing.
7. Process tanks associated with a chromium electroplating or chromium anodizing process, but in which neither chromium electroplating nor chromium anodizing is taking place, are not subject to the provisions of the NESHAP. Examples of such tanks include, but are not limited to, rinse tanks, etching tanks, and cleaning tanks. Likewise, tanks that contain a chromium solution, but in which no electrolytic process occurs, are not subject to this subpart. An example of such a tank is a chrome conversion coating tank where no electrical current is applied.

NESHAP MACHINE DEFINITIONS AND CLASSIFICATION:

8. The NESHAP splits chromium electroplating into two categories:
 - a. Decorative chromium electroplating: The process by which a thin layer of chromium (typically 0.003 to 2.5 microns) is electrodeposited on a base metal, plastic, or undercoating to provide a bright surface with wear and tarnish resistance. In this process, the part(s) serves as the cathode in the electrolytic cell and the solution serves as the electrolyte. Typical current density applied during this process ranges from 540 to 2,400 Amperes per square meter (A/m^2) for total plating times ranging between 0.5 to 5 minutes. Decorative chromium electroplating can be performed using either a chromic acid (or hexavalent chromium) bath or a trivalent chromium bath.
 - b. Hard chromium electroplating: A process by which a thick layer of chromium (typically 1.3 to 760 microns) is electrodeposited on a base material to provide a surface with functional properties such as wear resistance, a low coefficient of friction, hardness, and corrosion resistance. In this process, the part serves as the cathode in the electrolytic cell and the solution serves as the electrolyte. Hard chromium electroplating process is performed at current densities typically ranging from 1,600 to 6,500 A/m^2 for total plating times ranging from 20 minutes to 36 hours depending upon the desired plate thickness.
9. The NESHAP defines chromium anodizing as: The electrolytic process by which an oxide layer is produced on the surface of a base metal for functional purposes (e.g., corrosion resistance or electrical insulation) using a chromic acid solution. In chromium anodizing, the part to be anodized acts as the anode in the electrical circuit, and the chromic acid solution, with a concentration typically ranging from 50 to 100 grams per liter (g/L), serves as the electrolyte.
10. The NESHAP classifies facilities that perform hard chromium electroplating as follows:

- a. Large, hard chromium electroplating facility: A facility that has a maximum cumulative potential rectifier capacity greater than or equal to 60 million ampere-hours per year.
 - b. Small, hard chromium electroplating facility: A facility that has a maximum cumulative potential rectifier capacity less than 60 million ampere-hours per year.
11. The NESHAP defines maximum cumulative potential rectifier capacity as the summation of the total installed rectifier capacity associated with the hard chromium electroplating tanks at a facility, expressed in amperes, multiplied by the maximum potential operating schedule of 8,400 hours per year and 0.7, which assumes that electrodes are energized 70% of the total operating time.
 12. The emission standards in the NESHAPs are more stringent for hard chromium electroplating facilities classified as large. The NESHAP allows a hard chromium electroplating facility to change its classification from large to small by demonstrating that actual rectifier utilization for the facility is less than 60 million ampere-hours per year. Initial demonstration must be made prior to January 25, 1997 and the actual rectifier utilization must be maintained below 60 million ampere-hours per year after January 25, 1997. If the actual rectifier utilization exceeds 60 million ampere-hours per year after January 25, 1997, the facility will be classified as large.

EMISSIONS

13. Particulate Matter (PM):
 - a. Default emission factors from AP42:

Process	Total PM (lb/A-hr)	EF Rating
Hard Chromium Electroplating	3.568E-5	C
-- With moisture extractor	3.996E-6	E
-- With polypropylene (poly) balls	1.256E-5	E
-- With fume suppressant	4.853E-6	E
-- With fume suppressant and poly balls	8.992E-7	E
-- With packed-bed scrubber	6.280E-7	E
-- With packed-bed scrubber, fume suppressant, and poly balls	7.850E-8	E
-- With chevron-blade mist eliminator	2.569E-6	E
-- With mesh-pad mist eliminator	3.711E-7	E
-- With packed-bed scrubber and mesh-pad eliminator	9.563E-10	E
-- With composite mesh-pad mist eliminator	1.142E-7	E

- b. Annual potential to emit in lbs/yr for PM is calculated as follows:

$$E_{PM} = \sum_{i=1}^n (EF_i \times RC_i \times 8760 \text{hrs/yr})$$

Where:

- E_{PM} = PM emissions, in lbs/yr
 EF_i = Emission factor for electroplating tank i, from table above or from a performance test on electroplating tank i, in lbs/Amperes-hr
 RC_i = Rectifier capacity for electroplating tank i, in Amperes

- c. Actual PM emissions in lbs/yr are calculated as follows:

$$E_{PM} = \sum_{i=1}^n (EF_i \times RU_i)$$

Where:

- E_{PM} = PM emissions, in lbs/yr
 EF_i = Emission factor for electroplating tank i, from table above or from a performance test on electroplating tank i, in lbs/Amperes-hr
 RU_i = Actual rectifier usage for electroplating tank i over a 12-month period, in Amperes-hr

14. Hazardous Air Pollutants (HAPs):

- a. Default emission factors from AP42:

Process	Chromium Compounds (lb/A-hr)	EF Rating
Hard Chromium Electroplating	1.713E-5	B
-- With moisture extractor	1.998E-6	D
-- With polypropylene (poly) balls	5.995E-6	D
-- With fume suppressant	2.284E-6	D
-- With fume suppressant and poly balls	4.282E-7	D
-- With packed-bed scrubber	2.997E-7	D
-- With packed-bed scrubber, fume suppressant, and poly balls	3.711E-8	D
-- With chevron-blade mist eliminator	1.256E-6	D
-- With mesh-pad mist eliminator	1.713E-7	D
-- With packed-bed scrubber and mesh-pad eliminator	4.567E-10	E
-- With composite mesh-pad mist eliminator	5.424E-8	D

$$E_{cr} = \sum_{i=1}^n (EF_i \times RC_i \times 8760 \text{hrs/yr})$$

- b. Annual potential to emit in lbs/yr for chromium compounds is calculated as follows:

$$E_{cr} = \sum_{i=1}^n (EF_i \times RC_i \times 8760 \text{hrs/yr})$$

Where

- E_{cr} = Chromium emissions, in lbs/yr
 EF_i = Emission factor for electroplating tank i, from table above or from a performance test on electroplating tank i, in lbs/Amperes-hr
 RC_i = Rectifier capacity for electroplating tank i, in Amperes

- c. Actual chromium emissions in lbs/yr are calculated as follows:

$$E_{cr} = \sum_{i=1}^n (EF_i \times RU_i)$$

Where:

- E_{cr} = Chromium emissions, in lbs/yr
 EF_i = Emission factor for electroplating tank i, from table above or from a performance test on electroplating tank i, in lbs/Amperes-hr
 RU_i = Actual rectifier usage for electroplating tank i over a 12-month period, in Amperes-hr

NESHAP EMISSION STANDARDS:

15. The NESHAP contains three compliance approaches for hard electroplating tanks:
- a. Emission limitations: The following is required for this compliance option.
 - i. New hard chromium electroplating tanks: Limit the concentration of total chromium emitted to the atmosphere to 0.015 mg/dscm.
 - ii. Existing hard chromium electroplating tanks located at a large, hard chromium electroplating facility: Limit the concentration of total chromium emitted to the atmosphere to 0.015 mg/dscm.
 - iii. Existing hard chromium electroplating tanks located at a small, hard chromium electroplating facility: Limit the concentration of total chromium emitted to the atmosphere to 0.03 mg/dscm.
 - b. Surface tension limits: The following is required for this compliance option.
 - i. Limit the surface tension of the electroplating bath using wetting agents to 45 dynes per centimeter as measured using a stalagmometer or 35 dynes per centimeter as measured by a tensiometer at any time during operation of the tank.
 - ii. Follow specific work practices to ensure that monitoring equipment are maintained and operated properly.
 - iii. Develop an operation and maintenance (O&M) plan.

c. Emission rates: This compliance option can be used for enclosed tanks in lieu of the concentration or surface tension limits. The following is required for this compliance option.

- i. New hard chromium electroplating tanks: Limit the mass rate of total chromium emitted to the atmosphere to the maximum allowable mass emission rate determined using the equation as follows.

$$\text{MAMER} = \text{ETSA} \times \text{K} \times 0.015 \text{ mg/dscm}$$

Where:

MAMER = the maximum allowable mass emission rate in mg/hr.

ETSA = the surface area of the tank in square feet (ft²).

K = a conversion factor, 425 dscm/(ft² x hr).

- ii. Existing hard chromium electroplating tanks located at a large, hard chromium electroplating facility: Limit the mass rate of total chromium emitted to the atmosphere to the maximum allowable mass emission rate determined using the calculation as follows.

$$\text{MAMER} = \text{ETSA} \times \text{K} \times 0.015 \text{ mg/dscm}$$

Where:

MAMER = the maximum allowable mass emission rate in mg/hr.

ETSA = the surface area of the tank in square feet (ft²).

K = a conversion factor, 425 dscm/(ft² x hr).

- iii. Existing hard chromium electroplating tanks located at a small, hard chromium electroplating facility: Limit the mass rate of total chromium emitted to the atmosphere to the maximum allowable mass emission rate determined using the calculation as follows.

$$\text{MAMER} = \text{ETSA} \times \text{K} \times 0.03 \text{ mg/dscm}$$

Where:

MAMER = the maximum allowable mass emission rate in mg/hr.

ETSA = the surface area of the tank in square feet (ft²).

K = a conversion factor, 425 dscm/(ft² x hr).

16. Work Practices Standards:

- a. Follow specific work practices to ensure that control system and monitoring equipment are maintained and operated properly.
- b. Follow additional work practices that include quarterly inspections of control devices, ductwork, and monitoring equipment.
- c. Develop an operation and maintenance (O&M) plan.

NESHAP COMPLIANCE DEMONSTRATION

17. Initial Compliance:
 - a. Perform an initial performance test.
 - b. Establish operating parameters or range of parameters to be monitored in order to ensure continuous compliance.

18. Continuous Compliance:
 - a. Emission limitations: Monitor operating parameters to demonstrate continuous compliance.
 - b. Surface tension limits: Monitor surface tension to demonstrate continuous compliance.
 - c. Emission rates: Monitor operating parameters to demonstrate continuous compliance.

NESHAP RECORDKEEPING

19. Maintain the following records for 5 years:
 - a. Records of actual rectifier utilization (hours);
 - b. Inspection records;
 - c. Equipment maintenance records;
 - d. Records of occurrence, duration, and cause of excess emissions;
 - e. Performance test results;
 - f. Monitoring data.

NESHAP REPORTING:

20. The NESHAP specifies the information required for each report. Report forms are also available through DEQ.
 - a. Initial Notification Report: This report is used to notify EPA and DEQ that a source is subject to the NESHAP. It also provides some preliminary facility and tank information. It is due according to the following schedule.
 - i. Existing sources: Was due July 24, 1995.
 - ii. New sources: Is due as soon as possible before construction is scheduled to commence.
 - b. Notification of Compliance Status Report: This report is due shortly after the compliance date and is used to demonstrate to EPA and DEQ that the tank is in compliance with the NESHAP. It includes information on the how compliance was achieved, how it was initially demonstrated and the necessary ongoing demonstration measurements. It is due according to the following schedule.
 - i. Existing sources: Was due October 22, 1997.
 - ii. New sources using add-on controls: Is due 270 days after startup.
 - c. Ongoing Compliance Status Report: This report is required to be prepared annually and submitted to DEQ.
 - d. Exceedance Report: The Ongoing Compliance Status Report should be prepared semiannually and submitted if:

- i. The total duration of excess emissions exceeds 1% of the total operating time for the reporting period; and
- ii. The total duration of malfunction of the add-on air pollution control device and monitoring equipment exceeds 5% of the total operating time.

COMPLIANCE ASSURANCE

21. Permittees are required to maintain records of fuel use, upset conditions, and complaints received at the facility. These items are reported to DEQ annually.
22. DEQ staff members perform site inspections of the permitted facilities on a routine basis, and more frequently if complaints are received.

REVOCACTION OF ASSIGNMENT

23. Any facility that fails to demonstrate compliance, generates complaints, or fails to conform to the requirements and limitations contained in the permit may have its assignment to the General Permit revoked. The facility would then be subject to a higher, more stringent level of permitting.

PUBLIC NOTICE

24. General Air Contaminant Discharge Permits are incorporated into the Oregon Administrative Rules by reference and are part of the State Implementation Plan. As part of the rulemaking process, the public will be provided at least 30 days to submit written. DEQ will review any comments and may modify the permits in response to the comments. The final permits will be issued as orders signed by the DEQ air quality administrator.

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