Stephen F. Rudy, CEF
Enequist Chemical Co.
100 Varick Avenue
Brooklyn, NY 11237
718/497-1200
E-mail: sfrudy@aol.com

Cleaning Alternatives for Platers

Over the years, the focus on cleaning has become more pronounced. We acknowledge how important this first step is in any process cycle. Removal of oils and grease must be complete, efficient, and done economically. This awareness has given rise to new cleaning systems, cycles, and improvements to existing methods. In most respects, the heated aqueous bath is still the standard way to work. The chemistries used and some equipment modifications have kept pace with critical cleaning demands, meeting the challenge of "How clean is clean?" Let us review some cleaning alternatives that platers may select.

Off Line

This has always been a popular, advantageous cleaning step. Parts are usually soak-cleaned in bulk, then loaded into barrels or baskets that are immersed into heated solutions. Time isn't normally a critical factor. In fact, it may be up to one hour. Rotating barrels, oscillating baskets, and mechanical circulation of the solution all help to remove soils. Off-line cleaning takes pressure off the plating line and keeps oily contaminants from entering it.

Another off-line cleaning application takes advantage of mass finishing equipment. Suitable parts are tumble-cleaned in barrels (oblique, horizontal) or in vibratory tubs. Once again, time is not a critical factor. This type of cleaning is often followed by burnishing. This produces a truly clean surface that has been smoothed and leveled, ready to be plated. An additional benefit to cleaning in a mass finishing cycle is almost always using a fresh solution for each load of parts.

Parts may also be cleaned off line using mechanical washer equipment. Warm to hot aqueous cleaning solutions are mixed with the parts inside specialized cleaning machines. Once sealed, the machine agitates the parts by spraying, rotating, or oscillating. This facilitates activity of the cleaner to lift and remove the soils.

In some instances the customer will preclean parts, removing bulk oils and grease before shipping them to the plater. Receiving fairly cleaned parts eases the cleaning demand before plating and takes pressure off the waste treatment system. A precleaning benefit for manufacturers is the ability to reclaim and recycle oils used in the manufacturing, stamping, or forming processes.

In-Line Cleaning

This step pertains to the plating line. Barrel and rack lines introduce parts into a heated soak cleaner. Oily soils are removed by emulsification or displacement action. The soak cycle may incorporate a fixed time, as part of an automatically programmed system. To overcome the time factor, some lines may incorporate a double soak cleaner or multiple stations. Otherwise, it would be an open time, conducive to a semiautomatic or manual line. A few lines combine soak cleaning and electrocleaning in a single step.

Types of Soak Cleaning

Soak cleaners are available in powder and liquid cleaner concentrates. They are formulated with special components, such as alkali builders, water hardness conditioners, surfactants, detergents, dispersants, and solvents. Powders readily mix and dissolve in water. Liquids are simply diluted to the preferred operating concentration.

Emulsification

For many years this was the predominant alkaline soak cleaning mechanism. Oils are encapsulated by a special group of surfactants and detergents (in specific proportion to the alkaline components and other additives), held in suspension to prevent redeposition on parts. Routine analysis of the cleaning bath is combined with appropriate maintenance additions of the cleaner. This provides a working cleaner bath life that may contain 5–15% emulsified oils.

Displacement

This cleaning mechanism became popular as a means to address waste handling concerns, and to improve the cost-effectiveness of cleaning baths. Oils are displaced off the substrate surface by a unique group of surfactants and detergents (in specific proportion to the alkaline components and other additives). The oils float to the surface, and are removed by skimming or mechanical separators. Displacing oils and continuously removing them minimizes oil contamination in the cleaner. This helps to maximize on-going cleaning efficiency, extends cleaner bath service life, and reduces demand on the waste treatment system.

Solvents

This group of chemicals can be water miscible or immiscible. Polar and non-polar solvents, having varying hydrocarbon chain lengths, emulsify or encapsulate oily soils. The cleaning action is usually 2–3 times faster than emulsification and displacement. Water-immiscible solvents are used either full strength or cut with another solvent. Parts cleaned in non-aqueous solvents exit dry. Solvents are usually safe to use on a wide range of ferrous and non-ferrous metals. In some applications, heavily soiled or spent solvents can be regenerated by distillation.

Bioremediation

This is a new and interesting system. The soak cleaner is maintained as a warm aqueous bath. Emulsifying-type surfactants remove and suspend the oils. Next, special microorganisms feed on the oils, metabolizing and breaking them down. The resulting by-product consists of simpler compounds, such as carbon dioxide and water. Oils and sludges are greatly decreased and bath dumps are rare. The microorganisms, under controlled bath operating parameters and maintenance, enjoy a bountiful food source consisting of oils.

New Developments In The System

On-going research and product development has lead to the introduction of many new surfactants, detergents, solvents, and other cleaning agents. These products are newer and improved generations of their respective chemical groupings. Most of them exhibit stronger cleaning tendencies, aggressively attacking different oils (chlorinated, paraffinic, mineral, synthetics, etc). Many of these new cleaning agents are biodegradable and SARA Title III exempt. The use of chlorinated solvents, such as methylene chloride, 1,1,1-trichloroethane, perchloroethylene, and trichloroethylene, have been severely curtailed. In their place have emerged powerful, more earth-friendly solvents. These products include many natural sources, such as soy, citrus, and wood terpenes.

Developments in new equipment and related technologies have also benefitted cleaning. Redesigned and configured side tanks and overflow dams more efficiently capture displaced oils. Mechanical aids, such as coalescers, separate emulsified oils from the water. A step-up in technology utilizes special membranes for excellent separation of oils from the working cleaner bath. Filtration units, specially designed for cleaners, remove sludges, fine metallic particles, and separate the emulsified oils from water.

Cleaning is the first step in most process cycles. This first step is a BIG one, and a very important one. If parts aren't cleaned right, the final finish will suffer. It will undoubtedly reflect negatively on the service life or intended application of parts in use. The plater now has quality selections for cleaning—off line and on line. Chemistries have progressed, offering newer generation raw materials blended into more effective cleaners. Equipment technologies have combined chemical reactions and their tendencies with state-of-the art engineered systems. ***P&SF***