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Pulp & Paper

Industry Solution

## Summary

Foxboro analyzers and sensors can measure the most demanding pH applications. DolpHin sensors utilize a unique, glass formulation for high-temperature service. Their breakthrough performance comes in a robust, easy-to-use package. The innovative reference electrode is stabilized and protected from process contamination and clogging through a double junction design and an ion barrier.

## Business Value

With more than 40 years experience in measurement, Foxboro offers the most complete line of instrumentation available. The proven reliability and robustness of the Invensys Foxboro DolpHin sensor along with our intelligent analyzers help improve process performance, increases production yields and reduce equipment and maintenance costs.

Foxboro®

# Foxboro pH Analyzers and Sensors

## Paper Machine — Wet End pH Control

## BENEFITS

- On-Line sensor and analyzer diagnostics communicate real-time measurement fault
- Twice the service life of conventional sensors in demanding, high-temperature applications
- Up to twice the response speed
- Savings and ease of use in installation, maintenance, replacement

## ABOUT FOXBORO ANALYZERS AND SENSORS

Invensys Foxboro® 875PH intelligent analyzer and DolpHin sensors are a proven system for demanding pH measurement applications. The 875PH analyzer provides ease-of-use advantages such as two alarm relays, two 4-20 mA outputs, and an RS-232 serial port for remote configuration. The Foxboro DolpHin™ pH sensors utilize a proprietary glass formulation for high temperature service, allowing use in applications with temperatures as high as 250° Fahrenheit (121° Celsius).

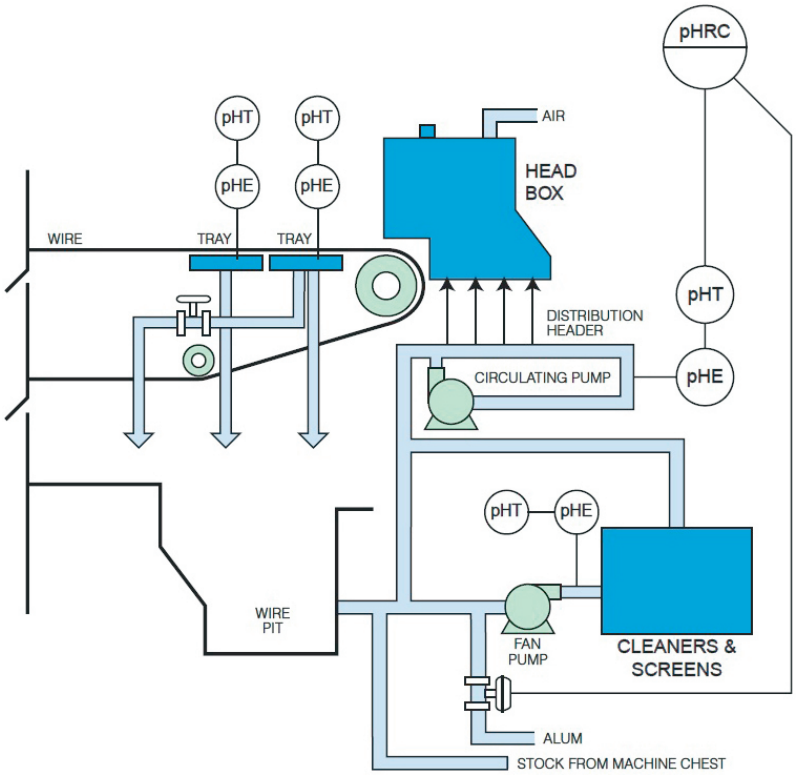
## PROCESS DESCRIPTION

The wet end of a paper machine includes the storage chest, refiner, stuff box, fan pump, cleaners, screens, headbox, wire screen, white water tank, wire pit, couch pit, presses, save-all, broke pulper and other related equipment.

Many grades of paper are sized to prevent water penetration by adding rosin to stock before it goes to the machine. At this point, alum is used to “set” the size on the individual fibers. To insure proper quality and uniformity, pH measurement at this point is critical. The alum flow to the stock is controlled by the pH measurement.

The objective of wet end pH control is to maintain a constant pH of the dilute stock slurry fed into the headbox. Different mills run their paper machines at different pH settings, but most paper machines today are operated on the acid side, with the pH usually ranging from 4.5 to 5.5. Some machines operate on the alkaline side, with a pH of 8 to 10.

Some can operate either way. Use of alum, sulfuric acid, or both for pH control assumes acidic machine operation.




## APPLICATION CHALLENGE

This area of the paper process is very hard on electrochemical sensors. The process is a thick consistency stock, and very rough on electrodes. The process temperature can run from 50° C (122° F) to over 90° C (194° F). High temperature shortens the useful life of the pH electrode. Often the machine is shut down for a cleaning process called a boil-out. At this time, a wash of heated water and caustic at about 13% to 18% is used to clean the buildup from the screen and pans. This will destroy the glass electrode after a few cycles.

The demand for upgrading paper quality and uniformity has introduced tougher challenges to online sensors. For example, in color control, the use of new pigments, dyes, fillers, and bonding agents has changed the wet end process environment. What is good for the process, however, is not always good for the sensors necessary for control.

The same pigments, dyes, and fillers that bond well to fibers also bond to sensor surfaces, creating the need for diligent maintenance.

Installation of pH sensors is often difficult. The optimum point for the measurement is in the head box circulation line. This proven location provides minimum dead time between the point of measurement and the point of addition of alum or sulfuric acid, an important consideration in providing stable control. However, this location tends to be difficult to access, so many users select the tray locations. The tray location is convenient, and easy to achieve, but introduces a longer dead time between measurement and point of chemical addition.

Hundreds of hours are spent each year cleaning pH sensors in this very aggressive process area.

Although pH is a difficult measurement to implement here, it is critical due to its effect on paper quality and uniformity. This control also impacts the ability to process the paper from this operation to ensuing ones.

## THE FOXBORO SOLUTION

Invensys Foxboro's DolpHin™ Series sensors and intelligent pH analyzers solve the challenges of controlling pH in the wet end of a paper machine. The DolpHin flat ruggedized electrode lasts longer in this abrasive service due to the thickness of the glass membrane, while the flat profile resists accumulation of fibers. In applications running above 85° C, the DolpHin high temperature electrode is the best choice because of its proven ability to last longer at high temperature, due to its unique glass formulation. Though the DolpHin electrodes last longer in high temperature and abrasives, it is advisable to remove the sensor and store it in a pot of water during the boil-out procedure. Removal during boil-out has extended the probe life well over 100%.

The recommended location for pH measurement is the circulation line from the headbox. A second location is the fan pump discharge line. A third location is the white water tray. Some users object to the circulation line due to the difficulty of installation. However, there are numerous methods of installation to lessen this burden, among them retractable accessories such as ball valve assemblies, and universal bushing adaptors.

When a DolpHin pH sensor is used in conjunction with an intelligent pH analyzer, the system can let the user know if the sensor is coated or broken. When used in a predictive maintenance mode, it can extend the life of the electrodes, and save many man-hours of service time.

Though never an easy implementation, effective pH control in the wet end area is critical to achieve highest quality and uniformity of today's highly competitive paper products.

Invensys Operations Management • 5601 Granite Parkway III, #1000, Plano, TX 75024 • Tel: (469) 365-6400 • Fax: (469) 365-6401 • iom.invensys.com



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