Hands-on Management

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Good Cleaning Practices Part 2: High-tech Methods

Last month, this column examined the effect that oil loading of a soak cleaner can have on a barrel plating line. Low-tech (low capital cost) methods were discussed as one way to control or remove the oils from alkaline soak cleaners. Let's begin this month with an examination of the high-tech end of oil and grease extraction.

Microfiltration Equipment

Microfiltration equipment uses a wide range of membranes with specific pore sizes and materials. Pore sizes are used as a guide to define the technology.

- *Micro* is best used to remove solid particles and emulsified oils. These systems filter >0.1 micron, and operate at 30–50 lb of pressure. Microfilters will not remove free soaps, dissolved ions or free oils.
- *Ultra* will remove bacteria, viruses and free oils. Ultra will remove wetting agents, surfactants and saponifiers. They filter particles between .1 and .01 microns, and operate at 30–100 lb of pressure.
- *R.O.—reverse osmosis*—has a particle size removal capacity of .001 and below. This pore size is small enough that it will remove ions. These systems operate at 200–600 lb of pressure.

In the past, metal parts being prepared for surface finishing have typically been cleaned with chlorinated solvents. Concerns over the ozone layer and significant health effects have led finishers to all but eliminate the use of solvents. Finishers are moving toward aqueous cleaning. High-end techniques, such as membrane filtration, are being heavily promoted as the answer to dumping cleaning that is spent as a result of oil loading. Dumping concentrated cleaner is to be avoided because of the large burden this places on the waste treatment system.

In a high-volume barrel plating shop, the real cost savings are not found in using membranes to clean up the soak cleaner. Let's look at the economics for a company that has six plating lines. One line is cleaned per week, so each line is cleaned about once every two months. (This is jobshop math—do *not* attempt this with your home budget.)

The labor and chemical savings realized by using a membrane system to extend the dump cycle are fairly small, given the change schedule. Each line is plating about 800 barrels a week. Soak cleaner solution, present as a thin film over the surface area of the parts, in one of the barrel loads, along with solution retained in the barrel itself, adds up to as high as one gal per barrel run. In this example, the soak cleaner tank capacity is 400 gal.

In a week's time, the barrels run drag-out of the soak cleaner about two complete makeup chemistries. So the tangible cost savings of running the soak cleaner, with or without a membrane filter, are going down the drain with each barrel.

The microfiltration equipment itself is another source of economic loss. Ultrafiltration units have been known to strip out 90 percent of the cleaner in only one pass through the mem-

brane. Selection of the best pore size with microfiltration equipment is a compromise between getting all of the emulsified oil out of the cleaner and losing the surfactants along with the oils. It's going to take a long time to pay for the membrane filtration unit, based on the savings generated by increasing the dump cycle of the soak cleaner in a barrel plating jobshop.

What about intangible cost savings? Remember the "tar ball" floating in the plating bath (*e.g.*, acid zinc chloride)? It got in the tank when the oils and greases slowly dragged down the plating line, only to build up in the plating bath and become a tar ball. This is only the small visible portion of the oil in the plating bath. The rest of the "invisible" oil is being held in solution by the wetter (surfactant) package. If you can keep the oil from being dragged down the line, you'll need less wetter, less brightener, and the plating bath will clean the incoming parts better, thereby lowering rejects. Improved cleaning can have a dramatic effect on rejects, but don't hold your breath waiting for this to happen.

We tested a membrane filter, and so many things kept happening to the unit that the company selling the unit was forced to extend the test in order to look good. The one-month test ended up lasting four months, and it was only in the fourth month that all the good stuff started to happen. Intangible cost savings that may or may not be seen in six months can be a very tough sell to upper management.

If I have learned anything about finishing over the years, it's that every shop is just a little bit different and not everything works for everybody. Here are some ideas that may work for you.

- Use better draining barrels.
- Have two soak cleaner tanks, but three baths (one treated), rotating the dirtiest soak out to be treated as needed.
- Chemically treat one soak cleaner off-line while the other is working. Use R.O. on the rinse tank to return the chemistry to the soak cleaner and fresh water to the rinse.
- More rinse tanks—four counterflow rinses only need one gal/min flow rate. You could evaporate one gal/min of the soak cleaner and use the deionized rinsewater as the make-up for the soak cleaner. (Note: It takes about 8–10 boiler horsepower to evaporate one gal of water per min.)

It's tough trying to squeeze all this information into a couple of pages. We are doing a study that ties a bunch of this stuff together, and hope to have the paper ready for AESF Week '99 in January. I'd love to hear your ideas, so let's meet in Orlando in January. **P&SF**