

pH Measurement in Raw Milk



Background

Milk has a relatively short shelf life, so the speed of processing at the right quality is of paramount importance to the dairy industry. Process analytics play an important role in ensuring milk is of marketable quality. pH measurement is crucial in raw milk processing and monitoring as it serves as a key indicator of milk quality, freshness, and potential contamination.

Process

Fresh raw milk typically has a pH range of 6.6 to 6.8, and deviations from this range can signal bacterial growth, spoilage, or adulteration. Over time, naturally occurring lactic acid bacteria (LAB) and other microbes break down lactose into lactic acid, lowering the pH. This process is accelerated if milk is not stored at the proper refrigeration temperature. A pH below 6.0 indicates significant spoilage.

As soon as the pH falls below a specific value, the milk can no longer be marketed for direct consumption. Instead, it is processed into other, lower value, products such as casein and animal feed.

Monitoring pH at production plant reception helps detect milk spoiled in transit, bacterial contamination, and issues such as mastitis in dairy cows. A pH lower than 6.6 suggests increased acidity due to bacterial growth, while a pH higher than 6.8 may indicate adulteration or disease-related abnormalities. Monitoring pH at reception helps processors quickly identify and reject compromised milk, preventing quality defects in dairy products, improving shelf life, and ensuring compliance with safety standards.

Monitoring pH before and after pasteurization ensures proper heat treatment and identifies any unexpected changes due to bacterial activity.

Finished milk products are checked to ensure they meet pH specifications to confirm production consistency and shelf life.

ISFET pH Sensor Technology

ISFET pH sensors are an excellent choice for the measurement of pH in Milk. ISFET (Ion-Sensitive Field-Effect Transistor) pH sensors are glass-free, making them well suited for milk processing by satisfying a critical safety factor in food production. They are durable, have fast response time to changing pH and can withstand frequent cleaning and sterilization processes.

Being solid-state, ISFET sensors are very rugged. Their rapid response ensures accurate real-time monitoring, which is essential for detecting pH changes during reception, storage, pasteurization, and during final product checks. Their ability to withstand frequent CIP and SIP reduces overall maintenance and downtime.

ISFET sensors equipped with Memosens technology provide the additional advantage of having built in data storage to hold calibration and diagnostic data. With contactless digital signal connection to their associated electronic unit, they are impervious to moisture and signal cable interference, providing stable, accurate and reliable pH measurement, even in wet/wash down areas of the plant.



The SFI Solution

The ideal pH measurement loop for milk processing consists of an ISFET pH probe, advanced pH transmitter for local display and control system connectivity, and optionally, a sanitary retractable housing to remove the probe from the process without the need to shut down the line.

Properly specified solutions can provide reliable pH measurement for incoming raw milk testing, processing, and final product checking. Glass-free sensors remove the risk of contamination while Memosens technology reduces noise and eliminates failures due to the wet environment.

Adding a retractable housing further enhances maintainability, allowing probes to be removed/inserted into process lines aseptically without the need to shut down.



OCPS77E non-glass pH electrode

- Memosens Technology: Inductive digital communication through IP69 connection.
- Process safety: non-glass-design removes risk to product.
- Hygienic design: Certified to meet EHEDG/3-A sanitary standards. Wetted materials are FDA compliant and fully sterilizable.
- Specification: Operates in high pressure and temperature environments.



OCM44 Transmitter

- Easy to operate through an intuitive menu driven user interface with a clear display.
- Wide range of discrete and digital I/O for supervisory control system connectivity.
- Connect up to 8 Memosens probes and sensors in one unit.



Extract 830 Sanitary Retractable Housing

- Cost saving: Allows immediate removal of the probe from the process without the need to shut down the line.
- Hygienic: EHEDG/3-A design allows for re-sterilization of probes before reinsertion into the process.
- Specification: available with a wide variety of hygienic fittings.
- Safety: Advanced design prevents operation when no probe is installed and precludes removal of the probe when inline.
- Automation: automatic system available to automatically retract/clean/sterilize and return the probe to service available.



- **Improve Product Quality:** Real-time measurement against offline sample analysis allows for immediate process correction.
- **Increase Reliability:** Contactless signal transmission eliminates moisture-related failures in areas with frequent washdowns and high humidity.
- **Glass-Free:** ISFET sensors are glass-free, eliminating any risk of glass contamination from broken probes.
- **Easy Maintenance & Calibration:** Sensors are “plug-and-play” and can be pre-calibrated in a controlled environment to reduce plant downtime. Calibration data is stored in the probe and uploaded to the electronic unit when connected – simple and effective.
- **High Accuracy & Stability:** Memosens technology enhances data integrity by preventing signal loss or drift from connection issues, ensuring consistent pH monitoring throughout milk processing.
- **Durability in Harsh Conditions:** ISFET probes are resistant to CIP (Clean-in-Place) and SIP (Sterilize-in-Place) procedures.
- **Digital Data Storage & Traceability:** Memosens probes maintained ready to go with calibration and diagnostic data stored directly in the sensor significantly reduce risk from unexpected failures.

GET IN TOUCH

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