Below key technologies shall aim for your operational excellence. Comprehensive solutions and expertise help you achieve more results with less total costs of ownership. 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 shared goal is customer satisfaction through operational excellence.

Dual Frequency Coil Excitation

Our signal processing technique enables us to measure accurately as well as with a fast response simultaneously. The current given to coils affects measurement accuracy and response time. Yokogawa’s original technology to ensure 0.3% flow accuracy in high precision flowmeters provides reliable and accurate measurements.

Laser Gas Analyzer

The measurement technique using laser beam allows isolation of the optical components and enables high repeatability no matter when process gasses get wet and corroded. OpreX: Electrolyzer Solution

Our smart, super-reliable and low-maintenance engine for SMARTDAC+ with dual compartment housing for harsh environments makes maintenance and replacement easy. Best-in-class performance with dual frequency excitation method and high versatility materials also available. Special A/D converter developed for SMARTDAC+

Multi-Protocol / Function Adapters

YOKOGAWA CORPORATION OF AMERICA
YOKOGAWA ELECTRIC CORPORATION
All Rights Reserved. Copyright © 2008, Yokogawa Electric Corporation
Subject to change without notice.
Trademarks
YOKOGAWA ENGINEERING ASIA PTE. LTD.
**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 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 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
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.

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

TDLS8000 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.

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.

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.
**Electrolyzer Plant**

### Flow Measurements

**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

---

**Electrolysis Bath**

**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,...

---

**Cell Voltage Monitoring**

**Solution**
- 100 msec sampling fastest
- Isolated inputs, High Withstand Voltage : 600 VRMS/VDC (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

---

**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
## 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

---

## 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

---

## Chlorine Gas Drying Process Monitoring H₂SO₄ 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

---

### Chlorine Gas Drying Process

- **HCl plant**
  - **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

---

### Chlorine Gas Drying Process

- **Monitoring Trace Moisture**
  - TDL8000 Tunable diode laser spectrometer & YH8000 HMI

- **Monitoring NaOH Concentration**
  - DM8 Liquid Density Analyzers

- **Monitoring H₂SO₄ Concentration**
  - For H₂SO₄ monitoring, PFA Sensor
  - FLXA202 Inductive Conductivity Transmitter
  - For HCl monitoring, PEEK Sensor

---

### Chlorine Gas Drying Process

- **Final Production**
  - **Monitoring NaOH Concentration**
  - **Monitoring H₂SO₄ Concentration**
  - **Monitoring HCl Concentration**

### Chlorine Gas Drying Process

- **Overview and Problems**
  - **Monitoring Trace Moisture**
  - **Monitoring NaOH Concentration**
  - **Monitoring H₂SO₄ Concentration**
  - **Monitoring HCl Concentration**
## 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 Vrms/Vdc (cont.)
  - SD memory card for data backup
  - Expandability over Ethernet

**Magnetic Flowmeter**
- ADMAG TI Series
  - Best-in-class performance with dual frequency excitation method
  - Predictive electrodes adhesion diagnostics
  - Variety of liners & electrode materials

**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

**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

---

**Synaptic Business Automation**

Synaptic Business Automation creates sustainable value by connecting everything in our customers’ organization. To realize this, Yokogawa integrates its business and domain knowledge with digital automation technologies, and co-innovates with customers to drive their business process transformation.

---

**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]