US Ink® A Division of Sun Chemical Corporation

pH and Conductivity

Volume XIII

Fountain Solutions are a major variable in the printing process. The use of a fountain solution can be as critical as its selection. All fountain solutions are supplied in the form of a concentrate, which must de diluted before use. Improper dilution or variability in dilution can create consistency problems, which can be difficult to diagnose on press. In a previous article we have covered the use and maintenance of the incoming water supply. This article will cover the basics on the use of fountain solutions in the pressroom.

Fountain Solutions are typically diluted before use in a ratio of 1 to 2 ounces per gallon of water. Conductivity and pH are used to measure the dilution in order to ensure a proper dosage. The term pH is from the Roman meaning Apotential for Hydrogen,@ thus the small p and the capital H. This really is a measurement of the AHydrogen ion@ in solution. In practical terms the pH is a measure of the acidity or alkalinity of the solution.

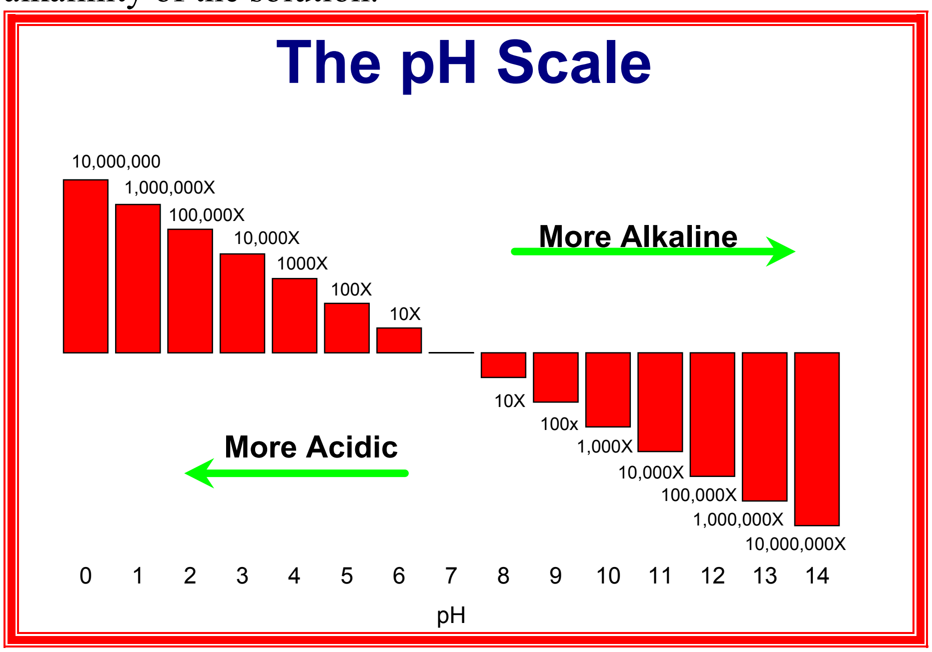

Figure 1

The pH scale runs from 0 to 14.0 with the midpoint, 7.0 being neutral. A solution with a pH lower than 7.0 is considered an acid. A solution with a pH above 7 would be considered a base (alkaline.) Each whole number on the pH scale represents a 10-fold change in the Hydrogen ion concentration. A change in pH from 5 to 6 would be a 10-fold change in acidity, whereas a change in pH from 4 to 6 would be a 100-fold change. Thus small changes in pH may in practical terms, be actually quite a large change in the hydrogen ion concentration (See Figure 1). The pH of a solution can be tested by the use of an electronic pH meter.

To complicate matters further, most fountain solutions today are buffered. A buffered solution is one that contains chemical salts that stabilize the acidity or alkalinity of the solution by neutralizing within certain limits any acid or base that is added to the system. When fountain solutions are buffered, the use of pH to control dilution is much more difficult. For example, a solution with a dilution of 1.5 and another solution with a dilution of 2 ounces per gallon may have the same pH (see Figure 2). So how can we assure a consistent dilution using these solutions? There is another measurement technique that printers can use to test the dilution of their solutions. This technique measures conductivity.

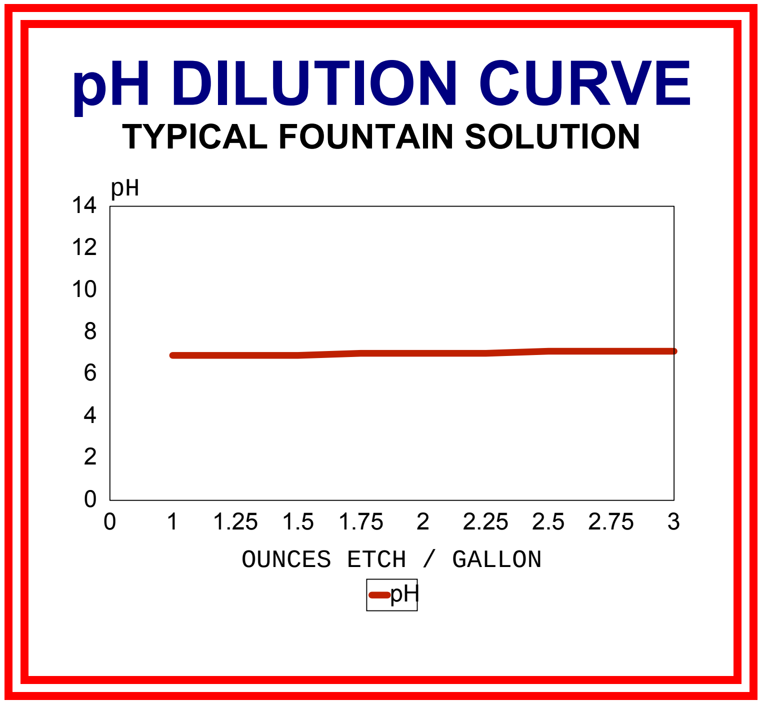

Figure 2

Conductivity is the ability to transmit or conduct an electrical charge. In solutions, the conductivity is determined by the number of ions present in solution (see Figure 3.) Basically, the higher the level of fountain solution concentrate used in the solution, the higher the conductivity will be.

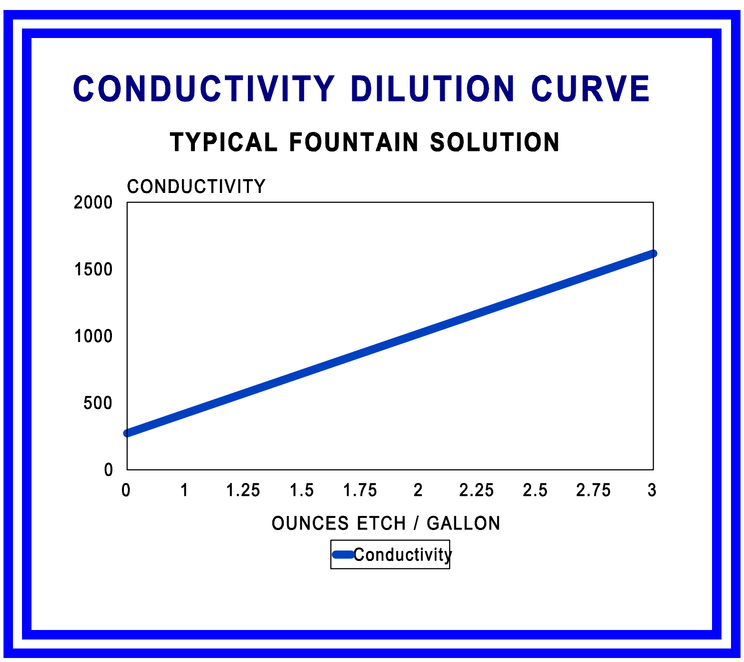

Figure 3

Figure 4 shows a typical conductivity vs. pH curve for a fountain solution. As you can see from the graph, the conductivity gradient or slope is substantially greater than the pH, which shows that the conductivity is a better method of measuring the dilution level of a fountain solution.

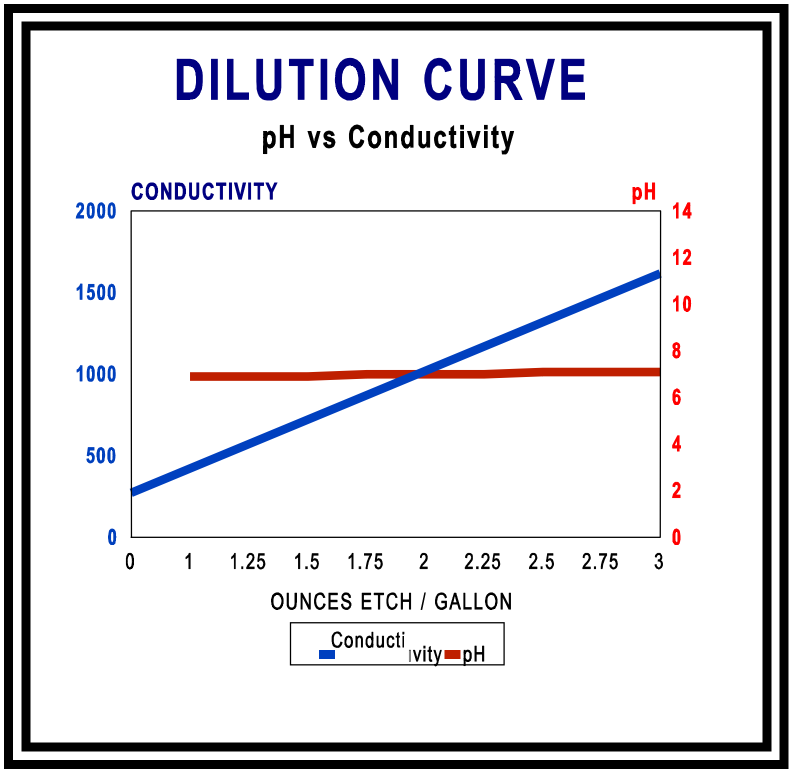

Figure 4

The unit of measurement for the resistance to the flow if electricity is Aohms.@ The unit of measurement for expressing conductivity, the opposite of resistance, is Amhos@ (ohm spelled backwards). In measuring the conductivity of fountain solutions, a very small fraction of a mho, or Amicromho@ is used. A micromho is equal to one millionth of a mho.

The level of conductivity of a solution is measured with a conductivity meter, which gives readings in micromhos. As a rule, conductivity meters are accurate, easy to calibrate, and simple to use. They are operated simply by either dipping the electrode into the solution and stirring for a few seconds to obtain a reading, or pouring the fountain solution into a cup and then getting the reading.

A calibration schedule needs to be established, with the proper standards to ensure the accuracy of the instrument. Many battery-operated models have an internal calibration standard, which is tested by just pushing a button. This is an electronic calibration and may not always be accurate. Check the meter's operating instructions for more details on your particular model.

A better way to test a conductivity meter would be to use a calibration standard conductivity fluid (around the conductivity range of press ready solution), which can be purchased from any scientific catalog. Discarding this solution after use is important, since it may be contaminated. These simple calibration steps can save a lot of confusion in discerning differences between meters and potential problems on press.

Some of the problems which could be associated with the improper dilution ratio are as follows:

- Improper Ink/Water Balance
- Scumming
- Gray and weak solids
- Linting
- Plate Wear
- Stripping
- Build-up
- Rub-off
- Set-off

The pH and conductivity of a fountain solution should be the first logical step in diagnosing a press problem. It is quick and easy to test, yet it can prevent a lot of press problems, if properly maintained.