



Tech Talk From

Prisco®

Tech Talk #13

MEASURING pH AND CONDUCTIVITY IN THE PRESSROOM

The ability to accurately measure pH and conductivity in the pressroom is essential to good quality printing. While these two properties are independent, each gives you, the printer, important information about the water in your pressroom and the mixed fountain solution on press. Each **PRINTERS' SERVICE** technical representative has the skills and instruments needed to measure these two properties. In this **Tech Talk** we'll discuss how to use these instruments, as well as the significance of pH and conductivity to your daily operations.

The importance of pH

You don't need to be a chemist to understand the basics of pH, but it's vital that printers understand the importance of pH in the operation of the dampening system and in keeping the press in control. To produce good printing it is necessary to have good ink density and proper dot area and the chemical balance of the dampening system is a primary factor in achieving this. The pH scale is logarithmic and runs from 0-14. A pH of 7.0 is neutral; less than 7.0 is acidic, and greater than 7.0 is basic (alkaline). It's important to remember that the pH scale is logarithmic and each whole number differs from the one next to it by a factor of 10 (*i.e. mixed fountain solution with a pH of 4.0 has 10 times the acidity as does one with a pH of 5.0*).

If the pH is too low, emulsification, tinting, excessive plate wear and slow ink drying may occur. If the pH is too high, it's possible to have plate sensitivity, emulsification, halftone plugging and scumming.

All **PRINTERS' SERVICE** acid-type fountain concentrates contain a buffer system to keep recirculator pH at a nearly constant value. While the press is running, the fountain solution absorbs alkaline materials from the paper and ink that will try to raise the pH. Eventually, the pH begins to rise as the buffer system is used up. As a general rule, once the pH increases 0.5 units above that of freshly mixed solution, it's a good idea to drain the recirculator(s) and refill them with clean, freshly mixed solution.

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Methods for measuring pH

pH Test Strips - These paper strips are impregnated with dyes (also called indicators) that change color over a range of pH, generally 1-2 pH units wide. For this reason, pH test strips cannot measure pH more closely than 0.3 to 0.5 pH units. They may not, for instance, be able to tell you if recirculator pH has risen to the point where the solution needs to be changed, and you could be printing with a fountain solution that contains much less acidity than needed.

In addition, pH test strips are difficult to read if the reservoir solution is excessively dirty or contaminated. It's also very important to replace test strips once they have reached their expiration date (indicated on the container).

Pocket Type pH Testers – These small devices are constructed like the more sophisticated units found in laboratories and have two parts - a very thin, usually round, glass membrane called the electrode, and a porous piece of ceramic called the junction. Both have very tiny holes or channels, which can be seen with the aid of a magnifying glass.

We have found through experience that most problems with pocket testers are the result of improper care of the electrode and junction. If the tiny holes or channels become clogged from failure to rinse off contaminated fountain solution after use, the tester will no longer give an accurate pH reading and will have to be discarded.

Follow these steps to ensure long life from pocket type pH testing devices:

1. Upon receipt of the tester, soak the measuring end for several hours in tap water to remove dried salt crystals and saturate the junction.
2. You must follow the manufacturer's directions for calibration with fresh pH buffer solutions. If you do not calibrate the tester, it will not give an accurate pH reading. We suggest that when purchasing the tester, you also purchase fresh buffer solution at the same time. Ask your **PRINTERS' SERVICE** sales representative for fresh buffer solution.
3. For best accuracy, calibrate the tester at two points – pH 7.0 and then at either 4.0 or 10.0, whichever is closest to the fountain solution you will be measuring.
4. Replace your buffer solutions on or before the expiration date shown on the bottle.
5. In between uses, the measuring end must be kept moist; place a small piece of moistened sponge or absorbent shop cloth inside the end cap. We have also found it helpful to wrap the tester in plastic wrap. *Use tap water or pH 4.0 buffer for this step.*
6. If the electrode and junction are allowed to become dry, you must re-soak and re-calibrate (steps 1-3) before using again.
7. After each use rinse the electrode and junction with tap water to remove contaminants.
8. Re-calibrate the tester periodically, at least once a week.

If the pH tester response time becomes slow (takes a long time to give the final reading) or if the tester refuses to calibrate with fresh buffer solution, this is an indication the electrode and/or junction have become dirty and/or clogged. Rinsing the measuring end with hot water, **Alkaless R** or an electrode cleaning solution may restore normal operation

What is conductivity?

Conductivity measures the ability of water and mixed fountain solution to conduct electricity. The units we use in the U.S. are “micromhos”. Dissolved salts in the pressroom water along with acids and salts in the fountain concentrate and materials absorbed by the mixed fountain solution while the press runs, all contribute to the conductivity figure in your recirculator.

Conductivity readings are used to ensure accuracy when mixing a batch of fresh fountain solution. **PRINTERS' SERVICE** makes many fountain solutions and each one has its own unique conductivity when correctly mixed.

As you add fountain concentrate to the water, the number of microsiemens may increase anywhere from 200 to 900 for every ounce added, depending on the fountain solution used. As the press runs, the conductivity of the fountain solution in the recirculator may rise as materials from the paper and ink contaminate it. These contaminants may neutralize the acid in the solution but the pH will not be affected by these contaminants until the solution's buffer is used up.

Look for conductivity increases

Once conductivity rises 1000 micromhos above that of fresh solution, we recommend draining the recirculator(s) and replenishing with fresh mixed fountain solution – even if print quality and water metering speeds are still satisfactory. The conductivity increase comes from contaminants (dirt) accumulating in the solution. As the press runs, the water form roller applies increasingly dirty fountain solution to the grain of the plate. Eventually the plate becomes sensitive, due to paper and ink particles displacing gum in the grain.

Conductivity test equipment

Since we believe printers should have the ability to monitor and record both pH and conductivity, **PRINTERS' SERVICE** supplies several reliable but inexpensive measuring devices that are suitable for measuring conductivity in the pressroom.

Each **PRINTERS' SERVICE** regional location has technical representatives who use the same equipment. In the following sections we will share with you advice, based on their experiences, about keeping this equipment in good operational condition.

Pocket conductivity testers – These testers should be rinsed after use, but are not nearly as subject to contamination as pH testers and do not have to be kept moist between uses. They are accurate, but have a limited range. When purchasing one, be sure its range covers the expected conductivity of the solutions you will be measuring.

Myron L conductivity meters – These meters are widely used throughout the printing industry. They are rugged and available in several models, with ranges that cover all conductivity readings that could reasonably be expected in the pressroom.

Tips for maintaining Myron L conductivity meters:

1. Use only a general purpose, never an alkaline type, battery. The electronics are calibrated for the voltage curve from a general-purpose battery; using an alkaline battery will result in an incorrect reading.
2. Never let moisture get into the inside of the meter, as corrosion will result. Be sure the bottom is firmly snapped into place.
3. Never fill the measuring cup by dipping or immersing the meter into the fountain solution reservoir. It is not designed for this type of use, which will ruin the meter.
4. All conductivity meters must be calibrated regularly to ensure accurate mixing. Meters like the Myron L 512M5 that have an internal electronic standard should be calibrated using this feature only. Instruments without this feature should be standardized against a standard reference conductivity solution (available from **PRINTERS' SERVICE**).
5. The "combination" type meters are capable of reading both pH and conductivity. Their pH electrode requires the same care as any other pH electrode, including keeping it moist between uses (be sure to use the cap provided for this purpose). The conductivity meter on this type can only be calibrated with the reference solution.

Once the conductivity has been measured for the mixed fountain solution that runs best on a given press, use only that specific meter for checking future batches of mixed solution.

Conclusion

We have discussed the significance of pH and conductivity and the simple but reliable testing equipment that can be used to monitor these numbers in the pressroom. The importance of controlling these variables in the printing process and their daily impact on quality and performance is undeniable.

A number of previous **Tech Talks** point out the importance of maintaining proper pH and conductivity in the pressroom. These include: **Image Area Problems (#11)**, **Reservoir Maintenance (#8)** and **Higher pH Fountain Solutions (#3)**. Your **PRINTERS' SERVICE** sales or technical representative can provide you with copies.

Vic Lewis, National Technical Service Manager for **PRINTERS' SERVICE**, contributed this Tech Talk topic.

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As always, your local PRINTERS' SERVICE office is happy to answer your questions:

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