Small Business: Know the FACTS

Chromium Electroplating MACT

AM-430 2012

In January 1995, the U.S. Environmental Protection Agency (EPA) issued the Maximum Achievable Control Technology (or MACT) standard regulating air pollution from chromium electroplating operations. The pollutants addressed in this federal standard are hexavalent chromium as well as trivalent chromium-hazardous air pollutants known to cause harm to the lungs. Chromium electroplating and anodizing tanks are one of the largest sources of these pollutants in the United States.

How Does this Standard Affect My Chromium Electroplating Operation?

All hard or decorative chromium electroplating or chromium anodizing activities, regardless of size, are affected by this rule. There are a few exceptions:

- process tanks containing low concentrations of chromium but not used for chromium electroplating or chromium anodizing, such as rinse tanks, etching tanks, and cleaning tanks
- tanks containing a chromium solution but not used with an electrolytic process, such as chrome conversion coating tanks where no electrical current is applied
- tanks used for research and laboratory operations

Complying with this rule requires meeting each of these requirements in the following order:

1. Initial Notification
2. Emission Limits
3. Work Practice Standards
4. Initial Performance Test
5. Notification of Compliance Status
6. Ongoing Monitoring

Decorative chrome plating operations using a trivalent chromium bath are only required to comply with the Initial Notification, Notification of Compliance Status, and the Process Records requirements under Ongoing Monitoring.

1. Initial (or Construction/ Reconstruction) Notification

All existing chromium electroplaters should already have submitted an Initial Notification Report to the DNR. For construction or reconstruction of a tank, you must:

- file an Initial Notification before starting your project (approval of the notice is not necessary)
- notify local DNR air inspector the actual date construction began within 30 days after that date, and
- notify your local DNR air inspector of the actual startup date of the tank within 30 days after that date

The Initial Notification Report form is available from the DNR or Small Business Environmental Assistance Program (SBEAP).

2. Emission Limits

You are required to reduce chromium emissions to limit(s) listed in Table I of Attachment 1 of the rule. The emission limits are based on use of specified air pollution control techniques. However, you may use

any pollution control technique, as long as it provides the same level of air pollution control or better. All compliance deadlines have passed. If you are not currently in compliance, contact your DNR Air Program compliance inspector to determine how you should come into compliance.

3. Work Practice Standards

To ensure that required pollution control and monitoring equipment is properly maintained, you must perform the Work Practice Standards listed in Table II of the Attachment of the rule. This requirement begins on the date you must comply with the Emission Limits and is usually performed quarterly. In addition, you must keep records. Although none of these records need to be submitted to DNR, you must have them available at your facility for 5 years in the event of an inspection.

A. Inspection and Maintenance Records

- Checklist of appropriate Work Practice Standards and dates performed (forms are available from DNR or the SBEAP).
- Record of maintenance performed on process, air pollution control system, and monitoring equipment. Dated, handwritten descriptions and/or contractor's invoice describing the work will suffice.

B. Operation and Maintenance (O&M) Plan

- An equipment manual should suffice if it contains:
  - I. description of the pollution control device and monitoring equipment you use
  - II. procedures to prevent equipment or process malfunctions due to poor maintenance or other preventable conditions
  - III. procedures for identifying malfunctions and for implementing corrective actions
- The records required for inspection and maintenance, identified above, should suffice for the other O&M requirements:
  - I. checklist to document the operation and maintenance of your equipment
  - II. list of the Work Practice Standards from Table II in Attachment 1 of the rule that apply to your facility
- Your O&M Plan may include all or parts of any standard operating procedure manual, vendor operation and maintenance manual, Occupational Safety and Health Administration (OSHA) plan, or other existing plans.

C. Malfunction Records

- Record of the date, duration and cause of any malfunction(s) of the process, air pollution control device, and/or monitoring equipment. If the action taken to correct the malfunction is different than that described in your O&M Plan, you also must record the corrective action taken and revise your O&M Plan accordingly.

4. Initial Performance Test

An Initial Performance Test is required for two reasons:

1. to demonstrate that you meet the Emission Limit for your type of chromium electroplating operation, and
2. to establish values, or ranges of values, as operating parameters for your air pollution control system (necessary for Ongoing Monitoring requirements).

Exemptions:

Businesses are not required to conduct an Initial Performance Test if:

- you use a trivalent chrome (Cr+3) bath,
- you use a wetting agent and meet the emission limit, or
- you conducted a performance test after December 1991, using the EPA test methods identified below, to obtain an air operating permit.

If you meet one of these exemptions, you still must submit a Notification of Compliance Status. Existing units were required to conduct an initial performance by deadlines that have passed. If you have not, contact your DNR Air

Program compliance inspector to determine how you should come into compliance.
Test Methods:

- If you have to conduct an Initial Performance test, use EPA Test Method 306 or 306A, "Determination of Chromium Emissions from Decorative and Hard Chromium Electroplating and Anodizing Operations."
- If you do not have to conduct an Initial Performance Test because you are using a wetting agent, you must use Test Method 306B, "Surface Tension Measurement and Recordkeeping for Tanks used at Decorative

Descriptions of these test methods are available from DNR or the SBEAP along with a list of testing consultants.

A. Notice of Performance Test
Sixty days in advance of your test, send a written notice of the scheduled date and time to your local DNR Air Program compliance inspector, in case he/she wants to be present for the testing. The notice must include:

- the number and type of tank(s) to be tested,
- type of air pollution control technique chosen, and
- the date of the test.

If the scheduled test date changes, you must notify your air inspector with the new scheduled date within five calendar days of the original test date. Notice of Performance Test forms are available from DNR or the SBEAP.

B. Test Plan
Before the test, you must create a test plan. This may be requested by your air inspector. It should describe the process to be tested, the conditions under which testing is to be conducted, the sampling locations, and the test method to be used.

C. Performance Test Report
During the Initial Performance Test, results must be documented so a Test Report can be written and submitted to DNR along with a Notification of Compliance Status form. The Test Report must contain:

- ☐ description of process
- ☐ description of pollution sampling locations
- ☐ description of sampling and analysis procedures
- ☐ any modifications to standard procedures
- ☐ test results
- ☐ Quality Assurance (QA) procedures and results
- ☐ records of:
  1. operating conditions during testing
  2. preparation of standards
  3. calibration procedures
- ☐ raw data sheets for:
  1. field sampling
  2. field and laboratory analyses
- ☐ documentation of calculations
- ☐ any additional information required by the given test method

Through the Initial Performance Test, you must establish operating parameters for your air pollution control system. You will use these parameters as a guide to stay in continual compliance. See Table III in Attachment 1 for acceptable methods to establish these parameters.

5. Notification of Compliance Status
All chromium electroplaters must submit a Notification of Compliance Status. If you are required to conduct an Initial Performance Test, the Notification and a Test Report must be submitted within 90 days of completing the Initial Performance Test. If you are not required to conduct an Initial Performance Test, you need to submit a Notification of Compliance Status within 30 days after your Emission Limit deadline. Notification of Compliance Status forms are available from DNR or the SBEAP.

6. Ongoing Monitoring
After your Initial Performance Test (or your Emission Limit deadline if you do not have to conduct an Initial Performance Test), you must begin monitoring each day to demonstrate that your chromium electroplating operation

continues to comply with the Emission Limit. See Table IV in Attachment 1 of the rule for these requirements.

In addition, you must maintain the following records:

A. Monitoring Data Records

Simple chart that identifies:

- your pollution control technique
- the monitored parameter(s)
- the value of the monitored parameter(s)
- the date and time when the parameter was monitored

B. Excess Emissions Records

Records of:

- start and end times
- dates of each incident when the values of the monitored parameters exceed the value, or range of values, established during the Initial Performance Test

C. Process Records

- Record of the operating time for each chromium electroplating tank.
- If you use a fume suppressant, record the date and time of each addition of fume suppressant.
- For small, hard chromium tanks using the actual rectifier capacity to demonstrate their size, record the actual rectifier capacity expended by month and the total capacity expended for the reporting period.
- For decorative chromium tanks using a trivalent chromium bath, record the bath components purchased. A wetting agent must be clearly identified as a bath constituent. Invoices showing the bath components, quantities purchased, and date of purchase will suffice.

D. Ongoing Compliance Status Reports

If you are a major source (see definitions section below), you must submit an Ongoing Compliance Status Report to DNR every six months after you receive an air operating permit. If your facility ever exceeds the emission standard, you are required to submit this report quarterly.

However, most chromium electroplaters are area sources (see the definitions section below). If your facility is an area source, you must prepare a Compliance Status Report annually. Although you are not required to submit this report, you must make it available to DNR or EPA upon request for up to five years. If your facility ever exceeds the emission standard, then you must prepare this report semiannually and submit it to DNR.

For an area source, an exceedance incident occurs when both of these conditions are met:

1. the length of time of excess emissions is equal to or greater than 1% of the total operating time for the reporting period, and
2. the duration of malfunctions of the add-on air pollution control equipment and monitoring equipment is equal to or greater than 5% of the total operating time.

Reducing Frequency of Compliance Status Reporting:

The increased quarterly frequency for major sources or the semi-annual frequency for area sources can be reduced if the following three criteria are met:

1. your facility does not exceed standards for a full year,
2. you comply with all applicable record keeping and reporting requirements, and
3. you notify your air inspector of your intent to change your reporting frequency.

Reporting Forms:

Ongoing Compliance Status Report forms are available from DNR or the SBEAP. The Report incorporates all other records listed in this section that you must keep for Ongoing Monitoring.

DEFINITIONS

An ***area source*** is a business that does not meet the major source definition.

Bath component means the trade or brand name of each component(s) in trivalent chromium plating baths. For trivalent chromium baths, the bath composition is proprietary in most cases. Therefore, the trade or brand name for each component(s) can be used; however, the actual chemical name of the wetting agent contained in that component must be identified.

Chromium anodizing is an electrolytic process by which an oxide layer is produced on the surface of a base metal for functional purposes like corrosion resistance or electrical insulation. In chromium anodizing, the part to be anodized acts as the anode in the electrical circuit and the chromic acid solution serves as the electrolyte. The chromic acid solution concentration ranges from 6.67 to 13.3 ounces per gallon (50 to 100 grams per liter).

Chromic acid is the common name for chromium anhydride (CrO3).

Composite mesh-pad (CMP) system is an add-on air pollution control device typically consisting of several mesh-pad layers. The smallest diameter fiber layer is located in the center of the pad with progressively larger diameter pads located on both sides. Emission particles collect and form large droplets that adhere to the pad's surface. These particles either drain to the bottom of the unit or are re-entrained in the gas stream and captured by large-diameter fiber layer in the back of the pad. This control devise is 99.5 percent efficient.

Decorative chromium electroplating means the process by which a thin layer of chromium is electrodeposited on a base metal, plastic, or undercoating to provide a bright surface with properties like 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 to create a plate thickness of 0.003 to 2.5 microns. Typical current density applied during this process ranges from 50 to 220 Amperes per square foot (540 to 2,400 Amperes per square meter) for total plating times ranging between 0.5 to 5 minutes.

Electroplating or anodizing bath means the electrolytic solution used as the conducting medium in which the flow of current is accompanied by movement of metal ions for the purposes of electroplating metal out of the solution onto a work piece or for oxidizing the base material.

A fiber-bed mist eliminator (FBME) is an add-on air pollution control device that typically is installed downstream of an existing control device. It is designed for horizontal, concurrent gas-liquid flow. The acid mist in the gas stream impacts on the FBME fibers and drains down the outer face of the bed while the cleaned gas flows up and out the top of the unit.

Foam blanket is a type of fume suppressant that generates a layer of foam across the surface of a solution when current is applied to that solution. The thickness of the blanket usually is 0.5 to 1.0 inch (1.3 to 2.5 centimeters).

Fume suppressants (FS) are chemical agents that are added directly to the bath to reduce or suppress fumes or mists at the surface. Fume suppressants include wetting agents, foam blankets and combinations of the two. Another term for fume suppressant is mist suppressant. Emission reduction efficiency is 99.5 percent.

Hard chromium electroplating is a process by which a thick layer of chromium is electrodeposited on a base material to provide a surface with functional properties like: wear resistance, a low coefficient of friction, hardness, and corrosion resistance. In this process, the part(s) serves as the cathode in the electrolytic cell and the solution serves as the electrolyte to create a plate thickness of 1.3 to 760 microns. Typical current density applied during this process ranges from 150 to 600 Amperes per square foot (1,600 to 6,500 Amperes per square meter) for total plating times ranging between 20 minutes to 36 hours.

Large equipment is a hard chromium electroplating tank or series of such tanks with a maximum potential rectifier capacity greater than or equal to 60 million ampere-hours per year.

Major source means any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit:

- 10 tons per year or more of any hazardous air pollutant; or
- 25 tons per year or more of any combination of hazardous air pollutants; or
- 100 tons per year or more of any air contaminant

Potential to emit is a measurement of your business' worst-case air pollution emissions at maximum production capacity, 24 hours per day and 365 days per year. The major source determination is based on all emission points inside the facility, not just the chromium electroplating and anodizing tanks.

Maximum potential rectifier capacity is the sum of the total installed rectifier capacities associated with all hard chromium electroplating tanks, expressed in amperes, multiplied by the maximum potential operating schedule of 8,400 hours per year (based on operating 24 hours per day, 7 days per week, 50 weeks per year) and by 70 percent tank utilization, which assumes that electrodes are energized 70 percent of the operating time. [Total installed rectifier capacity (amperes) x 8,400 hours/year x 0.7]

Operating parameter value means a minimum or maximum value established for a control device or similar subpart of a process which, if achieved by itself or in combination with one or more other operating parameter values, determines that an owner or operator is in continual compliance with the applicable emission limitation or standard.

A packed bed scrubber (PBS) is an add-on air pollution control devise consisting of a single or double packed bed that contains packing media on which chromic acid droplets impinge. The gas stream is wetted before it reaches the scrubber to enlarge the droplet size. In most cases, the packed-bed section of the scrubber is followed by a mist eliminator (see FBME) to remove any water entrained from the packed- bed section. The efficiencies of packed bed scrubbers range from 97 percent for decorative chromium electroplating and anodizing tanks to 99 percent for hard chromium electroplating tanks.

Small equipment is a hard chromium electro- plating tank or series of such tanks with a maxi- mum potential rectifier capacity of less than 60 million ampere-hours per year. Tanks can also be defined as "small" if their maximum rectifier capacity is limited to 60 million ampere-hours per year or less by an air operating permit or if a non-resettable ampere-hour meter is used on the tank and monthly records are kept to show that the actual rectifier capacity (based on the facility's actual tank utilization) is within these limits.

Stalagmometer means a device used to measure the surface tension of a solution.

Tensiometer means a device used to measure the surface tension of a solution.

Trivalent chromium process is used for electro-deposition of a thin layer of chromium onto a base material using a trivalent chromium solution instead of a chromic acid solution.

Wetting agent is a type of fume suppressant that reduces the surface tension of the bath. With this, gases escape at the surface of the solution with less "bursting" effect, forming less mist.

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