

pH Control

Reprint 154

Viscosity and pH Control Lead to Quality Control

Formerly published in Paper, Film & Foil Converter by Edward Boyle, Contributing Editor, Paper Film & Foil Converter

Pressmen at Wisconsin Label Co., Algoma, WI, have found that by precisely controlling ink viscosity—and carefully controlling the pH level of water-based inks—they can deliver exceptionally high quality printing.

This monitoring is accomplished with viscosity and pH control equipment from Norcross Corporation.

Wisconsin Label characterizes the impact of this combination of pH and viscosity control as having “significantly improved our ability to maximize the quality of our work and to maintain that level of quality over entire print runs of 13 to 14 million pieces,” according to chief operating officer Dan Fulwiler.

Wisconsin Label is a diversified printing company with a 30-year history of producing quality labels. It has five subsidiary plants located across the US and provides label, commercial sheet-fed offset, durable screen, specialty, and package printing services. The Algoma plant has more than 300 employees out of a total corporate workforce of more than 600.

About 95% of the work is flexographic, says Fulwiler. The company operates 28 different presses from Webtron, Mark Andy, and Propheteer at the Algoma facility. Widths range from 6-1/2 to 17 in., with presses running up to 14 colors. Substrates include film, paper, and foil.

A Georgia plant produces “give-aways” and game pieces, while the Milwaukee plant focuses on commercial printing. A second Algoma facility

handles screen printing, and the Voxcon Div. was responsible for the development of VoxStock and VoxSox liners and hangers to reduce packaging waste.

Measuring for Quality

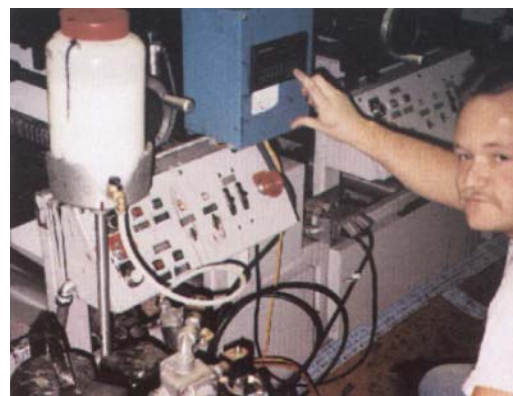
The high standards for consistency and quality required by many of its customers has led Wisconsin Label to undertake an ambitious quality control/quality assurance effort. Personnel tested and rejected some leading viscosity control technologies until finally settling on the current configuration of pH and viscosity measuring elements and controllers.

The control system in use comprises MP90 Series viscosity controllers, Model M8BO atmospheric pressure viscometers, and pH measuring elements, all from Norcross.

The installation consists of two systems mounted on two presses. Each system contains pH and viscosity measuring elements mounted on 5-gal ink tanks. These measuring elements are, in turn, tied to viscosity controllers.

“The in-tank design of the measuring elements provides ease of cleaning and a measuring cycle that can be easily observed by the pressman,” reports Dave Groessler, senior VP of manufacturing.

The system operates by maintaining pH and, therefore, viscosity within a setpoint range. Should pH levels exceed a setpoint during a press run, ammonia is automatically added to



An operator at Wisconsin Label tends the Norcross viscosity/pH control system. Seen here is the MP90 controller, the solvent bottle supply, and the M8BO measuring element.

the stable aid to bring pH (and viscosity) levels into the acceptable range. Merely entering new values at the viscosity controller's keypad can easily change Setpoints, Groessler points out.

He adds, “We ran one job 18 hours a day for almost a week, and the pH and viscosity control system definitely made it easier to eliminate changes in print quality during the run by giving us better, more consistent drying and clarity of the print.”

Supplier Information

Norcross Corp., Newton, MA
ph: 617/969-7020; fax: 617/969-3260.

Webtron Corp., Ft. Lauderdale, FL
ph: 954/971-1380; fax: 954/979-1676.

Mark Andy, Inc., Chesterfield, MO
ph: 314/532-4433; fax: 314/532-1510.

Propheteer Intl., Palatine, IL
ph: 847/359-8988; fax: 847/359-6098.

A Quick Lesson in Viscosity

Imagine that motor oil has been

pH Control

Reprint 154

A good incentive for increasing your understanding of viscosity is to keep in mind that improper viscosity can cost money.

poured on the floor and a desk placed upside down on the oil. One person pushing the desk will result in the desk moving at some velocity. If another person joins in and pushes, the desk will move faster; in theory, it will move twice as fast because the force is doubling and because the oil is Newtonian. Newtonian means it has a shear response linear with shear force. If two more people join in and push, the desk will move four times as fast as when one was pushing alone.

Sadly, printing ink is not Newtonian. If the oil were replaced with ink and one person began pushing; again a certain velocity would be attained. If another person then joined in and pushed, the velocity would increase, but instead of twice as fast, as with oil, the velocity might increase threefold. If four people push, the additional velocity might only increase by another 20%.

The results are nonlinear because inks are thixotropic. They are thixotropic because they are a mixture of pigments, suspenders, polymers, solvents, etc. Each of these items by itself may or may not have Newtonian characteristics, but, when combined, they shear in unique, nonlinear ways.

Even changing a pigment color can change the thixotropic qualities of ink. Another consideration is that water-based products are much more thixotropic than solvent-based products.

A good incentive for increasing your understanding of viscosity is to keep in mind that improper viscosity can cost money: A shift of 1 second on Zahn Cup (a simple measure of viscosity) can result in 50% excess ink laydown.

A Quick Lesson in pH and Printing

Here's a puzzling scenario: A press operator measures the viscosity of the ink and detects an increase of 1 Zahn Cup. He adds water to thin out the ink and then takes a new reading, but the situation has not been corrected. Finally, he adds so much water that the ink "kicks out," and the resins in the ink become unstable, gum-like masses, an irreversible condition.

What was the operator's error? The answer is that the increase in viscosity was not due to evaporation; it was due to a drop in pH from 9.0 to 8.0. This caused a viscosity increase of 1 complete Zahn Cup second, which the operator interpreted as a thickening of the ink. The result: a complete loss of materials and major problems in the print run.

The scenario above (not an uncommon occurrence) points out the interrelationship between viscosity and pH control. The right pH control system solves three major concerns for printers: the balance of pH and viscosity; the need for real time measurement and control of pH; and the problem of pH sensor reliability and maintenance.