

Best Practice Layup Procedure Guide

pH Electrodes, Sensors and Probes

Many plants go offline and the amount of time they are down varies from a few hours to longer periods of a few weeks to several months or more. It is critical to keep liquid analyzer measurements ready to go when a generating unit is placed back online so there will be minimal issues. Below are recommended practices to implement during a layup.

pH Layup Requirements:

In general, short periods of downtime are not harmful to a pH system. Nearly all pH electrodes are packaged and shipped in a 'wet boot' to avoid problems. However, from time to time the solution in these boots will leak. Also, some applications (especially batch processes) will drain away from the process, thereby leaving an exposed pH electrode to dry out. When a pH electrode is allowed to dry out either in storage or in a process line or tank, the electrode's performance characteristics are affected. If dehydration is severe enough, the gel's ability to conduct the electrical potential through the glass is affected negatively, and this causes the pH reading itself to become slow and erratic. If the drying is allowed to continue, the pH measurement can shift upscale, and a shortened span can result. Therefore, it is always a good practice to remove the equipment and store pH sensors wet. The following are recommendations regarding how to prepare sensors for storage:.

1. If an FF20 flow assembly is used with Bellomatic reference electrode (SR20-AC32):

- Turn flow assembly flow off
- Remove probes from holder
- Put stopper in reference probe to stop KCI flow
- Place probes in 200 ml or similar beaker filled with neutral clean tap water or salty water. DO NOT use RO or DI water for storage, as this will deplete the junction of KCI and will cause improper readings and calibrations at startup.

The solution level will need to be checked to ensure the sensor bulbs remain wet.

2. If Wide Body (FU20, FU24) sensors are used:

- Turn flow assembly flow off
- Remove probes from holder
- Store in 3.3 M KCl solution, neutral clean tap water, or salty water

If in a closed container (i.e. the original shipping wet boot) then no further action is needed. However, if stored in an open container, the solution level will need to be checked to ensure the sensor bulb remains wet.

3. If Retractable (PR10/PH87) probes are used:

- Turn flow assembly flow off
- Remove probes from holder
- Store the sensors in 3.3 M KCl solution, neutral clean tap water, or salty water. If in a closed container (i.e. the original shipping wet boot) then no further action is needed

However, if stored in an open container, the solution level will need to be checked to ensure the sensor bulb remains wet.

- The holder body can be inserted back into the process for storage while the process is dry

“Dry Condition” recommendations

Electrodes exposed to longer “dry conditions” such as in an empty tank overnight or left sitting on a bench can be soaked in 1 of the following:

- a 4.01 or 7.00 pH Buffer solution
- a reference fill solution
- regular tap water

The length of time required varies in relationship with the amount of time the electrode was left dry.

3 considerations to remember regarding a dry electrode:

1. Importance of the pH measurement accuracy
2. How long the electrode was dry?
3. Can a delay in replacing the current in-line electrode be tolerated?
 - If the answer to 3 is “no time to wait”, then the electrode is inspected, cleaned and placed into service. A new calibration should be done within the next 8-24 hours after the installation to correct for changes in the gel layer.
 - If the answer to 3 is “we have time”, then a 4-hour soak will suffice for electrodes allowed to dry out for 3 to 5 hours. If extreme accuracy is required or the electrodes were dry for 8 hours or longer then an 8-hour minimum soak is required. Overnight is better

An electrode can be placed immediately into service with the understanding that some measurement uncertainty will exist. It can take up to eight hours for an electrode to fully recover from prolonged “dry conditions”. During this recovery period, measurement accuracy and response time will continue to improve up to optimum values. Please note that during this recovery period, a pH calibration will be marginally helpful. Accuracy is improved during the immediate period following the calibration. It must be recognized, however, that the gel layer is changing with exposure to process fluids and a second calibration will be required for best accuracy within the next 8 to 24 hours.

Conductivity:

1. If it is in standing still water, you might get “growth” on the sensor. It is best practice to take the sensor out and keep it dry to prevent any scaling or (green) buildup.

Dissolved Oxygen:

1. Optical DO (LDO) sensor – No need to remove or do anything, but preferable to take out and store dry to prevent any buildup.
2. For Galvanic and Polarographic Sensors –
 - Turn flow assembly flow off
 - Remove probes from holder
 - Check and refill the internal electrolyte solution if needed
 - Store the probes wet in either electrolyte solution or neutral clean tap water

If in a closed container (i.e. the original shipping wet boot) then no further action is needed. However, if stored in an open container, the solution level will need to be checked to ensure the sensor membrane remains wet. If allowed to dry out could cause cracking of the membrane.

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