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Pulsafeeder Technical Bulletin

Troubleshooting pH/ORP Installations

If you are having difficulties getting a pH or ORP value to stabilize or read accurately in your process, there could be several issues causing these inaccuracies. These probes are sensitive glass electrodes. The measurement of pH compares the presence of hydrogen ions in the process to a reference electrode. An ORP probe measures the differential from a reference to a platinum rod. In short, they are measuring subtle chemical changes in the process. For best results, you want to ensure your installation is sound and you observe all operational limitations of the measurements devices.

Possible Issues:

- Probe Age
- Probe Maintenance
- Flow, Pressure, Temperature, and Storage Requirements
- Ground Loop Issues

Probe Age

Due to the nature and construction of these probes, they have a limited shelf-life. Probe readings will begin to drift with respect to time as the probe ages. Sitting on a shelf not in operation in a storage solution these probes only have a two (2) year life expectancy. In an actual process, the average recommended life span is one (1) year. Some processes may be more aggressive or sensitive and accelerate probe degradation. These processes would warrant more frequent probe replacement. However, routine maintenance and calibration can account for much of this drift. Our control unit does not allow for a calibration of more than +/-2.00pH. Calibration beyond this is not recommended. Probes which have drifted beyond a 2.00 variance are no longer reliable and should be replaced.

Probe Maintenance

Keep them wet! Never expose probe tips to air for more than 45 seconds.

Routine maintenance is important to maximize life expectancy and improve probe performance. Various contaminants interacting with the bulb of the sensor could cause a reading to drift or become unresponsive. Filtering the process solution can help protect the probe from debris damaging the sensitive optics. Cleaning and calibration monthly can help ensure your process remains controlled to the desired set point.

Sensor Cleaning

pH sensors: Mechanically intact pH sensors can often be restored to full response by the following procedures:

1. **Organic Oil or Grease** – Wash the sensor tip in a liquid detergent and water. If the film is known to be soluble in a particular organic solvent, wash the tip with this solvent. Rinse the sensor tip with tap water.

2. **Inorganic Scale Deposits** – Dissolve the deposit by immersing the sensor first in 0.1M (mole) Hydrochloric acid (HCl), then in 0.1M Sodium Hydroxide (NaOH), and again in 0.1M HCl. Each immersion should be for a five (5) minute period.

If these procedures fail to rejuvenate the sensor, the problem is most likely a clogged liquid junction. Cleaning the liquid junction involves heating a diluted Potassium Chloride (KCl) solution to 60 - 80°C (139 - 176°F). Place the sensor tip in the heated KCl solution before approximately 10 minutes. Allow the sensor to cool while immersed in the solution before re-testing. If these steps fail to improve the sensor's response – replace the sensor.

ORP Sensors: Flush ORP sensors with deionized water and measure the liquid in question. If the reading is incorrect by more than 10 mV, the ORP sensor should be cleaned with aqua regia: three volumes Hydrochloric acid (HCl), one volume concentrated Nitric acid (HNO3). Repeat the above tests. Once satisfactory readings are obtained, install the sensor and make a measurement in of the liquid in question. If this process fails – replace the sensor.

Flow, Pressure, Temperature, and Storage Requirements

These probes are only rated to work under certain conditions. Please observe the pressure and flow requirements of the probe, 0-125 PSI and 1 to 5 GPM. Failure to follow pressure limitations could irreversibly damage the sensor. Specifically, too much flow across the probe could extract the reference buffer inside the probe out of the semi-permeable membrane. The sensor should never be allowed to dry out; it should always be in an active process where the probe is submerged or moved into the provided storage vial in KCl 4 pH buffer. The sensor should always be stored within the recommended temperature. Low temperatures would risk freezing the reference buffer rendering it useless and high temperatures could cause accelerated entropic loss of probe performance.

Ground Loop Issues

A common occurrence is ground loop issues. Ground loop issues can occur when large electromechanical devices are contaminating the sample stream with stray voltage. Another concerning cause for stray voltage in the sample stream could be a metallurgic reaction within the process. It is important to ground the sample stream accordingly to prevent these electrical contaminants from interfering with the probe reading. A way to test if any issue encountered with pH and/or ORP readings is a result of ground loop issues is to remove the probe from the sample stream and place it in a test beaker isolated from the process. If the probe reads accurately in the test beaker, then the problem is likely a ground loop issue. Provided with all Pulsafeeder pH and/or ORP units is a stainless steel nipple with a clamp. This exists to give an easy access point to readily ground the process solution. Finding a true ground to wire the stainless steel nipple can be challenging. Ideally, the installation will have a copper clad ground rod driven 8ft into the ground connecting the stainless nipple with a wire should fix the issue. However, sometimes you will need to use an electrical ground or the ground pin on a power outlet. These are usually acceptable at resolving the issue. However, you might need to verify the integrity of the electrical ground. Occasionally, locations could have wired other pieces of equipment incorrectly resulting in a contaminated ground which could compound the issue. Additionally, moving the location of the nipple to the other side of the probe or potentially grounding the probe on both sides might be necessary depending on the direction of the stray contamination.