Hands On

Mark Zahn, CEF
Mid-Atlantic Finishing, Inc.
4656 Addison Road
Capitol Heights, MD 20743

Do You Trust Your Chemist (& Others, for That Matter) to Do His Job?

When everything is working well, a day at the shop can be very satisfying. Even a mistake that causes your work to be substandard can be tolerable, as long as you know what the mistake was and how to avoid it in the future. But when something beyond your control causes finished parts to be unacceptable, and you go home for the evening without knowing what actually caused the problem, that is unsettling.

It is true that your job depends on other people doing their jobs—whether you are a line worker, racker, packer, inspector, chemist or one of the administrative personnel.

Let's consider the important role of the chemist in your shop. Did you ever wonder what really goes on in the lab and how it affects you? How does the chemist determine the concentrations of constituents in your tanks? Why should you believe him when he says something needs to be added to one of your solutions? Do you feel apprehensive when everything is coming out great and the chemist decides to add some type of chemical to your tank?

Determining the Condition Of a Plating Solution

How in the world does the chemist determine what shape your solutions are in? There are several ways, and we're going to cover some of them now in very simple terms.

You are probably familiar with the pH test (with paper or a meter), which measures the acidity/alkalinity of a solution. Let's examine what really happens with pH paper. The paper is treated with a dye (called an "indicator") that changes color when it is dipped into a solution, depending on the relative acidity or alkalinity of the solution. There are hundreds of these chameleon-like indicators available, and each works in a unique way. Many of them change color as a reaction to pH of a solution; others will change color depending on how much of a particular metal is present in solution. Primarily, their job is to consistently make a visible change in color under predictable and repeatable circumstances.

Tests called "titrations" are performed on small quantities of solution right out of your tanks to determine their composition. These titrations use indicators—in liquid or powder form—to show the chemist when a certain condition has been reached in the solution under test. Although the chemicals used in the test vary, most titrations are based on making a carefully prepared solution reach a certain pH, at which point the indicator abruptly changes color.

Testing a Cleaning Solution

Let's take a look at the testing of a cleaning solution by titration. A typical cleaner will contain a certain amount of caustic soda, which is extremely alkaline. As an oversimplified example, imagine there are 10 lb of caustic soda in 100 gal of water. Its concentration, therefore, would be 1/10 lb/gal. Because cleaners contain other ingredients as well, let's throw five lb of those "other ingredients" into our 100-gal tank.

According to simple addition, we now have a tank with 15 lb of working cleaner in it. As long as we know that two-thirds of our cleaner is caustic soda, all we have to do to check the strength is to determine how much caustic soda is in the solution. If it is one lb short of caustic, we know to add 1/2 lb of the other stuff, too.

Keeping all that in mind, we take a carefully measured amount of the cleaner and put it in a flask with an indicator that will change color from red (in alkaline solutions) to clear (at a lower pH) at about a neutral pH. Phenolphthalein is an indicator that fills the bill. Because the solution starts out at a high pH, the indicator makes the solution bright red.

Now we start the titration by slowly adding acid to the amount of solution under test. *But wait!* We're not supposed to mix acids and alkaline materials—at least, not normally. But this is science, so we begin to introduce small amounts of a weak acid into the known quantity of cleaner. The pH of the solution will begin to drop, and will continue to drop as long as we continue to add acid. At some point, the solution will pass through the neutral mark on its way to becoming acidic. When it does, the indicator—which began as

Continued on page 59