Light Metals Finishing

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Applying an Environmental Awareness To Quality Cleaning Techniques & Practices

Editor's Note: This is the first article in P&SF's new "Light Metals Finishing" column. Members of the AESF Light Metals Finishing Committee are contributing authors on these columns.

The increased use and application of light metals-i.e., aluminum, magnesium, titanium, lithium, or beryllium-in many industries has led to new processing challenges, including the area of cleaning. Additionally, concerns about environmental and safety regulations have also left their impact on all areas of metal finishing. It was once common to use solvents as the bulk cleaning system, followed by aqueous cleaners to prepare a surface for pretreatment and finishing. In most industries, the use of solvents is limited or economically prohibitive. Some traditional components used in aqueous cleaners are now being regulated. Phosphate, boron, silicate, chelants, and organics that effect BOD, COD, FOG and biodegradability have all been regulated in varying degrees on a regional basis. As a result, the challenge to the metal finisher to continue to produce a quality part has become even greater.

Special Cleaning Techniques

Cleaning of light metals sometimes requires special techniques, chemistries and understanding of the metallurgical properties of the parts to be cleaned. Light metal alloys, such as aluminum and titanium used in aerospace, have process and performance requirements specific to that industry. Special tests such as Sandwich Clad Corrosion Resistance, Mass Loss, Endgrain Pitting, Intergranular Attack, Rinsability, Low Sulfur, and VOC limits are examples of these specification requirements. Other industries may have cosmetic or aesthetic requirements. The aluminum wheel industry requires a cleaner for polished or machined wheels that will not dull the exposed face of the wheel. Architectural aluminum extrusions are often cleaned and etched with either alkaline or acidic cleaners in one step, prior to conversion coating and painting.

The anodizing industry uses special aluminum alloys that are buffed and bright dipped to mirror finishes. Once again, the cleaner must remove the buffing compounds but not affect the reflective properties of the metal. Other anodizing specifications call for matte finishes that make complete soil removal the main role of the cleaner to prevent selective etching in subsequent stages. Cleaning of aluminum alloys before resistance welding, open air and vacuum brazing, and metallizing are examples of new areas of interest in light metals applications.

Choosing a Cleaner

Some common factors to consider when choosing a cleaner are:

- 1. The metal/metals and alloys to be cleaned
- 2. Type soils to be removed, *i.e.*, fats, oils, greases, waxes, inks, oxides, metal fines
- 3. Age of soils
- 4. Method of application—immersion, spray, ultrasonic, electrocleaning, hydromation, etc.
- 5. Process capabilities—time, temperature, agitation
- 6. Rinsing

- 7. Water quality
- 8. Worker safety
- 9. Ease of control
- 10. Compatibility with existing equipment and with subsequent processes
- 11. The geometry or configuration of the workpiece
- 12. Local and/or Federal environmental compliance requirements
- 13. Workpiece transfer times between processing stages
- 14. Oil removal method employedsplitout/emulsify/coelesce/ ultrafiltration
- 15. Economy

The factors listed above, along with industry specifications and government regulations, although limiting, also help focus the decision-making process for cleaner choice. Working with your chemical suppliers and making them aware of the your needs can help shorten the process considerably. Cleaner evaluations, environmental impact studies, bath life estimates, and any other concerns should be openly discussed.

As new light metal substrates are discovered and applied to materials applications, and as restrictions relating to environmental compliance of cleaner technology/chemistry increase, it is imperative that users and suppliers develop effective working partnerships to anticipate and ready themselves for the opportunities and challenges that lie ahead, in order to produce highquality products that are cost effective and meet or exceed environmental requirements. *PassF*