OpreX™ Measurement

Electrolysis Solutions

Instrumentation Solutions for Electrolysis Plant Applications

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ELECTROLYSIS PLANT CHALLENGES AND OPPORTUNITIES

The manufacturing of fundamental materials requires operational excellence

Fundamental Materials for Many Industries

Hydrogen, chlorine, caustic soda, and hydrochloric acid, produced in electrolysis plants, are fundamental materials used in a variety of industries such as chemical, food and beverage, petrochemical, pharmaceutical, pulp and paper, and more.

Profitability through Operational Excellence

As companies all over the world strive for a competitive advantage in their businesses, they must stay ahead of the competition by pursuing measures that will increase efficiency, optimize plant processes and other operations, and improve product quality.

Effective Production

Stable and efficient control of the process brings improved quality, safety, and profitability. Even when process conditions vary, the automation and control systems must respond effectively.

Energy Cost

While ion-membrane electrolysis is among the most efficient technology in caustic soda production, it still consumes a large amount of energy. By reducing energy consumption, manufacturers can minimize environmental stress such as CO_2 emissions and achieve increased profitability.

Membrane Maintenance Cost

Process upsets can easily stress or damage delicate diaphragm or membrane cells, resulting in costly repairs and downtime. Electrolysis plants require accurate and reliable instrumentation to improve control and prolong the operating lifetime of their electrolysis cells.

Harsh Environments

There is an intense electromagnetic field around the electrolysis process. In addition, chlorine and other by-products are corrosive and damage automation equipment. Instruments and analyzers must be able to withstand these tough environments and provide accurate and stable measurements.

Total Cost of Ownership (TCO)

Frequent instrument maintenance, repairs, and replacements can erode profitability. Investing in quality instrumentation and sensors can considerably reduce maintenance and provide a rapid return-on-investment (ROI) and improved TCO.

Why Buy Yokogawa?

The rigorous demands of chlor-alkali production require accurate, reliable instrumentation that provides all required measurements. Yokogawa delivers field-proven technologies that can endure the difficult conditions to allow plants to maximize performance, profitability, and, most importantly, safety.

TOTAL INSIGHT THROUGHOUT THE ENTIRE LIFECYCLE

OUR GOAL

Our shared goal is customer satisfaction through operational excellence.

Yokogawa has brought true innovations to industry. We are committed to ensuring accuracy, reliability, and safety for production systems throughout the plant life cycle. Our comprehensive solutions and expertise enable customers to achieve improved results with reduced total costs of ownership.

From 'Sensing' to 'Sensemaking'

Total Insight throughout the entire lifecycle

Combining reliable technology with superior field knowledge, Yokogawa's Total Insight optimizes operations and reduces maintenance costs through every phase of the product lifecycle.

Total Insight

Expert Solution
Utility and Maintenance

Simplified Selection
Engineering and Procurement

Smart Assist
Installation and Commissioning

Process Guard
Operation and Observation

Product and application lifecycle

Engineering & Procurement	Configuration & Commissioning	Operation & Observation	Maintenance & Service
• Selection and sizing with FlowConfigurator software • Dedicated products for various applications	• Wizard for easy setup • User friendly and multi-lingual operation concept • Concentration calculation tool	• Event management according NAMUR NE 107 • Data Logging before, during and after event • In-line meter verification with Tube Health Check	• MicroSD for data transfer and spare management • "Features on Demand" for function upgrade • Worldwide approvals

SALT DISSOLVER — Monitoring NaCl

FLXA202 Inductive Conductivity Transmitter and PEEK Sensor

Overview and Challenges

- Impurities in brine cause membrane blockage which can lead to high maintenance or replacement costs, as well as downtime.
- Reliable and constant conductivity readings are essential to ensuring salt concentration consistency.
- Depending on salt composition, precipitates are formed in the dissolver causing blockage of conductivity sensors.

Solution Features and Benefits

- The FLXA202 Inductive Conductivity Transmitter and PEEK Sensor provide a virtually maintenance-free solution with a unique wide hole design that resists obstruction from suspended solids.
- By providing consistent brine concentration measurements, the FLXA202 will help improve control, avoid downtime, and prolong the life of electrolysis cells.

ELECTROLYSIS PLANT — Flow Measurements

ADMAG TI Series
Magnetic Flowmeter

Overview and Challenges

- Flow measurements required throughout the electrolysis plant must be able to withstand highly corrosive materials such as caustic soda and sulfuric acid.
- Process piping is lined because of these corrosive materials, often leading to excessive electrostatic noise.
- Poor flowmeter performance from these conditions can result in damage to electrolysis cells or other process equipment, requiring significant maintenance and downtime.

Solution Features and Benefits

- Through dual frequency excitation, the ADMAG TI series of magnetic flowmeters can provide a stable flow measurement that is less susceptible to noise, preventing potential electrolysis cell damage.
- Unique PFA liner with retaining grid and spring-loaded electrodes help prevent process leaks that lead to costly maintenance and downtime.

CHLORINE GAS DRYING PROCESS — Monitoring Trace Moisture

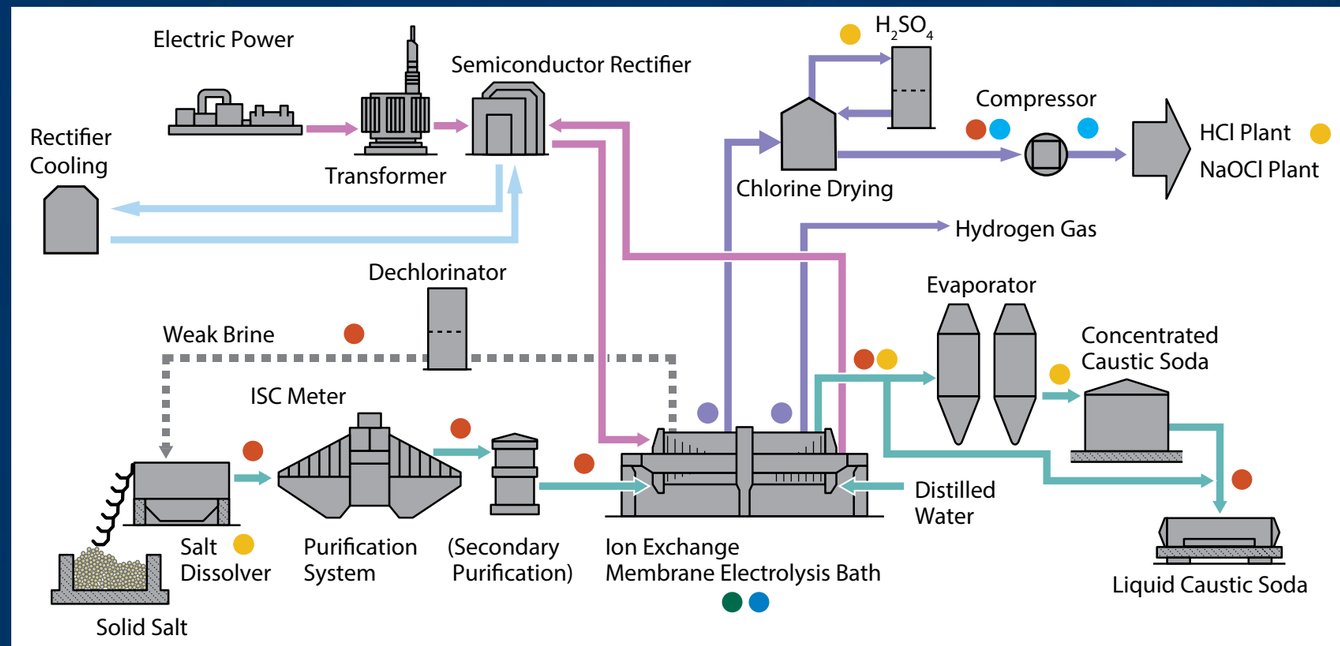
TDLS8000 Tunable Diode Laser Spectrometer & YH8000 HMI

Overview and Challenges

- Chlorine gas produced from electrolysis must be dried to prevent unwanted formation of hydrochloric acid (HCl).
- Even trace amounts of moisture can form HCl which can damage process equipment like compressors, leading to expensive maintenance and downtime.
- Conventional moisture detection is costly to maintain and provides slow detection recovery time.

Solution Features and Benefits

- Moisture can be measured before and after the chlorine compressor using the TDLS8000 Laser Analyzer to protect equipment and check for process leaks.
- Analyzer maintenance cost is reduced due to the non-contacting technology and no consumables required.
- Moisture detection and recovery as fast as one second allows operations to respond to trace moisture, preserving compressor health and avoiding costly repairs and downtime.



ELECTROLYSIS BATH — Cl_2 and H_2 Header Pressures

EJXC80A Direct Mount Diaphragm Seal System

Overview and Challenges

- Stable control of the chlorine and hydrogen gas header pressures is needed to prevent wear and tearing of the electrolysis cells.
- Chlorine and hydrogen can damage conventional pressure transmitters causing the measurements to drift and ultimately fail.
- High maintenance and replacement costs are associated with frequently re-zeroing and replacing these devices.

Solution Features and Benefits

- The EJXC80A Diaphragm Seal System provides a direct mount 'chemical' seal which can better withstand harsh process chemicals and high temperatures.
- Using advanced alloy materials for the diaphragm seal provides superior resistance to corrosion due to chlorine or the effects of hydrogen permeation.
- Maintenance teams can save time and costs by greatly reducing the need to re-zero or replace pressure transmitters.
- By providing stable pressure control, operators can avoid damaging electrolysis cells that would lead to costly maintenance and downtime.

ELECTROLYSIS BATH — Monitoring pH

FLXA202
pH Transmitter & Sensor

Overview and Challenges

- Chemical (brine) dosing in electrolysis cells is controlled by pH measurements in order to achieve maximum stability and efficiency.
- Monitoring pH in electrolysis cells is difficult for traditional sensors due to the harsh environment, including corrosion, contamination, and high temperatures.
- Failure of pH measurements can lead to increased maintenance, reduced process efficiency, and higher energy costs.

Solution Features and Benefits

- The FU20-MTS differential reference sensor lasts months longer than traditional sensors in the same harsh environment.
- The FLXA202 and FU20-MTS ensure confident pH measurements that maintain accurate chemical dosing, saving in raw material cost.

ELECTROLYSIS BATH — Cell Voltage Monitoring

SMARTDAC+ GM10 Data Acquisition
High Withstand
Voltage Module

Overview and Challenges

- Delicate electrolysis cell membranes can be damaged by even small process deviations.
- Measuring slight fluctuations in voltage can help detect the formation of pinhole size tears in cell membrane before significant damage is done

Solution Features and Benefits

- The SMARTDAC+ GM10 Data Acquisition unit provides multi-channel data logging with fast sampling to measure voltages in each electrolysis cell.
- Early event detection allows corrective action before costly damage occurs. Even minor deviation can be detected, extending the operating life of electrolysis cell.

CHLORINE GAS DRYING PROCESS / HCL PLANT — Monitoring H_2SO_4 Concentration / Monitoring HCl Concentration

FLXA202 Inductive Conductivity Transmitter
For H_2SO_4 – PFA Sensor
For HCl – Peek Sesnor

Overview and Challenges

- Product quality and equipment health rely heavily on concentration measurement to ensure the proper purity.
- Concentration measurements can be difficult in chlor-alkali production because high temperatures and high concentrations of corrosive materials can quickly destroy sensors, leading to high maintenance costs and potential downtime.

Solution Features and Benefits

- The FLXA202 inductive conductivity transmitter with PFA and PEEK sensors are designed to withstand harsh process conditions such as high temperatures and corrosive chemicals, allowing longer sensor replacement intervals.
- The no O-ring design further reduces maintenance requirements and provides better total cost of ownership.

INSTRUMENTS FOR OPERATIONAL EXCELLENCE

PRESSURE TRANSMITTERS

DPharp EJA/EJX Series

- Best-in-class total accuracy and long-term stability of up to 15 years
- DPharp digital sensor with simultaneous DP and static pressure with NE107 diagnostics
- SIL2 safety as standard on wired devices
- Available with wireless communications

TEMPERATURE TRANSMITTERS

YTA Series/YTMX580

- Multi-sensor input with NE107 diagnostics
- Dual-compartment housing for harsh environments
- SIL2 safety as standard on wired devices
- Available with wireless communications

MAGNETIC FLOWMETER

ADMAG TI Series

- Best-in-class performance with dual frequency excitation method
- Predictive electrodes adhesion detection and meter health check diagnostics with NE107
- Wide variety of liners and electrode materials to resist corrosive processes

CORIOLIS FLOWMETERS

ROTAMASS TI Series

- Unique “box-in-box” design and Smart Power Management provide superior reliability under harsh environmental and process conditions
- Tube Health Check function for meter verification without disturbing process measurements
- Advanced liquid concentration measurement

LIQUID ANALYZERS AND SENSORS

FLXA202 and SMART SENCOM 4.0

- Designed for two-wire system configuration
- Tough screen display
- Rugged cast aluminum case
- Predictive sensor maintenance and replacement diagnostic with NE107
- Event logbook

LASER GAS ANALYZER

TDLS8000 and TDLS8100

- Non-contacting: Nothing to corrode or degrade from aggressive process conditions
- No calibration, no consumables
- Fast Respond time: as fast as one second
- Fully field serviceable
- 50-day data storage

DATA ACQUISITION

SMARTDAC+ Series

- Modular layout with up to 420 channels
- High speed sampling as fast as one msec
- High Withstand Voltage (reinforced insulation): 600 VRMS/VDC
- SD memory card for data backup
- Expandable over Ethernet

FIELD WIRELESS AND IIOT

Sushi Sensor

- Automated plant equipment health monitoring to replace manual operator rounds and digitize data
- Industrial IoT sensor with long-range wireless capability via LoRaWAN
- Easy plug-and-play installation with intuitive set-up from Smart phone application
- Artificial Intelligence and data monitoring on-premise and/or in the Cloud

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