Sugar Starch & Yeast
Perspectives in Liquid Process Analytics
News 4

pH measurement in sugar manufacturing – application challenges and product solutions

Processed sugar can be obtained from one of two sources; from raw sugar cane or beets. In both cases the general process includes many steps get to the final product. In many of these steps it is critical to monitor and control the pH of the process. The wide range of pH, high temperatures and low conductivity of the process presents a substantial application challenge.

The Challenges

A large US sugar refinery that produces sugar from beets was having great difficulty with their pH measurement in their sugar process especially in the purification step. The problem was that the sugar was fed into ion exchange units so the process had a very low conductivity of less than 2 µS/cm. This low conductivity caused so much online pH measurement deviation that it was considered an unreliable measurement. The action of taking grab samples back to the lab for offline pH measurement was not an efficient solution for the facility because the production of sugar is a continuous process and any delay in obtaining results could affect the integrity of the product and lower the amount of production.

Other measurement challenges were present in this process that needed to be overcome as well. Many steps in the sugar production process require pH adjustment and high temperature in order to refine the product, and that can lead to problematic pH measurement. Characteristics of sugar production processes such as high suspended solids and thick viscous process also tend to foul pH sensor reference junctions which will likely impair online pH measurement.

The Solution

The ultimate solution provided by METTLER TOLEDO was the InPro 3200 SG pH sensor and the InTrac 777 e retractable housing. The InPro 3200 SG was ideal for this customer's process because it has a

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Retractable housing InTrac 777 e.

pre-pressurized reference system that provides a positive flow of reference electrolyte. This pressurized flow helps to maintain an excellent reference potential even at high process flow rates, and because the electrolyte is concentrated it works well even in low conductivity steps. The flow of electrolyte also helps to prevent the fouling of the reference junction which is critical to maintain reference potentials especially in a continuous process.

The facility chose to insert the InPro 3200 SG sensor into the process via an InTrac 777 e retractable housing. The InTrac housing facilitates the removal of the sensor from a continuous operation without process interruption.

By installing this housing, the customer is now able to remove the InPro 3200 SG sensor from their process to clean, calibrate or replace the pH sensor without having to shut down their production. This increases process up time and ultimately saves money while maintaining process quality.

The Results

Performance of the pH sensor was tracked by comparing the sensor to offline pH measurements in a laboratory. The correlation of the online METTLER TOLEDO system to the lab pH measurement was deemed to be excellent. After one year of service, the electrode still functioned with near ideal specifications for slope and offset. Electrode calibration occurs when the pH measurement drifts 0.2 pH units from the offline sample or once monthly during routine product maintenance cycles.

The implementation of the InPro 3200 SG pH sensor and the InTrac 777 e not only assisted the plant in maintaining accurate online measurement, but also increased sensor life, minimized process downtime, and increased product yield. The application challenge that the facility could not overcome with competitive sensors was solved quickly and effectively by using innovative METTLER TOLEDO pH sensor technology. ■

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New InTrac retractable housings – when process

The InTrac 777 e/797 e retractable housings have been specifically designed for use with 12 mm electrodes and sensors for the measurement of pH/redox, dissolved oxygen, CO_2 and conductivity.

The concept

The new, improved InTrac retractable housings offer enhanced reliability and operational safety due to a completely new sealing and bearing concept. These housings are dedicated to harsh and demanding applications in the chemical process industry where the use of pH/ORP probes with liquid or gel/polymer electrolyte is necessary to control and monitor the conditions of the process.

The safety

Complete separation of the sealing and bearing functions improves operation and reliability even in highly contaminating applications. TRI-LOCK™ features several safety elements, consisting of sensor detector, safety immersion tube and positive position locks. All safety features aim towards avoiding unintentional release of process fluids. The sensor detector prevents the housing from being inserted without an electrode or sensor being installed. The patented immersion tube seals the housing from the process at all times during operation, and the positive position locks always keep the electrode/sensor in an optimal measuring position.

The versatility

METTLER TOLEDO also offers a broad range of sensor versions for other measuring parameters such as dissolved oxygen, conductivity, CO_2 or turbidity able to work with this housing.

The cleaning

For applications in the yeast industry, a double flushing chamber is available that guarantees complete sterilization of a probe outside the process, thereby extending the range of applications for which this housing can be employed. In combination with an EasyClean cleaning and calibration system, a fully automated measuring loop is available, bringing about an enormous reduction in operation costs.

The compliancy

The new InTrac housings are the first to be fully compliant with ATEX guideline 94/9/EC and suitable for installation in hazardous areas Zone 0 and 1 as well as with PED 97/23/EC Category III. A wide selection of process fittings enables unrivaled flexibility for any installation purpose.

InTrac 797 e.

InTrac 777 e.

Examples of a complete measurement loop

Retractable housing	Parameter	Electrodes/ Sensors	Transmitter	Cleaning & Calibration System
InTrac776 e	pH/Redox	Liquid electrolyte electrodes	pH 2100 e pH 2500	EC 150 EC 200
InTrac777 e	pH/Redox	Gel and solid polymer electrolyte electrodes	pH 2220 X M 700	EC 300 EC 300EX EC 350
	DO	InPro 6800	O_2 4100 e	
	Conductivity	InPro 7001-VP	Cond 7100 e	
InTrac 779 e	Turbidity	InPro 8100 InPro 8200	Trb 8300	

safety is crucial!

InTrac 777 e/InTrac 797 e: versatility at a glance

The InTrac 777 e/797 e retractable housings have been specifically designed for use with 12 mm electrodes and sensors for the measurement of pH/redox, dissolved oxygen, CO_2 and conductivity in industrial processes.

High versatility with flushing and double chamber options

InTrac 777 e with a single flushing chamber is suitable for employment in the sugar and starch industry. InTrac 797 e with double chambers is the preferred choice for sterile processes in the yeast industry. Special models (InTrac 779 e/799 e) are also available for InPro 8100/8200 turbidity sensors.

High flexibility in process adaptions

METTLER TOLEDO offers a wide selection of process adaptions in various materials and sizes, such as

- DN 25 for INGOLD weld-in sockets
- Flanges (DIN and ANSI)
- NPT threads
- TriClamp
- Tuchenhagen Varivent

Safety weld-in socket.

Benefits of new InTrac housings

- Bundle of safety elements with TriLock™
- Fully automated measuring loop
- Fully compliant with ATEX
- Built for hazardous zones 0 and 1

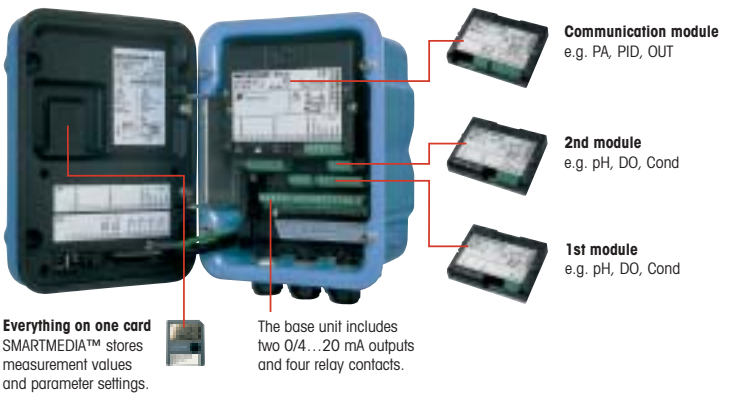
Main specifications

		InTrac 777 e and InTrac 797 e		
Operation		Manual or pneumatic		
Immersion depths	InTrac 777 e/779 e:	70, 100 or 200 mm		
	InTrac 797 e/799 e:	100 mm		
Electrodes/sensors	pH:	Gel or solid polymer electrolyte models, ø 12 mm		
	CO_2:	InPro 5000 (InTrac 797 e)		
	Dissolved oxygen:	InPro 6800/InPro 6900		
	Conductivity:	InPro 7001 (not with InTrac 797 e)		
	Turbidity:	InPro 8100/InPro 8200		
Wetted O-rings		Viton®-FDA, EPDM-FDA or Kalrez®-FDA		
Process-wetted parts	InTrac 77X e:	DIN 1.4404/AISI 316L, HA-C22, titanium, PP, PVDF, PEEK		
	InTrac 79X e:	DIN 1.4404/AISI 316L		
Flexible process adaptation		776 e	777 e/779 e	797 e/799 e
	DN 25:	•	•	•
	Flanges (DIN, ANSI):	•	•	
	NPT thread:	•	•	
	TriClamp:	•	•	•
	Tuchenhagen Varivent:	•	•	•
Specific features		TriLock™, sensor detector, position indicators, (optional, pneumatic or inductive version)		
Certificates/approvals		CE/PED*/ATEX (94/9/EC)/MaxCert™/ Sterile tests for InTrac 797 e/799 e		
		* PED = pressure equipment directive, 97/23/EC		

New Premium Line Transmitter M 700

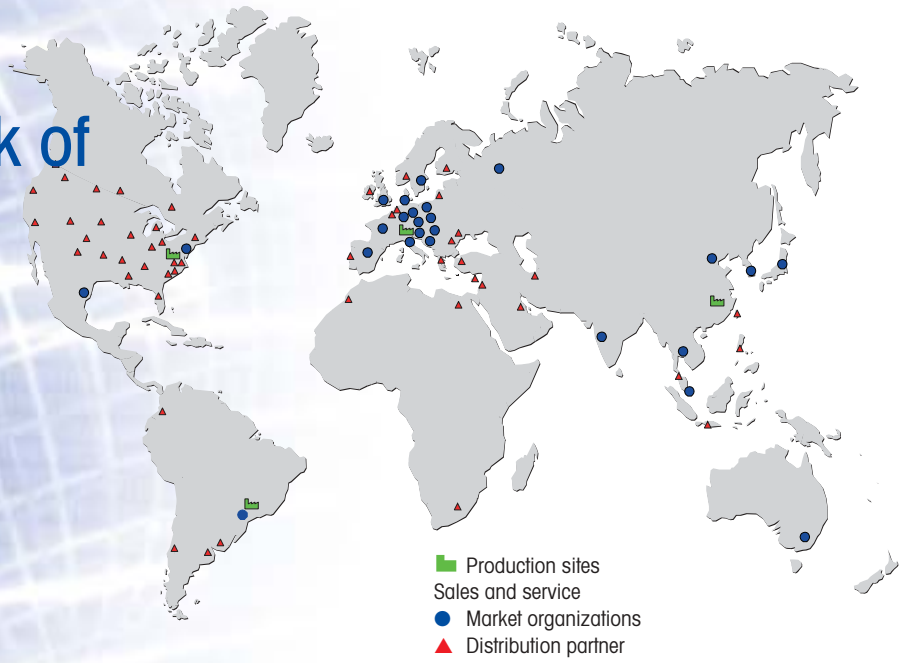
The new M 700 transmitter line is based on a completely new concept. So far, conventional in-line measuring systems for analytical parameters consisted of a transmitter and the corresponding sensor. The M 700 is different and based on a modular concept, allowing the simultaneous measurement of up to three parameters.

The basic unit of the M 700 transmitter is designed to accept modules for pH, conductivity and dissolved oxygen. A special high-resolution module for dissolved oxygen is offered to enable measurements to be taken at ppb level. Additional modules for PID control, out-put and limit contacts, as well as a PROFIBUS® communication module complete the M 700 concept. This remarkably versatile transmitter line guarantees an elevated standard of measurement together with optimal safety in the management of your process. The instruments offer a range of powerful features through a menu-driven set-up program supported by graphical pictograms. The large and clear backlit LC display shows 2 process parameters. The display can be configured to show process temperature, sensor-related data, differential measurement and much other important information. Special attention has been paid to the many maintenance functions and sensor diagnostic tools implemented in the basic unit of the M 700. A variety of options, such as an extended logbook, a 2-channel measuring recorder, a service scope function, and others, are available to optimize the functionality of the M 700 according to customer needs. All data and configurations are stored on a SmartMedia™ card. This storage medium is used worldwide as standard and allows easy data processing in peripheral computer systems. The M 700 system comes in two designs. One version features a coated stainless steel enclosure which is mainly used in harsh process applications like in sugar production. The enclosure is available for standard power supply, is intrinsically safe and with ATEX approval as Ex versions for use in hazardous areas. ■



A worldwide network of experts at service

METTLER TOLEDO provides full sales and service coverage worldwide. Wherever our customers are, we are the competent partner. Many global industrial manufacturers rely on our longstanding experience.



Distribution network

Based on its several global production sites, more than 20 market organizations, and numerous sales representatives,

METTLER TOLEDO maintains a wide distribution network all over the world. Satisfaction of our customers is based on three pillars:

Consulting

With the knowledge of our experts, we support you in finding the best solution, including planning, product selection, and installation of our measurement solution.

Top products

A complete range of products and systems to meet measurement requirements

After-sales service

With our customized, lifelong service management, we are able to assist in maintaining measurement loops throughout their whole life-cycle.

Mettler-Toledo Process Analytics' four producing organizations are close to our customers all over the world and provide:

- Faster logistics
- Fast response time to market demands

ServiceXXL®
Tailored Services

Mettler-Toledo GmbH
Process Analytics
Im Hackacker 15
CH-8902 Urdorf
Switzerland

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www.mtpro.com

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