ALUMINUM

Project Fact Sheet

Microsmooth® Process on Aluminum Wheels

Benefits

- Reduces electric energy use by 33% and natural gas requirements by 59%
- Potential to save an estimated 350 billion Btu by 2010
- Cuts water usage and treatment by 50%
- Lowers production costs by 30% to 40% per wheel
- Eliminates the use of zincate in conventional plating, reducing worker health risks
- Reduces greenhouse gas emissions by 46%
- Based on projected nationwide production of 12.4 million wheels by 2010, the new technology has the potential to:
  - Save 173,000 tons of waste per year (formerly used in zincate processing)
  - Eliminate 6.5 tons per year in the caustic etch step
  - Reduce copper consumption by 51 tons per year

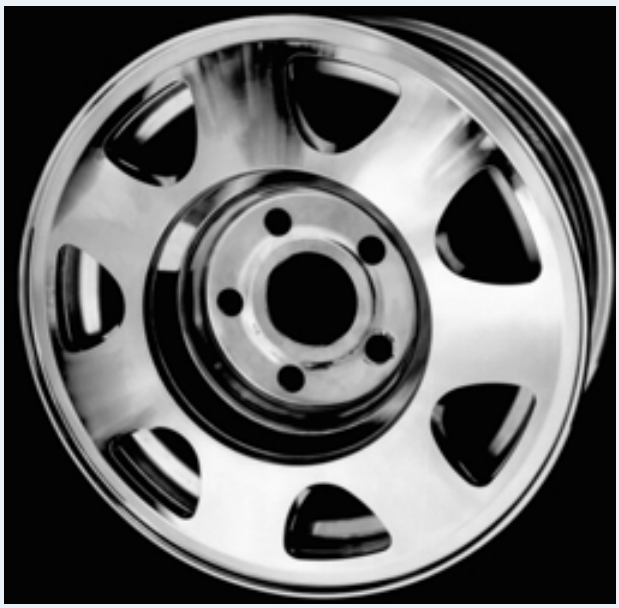
Applications

While this project focuses on aluminum wheel manufacturing for the automotive industry, the plating process can also be applied to computer disk manufacturing.

New process using Microsmooth® substantially reduces energy, chemical usage, and waste for aluminum treated with nickel/chrome plating

Metal Arts Company, Inc., in conjunction with the NICE^3 program, is developing for full-scale demonstration and commercialization an innovative electroless nickel-plating process for the aluminum industry that reduces electrical energy use by one-third and natural gas usage by 59%. Microsmooth® eliminates wastes associated with zincate use, as well as worker exposure to zincate-related chemicals (including cyanide), while increasing the product quality of aluminum chrome plating for finished products. This method does not require electric plating, but depends on Microsmooth® and specially prepared aluminum surfaces to produce a smoother, more durable product than is currently available. By removing zincate from the manufacturing process, nitric acid and other liquid wastes generated by current technology are eliminated. There is also a substantial reduction in greenhouse gas emissions.

Microsmooth® Process on Aluminum Wheels



PIX09170 Photo courtesy of Metal Arts Company, Inc.

The Microsmooth® bathing process improves aluminum-chromium plating quality, while substantially reducing electric and natural gas usage in the plating process.

Project Description

Goal: The project goals are to demonstrate a fully operational, limited commercial production-scale unit (approximately 1/20 the cost and size of a full production line) for applying Microsmooth® and to provide necessary data for full-scale implementation in industry-wide application. The unit will continue to serve in limited use as a test unit toward developing the best processing methods and chemistries possible.

Prior to receiving a NICE^3 grant for this project, Metal Arts conducted tests over a 3-year period to determine proper activator bath formulas, mixing requirements, adhesion characteristics, and energy usage for the process. When Microsmooth® is applied to aluminum automotive wheels, forged aluminum is used with a substrate surface that produces fewer pores and less surface blistering. Wheels that are processed with Microsmooth® go through a simplified plating method that increases energy efficiency and eliminates zincate use, while improving corrosion resistance.

Metal Arts Company, Inc., is demonstrating this new technology with assistance from the New York State Energy and Research Development Authority and the NICE^3 Program in the Department of Energy's Office of Industrial Technologies.

Progress and Milestones

- Optimize chemistry by using coupon-sized aluminum pieces.
- Monitor, evaluate, and refine activator baths, mixing requirements, plating characteristics, energy and raw material requirements, and processes.
- Determine plating thickness and corrosion resistance through test protocols and evaluation criteria.
- Conduct testing on larger pieces, including complete wheels, to determine plating thickness, corrosion resistance, electrochemical potential, and porosity.
- Develop a statistical process control system to quantify and standardize mixing regimens and to catalog plating characteristics, including: adhesion, corrosion characteristics, metal turnovers, bath-loading factors, and run-to-run consistency.
- Demonstrate a fully operational, limited production-scale process.
- Implement the successful Microsmooth® process at Alcoa.

Industry of the Future—Aluminum

Through OIT's Industries of the Future initiative, the Aluminum Association, Inc., on behalf of the aluminum industry, has partnered with the U.S. Department of Energy (DOE) to spur technological innovations that will reduce energy consumption, pollution, and production costs. In March 1996, the industry outlined its vision for maintaining and building its competitive position in the world market in the document, ***Aluminum Industry: Industry/Government Partnerships for the Future****.*

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NICE^3—National Industrial Competitiveness through Energy, Environment, and Economics: An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partners for the first commercial demonstration of energy efficient and clean production manufacturing and industrial technologies. Total project cost for a single award must be cost-shared at a minimum of 50% by a combination of state and industrial partner dollars. The DOE share for each award shall not exceed $500,000 to the industrial partner and up to $25,000 to the sponsoring state agency for a maximum of $525,000.

Project Partners

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