

PRO - Refining and Petrochemicals



Battling Corrosion

Industry Situation

Background

The global refined petroleum products market grew from \$2,616.61 billion in 2022 to \$2,703.40 billion in 2023 at a compound annual growth rate (CAGR) of 3.3%. It is expected to grow to \$3,011.98 billion in 2027 at a CAGR of 2.7%.

Trends: Growing environmental concerns and stricter regulations are driving a shift towards cleaner fuels with lower sulfur content. Refineries are investing in technologies to produce ultra-low sulfur gasoline and diesel and alternative fuels such as biofuels.

With growing energy demand in emerging economies, especially in Asia, several countries are investing in new refinery projects or expanding their existing capacities to meet domestic fuel requirements and reduce reliance on imports. Due to rising energy costs and environmental considerations, energy efficiency is a key concern for refineries. They are implementing energy management systems, utilizing waste heat recovery technologies, and exploring renewable energy sources to reduce their carbon footprint and improve profitability.

Application Challenges

Harsh Process Conditions: Refining and petrochemical processes often involve high temperatures, high pressures, corrosive chemicals, and challenging operating environments. These conditions can pose difficulties in maintaining accurate and reliable measurements, as sensors and instruments may be subjected to extreme conditions that affect their performance. METTLER TOLEDO sensors withstand harsh process conditions.

Corrosion and Fouling: Corrosive substances and fouling agents present in the processes can affect measurement devices, leading to degradation or inaccurate readings. Regular maintenance, material selection, and protective coatings are required to mitigate the impact of corrosion and fouling on measurement accuracy. Proper pH and low oxygen levels in desalter operations are invaluable in fighting corrosion.

Safety and Environmental Concerns: Accurate measurements are critical for maintaining safe operations and complying with environmental regulations. Challenges arise in ensuring precise measurements of emissions, leak detection, and monitoring of hazardous substances to prevent accidents and minimize environmental impacts.

Calibration and Validation: Calibration and validation of measurement devices in refining and petrochemical processes are essential to ensure accuracy and reliability.

Reference Application

Refining and petrochemical processes involve the conversion of crude oil into various valuable products. The process typically consists of several stages, including crude distillation, sour water stripping, and desalting (these 3 are the focus of this pager).

Crude distillation is the initial stage where crude oil is heated and separated into different fractions based on their boiling points. This process separates crude oil into lighter hydrocarbons such as gasoline, diesel, and jet fuel.

Sour water stripping involves the removal of impurities, such as hydrogen sulfide and ammonia, from the water used in the refining process. This is done to meet environmental regulations and ensure water quality.

Desalting is a process that removes salt and other impurities from crude oil. It involves mixing the crude oil with water to dissolve the salt and then separating the water from the oil. Desalting helps protect refining equipment from corrosion and improves the quality of the final products.

These stages are just a part of the overall refining and petrochemical processes, which include additional steps such as cracking, reforming, and treatment to produce various fuels, lubricants, and chemical feedstocks.

SBU Contact

Stefan Van der Wal – Chemical Industry Manager

Sour Water Stripper

Door Opener Solution

Door Opener/Value Offering

Improving sour water stripper efficiency with process-tolerant pH sensors

Solutions:

We offer in-line pH measurement that will withstand the challenging conditions of this application (presence of sulfides). Thanks to ISM technology, maintenance is reduced by 90%

Product/Solution to be presented:

InPro 4260i, InTrac 777

Advantage over competition

- Process-tolerant pH sensors withstand poisoning so that the sensor can be installed in this challenging environment. Superior measurement reliability and ISM reduce maintenance requirements dramatically.
- Easy integration with retractable housings.

Contact Job Titles

- Instrument Manager
- Reliability Engineer



Value Selling Approach

Pre-Visit

Check Chemical Application Spotters Guide with details of this application and supporting material listed under sales tools.

During Visit

Learn what process analyses they do on the stripper and what are the typical gases that are stripped. Ask what typical issues the stripper suffers from typically. Check their concerns regarding insufficient gas stripping, equipment corrosion and operator safety. Show the benefits of service coverage.

After Visit

Send the selected value content.

Sales Insights

In petroleum refining, so-called 'sour water' is produced in various processes. Sour water is process water that contains dissolved hydrogen sulfide (H₂S). Because of environmental legislation and the fact that H₂S is toxic, refineries nowadays adhere to strict sulfur management, which requires that H₂S is removed from the sour water through steam stripping. In the sour water stripper, dissolved gases such as hydrogen sulfide (H₂S) and ammonia (NH₃) are removed from the sour water. pH control is necessary to enable the release of dissolved gases. This is an important and standard in-line measurement with a high maintenance requirement. This is because sulfides poison the sensor's reference system causing unreliable readings and damage to the sensor.

Sales Tools

Recommended Content – Review Before

- Detailed Application Overview PA9435EN
- FOCA Questions PA9436EN Application Spotters Guide: PA9383EN
- VSG Refining and Petrochemicals: COR00133, COR00131
- Conversation: Reducing Maintenance with ISM pH Sensors (Chem)

Recommended Content – To Show

- Customer Presentation PA9437EN

Recommended Content – To Share

- Application Note: pH Control in Sour Water Stripping PA0148EN
- Datasheet: InPro 4260i PA0122EN
- Brochure: Optimizing Chemical Industry Processes PA1013EN
- White Paper: ISM - Make the Right Maintenance Decisions PA5099EN

[LMS](#)

[pH](#)

Service DO Opportunities

Full preventive maintenance covering calibration, inspection, cleaning and operational testing will help maximize sensor lifetime and catch any out-of-specification performance issues.

- For more details, check service datasheets: Recommended Services for pH Sensors (PA2051EN) and DO sensors (PA2053EN), Housing (PA2126EN).

Door Opener Solution

Door Opener/Value Offering

pH and DO control in crude desalting to reduce downstream corrosion and fouling.

Solutions:

We offer a DO sensor, an automated pH cleaning solution and a specific pH sensor family that is reliable in the presence of hydrocarbons and sulfides and resists the common coating problem. This will allow to minimize grab sampling at the wash water and optimize demulsifying and reduce the risk of corrosion.

Product/Solution to be presented:

InPro 6850i, InPro 4800i, EasyClean 400

Advantage over competition

- We can offer a measurement that will withstand the challenging conditions of the desalter process. Process-tolerant DO and pH sensors withstand fouling, so the sensor can be installed in this challenging environment.
- Automated cleaning and calibration reduces maintenance requirements
- Easier integration with retractable housings
- Suitable for hazardous areas.

Contact Job Titles

- Process Engineer (desalter)
- Process Improvement Manager
- Plant Superintendent



Value Selling Approach

Pre-Visit

Check Chemical Application Spotters Guide with details of this application and supporting material listed under sales tools.

During Visit

Ask where in the process they measure pH (DO) and if they do it in-line or online. Learn what chemical treatment they do in your desalter. Ask what it would mean to them to reduce the operational costs of the desalter. Inquire about what downstream fouling/corrosion issues they face. Mention the importance of service coverage in extending the pH sensors' lifetime.

After Visit

Send the selected value content.

Sales Insights

If not conducted correctly, contaminants remaining in crude after desalting cause fouling and corrosion in downstream process operations and reduce the heat transfer efficiency of furnaces and heat exchangers. Changes in crude oil quality and desalter wash water cause process conditions to vary constantly, making efficient desalting challenging.

- pH control is necessary to neutralize natural acids and to enable better oil/water separation;
- wash water DO is measured to ensure low oxygen levels

These are necessary measurements to help reduce overcarry of corrosive species that damage downstream plant equipment, but many companies do not measure in-line here. This is because hydrocarbons coat the sensor and sulfides poison the pH reference system, causing unreliable readings and damage.

Sales Tools

Recommended Content – Review Before

- Detailed Application Overview: PA9111EN
- FOCA Questions: PA9112EN
- Application Spotters Guide: PA9383EN
- VSG Refining and Petrochemicals: COR00133, COR00131
- Conversation: Reducing Maintenance with ISM pH Sensors (Chem)

Recommended Content – To Show

- Application Presentation PA9110ENB

Recommended Content – To Share

- White Paper: pH Control in Crude Desalting "More Oil, Less Chemicals" PA5067EN
- Datasheet: InPro 4800i PA2032EN
- Datasheet: InPro 6850i PA2084EN
- Brochure: Optimizing Chemical Industry Processes PA1013EN
- Case Study: TNK-BP Improves Its Desalting with In-line pH Analysis PA4075EN

[LMS](#)

[pH](#)

Service DO Opportunities

Full preventive maintenance covering calibration, inspection, cleaning and operational testing will help maximize sensor lifetime and catch any out-of-specification performance issues.

- For more details, check service datasheets: Recommended Services for pH Sensors (PA2051EN) and DO sensors (PA2053EN)

Door Opener Solution

Door Opener/Value Offering

Reducing crude unit corrosion with process-tolerant pH sensors, Protecting tower top and condenser tubing.

Solutions:

An automated pH cleaning solution and a specific pH sensor family that is reliable in the presence of hydrocarbons and sulfides and resists the common coating problem. This will allow customers to minimize the grab sampling of sour water and reduce process variability and corrosion.

Product/Solution to be presented:

InPro 4800i:, EasyClean 400

Advantage over competition

- Process-tolerant intelligent pH sensors withstand fouling so that the sensor can be installed in this challenging environment; suitable for hazardous area
- Automated cleaning and calibration reduce maintenance requirements.

Contact Job Titles

- Instrument Manager
- Process Improvement Manager



Value Selling Approach

Pre-Visit

Check Chemical Application Spotters Guide with details of this application and supporting material listed under sales tools.

During Visit

Ask what types of crudes they are processing (sweet, sour/both). Inquire about what corrosion/fouling issues they face and where they occur. Check where in the process they measure pH. Stress that our solution helps reduce the operation costs of a crude unit and chemical consumption and helps optimize maintenance schedules. Mention the importance of service coverage in extending the pH sensors' lifetime.

After Visit

Send the selected value content.

Sales Insights

Distillation of crude oil is one of the main steps in petroleum refining. The presence of various salts and substantial amounts of water in the feed can be detrimental to the process and process equipment if not countered properly.

- The pH of the sour water from the overhead condenser accumulator boot is controlled to reduce corrosion and fouling in the distillation tower top section and the overhead condenser. This is an important and fairly common in-line measurement to help reduce corrosion, but usually there is a high maintenance requirement. This is because hydrocarbons coat the sensor and sulfides poison the pH reference system, causing unreliable readings and damage to the sensor. This leads to control difficulties and process variability.

Sales Tools

Recommended Content – Review Before

- Detailed Application Overview PA9203EN
- FOCA Questions PA9204EN
- Application Spotters Guide: PA9383EN
- VSG Refining and Petrochemicals: COR00133, COR00131
- Conversation: Reducing Maintenance with ISM pH Sensors (Chem)

Recommended Content – To Show

- Customer Presentation PA9342EN

Recommended Content – To Share

- White Paper: Reducing Corrosion in the Hydrocarbon Processing Industry PA5065EN
- Application Note: Crude Unit Overhead Condenser pH Control PA0147EN
- Case Study: Beating Corrosion – pH Control in Overhead Condensers PA7029EN
- Datasheet: InPro 4800i PA2032EN
- Brochure: EasyClean 400 PA2005EN
- Brochure: Optimizing Chemical Industry Processes PA1013EN

LMS

pH

Service DO Opportunities

Full preventive maintenance covering calibration, inspection, cleaning and operational testing will help maximize sensor lifetime and catch any out-of-specification performance issues.

- For more details, check service datasheets: Recommended Services for pH Sensors (PA2051EN) and DO sensors (PA2053EN)