

Eastman Chemical Company

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“With the Foxboro DolpHin pH sensors, Eastman’s equipment and maintenance costs were eight times lower than with the previous sensors, and the efficiency of our scrubber operation was optimized”.

Wyatt Partney,
Senior Control Systems Technician,
Eastman Chemical Company

Foxboro pH Sensors Cut Costs and Optimize Operations in a Corrosive Petrochemical Application

by Invensys Operations Management

Goals

- Increase the life and performance of sensors immersed in highly corrosive solutions, exposed to extreme high operating temperatures, while gathering and delivering key data, providing regulatory monitoring and validation, ensuring quality control, and reducing caustic chemical consumption costs.

Challenges

- Existing pH sensors had to be replaced frequently — often within two weeks of installation, and even as frequently as three times per week;
- Existing sensors could not withstand the environment, readings were not accurate, so operators had to add caustic resulting in unacceptably high manufacturing and maintenance costs.

Solutions and Products

- Foxboro Measurement & Instruments

Results

- New sensors provided improved stability, accuracy, performance with up to fivefold increase in sensor response speed while measuring 8.8 million pounds of chemicals per day;
- The sensors’ pH glass formulation increased sensor life to six months —this longevity reduced equipment and related maintenance/replacement costs eightfold;
- Measurements no longer causes operators to continuously add sodium hydroxide scrubbing solution, slashing caustic use levels by a remarkable 50%.

Kingsport, Tennessee – Eastman Chemical Company is a global manufacturer and marketer of more than 1,200 chemicals, fibers and plastics. With annual sales revenue of \$5.3 billion, the company is the world's largest supplier of polyester plastics for packaging; a leading supplier of coatings, raw materials, specialty chemicals and plastics; and a major supplier of cellulose acetate fibers and basic chemicals.

Sensor Challenge

In harsh applications such as chemical and petrochemical processing, one plant-floor device that can represent significant costs is the sensor. Often exposed to or immersed in highly corrosive solutions and subject to extremely high operating temperatures, sensors are the critical front-line probes that gather and deliver key data; support safe, reliable operation; provide regulatory monitoring and validation; and ensure quality control, process efficiency and optimization.

Eastman Chemical Company turned to Invensys Operations Management — specifically to its Foxboro® line of DolpHin™ series pH sensors — to provide these solutions for a gas scrubber at the company's Longview, Texas, manufacturing complex. Eastman's Texas operations manufacture and ship 8.8 million pounds per day of chemicals and plastics to customers worldwide. At Longview, its gas scrubber uses water and caustic in a 20% sodium hydroxide solution to remove hydrochloric acid from flue gas before venting.

To meet company standards and federal environmental requirements, acid gas content in vented emissions must remain within acceptable levels. Reliable measurement of pH level in the caustic solution is critical for effective scrubbing, regulatory compliance — and reduced caustic chemical consumption costs.

To monitor pH levels, the scrubber uses a two-probe, redundant system. Scrubber conditions present significant challenges, including exposure to liquid caustic at a nominal operating temperature of 185° F and pH of up to 10.5. Existing pH sensors thus had to be replaced frequently — often within two weeks of installation, and even as frequently as three times per week.

Because the sensors could not withstand the environment, readings were not accurate, so operators had to add caustic. This drove up use of this costly material and gave higher pH values. In turn, higher pH etched the sensor glass, leading to inaccurate performance and faster failure. Results: unacceptably high manufacturing and maintenance costs.

Unique Sensor Solution

Determining that other options were inadequate, Eastman Chemical engineers tested new Foxboro brand DolpHin high-temperature pH sensors from Invensys Operations Management. They proved to be the ideal solution.

These sensors are designed specifically for challenging process applications that span the entire pH scale, exhibit strong chemical concentrations and high solids, run at high temperatures, and cycle from high to low temperatures.

Their unique, patent-pending pH glass formulation provides superior measurement stability and accuracy, plus longer service life in high-temperature applications up to 250° F (121° C). The pH glass also increases response speed up to five times and provides longer duty cycles than conventional sensors.

A DolpHin sensor's innovative reference electrode construction includes an ion barrier to protect and stabilize the reference potential in harsh



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conditions. Its electrodes are packaged in a rugged mechanical housing that facilitates installation, removal, cleaning and calibration, reducing maintenance time and costs.

Impressive Results

Eastman reports most impressive results. The DolpHin sensors' pH glass formulation increased sensor life to six months — a dramatic improvement over previous products that operated properly for three to four weeks at best. This longevity reduced equipment and related maintenance/replacement costs eightfold!

According to Wyatt Partney, Senior Control Systems Technician, *"With the Foxboro DolpHin pH sensors,*

Eastman's equipment and maintenance costs were eight times lower than with the previous sensors, and the efficiency of our scrubber operation was optimized. In fact, the DolpHin sensors were so successful in solving the problems of high costs, reliable pH measurement and process optimization for our scrubbers that we implemented them in a number of other demanding applications."

Besides significantly reducing equipment and related maintenance costs, the DolpHin sensors provide more accurate pH readings, ensuring that operators can use online pH measurements to optimize efficiency of scrubber operations. In addition, since inaccurate pH level measurement no longer causes operators to continuously add sodium hydroxide scrubbing solution, DolpHin sensors have slashed caustic use levels by a remarkable 50%.

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