pH AND CONDUCTIVITY

Every printer needs to be able to monitor the condition of the fountain solution mixture that is used on press. Measuring the pH and the conductivity provides useful information on fountain solution characteristics such as dosage, degree of contamination and even the suitability of a product for a given application. Knowing a little about the theory behind the concepts of pH and conductivity helps us appreciate the usefulness of these numbers.

THEORY OF pH AND CONDUCTIVITY

Without getting too technical, pH is a number on a scale of 0 to 14 and that number is a measure of how acidic or alkaline is the fountain solution. A pH of 7 is neutral, less than 7 is acidic and greater than 7 is alkaline. As the number decreases the solution becomes more acidic and as the number increases the solution becomes more alkaline. Acidic fountain solution usually work around the pH range of 3.5 to 4.5, neutrals work around a pH of 7, while alkaline founts run at around pH 10 to 12.

Most fountain solutions today are buffered. This means they are designed to maintain a fairly constant pH value even when small amounts of acidic or alkaline materials are added to them. This way the function of the fount is not affected as it becomes contaminated by components of the paper and ink during the press run. As a result of building a good buffer system in the fount, the pH also does not change significantly as the dosage is varied within the normal working range of the solution.

Because of the nature of the pH scale used, small changes in pH value reflect large changes in degree of acidity. A drop in pH from 4.5 to 3.5 means the solution became 10 times more acidic! This fact, together with buffer systems used, makes it impossible sometimes to use a pH measurement to determine the dosage of the fountain solution mixture.

The conductivity of a solution is a reflection of its ability to allow an electric current to pass through it. Dissolved salts and acids in the fount are responsible for this. Normally as fountain solution dosage increases, the conductivity increases at a fairly constant rate. Therefore for any fountain solution we can determine ourselves or obtain from the manufacturer what would be the conductivity for every ounce of fount added. e.g., 100 or 200 or 300 micromhos, etc per ounce. This makes conductivity a useful number to determine the concentration of freshly mixed fountain solutions. Every fountain solution is designed differently and so will have different conductivities at its working dosage. There is no universally “correct” number since every solution is different.

USES OF pH AND CONDUCTIVITY NUMBERS

(a) Conductivity is an indicator of the dosage of freshly mixed fountain solution. A chart can be made in the pressroom, or obtained from the manufacturer, of the conductivity at 1, 2 3, etc oz/gallon dosages of the fountain solution. Comparing conductivity reading from freshly mixed fount with this chart can tell if the fount is dosed correctly. If alcohol is used, the measurements are taken before alcohol is added, since alcohol makes the conductivity drop significantly. The small dosages of alcohol substitutes used do not have any great effect on conductivity, and conductivity does not usually tell about the concentration of alcohol substitutes since most substitutes do not conduct electricity. (b) Conductivity is an indicator of the degree of contamination in the fountain solution. Paper, ink and other materials normally contaminate the fountain solution during the press run. Most of the contaminants usually cause an increase in conductivity. Measuring the conductivity changes of the fount over time gives a good indication when to dump the tanks and re-fill with fresh fountain solution. Although there is no “correct” number, most printers will make fresh chemistry when the conductivity rises to approximately 1000 to 1500 over that of the fresh solution. (c) Although pH is not a good measure of the dosage of the fountain solution, it is still important to measure it and track its changes over time. It can also be used as a measure of the contamination levels in the fountain solution. If the freshly mixed solution starts off at 3.8 but rises to, say 5.0 over time, it tells that the gum in the solution does not have to correct pH environment to function properly any more. Therefore fresh fount will have to be made. (d) pH measurements are also useful in telling if the appropriate fountain solution is chosen for the water that is used in a particular print shop. For example a hard water version of a particular fountain solution is sometimes made more acidic than the same fount designed for use in soft water. Using a hard water formula in soft water gives much lower pH values. This can adversely affect printing performance – causing drying problems, over-emulsification, stripping, plate wear, etc. Conversely using a soft water formula with hard water gives too high pH values in the mixed fountain solution leading to plate sensitivity, scumming, plugged reverses and half-tones, etc.

MEASUREMENT OF pH AND CONDUCTIVITY

Most suppliers have available pH and conductivity measuring devices. Many printers today have moved away from the use of pH test strips which may not be as accurate and reliable as the electronic meters available today.

Meters for measuring pH and conductivity function according to the same basic principles although they may appear to be constructed differently – e.g., pocket-type Hanna meters, Myron L meters are familiar names in the industry. It is important that these instruments be maintained according to the manufacturers recommendations. Electrodes have to be kept clean and moist and batteries must have optimum charge. It is also very important that the instrument be calibrated periodically according to the manufacturer’s recommendations, as often as once a week sometimes.

CONCLUSION

Some trial and error is necessary before the most appropriate fountain solution and its dosage can be found. Once this has been established, the monitoring of pH and conductivity numbers of the freshly mixed fount and the variation of these numbers over time, provide useful information about the condition of the fountain solution mixture.

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