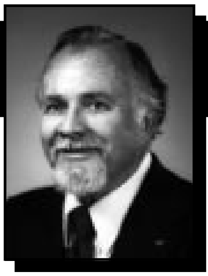

R.W. Phillips Jr. (Left) • MarRich Associates
P.O. Box 3072 • Lynchburg, VA 24503

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

Reality, Recovery and Recycling: 'Oops!' Did We Do It Right?

We humans often attempt to do one thing and end up doing something completely different from the original plan. Sometimes, it turns out right anyway. Thank goodness!

When counterflow rinsing began back in the 1970s and 80s, some of us didn't know what we were doing. We felt, however, that we were on to something that would reduce water consumption and, possibly, the cost of chemicals used in a pre-paint treatment process. It was working in electroplating lines, so why not make an effort to use it in painting processes?

A Case History

I remember helping some clients modify washers by installing pre-and post-rinses for their rinsing stages, and even at the exit of the chemical cleaning and phosphate stages. We found that water consumption could be reduced by up to 25 percent, and we could eliminate the fresh water make-up into the chemical stages.

By incorporating some double rinse stages with the pre- and post-rinsing, water consumption was reduced by 40–50 percent. This was enough to justify installing recycling systems of distillation and evaporation to help recover the rinsewaters, while having to treat and dispose of only a small amount of contaminated slurry.

Today, we can completely close-loop a pretreatment washer system and improve the quality of cleaning and phosphating, while saving water and disposal cost. We have to do more, however, than just counterflow and treat. We must filter the chemical stages to remove particulates, semi-solids, grease and oils, or soils from the process.

It helped to obtain information from existing research to calculate water and solution evaporation and dragout rates during spraying operations.

Evaporation rates at different temperatures:
- 110–120 °F — 3% loss/hr
- 130–140 °F — 4% loss/hr
- 150–160 °F — 6% loss/hr
- Above 160 °F — 7% loss/hr

Dragout averages for:
- Flat sheet parts — 2%
- Boxed parts — 3%
- Cupped or cabinet-type parts — 4% or more

(Based on measurements of water loss before and after modifications.)

We then designed some fresh water mist rinses, counterflowing the rinsewater and sending the overflow to treatment, such as freeze-vaporization recovery. From the results of the evaluations, we concluded that a standard five-stage washer could run forever without dumping or sending wastewater to the sewer. It did not take long, however, to find that soils were building in the cleaner and phosphate baths faster than expected.

The cartridge filters were filling up too fast, so we incorporated a membrane filter to help keep the chemical solutions clean. The results were excellent, except chemical consumption increased. So we began filtering first through some stack-plate filter, and sending only about half through the membrane unit. This worked better, but was not what we wanted to achieve (we were looking for perfection).

By this time, we had about six months' experience. Compared to past years, we had increased quality, lowered chemical cost. We were also sending almost no waste to sewer, and water consumption dropped by about 50 percent.

The loss of chemicals from dragout and evaporation was reduced by using a mist post-rinse as parts came out of each stage. By using water from the pre-rinse stages, we were able to reduce both water consumption and chemical dragout. Rinses were also cleaner, and less rinsewater had to be treated for recycling.

A small amount of pre-cleaner rinse mist was used to wet-out the soils for better removal during the cleaning stage. This pre-rinse wetting was sent to the membrane filter and returned to the pre-rinse riser at the entrance to the rinse stage, along with some of the rinsewater being applied as a pre-rinse. This was counterflowed to the cleaner stage as make-up. The plate filters helped remove the particulate, and the cleaner was sent back to the cleaner stage. This set-up was used for the phosphate process to remove the fine particulate and soils.

Achieving the Goal

With all the overflow water, cleaner, and phosphate solution going to freeze-vaporization recovery, we were finally at zero discharge. Water was being returned for rinsing and processing. The unit produced about five to six drums of heavy, treatable waste sludge during a six month period.

If you want to eliminate the "oops," you must do some practical evaluation of the available filtering and recovery systems. It seems that several systems will have to be incorporated to achieve the goal of "zero discharge." o