How to Clean and Handle pH Sensors

Here's how to keep your pH sensors operating accurately.

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For a pH sensor to maintain an accurate reading, the sensor must remain clean. Specifically, the glass measuring electrode cannot become coated, and the reference electrode assembly must not become coated, plugged or otherwise contaminated by the process solution. Here's how to clean pH sensors to ensure correct operation.

General Cleaning Procedure

1. Remove the bulk of contaminant by carefully blotting/wiping away debris using a clean damp cloth or towel (Figure 1). Be careful not to rub too vigorously as this may cause static charge.

Figure 1: The first steps are to wipe away debris and rinse the sensor in water.

2. Rinse the sensor in warm tap water or distilled water.
3. Prepare a cleaning solution containing a soap and water mixture. Use dishwashing detergent and warm water. Use only soaps that do not contain abrasives or lanolin.
4. Soak the sensor in this solution for five minutes, and then use a soft bristle brush to gently scrub the bulb and reference area of the sensor.
5. Rinse the pH sensor in warm tap water, and then check/standardize the sensor in buffer solutions. If the readings in buffers are still out of tolerance and the contaminants are acidic, soak the sensor in a weak caustic (less than 4%NaOH), as shown in the Table.

   If the contaminants are alkaline or scale, soak the sensor in a 5% to 10% HCI acid solution for less than five minutes. Caution: do not follow this procedure if the sensor has been used in a solution containing cyanide as this may produce poisonous cyanide gas.
6. Rinse the sensor in warm tap water and then place the sensor into dishwashing detergent and warm water for two minutes to neutralize any remaining acid, and to let the sensor come to equilibrium.
7. Rinse in warm tap water and check/standardize the sensor in buffer solutions.

If the above procedures yield results within operational tolerances, the pH sensor is once again suitable for use. However, if the above results do not bring the readings of the pH sensor within tolerance, it's time to replace the sensor.

Cleaning Solutions

Contaminant	Cleaning Solutions
Alkaline or Scale	5% hydrochloric acid or vinegar
Acidic Coatings	Weak caustic (less than 4% NaOH)
Oil, Grease, Organic	Detergent or if coating is tenacious, and organic solvent compatible with sensor material.

Cleaning tips

If the pH sensor has a slight coating or scaling, these can usually be removed using a water jet from a faucet or spray bottle. More entrenched coatings may require the use of a gentle acid brush or toothbrush to carefully remove the coating.

Depending on the nature of the scale or coating, it may be necessary to dip the sensor in a hot water solution containing dishwashing detergent, and then lightly scrub the electrode for a few seconds to facilitate cleaning.

For a more aggressive coating of the sensor where the detergent cleaning procedure outline above does not suffice, dip the brush in a 2% HCI acid solution, and then lightly scrub the electrode for a few seconds or so to facilitate cleaning. You may have to allow the sensor electrodes to soak in a similar solution for a few minutes to really work at attacking the contaminant.

Immediately after cleaning, rinse the sensor in water, then soak the pH sensor in tap water or a 7 pH buffer solution for a few minutes to allow the pH sensor to stabilize.

Knife blades or wire brushes shouldn't be used to clean deposits left on the glass bulb as they can scratch the glass or break off the bulb at the neck. A soft bristle brush should be used instead.

Handling and Installing pH Sensors

pH sensors are fragile, so handle them carefully (Figure 2). Take care to avoid process vibrations and thermal shock.

Figure 2: Glass pH sensors are fragile. Handle carefully.

Do not mount sensors horizontally. Keep the back end of the sensor a minimum of 15 degrees from horizontal (Figure 3).

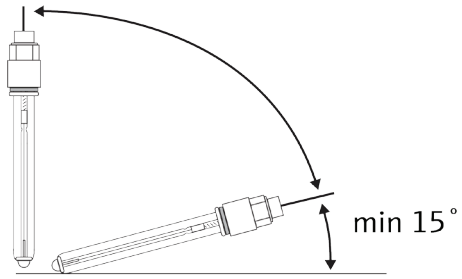

Figure 3: Never mount a pH sensor horizontally.

Avoid mounting where a pH sensor becomes dry or is exposed to air (Figure 4). Glass pH sensors must remain wet at all times. Should the process only run part of a day and then be shut down until the next day, that sensor must remain wet to ensure its proper measurement the next time it's needed.

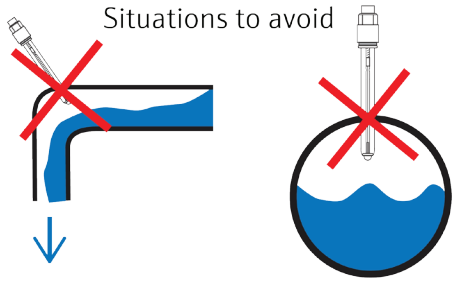

Figure 4: Avoid exposure to air. Mount pH sensors so they are always immersed.

For new installations, make sure the sensor is accessible, and easy to remove and re-install for cleaning and calibration.

Excess pressure and/or temperature can negatively affect sensor life, particularly if process temperatures rise above 80°C for prolonged periods.

When sensors are not in use they must be stored wet with their protective caps, and the caps filled with 4 pH, 7 pH or tap water. Alternatively, if you have several sensors, they can be stored in beakers with these same solutions, without their protective covers, such that the sensor bulbs rest on the bottom of the beaker and the storage solution rises two to three inches within the beaker.

About the Author

Fred Kohlmann joined Endress+Hauser in 2006 and is currently the Midwest Product Marketing Manager for Analytical products, located near Milwaukee, WI. Since 1976, Kohlmann has been involved in engineering, design, service, marketing and sales of online analytical water quality and process control instrumentation.

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