

Chlor-Alkali Industry



Dependable online, inline, and atline solutions for your process needs.

Safer analysis through online measurements

02

Basic information

Chlorine (Cl₂) ranks number 7 on the list of the most commonly produced chemical substances. It is the basis for the production of numerous intermediate substances, which, in turn, are important feedstock materials in the petroleum, aluminum, paper and pulp, or pharmaceutical industries. For instance, chlorine is used in the production of an impressive 80% of drugs. Polyvinyl chloride (PVC) and isocyanates can be made as a result of the generation of chlorine.

Caustic soda (sodium hydroxide, NaOH) is another crucial basic chemical which enables production of organic chemical products, bleach, detergents, paper, cellulose products, and several other materials.

Chlor-alkali process

By far the largest part – about 95% – of the chlorine produced globally is obtained via the chlor-alkali process. In this process, caustic and chlorine are created together in similar proportions via electrolysis of sodium (or potassium) chloride brine.

There are three main methods used to create chlorine and caustic from brine:

- membrane cell process
- mercury cell process
- diaphragm cell process

In Europe, the top chlor-alkali producers are Germany, followed by France, Belgium, and the Netherlands.

Safer technologies for the future

The most commonly applied electrolysis technique in Europe is the membrane cell technique (64%). All new plants are based on membrane cell electrolysis of brine, which does not include mercury and asbestos like the other processes.

Advantages of online process analysis

Metrohm Applikon, with the brand of Metrohm Process Analytics instruments, is able to offer several application solutions for the chlor-alkali industry.

Process analyzers from Metrohm are designed to offer fast, reliable, accurate measurements in a rugged housing, 24/7 to ensure processes are always running within specifications. Online analysis lessens the need for highly-skilled technical employees. Reducing manual sampling **lowers costs** and **increases the safety** of plant operations.

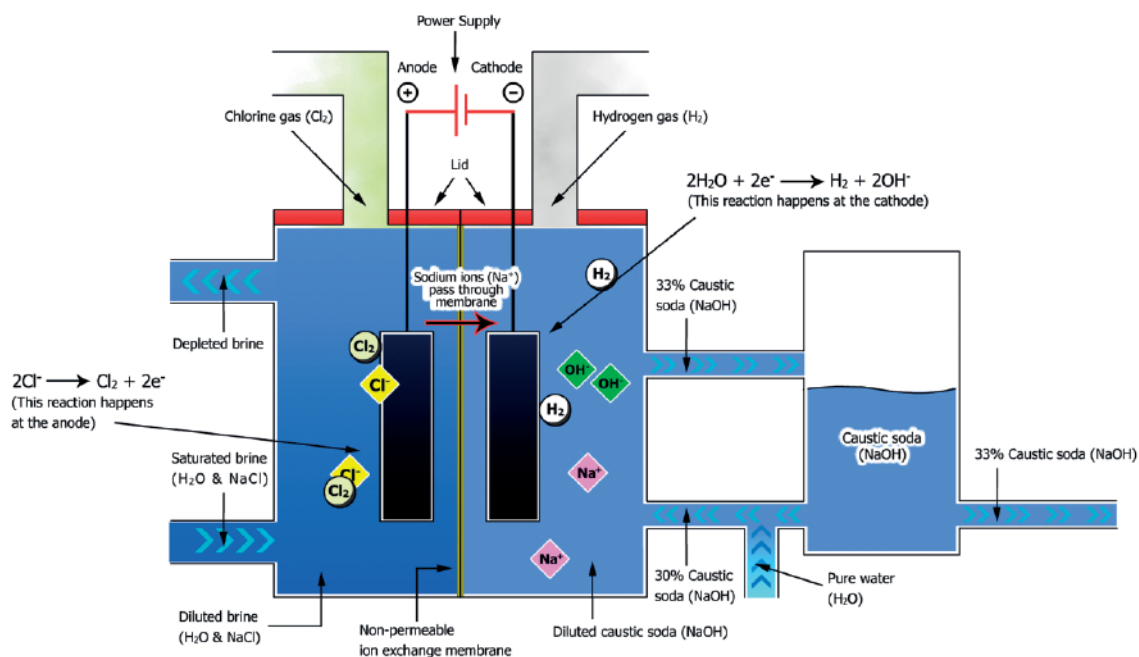


Diagram of membrane cell technique for the production of chlorine. Source: www.eurochlor.org

Applications

Improve upon your brine treatment efficiency

Brine must be pretreated in several steps to reduce impurities such as calcium and magnesium ions (hardness). After primary treatment, the purified brine is passed through an ion exchange unit to further minimize contaminants before the electrolysis process.

Accurate determination of hardness concentrations can estimate the efficiency of settling and resin treatments. Upstream control of brine quality helps overcome costly membrane remediation procedures before fouling occurs. The 2035 Process Analyzer is suitable to monitor hardness in brine during all stages of this process.

- Monitor hardness in brine in $\mu\text{g/L}$ to mg/L with high-precision burette dosing & auto-calibration.
- Suitable for other applications such as caustic and carbonate in brine, hypochlorite in brine, chlorine in brine & waste streams, and much more.



2035 Process Analyzer



NIRS XDS Process Analyzer for ATEX applications

Fast, safe moisture measurements in gases

Moisture determination in the produced gases (Cl_2 , H_2) is necessary to overcome corrosion in storage containers and transport pipelines. Vaporization of the gases after storage, without proper removal of moisture beforehand, can also clog the container valves and lead to further handling issues. Near infrared spectroscopy (NIRS), with a reference method, is ideal for this application.

- Safe, reagent-free analysis directly inline.
- NIRS XDS is capable of monitoring 9 different process points with the multiplexing capability.
- Available in ATEX version.

Impurities in concentrated caustic with Process IC

ASTM method E1787-16 specifies ion chromatography to measure several anions in concentrated NaOH or KOH solutions. The many **intelligent sample preconditioning techniques** offered by the Metrohm Process IC make the analysis of anion impurities in concentrated caustic solutions simple and easy to perform online.

- IC is a robust analysis method suitable for measuring several components in a single sample run.
- Intelligent sample preparation leads to safer analysis and more reproducible results.
- Measures analytes from ng/L to %.



Process Ion Chromatograph TWO

Other resources from Metrohm

Process Application Notes for the Chlor-Alkali Industry

- Hardness in Brine.
[AN-PAN-1005](#)
- Online Determination of Anions in 50% NaOH and 50% KOH by IC (ASTM E1787-16).
[AN-PAN-1046](#)
- Analysis in the chlor-alkali process:
www.metrohm.com/en/industries/chemical-industry-basic-chemicals/#chlor-alkali

www.metrohm.com