

# Technical Reference Section: pH/ORP

## Installation and Application Tips

- It is important that the sensing end of pH and ORP electrodes remain wet, for they may be permanently damaged if allowed to dehydrate. This is true for both in-line and submersible installation configurations. However, be careful to keep the electrical interconnection between electrode and preamplifier dry and clean at all times. Moisture in this area can also cause permanent damage.
- Some pH and ORP electrode models should be installed greater than  $\pm 30^\circ$  above the horizontal plane, so the internal solutions remain in contact with the sensing ends. Other electrodes allow horizontal or inverted installation. See individual sensor models for more information.
- pH control is best when performed in a tank. This is especially true in neutralization applications since it is very important for reagents to mix thoroughly with waste fluids, and to be allowed adequate time for the reactions to occur. Limiting adjustments to fewer than 3 pH units per stage, and sizing tanks to provide at least 10 minutes retention time, will increase the probability of producing safe effluents.
- For bulb-style pH and ORP electrodes, significant natural self-cleaning by turbulent eddies is achieved at velocities of 1.5m/s or more (5 ft/s). Flat surface electrodes get adequate self-cleaning at velocities of 0.3 to 0.6m/s (1 to 2 ft/s). In all cases, exposure to velocities greater than 3m/s (10 ft/s) can cause excessive measurement noise and electrode wear and should be avoided.
- Simply stated, the aging of pH and ORP electrodes (i.e., reference depletion and decreased glass sensitivity) results from a series of chemical reactions. And as a general rule, the rates of chemical reactions double with every increase of  $10^\circ\text{C}$  ( $50^\circ\text{F}$ ). This means shorter life expectancy for all pH and ORP electrodes as application temperatures increase.
- HF acid and strong caustics etch pH glass. High concentrations, especially at high temperatures, destroy electrodes quickly. For applications containing trace quantities of HF (<2%), use the +GF+ SIGNET 3-2714-HF or 3-2754-HF electrode. This electrode has a polymeric constituent in the pH glass that resists attack by HF and extends the service life considerably over "normal" electrodes.
- In applications where process temperatures will drop below  $10^\circ\text{C}$  ( $50^\circ\text{F}$ ), use the bulb-style electrodes in place of the Flat style electrode. This is a function of the electrical impedance of the glass that increases dramatically as temperature decreases.
- Proper electrode placement within a tank is also very important. Electrodes should be mounted in well-mixed areas, away from reagent and waste introduction. It is usually advisable to position the electrode near the discharge outlet of the tank.
- In-line pH control is not recommended because it is very difficult to determine the amounts of reagent necessary to achieve a desired reaction if both pH and flow are variables. However, in-line pH monitoring is very common and useful.