Metal Finishing

Sector At-a-Glance	
Number of Facilities:	3,200
Value of Shipments:	$5.9 Billion
Number of Employees:	74,000

Source: U.S. Census Bureau, 2001[1]

Profile

The metal finishing sector[2] encompasses a variety of surface finishing and electroplating operations. Broadly speaking, metal finishing is the process of coating an object with one or more layers of metal so as to improve its wear and corrosion resistance, control friction, impart new physical properties or dimensions, and/or alter its appearance. Applications range from jewelry, to common hardware items and automotive parts, to communications equipment and aerospace technologies.

Most metal finishing shops are small, independently owned facilities that perform on a contract basis. Other metal finishing operations are a part of larger manufacturing facilities. While the industry is geographically diverse, it is concentrated in highly industrialized areas like California, Texas, and the Great Lakes states.[3]

Low-cost imports from overseas and other globalization trends have led to changes in this industry. Recent industry estimates indicate job losses in the range of 25-30% between 2000 and 2003, with a corresponding reduction in sales of approximately 40%.[4]

Production Process Most finished objects undergo three stages of processing:

- Surface preparation and cleaning;
- Surface treatment through plating, organic coating, or other chemical surface finishing; and
- Post-treatment activities, such as rinsing and additional surface treatment.

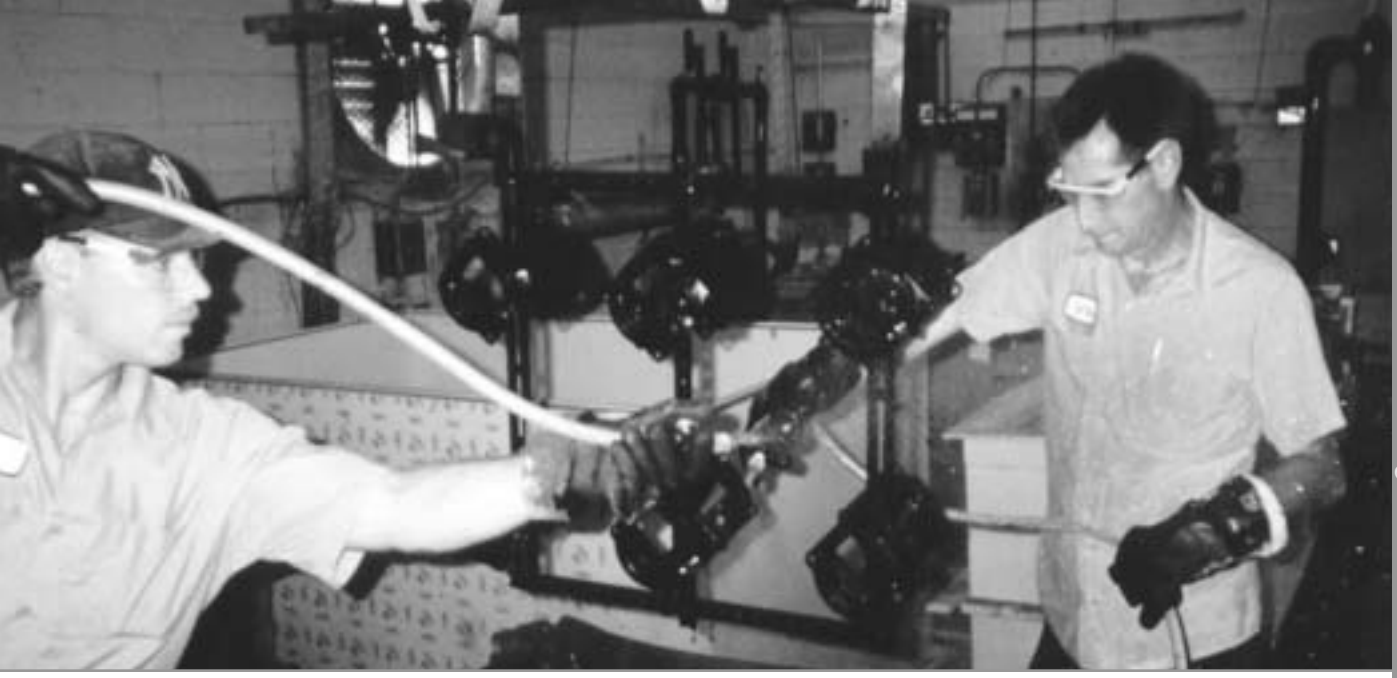
Partnerships Four trade associations have formed a partnership with EPA's Sector Strategies Program to improve the environmental performance of the metal finishing sector. These organizations include:

- American Electroplaters and Surface Finishers (AESF);
- Metal Finishing Suppliers' Association (MFSA);
- National Association of Metal Finishers (NAMF); and
- Surface Finishing Industry Council (SFIC).[5]

Current collaboration with the metal finishing industry builds upon the success of past partnerships, particularly the Strategic Goals Program.[6]

Key Environmental Opportunities The metal finishing sector is working with EPA to improve the industry's performance by:

- Managing and minimizing waste;
- Conserving water; and
- Promoting environmental management systems.



Case Study: Improving Performance through the Strategic Goals Program

Between 1998 and 2002, more than 500 metal finishers, 20 states, and 80 local regulatory agencies (primarily publicly owned treatment works) participated with EPA in the Strategic Goals Program. Participating metal finishers pursued facility-specific environmental targets for resource inputs and waste outputs, including:

- *25% reduction in energy use;*
- *50% reduction in water use;*
- *50% reduction in land disposal of hazardous sludge;*
- *50% reduction in emissions of metals to water; and*
- *90% reduction in organic chemical releases reported to EPA's Toxics Release Inventory (TRI).*

Participating state and local regulatory agencies supported metal finishers in their pursuit of these goals through a strategically defined set of actions, including state recognition programs, targeted assistance, a targeted research and development agenda, and regulatory changes to reduce barriers to metals recovery and wastewater pretreatment.

An independent third-party, the National Center for Manufacturing Sciences, tracked the progress of 150 participating metal finishers that consistently reported their environmental progress. Through 2001, cumulative improvements for these facilities included:

- *7% reduction in energy use;*
- *38% reduction in water use;*
- *23% reduction in land disposal of hazardous sludge;*
- *62% reduction in emissions of metals to water; and*
- *62% reduction in organic chemical releases reported to TRI.*[7]

All percentages are normalized by dollar value of sales to account for changes in production levels.

Based upon the success of the Strategic Goals Program, EPA and the trade associations are now encouraging broader use of these five indicators.

Managing and Minimizing Waste

During the metal finishing process, some portion of the materials used in production is not totally captured on the finished product and can exit the process in wastewater and waste. EPA effluent guidelines require metal finishers to treat their wastewater to remove or reduce pollutants prior to discharge to either a publicly owned treatment works or a public waterway. To comply, metal finishers add chemicals to the wastewater to remove metals and other constituents. Most metals then settle and are dewatered to form sludge. This sludge, known as F006, is regulated as a hazardous waste under the Resource Conservation and Recovery Act.

EPA's Toxics Release Inventory (TRI) does not track sludge releases, but it does track individual chemicals that may be constituents of sludge. Although less than 20% of the metal finishing sector was subject to TRI reporting requirements in 2001, it is still notable that from 1993 to 2001, the normalized amount of TRI releases from those shops decreased by 44%. In 2001, releases accounted for only 11% of the sector's waste, while 88% of metal finishing waste was treated or recycled.[8]

Improved performance was driven by the use of alternative plating chemistries, as well as by:

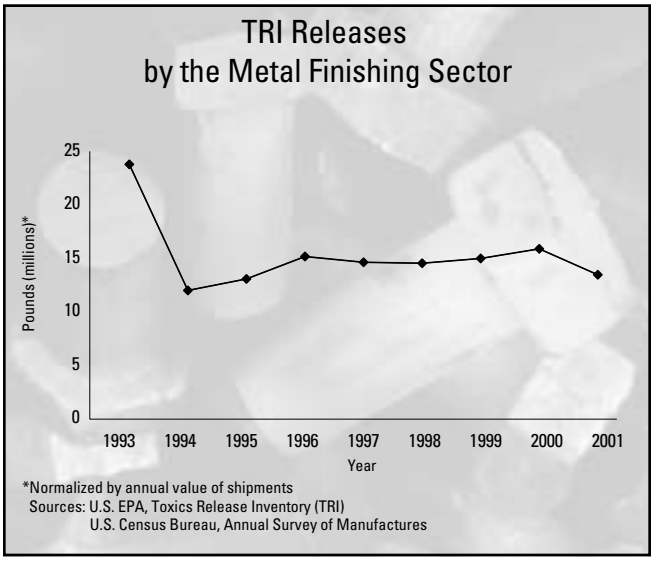
- Increased recovery of metals from the sludge; and
- Introduction of rinsing techniques that conserve water and reduce the volume of sludge generated.

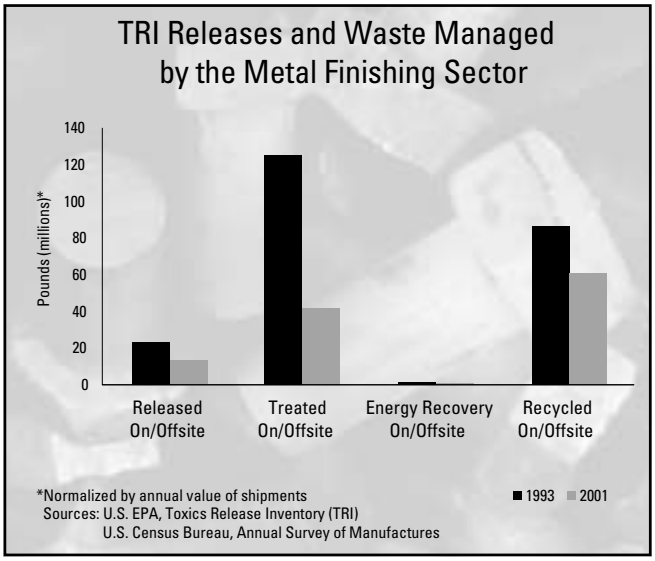
Metals Recovery through Sludge Recycling

EPA and the industry are working together to increase recovery of metals from metals-bearing sludge. EPA estimates that 10-20% of plating sludge is sent to permitted hazardous waste recycling facilities,[9] which use techniques such as ion exchange canisters and electrowinning to recover economically valuable metals from the sludge. Metal recovery reduces land disturbance, resource depletion, energy consumption, and other environmental impacts that result from the mining and processing of virgin metal ore.

Rinsing Techniques to Reduce Sludge Generation

In many cases, metal finishers have implemented more effective and efficient rinsing techniques, such as concurrent flow rinsing, which reduce the need to treat and dispose of plating baths. These techniques result in less water use, less chemical use, and less sludge generation. For example, between 1997 and 2001, Artistic Plating Company in Anaheim, CA, reduced its sludge volume by 40% by installing flow restrictors and conductivity sensors.[10]





Conserving Water

Water use and sludge generation go hand-in-hand for the metal finishing industry. Reducing water use at metal finishing facilities can reduce sludge generation and allow wastewater treatment systems to more successfully treat the wastewater.

Case Study: Reducing Water Use at East Side Plating

By installing two cooling towers and adding sludge dryers, East Side Plating in Portland, OR:

- *Reduced water use by 64% (between 1997 and 1999);*
- *Reduced sludge discharge by 67% (between 1997 and 1999); and*
- *Reduced permitted copper, nickel, chrome, and zinc discharges by almost 50% (between 1997 and 2002).*[11]

Promoting Environmental Management Systems

Industry leadership has taken an active role in encouraging the development of environmental management systems (EMS) at member facilities. To help promote widespread adoption of EMS, the Sector Strategies Program partnered with the major metal finishing trade associations to create a customized EMS Implementation Guide, a brochure highlighting the financial benefits of EMS, and an EMS training program tailored to the sector.[12] Since the start of the Strategic Goals Program in 1998, over 100 metal finishing job shops, all small businesses, have completed EMS training.[13]

Many metal finishing customers, including some automobile manufacturers, are encouraging metal finishers to adopt EMS. This factor is recognized by the industry leadership and is one of the drivers behind their commitment to industry-wide EMS development. This factor also has led corporate customers to help drive EMS development by their metal finisher suppliers, and by job shops themselves to take the next step to ISO 14001 certification in order to maintain a competitive edge.

Case Study: Supply Chain Mentoring

EPA's Regional office in New England (EPA Region 1) established a novel approach to environmental stewardship through their Corporate Sponsor Program. The program encourages large equipment manufacturers to offer environmental management or environmental, health, and safety training to metal finishers and other companies within their supply chain.[14]

EPA's National Environmental Performance Track awarded special recognition to New Hampshire Ball Bearings, Inc., (NHBB) in Peterborough, NH, for its participation in the program. NHBB mentors suppliers and offers preferred status to suppliers with EMS.[15]

In addition, many metal finishers are finding that EMS can be an effective tool for performance improvement.

Case Study: EMS at SWD, Inc.

SWD, Inc., in Addison, IL, adopted an EMS in 1997 and became the first metal finisher in the U.S. to certify its EMS to the ISO 14001 standard in 1998. Through its EMS, SWD:

- *Identified the environmental impacts of molybdenum and barium as areas for improvement and took steps to eliminate both substances from all incoming raw materials;*
- *Reduced sludge by 50% between 1996 and 1998 by changing its chemical process; and*
- *Reduced water discharge by 28% between 1996 and 2000 by reusing water in non-critical rinses.*[16]

Case Study: EMS at Imagineering Finishing Technologies

Imagineering Finishing Technologies in South Bend, IN, implemented an EMS in 1998. Through its EMS, Imagineering identified a way to increase the recyclability of metal-bearing baths by direct discharging clean rinses (with appropriate monitoring). Between 2001 and 2003, Imagineering recycled almost 4,500 pounds of metals. Besides alleviating stress on its wastewater treatment system, this project reduced shipments of sludge to a landfill by 66% and reduced purchases of wastewater treatment chemicals by more than 9,000 pounds within one year.[17]