

R.W. Phillips Jr. (left) • MarRich Associates
P.O. Box 3072 • Lynchburg, VA 24503

R.W. Phillips III • Brent America, Inc.
Arlington, TN

# Reducing Wastes Can Cut Costs

Last fall, I started a project to help a jobshop find a way to "close loop" its pre-paint treatment process in a three-stage washer. The process used a standard clean-iron phosphate, a rinse with overflowing water, and an alkaline seal as a final rinse.

First observations showed a considerable amount of emulsified oil and floating oil building up in stage one, indicating a need for an oil/water separator. An additive was found through one supplier that would cause more oil to float. The rotary disc skimmer on the system was removing a lot of oil and water already. A check revealed that the water content of the waste being skimmed off was about 75 percent. Using the disc skimmer to remove more oil would also remove more water.

Another supplier had a coalescing unit that was said to be more efficient than others. The supplier agreed to install a unit for demonstration and evaluation by this jobshop. The unit had been built for an automotive rebuilding shop, and the supplier said it was about 25 to 30 percent undersized for this operation. Regardless, the jobshop was willing to give it a test.

## Changing the Process

The old chemical solution was replaced with a combination formula in October. After two weeks of operation with the new formula, using only the disc skimmer, a test of stage one found that the oil contamination in solution was 390 mg/L. This was about 60–75 mg/L lower than tests run before changing chemical solutions.

The coalescing unit was started up on October 20, with an oil concentration of 390 mg/L. By November 23, the concentration was 350 mg/L, and eight gal of oil had been removed, containing only about five percent water.

By December 3, the concentration was down to 230 mg/L. By December 13, the concentration was 55 mg/L, and 16 gal of oil had been removed. The amount removed during the entire period was equivalent to about three or four days of operation, before the changes were made in stage one.

## Producing Better Quality

The quality of work has improved considerably. The process is producing cleaner, more effective conversion coatings on parts. By just using the old fingernail scratch test, the iron phosphate conversion appears more uniform and provides better grain structure. One lab test showed that parts finished with the new process have double the resistance to adhesion tests. Salt spray tests are continuing, but after 180 hr, parts show no corrosion. Following 180 hr of salt spray with the old process, a 1/16-in. creepage along the score line of the paint was normal.

From this beginning, we expect to be able to more than triple the life of the solution. A filtering process is being installed to remove the particulates and sludge. A unit has been ordered that will provide four turnovers per hr, using 50 µm of wound coil filters.

Preliminary tests revealed a buildup of sludge in the bottom that is almost free of oils. Eductors will be installed to filter some of this solution from the bottom of the tank, directing it to the pickup points for the coalescing unit.

Chemical use has dropped about 25 percent with the new process. If chemicals can be reduced further by removing more oils and particulate, the solution could be made into a "no dump process." A sand bed filtering unit has been installed on the stage two rinse tank. There is a heavy overflow caused by water being transferred through this stage from spot-welding coolers. To eliminate this, a refrigerant cooler is being considered for the spot-welding water.

## Reducing Costs

The shop uses about 16,000 to 18,000 gal of water per week just for spot welding. This is costing about $360 a week for water, and another $360 a week for sewage.

The washer requires a minimum of 4,400 gal of water per week, costing about $180 each week for water and sewage. When the program is complete, the shop will realize a savings of at least $37,440 per year.

Today's estimated cost of the coalescing unit, filter unit and cooler is $21,000. A savings of $16,440 over the cost of the equipment will be realized the first year. It also eliminates the cost of lab tests that are required when sending dumped solution to the publicly owned treatment works (POTW), estimated at $1,800 every six to eight weeks.

The time required for servicing the coalescing unit, filter unit and sand bed filters was not considered in the estimated costs, but servicing costs would be comparable to the costs of the downtime required for dumping the washer and cleaning up with the old system.

An update on this project will be coming this summer. Because this company is a small jobshop, the progress being made toward achieving zero discharge makes it even more impressive. This is one of those "win-win" situations. ***P&SF***