

Sodium Chlorate Process Diagram

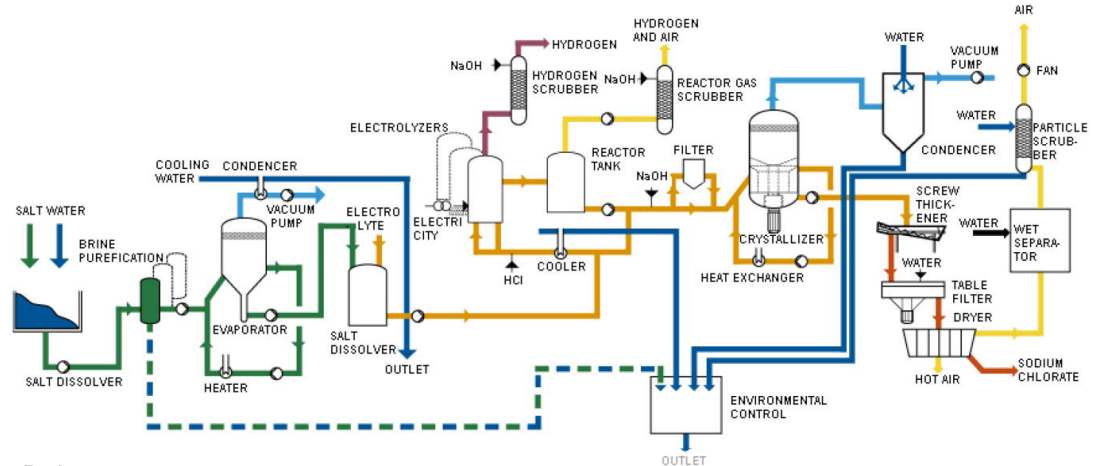
Green stream

- Incoming salt is dissolved and then purified to remove impurities (e.g., calcium and magnesium) that could harm the electrolysis operation by precipitating on the electrodes, resulting in higher electrode potentials.
- The evaporator recrystallizes the salt to remove sulfate ions, which can otherwise harm the anode operation, resulting in increased levels of byproduct oxygen.

Orange stream

The purified salt is dissolved into chlorate electrolyte and enters the electrolyte circulation, which runs through several steps:

- Cooling is necessary because excess heat is generated from irreversible losses in the electrochemical cells - about 50% of the electrical energy added ends up as heat that can be used in the process for evaporation steps and/or for external district heating.
- Hydrochloric acid is added to the electrolyte prior to the electrolysis, because active chlorine escaping with the cell gas, lowering the pH of the electrolyte
- The electrolyte enters the electrolysis cells – chloride ions are oxidized on the anodes and water is reduced on the cathodes, producing hydrogen gas.
- Gas from the electrolysis cells and reactor tanks is purified by scrubbing with alkaline to remove chlorine. Additional gas purification methods may be necessary, depending of the specific use of the hydrogen product.
- A sodium chlorate crystal slurry exits the vacuum crystallizer



Red stream

- The slurry is dewatered using a screw thickener, washed, filtered and dried.
- The chlorate product is then packed and ready for delivery to customers.

Light blue stream

- Water vapor exiting the vacuum crystallizer

Yellow stream

- An electrolyte side stream from the circulation loop is alkalinized by addition of NaOH, filtered to remove precipitations that resulted from the alkalinization, and fed to a crystallizer.

Careful environmental control of all outlet streams is necessary, in particular as the process contains chromium (VI) and chlorate which can be harmful to living organisms.