



**INGOLD**

Leading Process Analytics

## Replacement of Lost Products with Automated Non-Glass pH Measurement

**During the cheese drying process a fair amount of product is lost down the drain through the wet scrubbing of the exhaust air. With the use of the METTLER TOLEDO EasyClean 400 and InPro 3300 ISFET this lost product can be recovered and the water reused.**

### **Cheese production in the US**

About 2/3 of the milk produced in the United States is converted to cheese or cheese products. This roughly equates to about 9.4 billions pounds (4.26 billions kg) of cheese. A significant portion of this cheese is used in the process for producing powdered cheeses, with applications ranging from cheese flavoring to powdered cheese coatings on snack foods. Most major producers of cheese will powder their cheese in one form or another.

### **Cheese drying process**

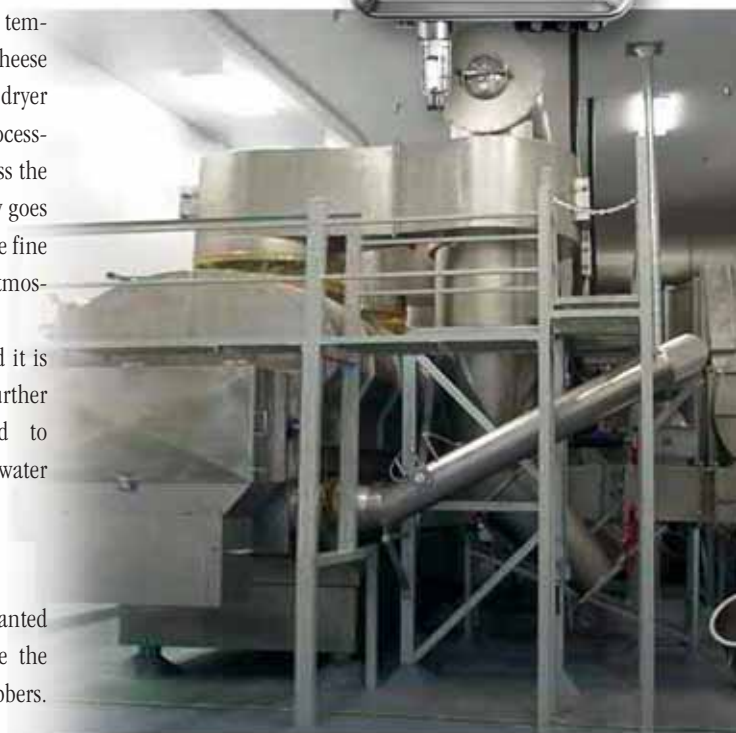
The process of making powdered cheese is a fairly simple one. Cheese is melted into a liquid form and is mixed with water and salts to achieve a mixture that is about 35% solids at a temperature of about 75 °C. From there the mixture is atomized into

a large column that has an internal temperature around 180 to 190 °C. The cheese powder then falls to the bottom of the dryer cone and is collected for further processing or packaging. During this process the hot exhaust air is vented and usually goes through a wet scrubber to capture the fine cheese particles before going to atmosphere.

Once the scrubber water is saturated it is then dumped to the waste water for further processing before being released to the municipal water system and new water is brought in to repeat the cycle.

### **What the customer needed**

A large US cheese manufacturer wanted to optimize their process to reduce the amount of cheese lost to the scrubbers. This would reduce costs in 2 ways:



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- 1) Minimize the amount of valuable product lost through the scrubbers, and
- 2) Minimize the wastewater treatment cost by reducing the amount of dumped scrubber water.

Our customer investigated the possibility of reusing the scrubber water as opposed to dumping it, enabling them to reclaim the cheese from the scrubber water and save on water by reintroducing it into the cheese/water mixture. What they confirmed was it was not only a viable option, but also could be a significant cost savings.

A major parameter of the process for reuse of this water was to monitor the pH to a very tight tolerance, as tight as  $\pm 0.2$  pH in some cases.

This tight pH range is both critical – to the efficiency of the reclamation process and – to the way water and acid is dosed into the scrubber.

Another critical requirement for this application was that it needed to be a non-glass solution. This process was very near to the final stages of processing so a glass pH electrode was out of the question.

### METTLER TOLEDO solution

METTLER TOLEDO recognized the difficulty of this application and recommended a solution that would not only address the technical aspects but also help in the automation of a process, which was in the past, very labor intensive.

The following components, together, form a full measurement, cleaning, and calibration system:

- The InPro 3300 ISFET solid state sensor
- The M700 transmitter with the EC 700 module and additional 2700 i module for the use of the InPro 3300 sensor
- The EasyClean 400 automated cleaning and calibration system
- The InTrac 798e Hygienic Housing

By leveraging our knowledge of the F&B experience with our advanced liquid analytics product line, we were able to offer a total solution to achieve the process improvement targets of the customer and deliver results to the bottom line.

### Precision, reliability, and safety

METTLER TOLEDO's InPro 3300 sensor satisfied the first critical need of the customer; accurate pH measurement with a non-glass sensor. By using the EasyClean 400 system in combination with the InTrac 798 e housing we were able to tackle multiple problems with outstanding results:

#### □ Increased accuracy and reduced manpower:

The customer found that by doing calibrations close to the range of the process parameter they were able to maintain a very high level of accuracy. The EasyClean 400 was able to do this through its automated calibration feature and reduce the manpower that was normally required. Accuracy was maintained automatically and was verified through offline side by side sampling. The level of confidence in the system grew with each sample as the system proved it was able to consistently calibrate itself without any user intervention.



InPro 3300.

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□ **Increased sensor life:**

The EasyClean 400 delivered longer sensor life through the automated retraction and cleaning of the InPro 3300. This particular process is a very high protein application and constant cleaning is essential in order to maintain the accuracy required. As with most F&B application this is usually accomplished with in-situ hot CIP cycles. In order to protect the InPro 3300 from these harsh cycles the EasyClean 400 system retracts the sensor and places it in a buffer solution during CIP cycles. When the dryer system is ready again the sensor is calibrated and sanitized by the EasyClean 400 and placed back into the process. This was easily accomplished through the use of the custom programming features of the EasyClean 400.

**Summary**

METTLER TOLEDO has been working with the Food and Beverage industry for many years and has the expertise and the product line to meet the tough requirements of this industry. Our customer had a tough application with some mission critical requirements. With our non-glass InPro 3300 and our EasyClean 400 automated cleaning and calibration system, we helped our customer achieve their targeted process improvements with additional cost savings and operational benefits than they initially expected.

**Key benefits of the InPro 3300**

- Unbreakable electrode
- pH 0 to 14
- 0 to 80 °C (32 to 176 °F)
- 0 to 6 bar (0 to 87 psi)
- 45° design prevents air bubble problems
- Stable measurement values
- Almost no alkaline or acidic errors
- Rated to IP 68
- Hygienic design/sterilizabile

**Key benefits of EC 400**

- Automatic cleaning and sensor calibration
- Freely programmable cleaning sequences and time intervals
- Minimum consumption of buffer and cleaning solution
- Flexible system integration
- Low maintenance costs



M 700 transmitter.



EasyClean 400.



▶ [www.mt.com/cleaning](http://www.mt.com/cleaning)

▶ [www.mt.com/pro-pH](http://www.mt.com/pro-pH)

## Optimize your pH Measurement during Cream Maturing Process

Depending on the measuring preferences METTLER TOLEDO offers three measuring systems to control cream maturation in the churning processes. High accuracy, best reliability and low maintenance are typical for all three systems.



### Cream maturing process

In the process of butter making the cream is inoculated with a bacteria culture. 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 about 6.6 and the fermentation temperature is 18 to 19 °C/64 to 66 °F. The optimal pH value of 4.8 is reached after 12 to 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 12 to 13 °C/53 to 55 °F when pH 5.3 is reached. The cream is now ready for the butter process.

### pH process control – indispensable

A potential problem in pH measurement 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.

### 3 solutions from METTLER TOLEDO

METTLER TOLEDO features three different measuring systems, depending on measurement preferences and specific requirements. All METTLER TOLEDO pH electrodes are compatible with the transmitter pH 2100 e.

#### 1<sup>st</sup> solution:

##### InPro 3300 – the unbreakable

METTLER TOLEDO recommends the combined pH electrode InPro 3300 with a solid-state pH sensitive part (ISFET) and a high temperature reference for highly demanding processes. The non-glass technology eliminates the risk of broken glass in your process. Together with the hygienically designed retractable housing InTrac 798 this electrode offers real-time pH control of the dairy process without time consuming grab-sample analysis. The high temperature reference system with gel electrolyte, makes the electrode practically maintenance-free. It is pressure-resistant up to 6 bar at 130 °C and fully ster-

ilizable. The 45° design of the electrode end prevents air bubbles from being trapped at the pH-sensitive tip. The electrode is compliant with 3-A sanitary standards and with the EHEDG regulations.

#### 2<sup>nd</sup> solution:

##### InPro 3250 – for highest performance

In this case the pre-pressurized, liquid-filled pH-electrode InPro 3250 is installed in an InTrac 797 or in an InTrac 798 retractable housing. The InPro 3250 with built-in RTD (Pt 100 or Pt 1000) and Vario-Pin connector is pre-pressurized. The silver-ion trap prevents backflow reference cell contamination and diaphragm clogging. The InTrac housings allow electrode cleaning/sterilization/exchange without process interruption.

#### 3<sup>rd</sup> solution:

##### InPro 2000 – solution provider

This system consists of the liquid filled pH-electrode InPro 2000 with built-in RTD and the housing InFit 764-50 CIP. The glycerol content of FRISCOLYT® prevents diaphragm clogging due to high protein content in the process sample. When used in combination with the InFit 764-50CIP housing at a recommended overpressure of 1.5 to 2 bar (22 to 29 psi), users are assured a hygienic, sterilizable measurement system.



InPro 3300.



InPro 3250.



InPro 2000.

[www.mt.com/pro-pH](http://www.mt.com/pro-pH)

## Versatile and Reliable Transmitter for Single- and Multiparameter Solutions

The M300 transmitter series for pH/ORP, oxygen, and conductivity measurements combines robustness with ease of use. High versatility and reliability make this instrument the ideal choice for your basic process applications.

The M300 is a multi-purpose, single or dual parameter transmitter for pH, oxygen, or conductivity measurements – or for two of them at the same time.

### Key benefits at a glance:

#### Ease of use due to advanced design

The M300 transmitter series are designed for easy operation

- Large, dual-value display with four text lines allows reading under weak light conditions
- Intuitive software for immediate use without extended training
- Harmonized user interface for all parameters for easy menu navigation

#### Optimized process control

Continuous innovation for better process control: the M300 meets your requirements for reliable in-line measurement.

- Superior accuracy results are guaranteed by proven measurement technology and sensor diagnostics.
- Versatile PID controller for enhanced process control
- A user-friendly and sophisticated “Quick Setup” routine guides you through the first settings.
- With the multi-parameter version, switch easily between measurement parameters.

#### Ready for future demands with USB interface

- Use the PC-based configuration tool for comfortable access to all settings, including up- and download.
- Open to the future: upgrade the transmitter software at any time using the USB port.

#### Dual-Channel for versatility

With the dual-channel option, both channels are user-definable, making the transmitter ideal for a wide range of applications for the following parameters:

#### pH

- Sensor monitoring through diagnostic features
- Easy calibration based on auto buffer recognition and process calibration
- ORP measurement available at all times

#### DO

- More accurate measurements through salinity and pressure correction
- High DO measurement range
- Units: mg/l, % saturation, ppm

#### Conductivity

- Wide application coverage due to compatibility with 2- and 4-electrode cells
- Selection of solubility curves for salts

#### New M300 digital version

In addition to the analog version the digital M300

- accepts digital pH/ORP and DO sensors
- offers ISM plug and measure functionalities as auto-configuration, use of calibration data (stored in the sensor) and additional sensor information as type, serial and part number.

▶ [www.mt.com/ISM](http://www.mt.com/ISM)

▶ [www.mt.com/transmitter](http://www.mt.com/transmitter)



M300 transmitter.



InPro 3250 i.

InPro 6850 i.

# New Developments in Process Analytics

**METTLER TOLEDO delivers powerful solutions to optimize your processes and reduce maintenance costs. Recently, we introduced new intelligent technologies that allow you to improve handling and optimize maintenance thus addressing your most pressing needs.**

## **ISM – the next generation of intelligent process analytics!**

With the groundbreaking ISM technology METTLER TOLEDO provides another milestone in process analytics measurement!

Dissolved oxygen sensors and pH electrodes with integrated preamplifier are using a new technology with “Plug and Measure” and intelligent diagnostics functionalities. The Intelligent Sensor Management (ISM) technology simplifies all maintenance operations of the sensor. Process interruptions are shorter or even avoided, leading to enhanced productivity.

## **iSense – the key to maximize the benefits of the ISM technology**

iSense ISM Asset Suite allows efficient and easy verification and calibration of METTLER TOLEDO digital ISM pH and DO sensors in an instant with an intuitive software application that includes advanced analysis and documentation functionalities to support your sensor management.

## **Digital transmitter line M300**

The digital M300 transmitter represents an easy-to-use version of the M300 transmitter line. Its unique “Plug and Measure” features enable a fast start-up and robust measurements for digital pH/ORP and dissolved oxygen sensors. Its versatility and reliability make this instrument the ideal choice for a wide range of applications.

If you want to take advantage of these advanced products ask your local METTLER TOLEDO representative or visit [www.mt.com/ISM](http://www.mt.com/ISM).

# ISM



**iSense**  
ISM Asset Suite



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