Application 2-Pager

PRO – Chlor-alkali

pH Measurement for Process Control

Industry Situation

Background
The market size of chlor-alkali was estimated at USD 63.2bn in 2021 and is projected to grow at a CAGR of 4.1% during the forecast period.

The chlor-alkali market encompasses the manufacturing and distribution of chlorine, caustic soda (sodium hydroxide), and hydrogen gas. These substances are generated through the electrolysis of brine (saltwater) in a process known as chlor-alkali.

Chlor-alkali products are utilized in applications such as plastics, alumina, paper & pulp, and others, and have diverse end-use applications in construction, automotive, and other industries.

The demand for these products is influenced by various factors, including the needs of downstream industries, the accessibility and pricing of raw materials, energy expenses, and regulatory measures.

Application Challenges

The chlor-alkali industry's environmental impact is a restraining factor for the market. Chlorine is toxic, and its leakage and discharge are monitored due to environmental safety concerns. Chlorine derivatives are harmful and contribute to ozone depletion, restricting their use. The mercury cell process emits mercury, which can poison freshwater resources if not treated. Asbestos-based separators in the diaphragm cell technology cause lung cancer, leading to a ban imposed by US EPA. Caustic soda's high concentration negatively impacts aquatic life. Regulating bodies like EPA and REACH monitor the production and utilization of these products due to environmental concerns. The synthetic soda ash manufacturing process also results in visible pollutants. These issues limit the growth of the chlor-alkali market. MT can capitalize on the chlor-alkali industry's environmental challenges by offering solutions for process optimization, emission control, and safety compliance.

Reference Application

Process description:
Chlorine, sodium hydroxide, vinyl chloride and the rest are made possible through the chlor-alkali process, a chemical reaction.
The process begins with sodium chloride - or salt, to the non-scientist - which is made into a salt-water solution called brine.
The brine is charged with electricity, which forces the sodium and chloride to separate, resulting in sodium hydroxide, hydrogen, and chlorine.
Manufacturers can make sodium hydroxide, vinyl chloride, and hydrogen chloride using these byproducts.

The applications covered in this document are:

- Anolyte pH
- pH Brine Recovery

SBU Contact

Stefan Van der Wal – Chemical Industry Manager

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Application 2-Pager

pH Control of Anolyte

Door Opener Solution

Door Opener/Value Offering
The pH control of anolyte in the chlor-alkali cell membrane process to achieve high efficiency and protect the membrane.
Solutions:
- pH sensor with pNa glass membrane reference that is hermetically sealed and cannot clog, so the measurement is not compromised
- ISM for superior measurement reliability reduce maintenance requirements

Product/Solution to be presented:
InPro 4850i, InTrac 777
Advantage over competition
The InPro 4850i sensor is specifically designed for use in sodium brines. Thanks to hermetically sealed construction, the reference is not affected by chlorine. pNa glass membrane generates reference potential from brine Na+ concentration, which provides superior measurement stability, also in high ionic strength media. This will allow customers to minimize maintenance, reduce process variability and sustain membrane integrity.
- Cost savings with Intrac: it allows direct installation without the need for a bypass.

Contact Job Titles

- Instrument Manager
- Reliability Engineer

Value Selling Approach

Pre-Visit
Check the Chemical Application Spotters Guide with details of this application and supporting material listed in the sales tools section
During Visit
Use the FOCA technique to discover their needs and concerns related to the upcoming project. Check whether they measure pH in-line or online. Ask application focused-questions, like: What is the pH/temperature of anolyte and what chemical treatment they do. Inquire about their main challenges in anolyte conditioning and how often they experience unplanned shutdowns. If they grab samples, ask how they feel about process control and chemical expenditure. Learn if the measurement suffers from being affected by the process medium/conditions and if they have concerns regarding measurement reliability.
Show the value of service coverage.
After Visit
Send the selected value content.

Sales Insights

Purified brine is electrolyzed to produce chlorine, hydrogen and caustic soda.
pH control is necessary to ensure process efficiency and avoid the formation of side products that adversely affect yield and membrane integrity. Too low pH shortens ion exchange membrane life; too high pH reduces yield.
This is an important and standard measurement to help reduce process variability, but many companies still struggle with it. This is because reactive chlorine enters the sensor's reference system, which causes drift and damage to the sensor. Thus, the maintenance load is high.

Sales Tools

Recommended Content – Review Before
- Conversation: pH sensors to withstand chlor-alkali processes:
- VSG: COR00079, COR00080
- Detailed Application Overview PA9330EN
- Chemical ASG: PA9383EN
- FOCA Questions PA9331EN
- Talking Points: PA9225EN

Recommended Content – To Show
- Application Presentation PA9332EN
- Solution Presentation: PA9075EN
- ISM Videos: PA8004EN, PA0054EN

Recommended Content – To Share
- White Paper: Durable Chlor-Alkali pH Electrode "No More Tears" PA0028EN
- Application Note: pH Measurement in the Chlor-Alkali Process PA4076EN
- Case Study: High Yield in Chlor-Alkali PA4077EN
- Datasheet: InPro 4850i PA2030EN
- White Paper: ISM - Make the Right Maintenance Decisions PA5099EN
- Brochure: Optimizing Chemical Industry

Web
Cross-selling chlor-alkali page
LMS
pH measurement

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)

Application 2-Pager

Brine Recovery

Door Opener Solution

Door Opener/Value Offering
Improve brine recovery in the chlor-alkali cell membrane process with reliable pH measurement..

Solutions:
We have a specific intelligent sensor that measures pH and ORP simultaneously. It's is designed for (sodium) brine processes and resists the common poisoning by oxidant species. This will allow customers to minimize maintenance, reduce process variability and sustain equipment integrity

Product/Solution to be presented:
InPro 4850i, InTrac 777

Advantage over competition
- Our pH sensor is equipped with a pNa glass membrane reference that is hermetically sealed and cannot be poisoned, so the measurement is not compromised
- Intelligent Sensor Management for superior measurement reliability reduces maintenance requirements

Contact Job Titles

- Instrument Manager
- Process Improvement Manager

Value Selling Approach

Pre-Visit
Check the Chemical Application Spotters Guide with details of this application and supporting material listed in the sales tools section.

During Visit
Use the FOCA technique to discover their needs and concerns related to the upcoming project. Inquire where in the process and how they measure pH (in-line/online/off-line). Find out what are their main challenges in brine recovery. Ask if they have concerns about the process/equipment being affected due to faulty process analysis. Present the value of service coverage.

After Visit
Send the selected value content.

Sales Insights

Brine recovery refers to the process of recycling or reusing the saltwater solution (brine) that is used as a raw material. Instead of discarding the brine after the electrolysis process, it is treated and purified to remove impurities and contaminants. The purified brine can then be reused in the chlor-alkali process. After electrolysis, the anolyte brine must be resaturated, but first needs treatment to remove oxidants.

- pH control is needed to convert chlorate/ hypochlorite and remove dissolved chlorine
- ORP is used to monitor the presence of oxidants and sometimes to control adding of reducing agents.

These are important measurements to reduce process variability and guarantee brine quality, but maintenance is usually intensive because of the oxidant species that poison the sensor's reference system, causing unreliable reading, very frequent recalibration and damage to the sensor.

Sales Tools

Recommended Content – Review Before
- Conversation: pH Sensors to Withstand Chlor-Alkali Processes:
- VSG: COR00079, COR00080
- Detailed Application Overview: PA9333EN
- Chemical ASG: PA9383EN
- FOCA Questions PA9334EN

Recommended Content – To Show
- Application Presentation: PA9335EN

Recommended Content – To Share
- White Paper: Durable Chlor-Alkali pH Electrode "No More Tears" PA0028EN
- Application Note: Dechlorination PA4090EN
- Application Note: Chlorate Destruction PA4091EN
- Case Study: High Yield in Chlor-Alkali PA4077EN
- Datasheet: InPro 4850i PA2030EN
- White Paper: ISM - Make the Right Maintenance Decisions PA5099EN
- Brochure: Optimizing Chemical Industry Processes PA1013EN

Web
Cross-selling chlor-alkali page
LMS
pH measurement

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)