1/20/2022

Preliminary Cost Document

Chrome Plating and Chromic Acid Anodizing Air Toxic Control Measure Amendments
01/20/2022

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Purpose

This document was prepared by California Air Resources Board (CARB or Board) staff to document the preliminary cost inputs and assumptions to be used for the economic analysis of the amendments to the Chrome Plating and Chromic Acid Anodizing ATCM (Chrome ATCM) under development. This document is being released in advance of the Standardized Regulatory Impact Analysis (SRIA) and Initial Statement of Reasons (ISOR) for the Chrome ATCM to support stakeholder input and to provide an opportunity for staff to make revisions prior to publication of the SRIA and ISOR.

Please send comments or cost information to *Eugene Rubin* by February 18, 2022, to be considered prior to completion of the SRIA. Stakeholders can also continue to comment through the formal regulatory process.

Background

This document outlines the preliminary cost inputs and assumptions to be used to develop the cost estimates for the version of the concept presented during the technical work group meeting to be held on January 20, 2021. The SRIA will assess the economic impact of the formal regulatory proposal that is anticipated to be considered by the Board and will be released prior to the Board hearing. This document is not intended to detail the regulatory requirements or implementation dates, which will be posted to the *Chrome Plating ATCM webpage* when they are available in draft form.

Assumptions

CARB staff are utilizing the following assumptions for SRIA development. Please provide comments and supporting data if they should be revised.

Decorative Plating

1. Hexavalent chromium decorative plating means the process by which a thin layer of chromium (typically 0.003 to 2.5 micrometers) is electrodeposited on a base metal, plastic, or undercoating material 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/m2) for total plating times ranging between 0.5 to 5 minutes. Trivalent chromium plating technology for decorative plating applications has been developed. The technology is commercially available and technically feasible. Trivalent technology can meet all performance specifications required for decorative plated parts.

Hard Plating

1. Hexavalent chromium hard plating means a process by which a thick layer of chromium (typically greater than 1.0 micrometers) 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. The hard chromium electroplating process is performed at current densities typically ranging from 1,600 to 6,500 A/m2 for total plating times ranging from 20 minutes to 36 hours depending upon the desired plate thickness.
2. Trivalent chromium plating technology for hard plating is current being developed but has not progressed to a state where it has broad commercially availability.

Chromic Acid Anodizing

1. Chromic acid anodizing means the electrolytic process by which an oxide layer is produced on the surface of a base material for functional purposes (e.g., corrosion resistance or electrical insulation) using a chromic acid solution. In chromic acid 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.
2. Trivalent chromic acid anodizing technology has not been developed and is not currently under development.
3. All chromic acid anodizing costs and timelines will be considered to mimic hard plating.

Cost Assumptions

1. All cost amounts will be converted to 2021 U.S. Dollars for the purposes of SRIA. Year of each cost is stated in the quote below.
2. In the SRIA, CARB staff will evaluate a variety of potential responses by business to the requirements presented in the amendments as well as alternatives not listed in this preliminary document.
3. Cost estimates have been rounded.

Summary of Regulatory Concepts

Table 1 - Requirements for Decorative Plating

Requirement	Date	Description
No new decorative plating using hexavalent chromium	01/01/2024	New decorative plating facilities may not operate using hexavalent chromium.
No expansion of hexavalent chromium for decorative plating	01/01/2024	Existing decorative plating facilities may not add any hexavalent chrome plating tanks or lines that result in the increase in potential to emit hexavalent chromium.
No hexavalent chromium plating for decorative purposes	01/01/2026	All existing hexavalent chromium used for decorative plating shall be removed.

Table 2 - Requirements for Hard Plating and Chromic Acid Anodizing

Requirement	Date	Description
No new hard plating or chromic acid anodizing hexavalent chromium	01/01/2024	New hard plating or chromic acid anodizing facilities may not operate using hexavalent chromium.
No expansion of hexavalent chromium for hard plating or chromic acid anodizing at existing facilities	01/01/2024	Existing hard plating or chromic acid anodizing facilities may not add any hexavalent chrome plating tanks or lines that result in the increase in potential to emit hexavalent chromium. Facilities may install tanks, but may not increase their permitted amp-hrs.
Add on control for qualifying chrome containing tanks	01/01/2026	Existing hard plating or chromic acid anodizing facilities must install add-on control on tanks that contain hexavalent chromium and meet specific temperature and concentration requirements.
Upgrade existing controls	01/01/2026	Existing hard plating or chromic acid anodizing must meet a more stringent emission limit still to be determined. Facilities that do not currently meet that limit will need to upgrade controls.
Building enclosures	01/01/2026	Existing hard plating or chromic acid anodizing facilities must seal off their building except for 3.5 percent of the building opening.
Best management practices, enhanced housekeeping, and parameter monitoring for add-on controls	07/01/2024	Existing hard plating or chromic acid anodizing facilities must meet new best management practices and housekeeping requirements.
Biannual source testing	01/01/2026	Existing hard plating or chromic acid anodizing facilities must source test add-on control equipment every 2 years.
Remove any hard plating and chromic acid anodizing operations using hexavalent chromium	01/01/2039	Existing hard plating or chromic acid anodizing facilities must stop using hexavalent chromium in hard plating and chromic acid anodizing operations. This requirement will be subject to a technical review that will assess the feasibility and adjust timeline and applicability based on the results.

Summary of Applicable Facilities

Table 3 - Approximate Number of Facilities by Type

Facility Type	Quantity
Decorative Plating	56
Hard Plating	43
Chromic Acid Anodizing	34

Summary of Cost Inputs

Table 4 - Decorative Plating Cost

Item	Cost	Unit	Basis
Trivalent Conversion Equipment Cost	$100,000 – $300,000	1 System	Based on various quotes given by trivalent technology suppliers (2021 US Dollars).
Trivalent Plating Operating Cost	$14.77	Per Kamp-hr	Based on various quotes given by trivalent technology suppliers (2021 US Dollars).
Hexavalent Plating Operating Cost	$12.41	Per Kamp-hr	Based on various quotes given by trivalent technology suppliers (2021 US Dollars).
Permitting and administrative cost	Up to $10,657	New permit for control system on previously uncontrolled chrome tank	-Permit modification fee varies by District
Permit Renewal	$1,238 - $2,492	Per year	Varies by District. -

Table 5 - Hard Plating and Chromic Acid Anodizing Cost

Item	Cost	Unit	Basis
Trivalent Conversion Equipment Cost	$4,000,000	1 system	Based on one estimate of a proposed trivalent functional plating technology by equipment manufacturer (2021 US Dollars).
Trivalent Plating Operating Cost	$25.00	Per Kamp-hr	Based on one estimate of a proposed trivalent functional plating technology by equipment manufacturer (2021 US Dollars).
Hexavalent plating operating cost	$2.5	Per Kamp-hr	Based on one estimate of a proposed trivalent functional plating technology by equipment manufacturer (2021 US Dollars)
Source testing	$17,000	1 test	Based on quote from source testing contractor (2021 US Dollars).
Add-on control system	$133,000	1 system	Based on quote from equipment provider (2021 US Dollars).
Add-on control system on-going cost	$29,222	Per year per system includes replacement of filters, disposal of filters, general maintenance, and electrical cost	Based on findings in South Coast Rule 1469 Socioeconomic Impact Assessment.
Best Management Practice	$2,445	3 drip trays 3 tank labels 1 barrier from grinding area	Based on South Coast Rule 1469 economic impact assessment (2018 US Dollars).
Building Modifications	$15,800	1,000 square feet of facility	Based on South Coast Rule 1469 economic

Item	Cost	Unit	Basis
		4 closed openings	impact assessment (2018 US Dollars).
Parameter monitoring system for existing control systems	$2,400	2 static pressure gauges 2 difference pressure gauges	Based on South Coast Rule 1469 economic impact assessment (2018 US Dollars).
Technology review	TBD	TBD	TBD