BARBEN ANALYTICAL

Technical Note
Cleaning pH & ORP Electrodes

Performance Series pH / ORP Sensors

pH sensors may require periodic cleaning if the process has foulants that adhere to the sensor tip. Often, cleaning of the sensor is part of a preventative maintenance program. Some common cues on when cleaning is required include:

- Visual inspection of the sensor shows build-up on the tip
- Response of the sensor has slowed or become noisy
- Maintenance schedule includes cleaning of sensor prior to each calibration

The purpose of this paper is to provide some best practice recommendations for cleaning of pH and ORP sensors.

Introduction

A pH sensor uses a specially formulated glass measurement electrode that is sensitive to the hydrogen ion concentration in aqueous liquids. If this glass electrode has build-up from the process than electrode response may become slow or erratic. If the coating is non-permeable by the process fluid (example: grease) than the electrode may be completely blinded and will be extremely noisy.

Proper installation should be considered if coating and build-up is a reoccurring problem. Installation in flowing pipelines is always preferred over installation in static vessels. The flow velocity within the pipeline has a scouring effect which helps prevent build-up from forming. The sensor tip should extend 1/4 - 1/2 inch (6 - 12mm) past the pipewall to take advantage of this scouring effect. A minimum flow rate of 3 ft/sec (1 m/sec) is generally enough velocity to keep solids from building up on the sensor. If abrasive particulates are present then the flow rate should be kept below 8 ft/sec (2.5 m/sec) to avoid physical damage to the glass electrode.

Mechanical Cleaning

Bio-films, sludge, and other soft coatings can usually be removed through mechanical cleaning of the sensor. A water jet may be enough to remove the coating. If the coating persists a cotton cloth or a toothbrush can be used to remove it. Avoid the temptation to scrape off the coating with hard objects such as knives or screwdrivers. Scraping may damage the pH sensitive glass thus damaging the sensor. Once the coating is removed, rinse the sensor with water (preferably deionized water) and tested in buffer solution. A typical response from 4pH buffer to immersion in 7pH buffer should be < 30 seconds for a functional electrode.

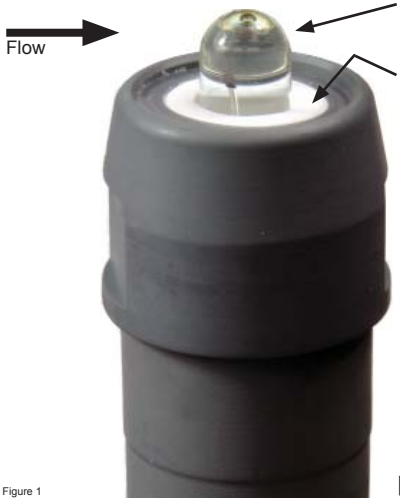
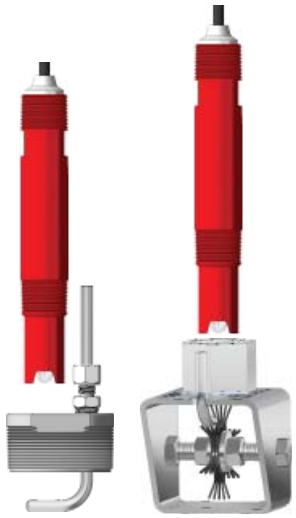


Figure 1 **pH Sensor Anatomy**



In applications where soft coatings are persistent, the addition of in-process cleaning may extend the time between cleaning.

Examples of in-process cleaning include the C36 Jet Cleaner (left) and the B38 Submersible Brush Scrubber (right). Both products use the Barben 546 sensor.

Pressurized air or water can be used as a cleaning agent. Distribution valve (not shown) are also available to fully automate sensor cleaning. Consult Barben Technical support for more information regarding these applications.

Figure 2

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Chemical Cleaning

If the sensor is not responsive after mechanical cleaning than chemical cleaning may be required. *Proceed with caution!* Strong chemicals can actually damage the glass electrode. Immerse the sensor in the cleaning solution for ≤ 5 minutes to dissolve the coating. Immerse the sensor in water to rinse off any residual cleaning chemical and test in buffer solution. As with mechanical cleaning, a typical response from 4pH buffer to immersion in 7pH buffer should be < 30 seconds for a functional electrode. Repeated cleanings may be required to fully remove the coating. If the sensor does not response after multiple cleanings than it may be due for replacement.

Process Conditions	Cleaning Fluid*
Coating from high pH process	5 to 10% Hydrochloric Acid
Coating from low pH process	5 to 10% Caustic (NaOH) (>130F)
Oil and grease	Isopropyl Alcohol
Sulfate & Carbonate Coatings	5 to 10% Hydrochloric Acid
Silica Coatings	3 to 5% Hydrofluoric Acid**

* Follow all MSDS procedures when handling strong acids and bases
** HF acid is extremely aggressive in low concentrations. Special care should be observed when using this cleaning solution. Please follow recommended handling procedures from supplier.

Cleaning for ORP & Antimony Electrodes

ORP and Antimony electrodes use metal electrodes instead of glass. Mechanical cleaning is typically the best approach to remove scale and build-up. 600 grit or finer paper can be used to polish the metal electrode. The metal should look clean and shiny when dry. *Note - Antimony is a known carcinogen thus wet polishing should be done to avoid airborne dust.*

Care for the Reference Junction

Just like the measurement electrode, the annular Teflon reference junction should be clean and clear of any coatings. A light scrub with a toothbrush is usually enough to remove any external coatings. Since the junction is porous, process chemicals can penetrate into the Teflon. Deionized water is very effective at leaching out hydrocarbons and strong chemicals from the reference junction. Soak the sensor in a bucket of deionized water for 5-10 minutes for best results.

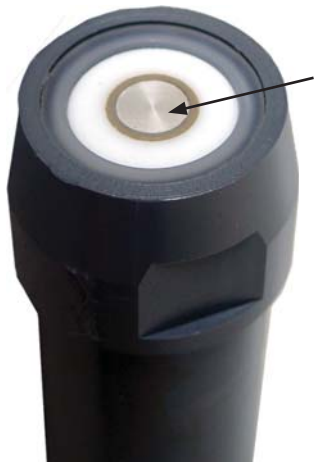
Glass pH Electrodes for Coating Processes

Barben Analytical offers specialty glass electrodes for high coating applications. These electrodes should be selected whenever coating is a concern.

CR Hemispherical Glass: This glass electrode uses our highly successful glass formulation for high temperature, high pressure industrial applications and adds a secondary, coat-resistant layer to keep build-up from forming.

CF Flat Glass: Select this glass electrode when abrasive particulates combine with coating to damage hemispherical glass electrodes. Consult factory when temperatures exceed 176°F (80°C) or pressure exceed 150 PSIG (10.3 BAR)

Silica Resistance Glass: Silica in ionic form can bond to glass, thus making removal extremely difficult. Select Barben HR (hemi) or FH (flat) glass electrodes for these applications. These electrodes use an additional non-stick coating that prevents silica bonding to the glass. Consult technical support for application feedback.



Barben Analytical's unique flat billet platinum ORP electrode is flush with the sensor tip. This design is very successful in abrasive applications and extremely easy to clean should build-up occur.

Figure 3 **Platinum ORP Sensors**

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