

METTLER TOLEDO APPLICATION NOTE

pH Measurement In Churning Processes Process Step: Cream Maturing

BACKGROUND

The process of butter making can be described as an inversion of the original cream emulsion. The system of fat droplets dispersed in water is converted into a continuous phase of fat containing water droplets.

The cream is inoculated with a bacteria culture (streptococcus lactis, streptococcus diacetylactis, streptococcus cremoris, leuconostoc cremoris). The lactose and citric acid in the cream are consumed by these bacteria, building lactic acid, flavor, and carbon dioxide.

The initial pH of the cream is approximately 6.6. The fermentation occurs at a temperature of 64 – 66 °F. The optimal pH value of 4.8 is reached after 12 - 14 hours.

Due to decreased lactose concentration and lower pH values, the activity of the bacteria also decreases but does not completely stop. To avoid too much acidity, the content of the vessel must be cooled down to 53 - 55 °F when pH 5.3 is reached. The cream is now ready for the butter process.

THE PROCESS

A potential problem in pH measurement in butter processing is contamination of the electrode diaphragm by proteins and fats. Potassium chloride from the reference electrolyte and proteins in the process may precipitate and clog the diaphragm, making accurate measurement impossible.

The cream is unstirred during the fermentation to avoid butter build-up in this process step. The viscosity of the cream changes during fermentation, ending with a yogurt-like consistency.

INSTRUMENTATION

Mettler Toledo features two different measuring systems that have a proven record in the dairy industry, depending on measurement preferences and specific requirements.

The system recommended for side entry applications is the InPro® 2000 refillable pH electrode mounted in an InFit® 764-50CIP insertion housing. To eliminate the problem of diaphragm clogging due to high protein content in the process sample it is recommended that FRISCOLYT electrolyte be used. When used in conjunction with the InFit 764-50CIP housing at a recommended overpressure of 22 – 29 psi, users are assured a hygienic, sterilizable measurement system.

An alternative system is a side entry installation using the gel-filled DPAS pH electrode installed in an InTrac® 797 retractable housing. The DPAS is pressurized and features our patented silver ion trap which prevents back-flow reference cell contamination and diaphragm clogging. The InTrac 797 housing allows users to retract the sensor to perform routine maintenance or to replace a sensor without process interruption. Furthermore, the twin chamber lock effectively prevents any external contamination and allows for steam sterilization within the housing.

All Mettler-Toledo pH electrodes are compatible with the 2100 pH Analyzer.

PRODUCTS

2100 pH Analyzer

- FM and CSA Approved
- IP65 weatherproof, corrosion-resistant enclosure
- Continuous system and sensor diagnostics
- Auto Buffer Recognition for accurate and easy calibration
- 3 programmable relays with a 4th for wash capabilities

InPro[®] 2000 Combination pH Electrode

- Refillable for increased electrode lifetime and reduced maintenance
- Liquid-fill design ensures fast response, highest accuracy and reliability
- Silver ion trap to minimize electrode contamination
- Integral RTD for higher measurement accuracy
- Rugged IP67 rated quick connect VarioPin connector

InFit[®] 764-50CIP Housing

- EHEDG and 3A Certificate for CIP Applications
- Ease of installation provide reduced maintenance
- FDA positive-listed O-ring Material

405-DPAS pH Electrode

- Gel electrolyte eliminates fill requirements to reduce maintenance
- Steam-sterilizable & autoclavable for hygienic and CIP/SIP applications
- Choice of K8S or VarioPin connectors for ease of use

InTrac[®] 797 Retractable Housing

- Stainless steel construction provides maximum chemical resistance
- Twin-chamber lock ensures optimum sterility
- Retractable design allows electrode to be serviced and calibrated without process interruption
- Manual or pneumatic operation