Foxboro® Analyzers and Sensors

Bleaching Application – Pulp and Paper

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 Foxboro DolpHin sensor along with our intelligent analyzers help improve process performance, increases production yields and reduce equipment and maintenance costs.

About Foxboro Analyzers and Sensors

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 HART communications 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°F (121°C).

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

Technical Challenges

In Kraft pulping, close to 90 percent of the wood is dissolved in the cooking liquor. The removal of the remaining lignin is completed through the bleaching process. In order to produce bright colored pulp and paper the bleaching process must use several chemical processes. The majority of bleaching processes rely on molecular chlorine, chlorine dioxide, hypochlorite, and peroxide, as oxidizing agents to remove the residual lignin from the cellulose fiber. A typical bleach sequence has two bleaching stages, each followed by an extraction stage. The bleaching stage is most efficient when operated at low pH levels (between 3.2 and 4.2). Conversely, the extraction stage is optimal when operated at higher pH (10.0 to 11.0), to maximize color removal. Accurate and reliable pH measurements increase process efficiency, lower maintenance costs, and minimize excess use of chemicals.

Process conditions inside the bleaching towers are not only harsh on the process-wetted parts of a pH sensor, but can have a progressively detrimental effect on the life of the pH sensor. The highly aggressive nature of the chemicals used as bleaching agents, along with the high solids inherent to the process, and elevated operating temperatures are all factors that are detrimental to most pH glass membranes. These factors will poison most reference electrodes in short order, cause error in pH measurements, delay pH response times, and shorten the useful life of a pH sensor.

The Foxboro Solution

Foxboro PH10 series DolpHin pH sensors were developed with the understanding of this type of process. The high temperature glass formulation was developed specifically to withstand exposure to higher process temperatures and chemicals that are more aggressive. To validate the design, DolpHin sensors were introduced to elevated temperature cycles along with several other top pH sensor manufacturers. The degradation in performance over time was measured comparing the time to respond to a pH change from caustic to acid solution (figure 1) and slope degradation (figure 2).

Figure 1:

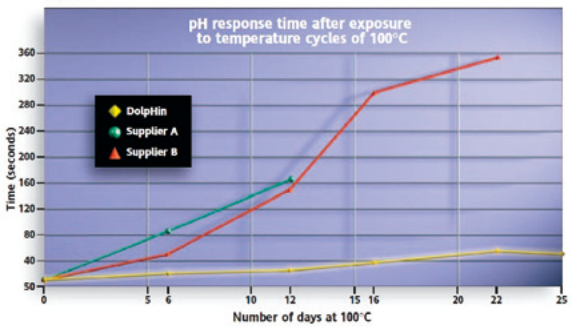
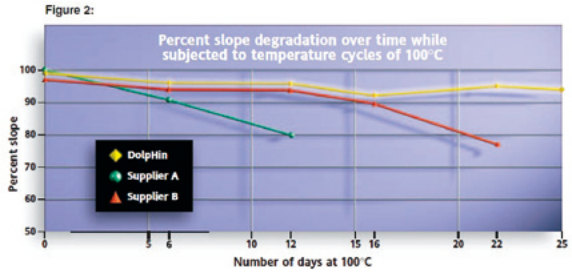


Figure 2:



The reference half-cell was designed to have a relatively small junction to lessen process infusion. Furthermore, a double reference junction was designed to incorporate Nafion® technology, which has the unique property of being permeable only to positively charged ions (cations). Therefore, it effectively holds the concentration of chloride at the electrode at a constant level and impedes the migration of soluble AgCl, present as negatively charged ions across its boundary. This Nafion ion barrier effectively prevents silver ion from migrating through the salt bridge and precipitating AgCl in the external diffusion barrier. AgCl in this barrier results in a clogged and electrically noisy liquid junction potential, a common failure mechanism in these applications.

With the robust design of the Foxboro PH10 Series DolpHin sensors and easy to use analyzers, clients will quickly realize the benefit of a low maintenance, low cost system with a longer service life.

Foxboro

38 Neponset Avenue
Foxboro, Massachusetts 02035 USA
Toll free within the USA 1-866-764-6477
Global +1-508-549-2424

www.fielddevices.foxboro.com

August 2015
Part Number: FD-AS-A-006