AMMONIUM IN BRINE MEASUREMENT. CHLOR-ALKALI INDUSTRY

Need to measure ammonium in chlor-alkali industry.

The chlor-alkali industry is the sector of the chemical industry that encompasses the production of various chemicals derived from chlorine. Among other products, chlorine (Cl_2), soda and caustic potash (NaOH, KOH), sodium chlorate ($NaClO_3$) or trichloroisocyanuric acid (TCCA) are produced.

Products from the chlor-alkali industry are widely used in the treatment and disinfection of swimming pool water, cleaning products, paper & pulp industry, etc.

One of the raw materials needed for the production of some derivatives is brine with NaCl concentrations in water higher than 80 g/l, some even up to 300 g/l, as for example in chlorine-soda or sodium chlorate electrolysis. This brine is prepared from solid NaCl dissolved in water. However, some companies in the sector obtain brine as a residue from other processes and, by applying the appropriate treatments, can reuse this brine as a raw material. The fact of reusing brine generates great economic savings for companies that produce on a large scale.

This is the case, for example, with brine reused as a by-product in the manufacture of TCCA, which uses cyanuric acid, chlorine and caustic soda as raw material to produce brine as a by-product. However, water containing NaCl must be treated **to control and remove ammonium if necessary**. By the decomposition of the ATCC itself during the dechlorination process, ammonium is generated. When brine is used in electrolysis processes, the presence of ammonium in combination with chlorine in cells **could produce nitrogen trichloride (NCl_3), which is highly explosive**. It is therefore of great importance to control the presence of ammonium.

An effective method of controlling the ammonium in the generated brine is to use an online analyzer. But the high concentration of NaCl in the sample, as well as the corrosive environment, hinder the functionality of the measuring equipment.

Ammonium Instran®

Instrumentación Analítica has extensive experience in monitoring ammonium both in drinking water and in wastewater treatment plants where the conditions of the sample make it difficult to treat. Not content with the aforementioned applications, Instrumentación Analítica has worked on the development of a robust ammonium equipment that is valid for the application in question: **measurement of ammonium in brine**. Thus, the **Ammonium Instran®** meets the necessary characteristics to be able to work in the aforementioned conditions. The improvements in the cleaning of the equipment, to eliminate any solidification of NaCl that clogs the hydraulic circuits, the conditioning of the sample prior to analysis and improvements of reagents in the measuring element developed and implemented by the R&D department make the **Ammonium Instran a unique equipment for the measurement of NH_3-NH_4 in brines above 80 g/l**, ensuring the operation and life of the mechanical elements.

AMMONIUM INSTRAN IN BRINE

Applications

In Spain, two of the leading companies in the chlor-alkali industry are Ercros SA and Electroquímica de Hernani. Both companies are members of the European chlor-alkali association Euro Chlor and the SCSG (Sodium Chlorate Sector Group), as two of the five sodium chlorate manufacturers in Europe.

Ercros SA, at its Sabiñanigo plant, focuses its activity, among others, on some of the products mentioned above, such as trichloroisocyanuric acid and the reuse of brine as a raw material to manufacture sodium chlorate and on the electrolysis of chlorine-soda. Ercros SA decided to purchase the **Instran online Ammonium analyser in May 2018** to monitor in real time the concentration of NH_3, critical in the process, **in an 85 g/l brine** up to values above 10 ppm. The Instran has been working for almost 4 years without complications, keeping the materials resistant to the plant environment and requiring no more maintenance than the equipment would need in a more optimal condition.

Electroquímica de Hernani has a business model similar to that of Ercros SA. However, due to different internal processes at the plant, that the management did not wish to explain, **brines are obtained for reuse with concentrations of 100 g/l and up to 300 g/l of NaCl. In October 2019, the Ammonium Instran was installed** in the first sample to control NH_4 to values above 2 ppm. Subsequently, in 2021 the challenge arose by common agreement between Electroquímica de Hernani and Instrumentación Analítica to control ammonium in the 300 g/l NaCl sample. Thus, **since May 2021, the Ammonium Instran** has been working without problems and perfectly fulfilling the specifications sought.

In conclusion, ammonium is one of the critical parameters to be controlled in the chlor-alkali industry that can be formed when the brine is to be reused. To ensure plant optimization, **the Instran Ammonium analyzer allows real-time monitoring, despite the difficulties presented by the high concentration of NaCl in the sample**

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