

Automated Bath Maintenance

By J.P. Bougneit & C.A. Henry

In this continuing series of articles on basic surface finishing techniques, the authors explain the problems associated with maintenance of plating and cleaning baths and the use of modern technology to solve them.

All electroplaters, anodizers and electrocoaters have baths that need to be maintained. One of the most frequent needs in the maintenance procedure is to replenish one or more materials that are depleted as items move through the plating process. We will compare some of the existing techniques for this replenishment.

Manual Methods

It has been, and continues to be, a common practice in the industry to add brighteners, plating solution, acid, caustic, pigment, resin and other materials manually based on current conditions, educated guesses or test-and-add methods. This can vary from measured amounts at prescribed times to a five-gallon bucket-full whenever someone thinks of it. Some of the obvious disadvantages include:

- Forgetting to add the materials
- Adding the wrong amounts
- Peaks and valleys in bath chemistry because of inconsistent additions
- Adding too much material, resulting in scrap, rework and wasted material
- Adding too little material, resulting in scrap, rework and loss of business
- Inability to certify the process
- Difficulty in tracking process costs

Why Automate?

Depletion of bath chemicals occurs as a function of time, temperature and the number of items plated or coated. Figuring the amount to be replenished

can be determined by monitoring different factors (parameters), depending on the process:

- Time
- Ampere-hours
- Conductivity
- pH

Ampere-hour Base for Additions

Using amp-hours to add materials is based on a one-to-one relationship between the depletion rate and the number of items going through the bath. The amp-hour measurement combines both time and current used and accommodates variances in load size, as well as the length of time spent in the bath. These measurements can be made using an amp-hour pump controller. It tracks the total amp-hours the process has used, then sends a signal to the pumping system to add the required amount of material to the bath to replace the amount consumed. The length of time to pump and the frequency of additions can be adjusted to provide the precise amount needed. After these adjustments, an operator should find that the bath will not require testing as often because the chemistry will remain more consistent throughout the day, week and month.

Depending on the measuring or controlling device (meter) chosen, an operator can monitor other factors and choose optional features as needed:

- Resettable amp-hour totals for load, shift, day or weekly tracking
- Non-resettable amp-hour totals to meet EPA or state compliance requirements
- Multiple pump operation
- Multiple rectifier summing
- Total and display presets, cycles and pump time



Dual pump controller.

- Permanent memory retention in case of power failure
- Level alarms for materials being added
- Level alarms for bath overflow
- Fused pump protection
- PC network compatibility to download data

Not all meters will have all these features. The operator must determine helpful features needed now or for the future.

Time Base for Additions

Some processes, such as cleaning, will deplete materials proportionately to the length of time that an item spends in the bath. In this situation, an operator would benefit from a time-based controller that replenishes by totaling the number of minutes that items sit in the bath. This applies to both electrocleaning and non-powered cleaning baths. The operation, benefits, features and options will be similar to the amp-hour approach, differing only on the parameter chosen on which to base the addition amounts.

Conductivity & pH Base For Additions

Replenishing baths based on conductivity, pH, or other instantly measurable factor can use a high- and low-level approach. The meter will constantly monitor the process parameter selected and when the low level is reached, will turn on a pump

for a preset length of time. This schedule can be adjusted so that small additions can be made and, after a predetermined delay, a new reading can be taken to decide whether the rate of change will exceed the high limit. The benefits, features and options are similar to the amp-hour and time approaches.

Benefits of Automatic Additions

- Consistent bath chemistry
- Reduced scrap and rework
- Reduced costs
- Accurate costs
- Process control
- Process certification
- Sales advantages

Achieving these advantages will require dedication in checking the meter and pumps periodically to assure that the material reservoir is full, that tubing is not plugged and that power has not been interrupted.

Meter Selection

Determining which brand and model of meter fits your needs should be based on several factors, including but not limited to:

- Ease of use
- Reliability
- Visibility of display
- Data retention in the event of power outage
- Resistance to chemical damage
- Size and convenience of mounting
- Ease of interfacing with pumps
- Ability to operate multiple pumps
- Ability to summarize multiple rectifiers on one tank
- Ability to prime pumps from the meter
- Ability to operate both electric and pneumatic pumps
- Ability to communicate on a data network
- Price (better thought of as value)

One of the most critical factors in product selection is in choosing a vendor who knows your industry and has a track record of supplying products that function reliably in a harsh environment. P&SF

Editor's note: This article was prepared for P&SF through the courtesy of JP Tech, Inc., P.O. Box 863, East Troy, WI 53120.