Hands-on Management

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Good Cleaning Practices
Part 1: Low-tech Methods

Cleaning line problems can affect all types of surface finishing operations anywhere in the world. Barrel electroplaters, however, seem to be overwhelmed by the oils coming in with the parts to be plated. Does anyone else feel like they're being used as a waste oil disposal facility, or is it just me?

As alkaline soak cleaners become loaded down with the oils and greases introduced by the parts, cleaning is significantly diminished. It only takes an oil content of four to six percent in the soak cleaner before the cleaning ability can decrease dramatically. As the concentration increases, oils and greases can make their way down the line, and excessive loading of oil and grease in the plating line will lead to the formation of the legendary "tar ball." In addtion, these impurities can be carried on the incompletely cleaned parts, as well as attached to the plastic walls of the barrels. This leads to contamination of the acid pickles, electrocleaner, plating baths (where the tar ball is created) and the chromates, thereby shortening the useful life of these chemistries.

Elimination of oil build-up at the cleaners would naturally extend the lives of all the baths following the alkaline soak cleaner. In "the good old days" (see June 1998 "Fact or Fiction?" column), cleaning parts before cyanide plating was not as important as it is with today's modern plating systems. The wetting systems in acid zinc chloride solutions will tie up the oil dragged down the plating line with the parts ... but at a price.

First, you will need to run a higher wetter-to-brightener ratio to make the same amount of brightener available in solution. Rejects in the form of blisters and poor chromating will increase because the chemistry's ability to clean the parts, in the short time before they start to plate, falls off rapidly with oil loading. If this happens to a chloride zinc, imagine how important good cleaning is in alloy zinc plating—some of those baths don't use any wetters.

Membrane technology can be used to separate oil and grease from soak cleaners. Let's begin this review, however, with a look at the low-tech methods available.

Soak Cleaners

Displacement Cleaners

Displacement cleaners are formulated so that oily soil is removed from the work, and the oil splits out and floats to the surface of the cleaner rather than remaining emulsified. The splitting usually occurs in a motionless cooling tank off the metal finishing cleaning line. A large drawback of this type of cleaner is that oil can split in a quiet area of the cleaning tank and be carried down the line.

Emulsion Cleaners

Emulsion cleaners are formulated with surfactants that dissolve the oily soil and promote the stabilization of an oil/water emulsion. Fully emulsifying cleaners are capable of holding up to 50-percent oil by volume, with a "normal" range of 4–12 percent oil-to-soak cleaner. With normal usage, these cleaners will not have "free oil" in them. The emulsifying power can hold oils over prolonged periods of time. Most of the soak cleaners used on the east coast of the U.S. are of this type.

Distinct technologies are used to draw off the oil and greases from a working soak cleaner. Different types of soak cleaners may help or hurt the technology selected. Depending on the raw ingredients selected, a soak cleaner may slide from fully emulsifying through fully displacing.

Oil Separators

Chemical Splitters

Chemical splitters will work on fully emulsifying cleaners and are not needed for fully displacing cleaners. Oil splitters can be of two major types. The first type is made up of a few non-water miscible surfactants. When introduced into the soak cleaner with vigorous agitation and sufficient heat, the reaction begins. This splitter type works by forming a more stable micelle with the oil, thereby "stripping" the oil away from the water miscible surfactants. Stopping the mixing allows the chemical splitter with the oil to float to the surface of the treatment tank, where the split can be skimmed.

The second oil splitter has its roots in the waste treatment area. It is used in very small concentrations to remove the oils that can cause "floaters" in the waste treatment *clarifier*. As a result of the reaction with this splitting cationic surfactant, the oil forms a loose flock that can be filtered or settled out.

In a waste treatment setting, the oil splitter can be aided by making the oily waste stream acidic. Adding metal ions (Al, Fe and Ca) at this point can help to prevent the oil from going back into solutions, after making the waste stream basic in front of the clarifier.

Coalescers

Coalescer systems are used to provide liquid from liquid separation (up to 150 °F) of oils from displacement-type cleaners. Coalescers will not work with emulsifying oils or fully emulsifying soak cleaners. They are capable of removing oils from rinsewaters, cleaning and plating solutions, or waste effluents. These systems pump, prefilter and separate non-emulsified fluids having a .09 or greater difference in specific gravity. Solution is pumped through the prefilter to the coalescing element, where small droplets come into contact with other droplets until they grow large enough to float to the top of the coalescing chamber. The light phase is discharged from the top of the coalescing chamber; the heavy phase is discharged from the bottom. The undesired phase is periodically "bled off" via a manual flow control valve. The purified solution is directed back to the tank or reservoir for reuse.

Combinations of these ideas are being used to remove oil and greases from soak cleaners today very successfully. Capital costs for start-up of these low-tech techniques are extremely reasonable.

Stay tuned—next month we'll look at the high-tech side of oil splitting, as well as ways to dispose of the separated oils and greases. **P&SF**