

Success story Nouryon

Yokogawa & Nouryon Co-Innovation Leads to New pH-Analyzer



Company: Nouryon

Location: Nouryon Industrial Chemicals Rotterdam MEB

Industries: Chemical

Trust and openness are two indispensable factors of collaboration that are essential to developing the right product solution. Over the past four years, Yokogawa worked with Nouryon on a pH analyzer that is considered a significant step forward by engineers, technicians, operators, and the chemical company's management. The Nouryon Industrial Chemicals Rotterdam MEB plant is active in the chlor-alkali industry.

The chlor-alkali industry produces chlorine with its co-products sodium/potassium hydroxide (also called caustic soda/potash) and hydrogen by electrolysis of brine. Chlorine is largely used in the synthesis of chlorinated organic compounds e.g. PVC and isocyanates. The main areas of application of sodium hydroxide are water treatment (acidity control), the synthesis of organic/inorganic compounds, pulp and paper, textile, soaps/surfactants and metallurgy.

In several of Nouryon's process steps it is essential to measure the acidity and to ensure that these measurements are accurate for process optimization. Due to the high salt concentrations in this process, it is challenging to measure the acidity accurately with a conventional pH sensor. Thanks to the close cooperation between Yokogawa and Nouryon, a new pH-sensor was born to monitor the acidity in this challenging process accurately.

High maintenance costs and malfunctions

Around four years ago, Martijn Dane, a process technician at Nouryon, started to acquaint himself better with pH analyzers. "The maintenance of our previous pH analyzers was very time-consuming and costly. We encountered frequent breakdowns causing the staff much work overtime. Furthermore, the sensors weren't user-friendly, and we had the impression the measurement results could be further improved".

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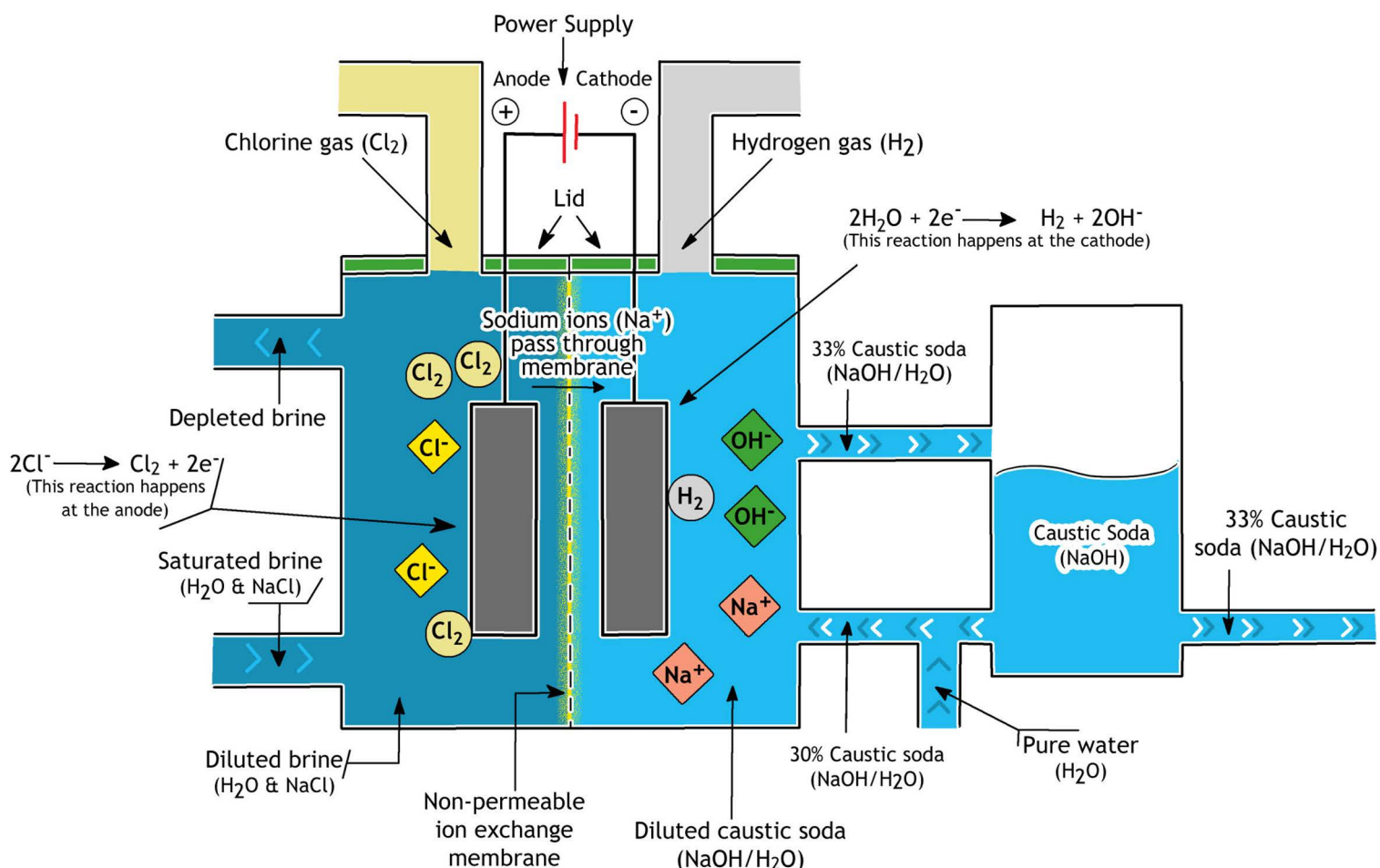


Figure 1: Brine solution undergoes electrolysis to produce chlorine, sodium hydroxide, and hydrogen.

Source: <https://www.eurochlor.org/about-chlor-alkali/how-are-chlorine-and-caustic-soda-made/membrane-cell-process/>

Hearing complaints such as this is considered a severe problem because chemical dosing is controlled based on the pH measurements. If these pH measurements are inaccurate, the dosage of chemicals will be incorrect, which dramatically affects the process efficiency.

One day, a brochure caught Martijn's eye – it presented a measurement suitable for brine applications. "After getting in touch with Yokogawa, it became evident that they were the perfect party to provide the right solution." Jorrit Walgien, account manager at Yokogawa Netherlands, remembers those first conversations. "These are challenges that drive us. When we presented a solution that could solve the challenge, we grasp the nettle and put our best foot forward".

Teamwork makes the dreamwork

With the slogan 'Co-innovating tomorrow', we aim to combine good citizenship with the courage to innovate. This project is related to the slogan in every respect," says Erik Visser, sales and marketing manager at Yokogawa Netherlands. The term symbolizes the drive to develop new solutions that add value in a long-term business relationship and close cooperation with customers. "It is more than selling a product. We showed that we are persistent and that we continue to communicate. The same goes for Nouryon. We have cooperated fully on both sides and shared insights and results openly. This approach has enabled us to make a great product that would never have been so successful without Nouryon's input. That is what we call co-innovation!"

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Yet, the right solution was not realized overnight. Martijn says: "Major change projects take time. Sometimes it took longer because of our busy schedules, and at other times Yokogawa needed more time. Thanks to openness and good communication, we understood that quality comes before speed".

In search for the best solution

Krystian Pietrzyk is a senior technician of instrumentation and quality measurements at Nouryon. "I cannot recall how many phone calls me and my colleagues in the I/KM department have had about pH measurements. That is why when I joined the company, I spent a lot of time looking for the best solution. I carried out tests, studied and compared reports, and then discussed with Yokogawa how the sensors could be further improved". Initially, an existing Yokogawa sensor, the SC24, was installed. Krystian says: "Previously, a flowing reference system was used, but our process poisoned this. That is why we started to focus on a closed reference system. The SC24 was a good step forward, and under close cooperation, this sensor was eventually further developed into the FU20-MTS with a salt-sensitive sensor". As the production process continued at Nouryon, prototypes were tested simultaneously with the existing pH measurements, so testing would never be at the expense of the production process. Moreover, the

results could be compared easily. Yokogawa thought along in this area as well.

The birth of a new sensor

Therefore, this process has led to the development of an entirely new pH sensor that is suitable for measuring the acidity in a brine solution. Erik Visser: "The measurement consists of a glass sensor measuring an electric voltage/current. When water with salt flows past it, the glass can wear out and eventually break". The salt also affects the measurement. The glass sensor reacts to hydrogen ions, but it needs a reference to define a zero signal. However, because of the salt, that zero signal is hard to define. The zero signal can be based on the salt percentage by creating a different glass-type sensitive to salt. From that zero signal, you can then measure the pH," Erik explains. Outstanding craftsmanship is required to make this unique, salt-sensitive glass bulb. At the Yokogawa factory in Amersfoort, our glassblowers manufacture these sensor parts manually. This salt-sensitive glass requires a special blowing technique because the sphere must be connected to the normal glass again. This is an extremely difficult and intensive procedure. In the old SC24 there were several glass welds. The FU20-MTS only has one glass weld left. Compared to the SC24, more polymer casing has been used so that the sensor is less prone to breakage. Care must be taken for proper sealing of



Yokogawa FU20-MTS sensor

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the plastic body with the glass electrode. All these improvements combined led to the outstanding suitability of the FU20-MTS sensor for the chlor-alkali process.

Specific Application for a Specific Customer

To create the ultimate pH sensor, both parties put a lot of time and effort into the project. Martijn: "I had to convince the management that this long development process would eventually prove itself. In the meantime, Krystian had to ask his colleagues in the production MEB department for their trust and patience. He was convinced this new development would be a success". Jorrit confirms this: "From Yokogawa, we sent our service engineers to Nouryon in the beginning. Krystian joined them to identify areas for improvement. In the end, Krystian wrote an entire procedure plan for Nouryon employees. Krystian adds: "Fortunately, I could count on the full support of my colleagues and my supervisor. On the other hand, Erik and Jorrit also encountered challenges within Yokogawa. Erik explains: "Our factory produces for customers worldwide. We had to make it clear that developing this sensor for this specific customer, for this specific application, would be worthwhile". Martijn: "We highly appreciated Yokogawa's contribution. I'm sure that has not always been easy, but we developed an outstanding new product thanks to good mutual cooperation".

Positive results

The basis for this co-innovation is trust and perseverance. Thanks to the open communication and personal contact, all those involved knew that this would result in new, unique technology. In addition to technology, it is also essential to maintain the correct usage. For this reason, Yokogawa organized a special training day to allow engineers to learn how to handle the equipment. "That went very well. In the field of corrective maintenance, we made a huge step forward. Optimized maintenance costs, smoother processes and satisfied operators made this journey worthwhile. Since we have been using the new sensors, I have not been called once regarding pH measurements. That is very different compared to the past," says Krystian. Martijn is also satisfied in many ways. "I can show positive results to the management. The costs of the preventive and corrective maintenance of the pH measurements have been reduced enormously. Furthermore, we are now performing much better in the pH range and the measurements are more accurate. We see that we use fewer chemicals and this fits in well with Nouryon's sustainability goals. Another goal for Nouryon is the complete automation of all systems. We do have insight what this pH measurement does, meaning we are more in control of dosing, calibration and maintenance".



More information

Would you like more information? Please contact your local Yokogawa office

Differential pH and ORP Sensors

pH and ORP Analyzers

pH and ORP analyzers are used for continuous process monitoring of pH and ORP to ensure water/product quality, monitor effluent discharge, batch neutralization, pulp stock, scrubbers, cooling towers, chemical, water/wastewater treatment and many other applications.

pH and ORP Sensors

pH electrodes and sensors are the sensing portions of a pH measurement. Various mounting options including retractable, flow thru, immersion, and direct insertion. Proper pH electrode/sensor selection is critical for optimal measurement results.