PART 5  RESOURCES

Trade Waste Officers
Metal finishing businesses have the opportunity to call on Council Trade Waste Officers for information and support about the disposal of hazardous wastes and Cleaner Production. Many businesses already have ongoing contact with Trade Waste Officers through the administration of trade waste permit or issues related to hazardous waste treatment and disposal. It is worth remembering that Trade Waste Officers can also be a valuable resource when embarking on a Cleaner Production project. Trade Waste Officers have had considerable exposure to the metal finishing industry and may also be quite familiar with your particular site. They can provide an extra set of eyes when looking for waste minimisation opportunities and can put you in touch with suppliers of technology and consultants in the field of waste management and Cleaner Production. They will be able to provide independent hazardous waste disposal and waste classification advice as well as assist in the co-ordination of industry-wide Cleaner Production initiatives, such as waste exchanges or joint projects.

Publications

Environmental Health Center, A Division of the National Safety Council, “Chemical Backgrounders”, Washington.
Howard Hughes Medical Institute and the National Academy of Sciences, “LCSS, Laboratory Chemical Safety Summaries” 1995.
ICI Chemical Fact Sheet, 1998
MSDS, Material Safety Data Sheet, University of Utah Department of Chemistry.
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Tay J., Cleaner Production for Electroplating Industry
United States-Asia Environmental Partnership & The Civil Engineering Research Foundation, “Clean Technologies in U.S. Industries: Focus on Metal Fabrication”, September, 1997
Waste Reduction Institute for Training and Applications Research (WRITAR), “Profile of the Metal Finishing Industry”, Prepared for the Cleveland Advanced
Manufacturing Program under contract to the Energy Environment and Manufacturing project of the Technology Reinvestment Program, April, 1995.

**Internet Sites**

General Metal Finishing Links Pages

The UNEP Working Group for Cleaner Production in the Metal Finishing Industry
[http://es.epa.gov/es-guide/metals/metals.htm](http://es.epa.gov/es-guide/metals/metals.htm)

Enviro$en$e Metal Finishing Content Guide
Cleaner Production in the Metal Finishing Industry
[http://www.iams.org/p2irisde/metalfin.htm](http://www.iams.org/p2irisde/metalfin.htm)

[http://es.epa.gov/comply/sector/fab/fabtitle.html](http://es.epa.gov/comply/sector/fab/fabtitle.html)

OECA Fabricated Metal Products Notebook, USEPA, Office of Enforcement and Compliance Assurance (OECA), December 14, 1995

[http://www.usaep.org/reports/metal.htm](http://www.usaep.org/reports/metal.htm)

Clean Technology in US Industries: Focus on Metal Fabrication, USAEP, 1996.

Case studies

Merit Partnership Pollution Prevention Project for Metal Finishers, Modifying tank layouts to improve process efficiency, 1996.

Cleaner Production Case study Directory

Cleaner Production Demonstration Project
[http://www.mfe.govt.nz/cases1.htm](http://www.mfe.govt.nz/cases1.htm)

New Zealand case studies
[http://www.unido.org/services/environment/envncpc/temp/casestudy](http://www.unido.org/services/environment/envncpc/temp/casestudy)
UNIDO Case studies
Canadian Centre for Pollution Prevention.

Coating Technologies
http://es.epa.gov/program/epaorgs/ord/org-rmvl.html

http://cage.rti.org/
Research Triangle Institute CAGE Coating Alternatives Guide. Developed in cooperation with the U.S. EPA Air Pollution Prevention and Control Division (APPCD) 1996.

http://es.epa.gov/oeca/fedfac/flfexp2/alt-metl.html
Enviro$en$e - A guide to cleaner technologies and alternative metal finishes.

http://www.ndcee.ctc.com/Core/inorg.htm
Standard Technology Information Products: Inorganic Finishing Product Tree

Powder Coating Information
http://www.powdercoating.org/
The Powder Coating Institute

Anodising Information
http://www.maricopa.gov/envsvc/chromp2.htm
Maricopa County Environmental Services Department, Air Quality Program, A guide for reducing air pollution from chromium electroplating and anodizing tanks, Phoenix, Arizona.

http://es.epa.gov/program/epaorgs/ord/org-coat.html
Enviro$en$e - Guide To Cleaner Technologies Organic Coating Replacements, September 1994

Metal Cleaning
http://es.epa.gov/program/regional/trade/msfn-rpt.html

http://es.epa.gov/techinfo/facts/metlprtz.html
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http://clean.rti.org/
Research Triangle Institute, Sage - Solvent Alternatives Guide Developed in cooperation with the U.S. EPA Air Pollution Prevention and Control Division (APPCD) 1995.

General Tip Sheets
http://es.epa.gov/techinfo/facts/california/metal-fs.html
Fact Sheet: Hazardous Waste Generated by Metal Refinishing Facilities, California Department of Health Services Toxic Substances Control Program Alternative Technology Division

http://es.epa.gov/techinfo/facts/cheklst3.html
Enviro$en$e - Metal Finishing Pollution Prevention Opportunities Checklist CH2M Hill and Solid Waste Management County Sanitation Districts Of Los Angeles County.
Be SMART (Save Money and Reduce Trash Program) Electronics Manufacturing: Common Operations

http://www.uwm.edu:80/Dept/besmart/Html/Business/Metal/metmenu.htm
Metal Cleaning Tip Sheets

http://www.umn.edu/mntap/P2/intp7-15.htm#metal finishing/plating
Minnesota Technical Assistance Program (MnTAP) Get it Plated Right, fact sheet series.

http://www.epa.ohio.gov/opp/fact24.html
Ohio EPA, Source Reduction and Metal Recovery Techniques for Metal Finishers, Fact Sheet #24

http://es.epa.gov/techinfo/facts/florida/2.html
Environ$e - Pollution Prevention for Electroplaters and Surface Finishers, Metro-Dade County, Department of Environmental Resources Management, June 1995.

http://www.epa.ohio.gov/opp/metalw/fact11.html
Ohio EPA, Extending the Life of Metal Working Fluids, Fact Sheet #11 March 1993

http://www.chmr.org/ppmfi.html

http://es.epa.gov/techinfo/facts/vdwm/16.html

Environment Sites
http://es.epa.gov/techinfo/facts/vdwm/16.html
Environment Australia Online, Federal Department of Environment
Queensland Department of Environment

General Cleaner Production Information
http://es.epa.gov/techinfo/facts/nc/tips.html
Environ$e - Pollution Prevention Tips: Developing and Implementing A Waste Reduction Program, North Carolina Department of Natural Resources and Community Development.

http://www.mmac.jccbi.gov/amp/ppp_2.htm
Pollution Prevention Plan, Prepared by: Environmental, Safety and Emergency Mgt. Division.

http://es.epa.gov/new/contacts/news1trs/unep/unep-pac.html
Cleaner Production at the United Nations Environment Program (UNEP)

http://es.epa.gov/new/business/sbdc/sbdc.htm
Small Business Waste Reduction Guide

Chemical Health and Environmental Safety Information
http://www.nsc.org/EHC/ew/chems/
Environment Writer Chemical Backgrounders, Chemical Information Environmental Health Center, A Division of the National Safety Council.

http://www.chem.utah.edu/MSDS/msds.html
Material Data Safety Sheets
Glossary

Chemical mist suppressant
Any chemical agent that reduces or suppresses fumes or mists at the of an electroplating or anodizing bath. Another term for chemical mist suppressant is fume suppressant.

Chromic acid:
The common name for chromium anhydride (CrO3).

Chromium anodizing:
The electrolytic process by which an oxide layer is produced on the of a base metal for functional purposes (e.g., corrosion resistance or electrical) using a chromic acid solution.

Chromium electroplating or chromium anodizing tank:
The receptacle or container in which hard or decorative chromium plating or anodizing occurs.

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. This chromium process can be hexavalent or trivalent. Typical current density applied during this process ranges from 50 to 220 Amperes per square foot for total plating times ranging between 0.5 to 5 minutes.

Electroplating or anodizing bath:
The electrolytic solution used as the conducting medium in which 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.

Hard chromium electroplating:
A process by which a thick layer of chromium (typically 1.3 to 760 microns) is electro-deposited on a base material to provide a surface with functional properties such as wear resistance, a low coefficient of friction, hardness and corrosion resistance. Hard chromium electroplating process is performed at current densities typically ranging from 150 to 600 ampere per square foot for total plating times ranging from 20 minutes to 36 hours depending upon the desired plate thickness.

Hard chromium:
The form of chromium in a valence state of +6.
Surface tension: The property, due to molecular forces, which exists in the surface film of all liquids and tends to prevent liquid from spreading.

Tank operation: The time in which current and/or voltage is being applied to a chromium electroplating tank or a chromium anodizing tank.

Trivalent chromium: The form of chromium in a valence state of +3.

Trivalent chromium process: The process 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: A component in a chemical mist suppressant that reduces the surface tension of a liquid.

Cleaner Production: The use of materials, processes, or practices that reduce or eliminate the reaction of pollutants or wastes at the source.

Source Segregation: The act of separating process chemical effluents or wastes at each individual point of origin to facilitate materials recovery.

Sources