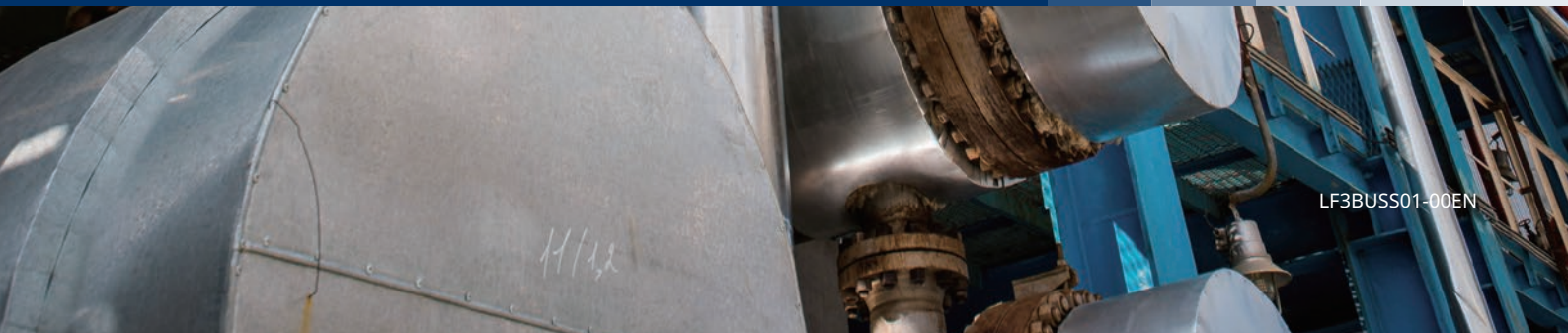




OpreX™

Electrolyzer Solution

Instruments and Solution for
Ion-Membrane Electrolyzer Plant Application



Electrolyzer Plant for the World

Process for Fundamental Materials, Requires Effective Production with vast Operational Excellences

Fundamental Materials for Industries

Caustic soda and hydrochloric acid, produced in electrolyzer plants, are fundamental materials used in varieties of industries; chemicals, pharmaceuticals, petrol-chemicals, pulp and papers, etc.

Profitability from Efficient Production

Profit is the result of the effective production with minimized running / maintenance cost.

Effective Production

Proper control of the process brings you stabilized quality of products with the vast operational profit. The process condition may vary often. When conditions are changed, the process controller and sensors have to follow well.

Energy Cost

Ion-Membrane electrolysis bath is the most effective among all types of electrolyzer in caustic soda production. But it still consumes huge energy. Energy consumption has to be reduced to minimize the environmental stress like CO₂ emissions, for increasing your profitability.

Maintenance Cost of Membrane

A Membrane has life time. It should be maintained periodically. To prolong operating life, the electrolyzer plant should be monitored for optimized control.

Tough Environments

There is an intensive electromagnetic field around electrolysis bath. In addition chlorine and other by-products are corrosive. Sensing devices have to be tough against such environment with providing accurate measurement all the time.

Total Cost of Ownership (TCO)

Maintenance costs for these sensing devices should be considered as TCO, next to the initial cost of your investment. Those should be in good balance.

Why Buy Yokogawa?

Our devices can afford to perform accurate measurements under tough condition in electrolyzer plant application. You can minimize these maintenance costs, achieving the maximum profit from the control of the process with accurate measurement.

Salt Dissolver



FLXA202 Inductive Conductivity Transmitter & PEEK Sensor

Monitoring NaCl

Overview and Problems

- NaCl concentration monitoring
- Raw salt easily clog the sensor
- Correlation characteristic changes depending on components of salt

Solution

- Wide hole sensor, no clogging of suspended solids, etc...
- Concentration (Weight %) free programmable
- Recommend bypass sampling

Benefits

- Reduce maintenance cost
- Supply stable brine to electrolysis bath

Electrolysis Bath



FLXA202 pH Transmitter & Sensor

Monitoring pH

Overview and Problems

- pH monitoring to detect membrane leakage
- Sensor is easily deteriorated by high temperature and saturated Chlorine gas

Solution

- Special anticorrosive glass membrane
- Special anticorrosive structure of Ag ion trap

Benefits

- Rapid detection of pin hole of electrolysis membrane
- Maintenance cost reduction

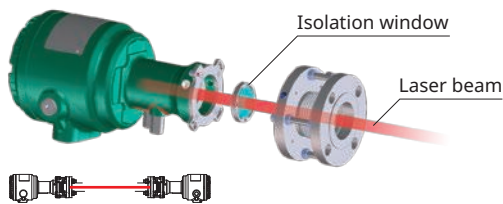
Technologies Commit Users' Benefits



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 of your production system throughout your business life cycle. Our comprehensive solutions and expertise help you achieve more results with less total costs of ownership. Below key technologies shall aim for your operational excellence.

Laser Gas Analyzer for moisture measurement



TDL8000 can keep high performance to monitor an object gas without exposure of the laser source & detector to process gasses.

The measurement technique using laser allows isolation of the optical components and enables high repeatability no matter when process gasses get wet and corrosive.

ASIC for Accurate Measurement



The measurement engine for SMARTDAC+ series is requested to ensure accurate measurement even under the sampling speed as fast as 100 msec measurement interval.

This performance is achieved by Yokogawa-developed special A/D converter.

High Withstand Voltage



For performing accurate monitoring for each of cell voltage as well as other parameters like temperature, isolation between channels is the key.

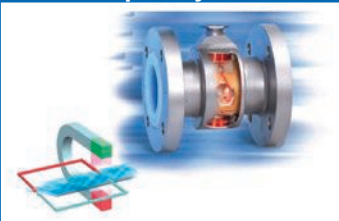
A/D circuits of SMARTDAC+'s input modules use customized transformer and special photo-couplers.

A customized semiconductor relay is another key component for tough isolation.

This enables high-speed scanning, while eliminating the periodic replacement of relay board.

In addition, SMARTDAC+'s input modules employ integrating A/D converters with superior noise rejection performance.

Dual Frequency Coil Excitation



Magnetic Flowmeters measure flow volume with Faraday's law. The frequency of excitation

current given to coils affects in the measurement accuracy and response time. Dual Frequency Coil Excitation is Yokogawa's original technology to ensure 0.3% accurate measurement as well as 0.1 second fast response simultaneously. Our signal processing technique enables us to bring the benefits of an AC & DC magnetic flowmeter into a single magnetic flowmeter.

Electrolyzer Plant

Flow Measurements



ADMAG TI Series
Magnetic Flowmeter

Overview and Problems

- Flow measurement in electrolyzer plants
- The stray current from electrolysis bath harms the measurement by magnetic flowmeter
- High corrosive liquids such as caustic soda, sulfuric acid etc

Solution

- Dedicated DC Noise Cut Filter to minimize the stray current
- 0.3% of reading, highly accurate and stable measurement by Dual Frequency Coil Excitation Method

Benefits

- High accurate and stable flow measurement is realized in electrolyzer plant
- Simple maintenance

Liners and Electrodes

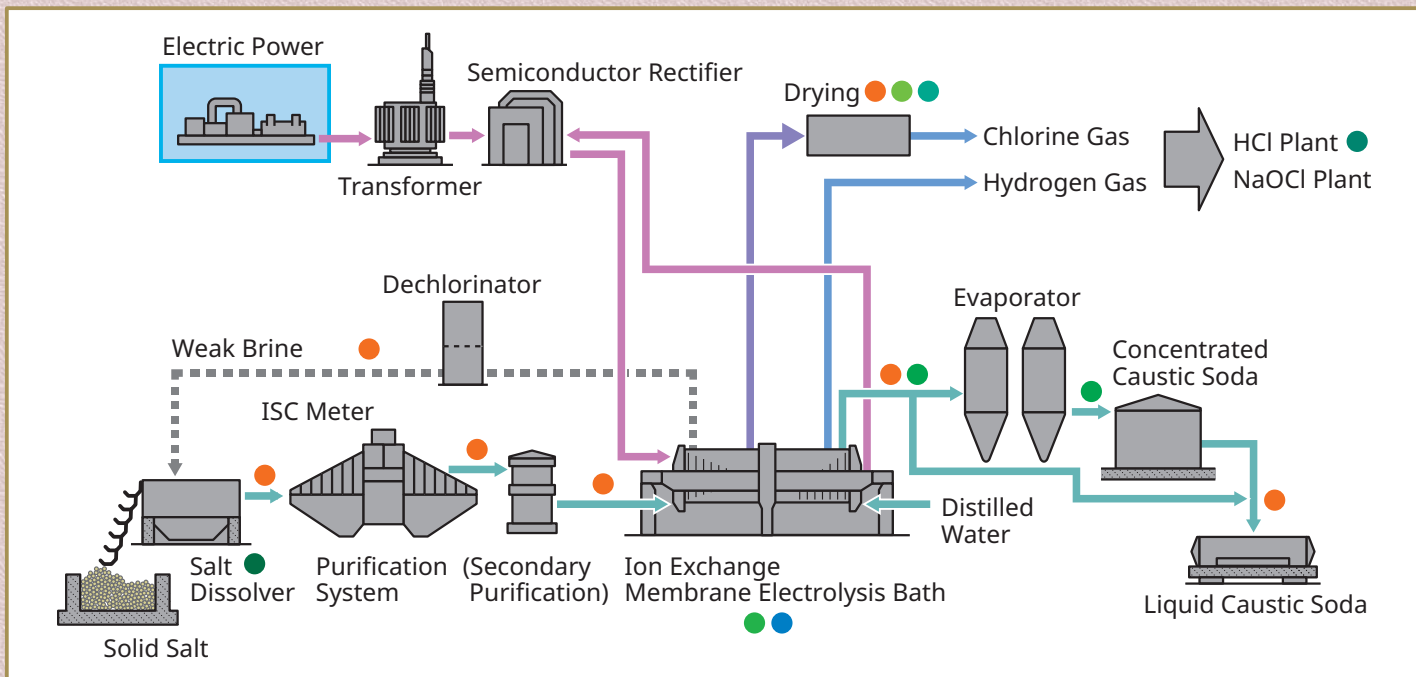
Yokogawa can prepare wide variety of wetted Parts Materials

Lining:

- PFA
- Ceramic, and more

Electrode and Earth Ring:

- SUS316L
- Platinum
- Tantalum, and more



Electrolysis Bath

Cell Voltage Monitoring

Overview and Problems

- Need multi-channel data logging with fast sampling measuring each cell voltage

Benefits

- Rapid detection of pin hole of membrane
- Longer maintenance period of each cell
- Less maintenance of relays
- Can accept other process inputs: pressure, temperature, pH, ...

Solution

- 100 msec sampling fastest
- Isolated inputs, High Withstand Voltage : 600 V_{RMS}/V_{DC} (cont.)
- Up to 420 ch per system, Ethernet interface for expandability
- Individual cell-voltage measurement with ±0.005 V accuracy
- Long-life semiconductor relay
- Modbus/TCP, Modbus/RTU, EtherNet/IP, OPC-UA, and SLMP communication are supported
- Power recovery operation



SMARTDAC+ GM10 Data Acquisition Unit



High withstand voltage module

Chlorine Gas Drying Process

Monitoring Trace Moisture



Overview and Problems

- Measuring trace H₂O in dry Chlorine gas
- Process interruption due to maintenance & sensor deteriorations

Solution

- Keeping reliable performance for years without calibration
- Corrosion free by isolated sensor from process gases

Benefits

- Ensuring stabilized operation
- Trustable moisture measurement without sensor damage

TDL8000 Tunable diode laser spectrometer & YH8000 HMI

Final Production

Monitoring NaOH Concentration



Overview and Problems

- NaOH concentration monitoring after electrolysis tank and concentrate drum
- Need accurate measurement not affected by temperature variation

Solution

- Special tuning fork sensor
- Stable density measurement against temperature change

Benefits

- High stability and accuracy, for quality control of Caustic Soda

DM8 Liquid Density Analyzers

Chlorine Gas Drying Process

Monitoring H₂SO₄ Concentration

HCl plant

Monitoring HCl Concentration



Overview and Problems

- Concentration Monitoring
- Strong acids easily deteriorate sensors
- Various measurement range

Solution

- Special electrode material resistant to strong corrosive and concentrated solution
- Concentration (Weight %) free programmable

Benefits

- High stability and accuracy for improving process efficiency and quality control

FLXA202 Inductive Conductivity Transmitter
For H₂SO₄ monitoring, PFA Sensor
For HCl monitoring, PEEK Sensor

For Your Operational Excellence

Laser Gas Analyzer



TDLS8000

- Non-contact measurement
- Super low-maintenance
- Seconds respond
- Fully field replaceable
- 50-day Data storage

PH / Inductive Conductivity Transmitter



FLXA202

- Designed for two-wire system configuration
- Touch screen display
- Rugged cast aluminum case
- Event logbook
- Intrinsically safe version

Liquid Density Analyzers



DM8

- Measures liquid density with high sensitivity and excellent stability
- Measuring range of 0.5 to 2.0 g/cm³, unaffected by flow rate and viscosity
- Sanitary and flameproof detector also available

Data Acquisition



SAMRTDAC+ Series

- Modular layout up to 420 ch
- High speed sampling: 1 msec fastest
- High Withstand Voltage (Reinforced Insulation): 600 V_{RMS}/V_{DC} (cont.)
- SD memory card for data backup
- Expandability over Ethernet

SMARTDAC+
Data Acquisition & Control

Magnetic Flowmeter



ADMAG TI Series

- Best-in-class performance with dual frequency excitation method
- Predictive electrodes adhesion diagnostics
- Variety of liners & electrode materials

ADMAG
Total Insight

Pressure Transmitter



DPharp EJA/EJX Series

- Best installed performance
 - Compact and rugged design
 - Multi-sensing digital sensor
 - SIL2 as standard*
 - Fieldbus communication capability*
- * : Applicable for wired transmitters

DPharp

Temperature Transmitter



YTA Series/YTMX580

- High resolution, high stability and high versatility
 - Dual compartment housing for harsh environments**
 - SIL2 safety as standard feature*
 - Fieldbus communication capability*
- * : Applicable for wired transmitters
** : Applicable for YTA Series

Multi Protocol / Function Adapters



FN310/FN510

- Enhancing Field Wireless product portfolio
- FN310 : HART (4-20 mA), Modbus (SENCOM)
- FN510 : DI/DO, AI (4-20 mA), Pulse
- Compact and low cost design
- Full battery powered solution available

YOKOGAWA ELECTRIC CORPORATION <http://www.yokogawa.com/>
YOKOGAWA CORPORATION OF AMERICA <http://www.yokogawa.com/us/>

YOKOGAWA EUROPE B.V. <http://www.yokogawa.com/eu/>
YOKOGAWA ENGINEERING ASIA PTE. LTD. <http://www.yokogawa.com/sg/>

Trademarks

All brand or product names of Yokogawa Electric Corporation in this bulletin are trademarks or registered trademarks of Yokogawa Electric Corporation. All other company brand or product names in this bulletin are trademarks or registered trademarks of their respective holders.

Subject to change without notice.

All Rights Reserved. Copyright © 2008, Yokogawa Electric Corporation

Printed in Japan, 907(KP) [Ed : 03/b]