

# pH Measurements for Corn Mash Slurry (Liquefaction)

## Application Description

Many Ethanol plants running today are using a combination style pH electrode with a non-flowing reference to measure pH in the Mash Slurry transfer line from the Mash slurry mix tank to cook. The Mash is being pumped out of the Mash Slurry tank is at approximately 82 °C and 2 to 4 bar (180 °F and 40 to 60 psig).

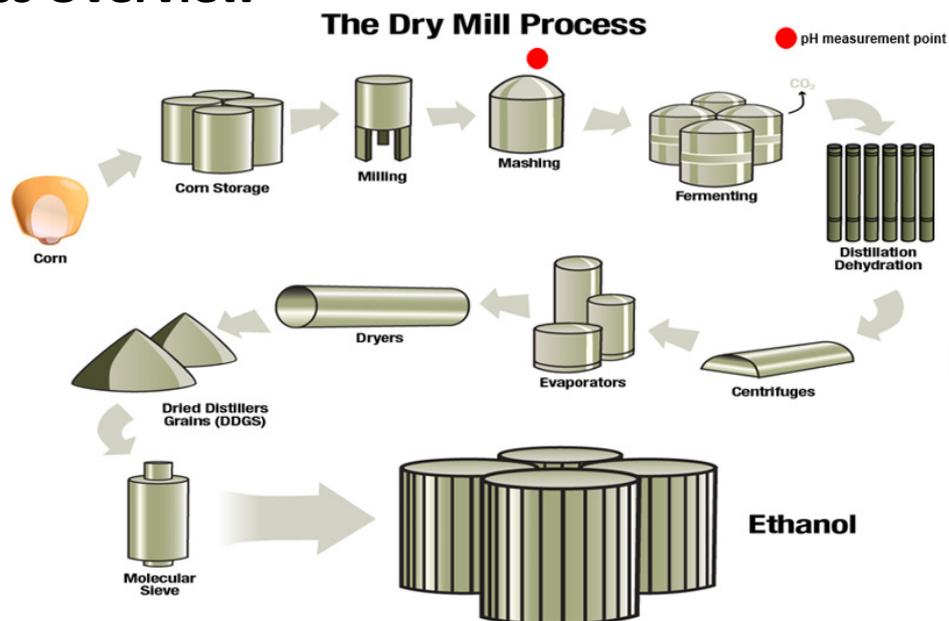
The original pH electrode systems that were installed during plant construction are online retractable assemblies and are mounted in orientations from completely horizontal to completely vertical and everywhere in between.



## The Problem

The combination probe that is being used will typically drift out of calibration very quickly. Also, the probe is damaged sometimes from excessive removal from the process. The reason this probe drifts out of calibration is due to the fact that the non-flowing reference system plugs and becomes fouled by the mash passing by it. pH measurements are only as good as the reference required to make this measurement. If the reference is not doing its job, the measurement electrode will drift.

## Process Overview



## Product Recommendations

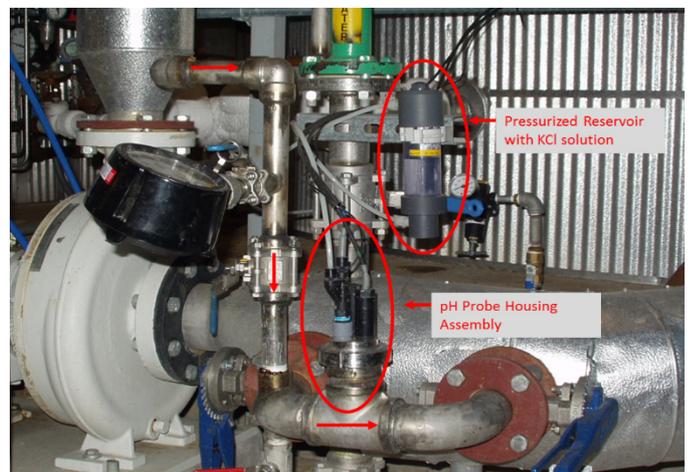
Yokogawa manufactures a multi-probe holder called the FF20 – flow through fitting or the FS20, which is pH chamber assembly with ½” NPT process connections. With these holders we use a combination electrode, part number: SC21C-AGC55 for measurement and reference and a separate temperature sensor part number: SM60-T1. The Yokogawa electrode system works due to the fact that the SC21C-AGC55 combination probe uses a pressurized reference system. By using plant air regulated to a KCl reservoir, the SC21C-AGC55 utilizes a positive flowing reference that does not foul.

Plants using this system typically check the pH measurement against a grab sample and only make adjustments if the sample and the online measured values are more than 0.2 pH difference from one another. Typically, the system will not need daily or weekly calibrations. Most plants will pull the electrodes once a month for cleaning and calibration in a standard 4 and 7 buffer solutions.

## Installation Considerations

The Yokogawa pH system is not retractable from the process. It is usually best to put the Yokogawa pH electrodes in a by-pass or recirculation line that you can add isolation valves for isolating the probes from the process for maintenance and calibration. The probe assembly should be mounted downstream of the Slurry Tank transfer pump. Ideally it will be in a recirculation line going back into the tank or into the suction side of the slurry pump.

The picture below shows an installation that is actually flowing from left to right. The arrows indicate the direction of the mash flow through the recirculation line and back into the suction side of the pump. You will get an idea of the installation of the Yokogawa probes and the pressurized reference KCl reservoir from this picture. The reservoir pressure is typically set 1 to 2 psig above the slurry line pressure. The KCl reservoir will require refilling every 2-3 months for most applications



Note: For additional information on this application contact the local Yokogawa Process Liquid Analyzer Department

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