Stephen F. Rudy, CEF
Hubbard-Hall Inc.
563 South Leonard Street
Waterbury, CT 06708
E-mail: sfrudy@optonline.net

Filtering Cleaners is a Wise Choice

Last month's column described several filtration methods, along with equipment, purifying agents, and the overall benefits of filtration. The underlying message was how the subject, as related to plating baths, is so important. Most of us, through experience, can relate to the strong link between effective filtration and quality metal finishing of parts. One would be hard pressed to not see some form of filtration in a plating line. By walking the line backwards, how many cleaner tanks have you seen being filtered? Do you think it is a good idea? Is there any real benefit? From practical experience, using equipment and formulating specific cleaners, I know that filtering these baths is a good decision. Let us consider some reasons for filtering cleaners and some available methods.

Is It Clean or Dirty

Obviously, the ideal condition for any cleaner is the freshly prepared working solution, just before immersion of any parts. After the initial dunk of parts, the solution becomes soiled—as should any good soak cleaner behave. As production use proceeds, the bath loads up with contaminants typically consisting of oils, grease, and fine particles. Perhaps you have noticed the tell tale signs: solution turns either a dark or tea brown, milky color, oils tend to separate and float (especially as the cleaner cools), grease rings form on the walls of the tank, sludge and particles build up on the bottom of the tank. Just how soiled does the cleaner become before it starts working against you? Why not try a couple of quick tests that might tip off trouble before it actually strikes.

- **Specific Gravity**. Measure the cleaner bath specific gravity when first made up (no parts as yet immersed). On a scheduled basis, measure and record the specific gravity as the bath ages. During this time, maintain the cleaner concentration at the initial make up. There will be a point at which the data coincides with a drop in quality cleaning. The specific gravity will have increased to a point that indicates how much oil, grease, and particles have built up in the bath. Corrective action may include making additions of the cleaner concentrate, cut the bath and replenish, or dump and replace with a new make-up.
- **Performance Test**. Immerse a clean panel (*eg*., Steel hull cell panel) in the cleaner bath for the same time as the parts. Rinse in cold running water for 60 seconds and examine for water breaks. Next, immerse in dilute acid (5% hydrochloric or sulfuric acid) for 15 seconds, followed by rinsing in cold running water. Examine for water breaks. A positive observation of water breaks at either step would indicate deposition of soils from the cleaner bath onto the panel. Once again, corrective action may include making additions of the cleaner concentrate, cut the bath and replenish, or dump and replace with a new make-up.
- **Oil Displacement**. As the bath ages, the concentration of emulsified oily soils becomes more concentrated. Take a 50 milliliter sample of the hot cleaner and, using care, slowly add to it 50 milliliters of 10% sulfuric acid. Mix the solution well for about 15 minutes. Pour the solution into a clean 100-milliliter graduate cylinder; adjust volume, if necessary, with water to 100 milliliters. Observe as the oils separate. Record the volume and multiply by two to obtain the percent of displaced oils. As with the two previous tests, corrective action may include making additions of the cleaner concentrate, cut the bath and replenish, or dump and replace with a new make up.

These control examples confirm or predict at what point the cleaner, even with proper maintenance additions and correct operating temperature, will approach its maximum service life. In most instances, adding more cleaner concentrate may restore quality cleaning, but perhaps only for a short time. We have only considered how to determine the extent of cleaner contamination, with the same type of corrective action alternatives. In no instance has any consideration been given to removing the contaminants or minimizing their buildup. Can this be done? Yes, quite effectively. By filtering the cleaner, the following realistic benefits are readily obtained:

- Extend cleaner bath service life. Less down time means longer periods of uninterrupted productivity.
- Less bath dumps reduce the workload in waste treatment.
- Minimizing contaminants in the cleaner helps to maintain the solution consistency closer to the new make up.
- Quality cleaning results in satisfactory surface preparation, leading to quality finishing and post treatments.

The cleaner can be filtered using some different options:

Cartridge Filter. These are enclosed canister types that have a polypropylene center around which similar fiber material is tightly wound. The porosity of the filter medium can range from 100 microns to below 5 microns, based on the specific filtering requirement. Particles are retained in the media pattern. The polypro material absorbs oily solutions. The cleaner is continually pumped through the filter cartridge. It is a relatively simple, yet effective system to remove the typical contaminants found in the cleaner. The unit does not take up much floor space. When spent, the supplier can dispose of cartridges, sometimes directly to a certified destruct facility.

Oil Absorbing Filter. This unit consists of an enclosed housing that contains polypropylene baskets containing special oil absorbing plastic type media. The cleaner is pumped through the enclosed system, where the media absorbs oils and grease. The saturated media is replaced as needed.

Bag and Indexing Fabric Filters. The cleaner is pumped through a large filter chamber where oil, grease, and particles are retained. Takes up large floor space. It is a decent filtration system, but not applicable to systems cleaning large volumes of very oily parts.

Ultrafiltration. This is an interesting technology, using a somewhat permeable membrane system. The soiled cleaner is pumped through the (ceramic) membrane tubes. Molecules of sizes larger than water are blocked from passing through, diverted to a discharge. The aqueous cleaner solution passes through and returns to the process tank. Ultrafiltration provides a rapid, very dramatic filtering action. Of the examples given, ultrafiltration is by far the more expensive (approximately $20,000 and up). Considering a flexible or mobile unit that can be used to treat several cleaner tanks can offset the application, or rental as required.

Filtration can be supplemented by the application of mechanical oil removal devises. These units are quite cost effective and can be used in-tank. An overflow weir or side tank can collect cleaner solution, which cools down about 10–20°F below the temperature of the cleaner while oils separate to the top. The oils can be skimmed off using a disk or belt. A coalescer is another oil removing device. It channels the flow of cleaner, separating the aqueous from oily solution.

A final consideration to assist in the filtering of cleaners would be to consider the type of cleaners to be used. Displacement cleaners remove and release the oils for quick removal by the filter or separator. Another type of cleaner is what I refer to as the "mini emulsion." Oils are kept emulsified as long as the cleaner is agitated (such as barrel soak cleaning). When the solution settles in dead zones or in a side tank, oils are released for suitable removal. Another choice is the emulsion cleaner that releases significant quantities of oils by simple cooling (*eg.*, from 160°F down to 120°F). A chemical additive can also be used for certain cleaner formulations. The mixture of agents selectively emulsifies the oils in favor of the heated cleaner, splitting out in mass with the oils.

Filtering cleaners offers the metal finisher several benefits. They include: quality, economics, productivity, compliance, and safety. The available filtration equipment provides the degree of treatment or sophistication that is preferred. Cleaning is the first step—in fact, the most important step—in a finishing cycle. By effectively filtering the cleaner, buildup of contaminating soils is kept at a minimum, or controlled. Subsequently, rinses and process tanks down the line are kept relatively free of contaminated cleaner solution drag-in.

Filtering cleaners—make the wise choice your choice. ***P&SF***

Fact or Faction?

Continued from page 26

mined by the IPCC, is very suspect. Sea levels may not have risen anywhere near the level established by the IPCC using its computer programs.

Christopher Stone observes that the fear that the concentrated warming in high latitudes will melt the ice caps, thereby inundating land masses has a counterintuitive response. He says, "the better betting seems to be that global warming would thicken the ice caps and tend to lower sea levels. To understand, one has to appreciate the fact that the polar regions are so cold that an increase of even 10° or 20°C is not about to melt the ice sheets, anyway." He adds that Russian academician, A. Yanshin, who has been watching the Western hubbub from the sidelines, has been trying to remind anyone who will listen that the thick glacial shield of the Antarctic appears to have formed 30 millions years ago and withstood several epochs of climatic warming well beyond the upper range of the predicted greenhouse effect.[13]

Lastly, from John Christy, "Science is clear that, just as with climate, there is no law that states sea level should remain stationary. During the last major ice age, 25,000 years ago, the sea level was more than 300 feet lower than today, so a considerable amount of rise has already occurred naturally. In the past 6,000 years, the sea rose about two inches per century, but the rate increased around 1850 to six inches per century, a rate change occurring before humans could have had any influence. Sea level changes naturally."[1]

References

1. Patrick J. Michaels, *Meltdown*, (Washington, DC, Cato Institute, 2004), 5.
2. Roy Spencer, "Global Warming vs. Tsunamis? Tsunamis Win," TCS Tech Central Station, January 5, 2005.
3. Steven Milloy, "Environmental Activists Exploit Catastrophic Tsunami," *Environment & Climate News*, **8**, 3, February 2005.
4. Leslie Allen, "Will Tuvalu Disappear Beneath the Sea?", *Smithsonian*, **35**, 44, August 2004.
5. Patrick J. Michaels, *Meltdown*, 203.
6. Cecile Cabanes, Anny Cazenave and Christian Le Proust, "Sea Level Rise During Past 40 Years Determined From Satellite And *In-Situ* Observations," *Science*, 294, 840, October 26, 2001.
7. K. O. Emery and David G. Aubrey, *Sea Levels, Land Levels and Tide Gauges*, (New York, Springer-Verlag, 1991), 126.
8. Patrick J. Michaels, *Meltdown*, 124.
9. Willie Soon, "Predicting Sea Level Change and the Triumph of Science Over Dramatized Fear," *George C. Marshall News*, **4**, 4, October 2002.
10. Christopher Essex and Ross McKitrick, *Taken by Storm*, (Toronto, Key Porter Books Limited, 2002), 263.
11. "The Global Warming Crisis: Predictions of Warming Continue to Drop," in *Facts on Global Warming*, (Washington, DC, George C. Marshall Institute, October 15, 1997).
12. "Are Sea Levels Rising Dramatically?", www.tsaugust.org, January 30, 2005.
13. Christopher D. Stone, *The Gnat Is Older Than Man*, (Princeton, New Jersey, Princeton University Press, 1993), 22.
14. John R. Christy, "The Global Warming Fiasco," in *Global Warming and Other Eco-Myths*, Ronald Bailey, Editor, (Roseville, CA, Prima Publishing, 2002), 21.