



**INGOLD**

Leading Process Analytics

## Inline pH measurement improves consistent grade of end products

**pH is one of the most critical measurement parameters in the production of cheese. Because of this, modern industrial cheese manufacturers have implemented pH standardization procedures in both the basic milk and the specific cheese production process in order to achieve a consistent grade of end product.**

### **pH measurement in the process**

Lowering and standardizing the pH value in milk for cheese production requires one of four different agents: Lactic acid, gluconic acid, CO<sub>2</sub>, and specific acid-bearing whey molecules. In the case of soft cheeses, citric acid is also used. Lowering the pH value prior to the addition of enzymes (rennet) for breaking down the protein accelerates the action of the enzymes. This optimization of the process offers an excellent potential for savings in consumption of rennet preparations to the extent of 40% or more, as well as the possibility of reducing production times.

In cases where pH is set to a standard value by the addition of acid, the cheese-maker has to measure and document the pH value of each bath before adding the ren-

net. This is very time consuming for an industrial operation and harbors a permanent source of error. Very precise pH measurement is necessary as +/-0.05 pH units can result in 50% more or less activity of the rennet.

In the past, the method of pH measurement used was a central laboratory to which samples are brought. This is not a desirable way to measure pH as the pH value is very susceptible to environmental influences such as temperature. Changes in the grab sample temperature can shift the pH measurement up to 0.2 pH units introducing a great deal of error!

Measuring pH inline has tremendous benefits such as a more reliable live measurement, ability to control the process



**METTLER TOLEDO**

instantly, and the labor savings alone can yield an immediate return on investment.

Mettler-Toledo Ingold is the world leader in inline pH measurement for multiple industries. Our pH electrodes are widely recognized as providing the most dependable measurements in the most difficult conditions.

### The METTLER TOLEDO pH solution

Mettler-Toledo Ingold offers two pH electrodes that are ideal for process measurements in the dairy industry.

The first electrode is the InPro 3250SG. This glass electrode is a pre-pressurized, liquid-filled, low maintenance pH and temperature sensor. Its robust pH sensitive glass membrane can stand up to the harsh conditions in the cheese production processes and the proprietary ceramic diaphragm allows a constant flow of electrolyte which resists fouling and supplies the most accurate and reproducible of measurements.

The second electrode is our innovative non-glass InPro 3300 sensor that is unbreakable and therefore eliminates the risk of broken glass in your process. This ISFET sensor has an FDA compliant PEEK body design which is 3A and EHEDG certified for hygienic use in the food industry.

### Customer benefit

Utilizing either the InPro 3250SG or the non-glass InPro 3300 pH sensors directly in the cheese making process will increase yield, improve product quality as well as provide a live accurate measurement of pH without having to bring samples to a central laboratory.

### No process downtime with InTrac 798 e

One challenge that customers may have installing an inline pH sensor is the interface of that sensor into the process. To answer this challenge, Mettler-Toledo Ingold has developed the InTrac 798e retractable housing which was specifically developed for applications based in the food industry.

The InTrac 798e allows the user to easily retract sensors from the process for cleaning and or calibration without the need of shutting down the process. The innovative design of the housing utilizes any of INGOLD's 12 mm diameter and 120 mm

length pH, conductivity or dissolved oxygen sensors. This allows for easy upgrade possibilities for future plant expansions.

The InTrac 798e has a unique design concept that was engineered specifically to meet the demanding hygienic requirements found in the dairy industry. The housing has a very high surface finish of Ra16 which allows for the ultimate in cleaning in place (CIP) efficiency. The InTrac 798e features EHEDG certification for hygienic design which is widely recognized as the strictest clean-ability compliance available.

INGOLD products have been designed specifically to take pH measurement from the central laboratory to the process and yet still meet or exceed the challenges associated with hygienic design, durability and accuracy of the pH measurement.

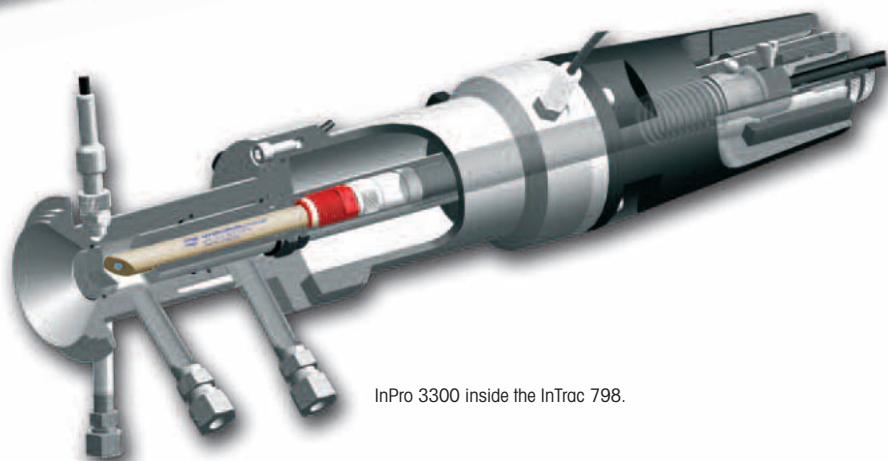
► [www.mtpro.com/pH](http://www.mtpro.com/pH)



InPro 3250SG.



InPro 3300 pH electrode.



InPro 3300 inside the InTrac 798.

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## Turbidity measurement controls cow water and product to water transition

**Turbidity measurement is important in the dairy process regarding cost savings and the detection of contamination. Sensors utilizing scattered light detect contamination in cow (condensate of whey) water lines as well as product to water interface during water push-outs.**

### Background

Product quality and productivity are both important cornerstones of a modern and competitive dairy producing business. The basis for success calls for the use of implementing an optimized process management system and employment of effective methods for optimizing product yield and increasing plant efficiency. Two areas of particular interest are product and water optimization and cow water monitoring.

### Transition of water to product

In several different applications in the dairy industry, transfer lines are flushed with water for cleaning purposes. Turbidity products are often used to avoid raw product loss and for water optimization by using light scattering to detect the transition of water to milk. Automated detection of process transition allows a plant to eliminate waste of product and of water.

■ The InPro 8100 or 8200 backscatter turbidity sensors has nearly immediate pay back by reducing loading on the waste treatment facilities, minimizing product loss and lowering water consumption. These backscatter turbidity sensors detect the amount of light energy that is scattered back to the sensor. They have a highly polished 12 mm stainless steel body which eliminates contamination concerns and offers a cost effective measuring option for the end user. Process adaptation is easy with a variety of housings that offer a host of connection types.

### Cow water monitoring

Condensed water vapors that are removed from dairy products during product concentration/evaporation tend to have undissolved solids. This water is termed cow

water and the solids that are present in it can often support bacterial growth and may lead to contamination. Because of this fact, cow water is considered non-potable and can not interact with dairy products.

Views towards cow water are changing in the dairy industry because of the necessity of recycling the water. Instead of sending the cow water to drain, it is being filtered and used in plant utilities or in non-product contact cleaning applications. The recovery and reuse of cow water requires reverse osmosis systems to remove impurities and turbidity systems to verify the removal of solids.

The amount of milk solids in the filtered cow water needs to be monitored by turbidity instruments in the lines of the various collection points of the evapo-



InPro 8200 backscatter turbidity sensor.

rator/condensers. Cow water will be diverted via valves out to waste when the turbidity values exceed a pre-determined value

### Cow water recycling benefits

The recycling of cow water in the dairy industry has a number of advantages:

- Fresh water savings on amount of water required for plant operation.
- Savings associated with waste output charges.
- Recovery of heat in the water put to use in the plant.
- Reduction of materials needed in any cleaning cycles

Turbidity measurement of cow water is therefore on the sharp increase in the dairy industry. Turbidity is required to verify that all solids have been removed from the process and that these solids will not be detrimental to the product or to plant utilities.

### METTLER TOLEDO solution

- The Trb 8300FS transmitter in conjunction with the InPro 8400 flow through turbidity sensor represents the INGOLD solution for this application. The sensor requires virtually no maintenance and is pre-calibrated in our facility, so system standardization is not required. This product utilizes forward scattered light to detect particles which may be invisible to the naked eye. The sensor is mounted as a flow through in line system that can detect specific levels of particles in the cow water. The Trb 8300FS transmitter can then automatically signal to a valve to send problematic cow water to drain before it gets downstream.

Mettler-Toledo Ingold's turbidity systems are a beneficial to the dairy industry in which this type of monitoring is an ever increasing requirement. Our product offering and exceptional customer support make our product portfolio an ideal fit in the marketplace.

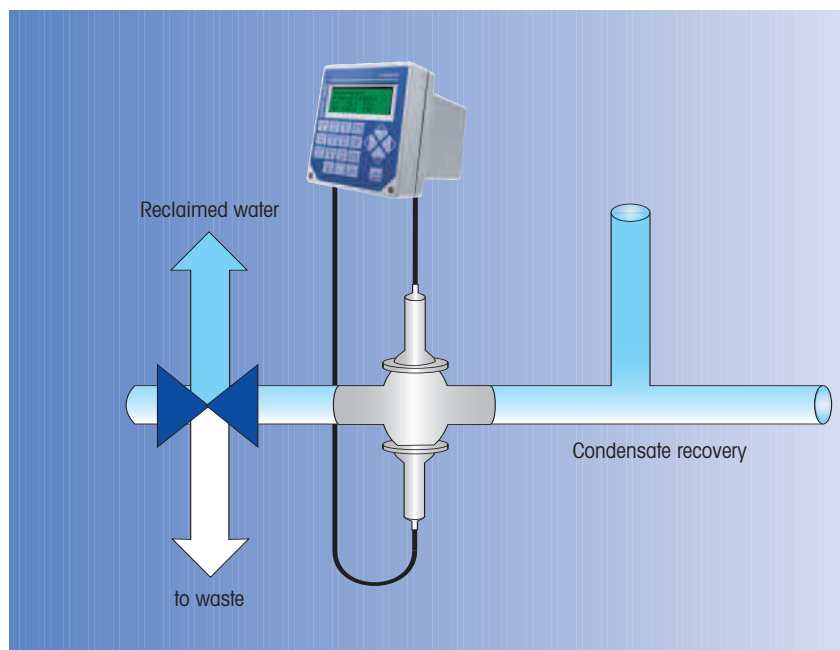
► [www.mtpro.com/turbidity](http://www.mtpro.com/turbidity)

### Benefits of the InPro 8400 turbidity sensor include:

- High accuracy and resolution
- Very limited maintenance
- Wide variety of line sizes & fittings available
- Multipoint factory calibration
- IP 65 waterproof for use in wet environments
- Durable stainless steel design



InPro 8400 sensor with sanitary design.



The turbidity system continuously measures the undissolved particle concentration in condensate.

## Cost savings with conductivity measurements in CIP processes

**CIP processes prevent bacterial growth and contamination. Proper control will ensure system disinfection and improve product quality. It also allows accurate adjustment of caustic soda and acid concentration, avoids unintended mixing of different cleaning solutions, and optimizes the use of the cleaning agents.**

### Introduction

CIP processes are critical in the dairy industry for proper cleaning and disinfection. These processes are also well suited for this market because cleaning and disinfecting solutions can be circulated through process piping which eliminates the need for dismantling the equipment and using labor intensive manual cleaning. In most food plants, the CIP agents are kept in multiple tanks and are often reused to save cost. These agents are also used in a specific sequence and in a particular interval both of which lead to conductivity as a necessary measurement for the optimization of cleaning in place.

During “Cleaning-in-Place” (CIP) and “Sterilization-in-Place” (SIP) procedures, the conductivity sensor is subject to severe material stress. Caustic and acidic concentrations of up to 5%, pH values ranging from 0–14, temperatures of up to 140 °C / 284 °F and pressures reaching 4 bar/ 58 psig (at 140 °C/284 °F) are only some of

the extreme conditions confronting a sensor in a CIP/SIP environment. In addition, the sensor must be made of FDA compliant materials of construction in order to qualify for unrestricted use in the industrial food sector.

### Solution

One sensor that meets these requirements is the METTLER TOLEDO InPro 7108 conductivity sensor. In addition to performing in such harsh conditions, the InPro 7108 four electrode cell has a very dynamic measuring range from 20µS/cm up to 800 mS/cm. For direct measurement of (process) temperature and for accurate compensation, the conductivity sensor is equipped with an integral Pt1000 temperature sensor.

The InPro 7108 is available with a durable PEEK body that resists chemical attack and the smooth flat surface design of the sensing area virtually eliminates fouling. The sensor is constructed with FDA compliant materials of construction and offers a NIST/ASTM traceable cell constant.

### Advantages at a glance

- Optimized use of caustic soda and acid with a more accurate and faster reading
- Accurate detection of water/caustic interface detection
- Reduction of load to the water treatment area
- Live monitoring of concentration of the caustic in the bulk tank
- Simple sensor process adaptation with a compact sensor design
- FDA compliant materials of construction

### Benefits of the InPro 7108 Conductivity sensor include:

- Withstands over 200 sterilization cycles
- Durable PEEK body design
- No polarization effects
- High accuracy and resolution
- FDA compliant materials
- Wide variety process connections

► [www.mtpro.com/conductivity](http://www.mtpro.com/conductivity)



InPro 7108 Conductivity Sensor.

# Outstanding digital communication capabilities

**METTLER TOLEDO "Advanced Line" transmitters offer HART®, PROFIBUS® PA and FOUNDATION Fieldbus® (FF) communication for measurements of pH, Redox (ORP), DO and conductivity.**

The "advanced line" transmitters feature built-in diagnostics to provide continuous self-check of both sensor and transmitter, and allow users to perform proactive maintenance. A large LCD display with plain text and pictographs guarantees user-friendly handling and total control of all transmitter functions.

Designed for high reliability and safety, the "x100e PROFIBUS PA and FF" transmitters are available as intrinsically safe versions for operation in hazardous areas and are in accordance with the FISCO (Fieldbus Intrinsically Safe Concept) model. Fieldbus installations are employed worldwide in a wide range of applications in the chemical, petrochemical and pulp and paper industries as well as in pharmaceutical and food & beverage processes.

Fieldbus transmitters offer the benefits of digital communication such as a) convenient set-up and configuration of the transmitter from a central control room, or b) field diagnostics via the fieldbus.

With a broad-based portfolio of transmitters with HART, PROFIBUS PA and Foundation Fieldbus communication, hazardous or non-hazardous areas versions, METTLER TOLEDO enables full integration of your measuring system into a PLC.



pH transmitter 2100 e PA.

► [www.mtpro.com/transmitters](http://www.mtpro.com/transmitters)

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