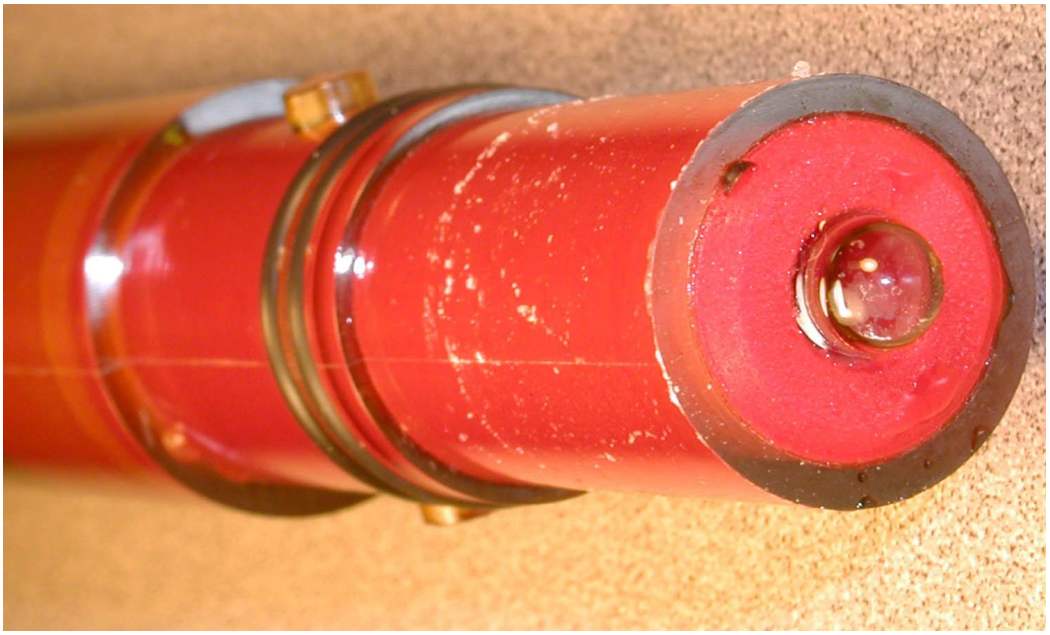
pH / ORP / ISE Process Control Systems
Case Study # 11 – HF Treatment Systems

Advanced Sensor Technologies, Inc.
Orange, California USA

Superior pH / ORP/ ISE Industrial Sensors

Features

- Guaranteed Longest Lasting Sensors Available *
- Sensors are Compatible with Most existing pH/ORP Meters, Transmitters & Analyzers **
- Application Specific Engineering allows optimum Lifetime & Performance ***
- Integrated Temperature Compensation, Preamplifiers & Solution Ground Elements
- Solid State Reference System offers superior resistance to Fouling & Dehydration
- Applications such as Acid/Fluoride, Hi-Temp, Saturated Sodium and Sulfide Resistant are standard options
- Custom Applications are available, often at no charge
- Most Installation Styles are Supported Including: Immersion, Twist Lock, Valve Retractable & Sanitary
- Available in a wide range of plastics, from cost effective CPVC to thermally & chemically resilient ULTEM® and PEEK
- Supports High Pressure Applications up to 100 psi for Valve Retractable Installations & 150 psi for Inline Installations
- Operating Temperatures from $^{-}30$ to $^{+}150$ ºC ($^{-}22$ to $^{+}302$ ºF) are supported for continuous use



Case Study No. 11

High HF Resistant pH Sensors for HF neutralization

- Improved HF treatment system efficiency through more accurate pH measurement and control
- Reduced Sensor Usage through less usage
- Increased inline service time for sensors during specialized reference

The Problem

An aluminum can etching company and a silicone wafer etching wanted to effectively treat their waste using a traditional CaF_2 removal system. To efficiently add calcium hydroxide or calcium chloride, a pH sensor must be used to control this addition. The typical coating of the pH sensor under such conditions was exacerbated by the intermittent excursions into the low pH and high fluoride process media due to poor process control from failing sensors.

The poor performance of the previously used sensors accelerated their own demise by causing process excursions by a lack of addition of caustic (sensor became insensitive to pH change after coatings even with repeated cleanings), thus flooding the system over time with strong hydrofluoric acid, primed with either sulfuric acid (aluminum etching) or hydrochloric and nitric acid (wafer etching).

The Solution

What was required was a sensor that was less susceptible to fouling from the addition of calcium hydroxide. This was accomplished by the use of an acid/fluoride resistant solid state polymer reference system. The sensor would also need to survive the brief but aggressive excursions into the low pH and high fluoride conditions that may occur due to etch solution dumping or intermittent process control issues.

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The sensor would also need to survive the brief but aggressive excursions into the low pH and high fluoride conditions that may occur due to etch solution dumping or intermittent process control issues. The use of a high HF resistant pH element accomplished this goal, with giving up the accuracy and stability that only a glass pH element provides. Alternative pH sensing elements used in high HF media by other companies such as antimony or ISFET survived the conditions but did not offer adequate accuracy for process control. Lastly, the sensor required cleaning with concentrated hydrochloric of half dilute hydrochloric acid to effectively remove the calcium deposits with the use of abrasive cleaning. Both the solid state reference and high acid/fluoride resistant pH element are well suited for such cleaning, thus greatly elongating the sensor lifetime due to reduced breakage and damage to sensors during the cleaning process.

Extent of Ionization (C_f / C_t)
as a function of pH at 25 ºC

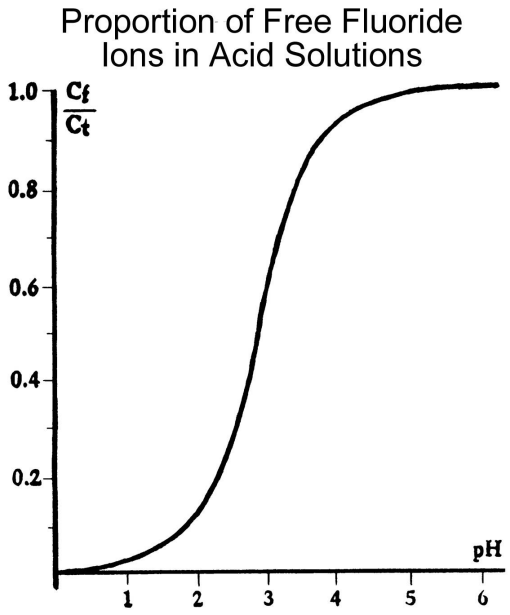
The pH Sensors Used:

Aluminum Can
Acid Etching Treatment Systems:

Model: PNHF 8431-1181-10
Description: 1" MNPT Twist Lock (Quick Disconnect) ULTEM Bodied High Acid/Fluoride Resistant pH Sensor with integrated Balco 3K Temperature Element & Rosemount Compatible 1181 preamplifier; 10 feet cable

Silicone Wafer
Acid Etching Treatment Systems:

Model: Model: PNHF 6431-3081-25
Description: ¾"-1" MNPT Immersion ULTEM Bodied High Acid/Fluoride Resistant pH Sensor with integrated 100 Ohm Platinum Temperature Element & Rosemount Compatible 3081 preamplifier; 25 feet cable



Choosing the Correct pH/ORP Sensor

1. Choose a sensor body type that suits the physical parameters of the installation (refer to the ***Configurations Portion of pH/ORP and Ion Selective webpages***).
2. Choose a sensor that suits the process application, temperature, chemistry, and physical parameters of the installation (refer to ***Sensor Selection Guides and call factory or local sales agent for support***)
3. Choose a sensor housing material that is compatible with the process chemistry, temperature & pressure (refer to ***Chemical Resistance Charts as posted under the Technical Documents portion of the website***).
4. Select suitable temperature compensation element, solution ground & integrated preamplifier based upon the mating pH/ORP Instrument (refer to ***Electrochemical Instrumentation Page & ask for factory support***).
5. Specify the required cable length based upon installation location (refer to ***Part Numbering Guide***).

* Subject to application qualification and review by an approved ASTI sales agent and/or factory. Performance guarantee is posted on the ASTI online application questionnaire page.
** See list of supported pH/ORP/ISE Instruments webpage as posted on the ASTI website.
*** Completion of Application Questionnaire form is required. Other restrictions may apply.

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