

ChlorGen™



ChlorGen Water Technologies — ChlorGen™ Effective Biofouling Management for Land-based and Offshore Facilities



More than 70% of the earth's surface is covered by seawater. This provides for an abundant supply of cooling water for coastal power stations, desalination plants, chemical plants, and offshore facilities. Yet, plant managers, engineers, and operators face the challenge of keeping heat transfer surfaces from being attacked by bio-species lingering in the seas and oceans. Macro-fouling (mussels, clams, oysters) and micro-fouling (bacteria, slime, algae) form deposits on condenser tubes, equipment, and piping systems resulting in unexpected plant shutdowns and losses in production.

Chlorine can be used to kill such species before the seawater enters the process, but gaseous chlorine is a lethal chemical that requires

strict safety and regulatory compliance. Sodium hypochlorite, as a biocide or disinfectant, is accepted around the world as a proven and effective means of treating water and is a safer and more cost-effective alternative to using chlorine gas. Sodium hypochlorite, in low concentrations, can be handled nearly as easily as water. However, transportation of sodium hypochlorite can be expensive and when stored, the product degrades over time to reduce its effectiveness.

Electrochlorination is the process of generating sodium hypochlorite on site using mainly salt, electricity, and water in the exact quantity needed for effective bio-fouling control.

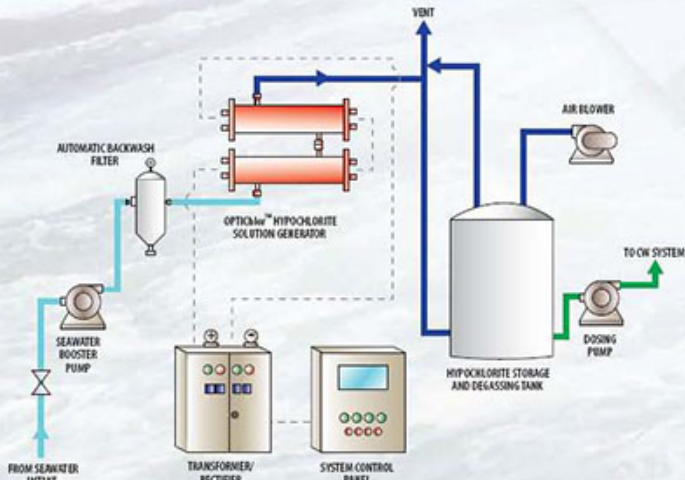
ChlorGen™ = Chlorine on Demand

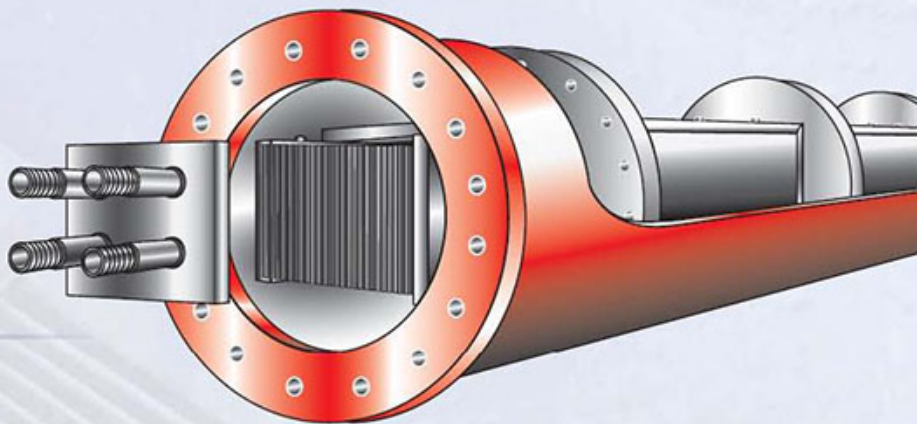
ChlorGen™ process concept involves the electrochemical production of sodium hypochlorite solution (NaOCl) and hydrogen gas (H_2) achieved by passing a DC current through nascent seawater at a defined flow rate and current concentration in an un-separated cell. This process yields the desired sodium hypochlorite concentration (typically 1500-2000 ppm) efficiently and economically.

The **Seawater Booster Pump** provides sufficient pressure to overcome the pressure drop in the equipment and the piping components. An **Automatic Backwash Filter** removes debris and contaminants that can potentially damage the surface of the electrodes or cause cell blockage.

ChlorGen™ Hypochlorite Solution Generator is specifically designed for the efficient electrochemical conversion of seawater salt to sodium hypochlorite. Each electrolyzer module consists of a number of titanium anode/cathode pairs intermeshed into a bi-polar assembly. The seawater is fed at the bottom of the electrolyzer where it flows up between the parallel plates to form a sodium hypochlorite solution with small amounts of hydrogen gas produced as a by-product of the reaction.

A **Hypochlorite Storage and Degassing Tank** removes the hydrogen gas from the liquid and the **Air Blower** provides positive venting of the hydrogen gas and air mixture to a safe location and maintains the hydrogen concentration well below the lower explosive limit. A **Transformer/Rectifier** converts alternating current to direct current to enable the operator to vary the production simply by adjusting the current at the **System Control Panel**. The hypochlorite product is then pumped to the dosing points using the **Dosing Pump**.





Your preferred global partner providing cost-innovative solutions for seawater cooling bio-fouling control and water disinfection using proven on-site electrochlorination technology.

ChlorGen™ Features and Benefits

Maximum Availability and On-stream Performance

- ChlorGen is designed for >99.5% uptime with only routine daily monitoring and annual shutdown inspection

Safe Operation

- ChlorGen can be designed for hazardous or non-hazardous areas.
- Electrical bus connections are enclosed for personnel protection

Low Maintenance Cost

- High performance Mix Metal Oxide anode coating guaranteed for 6+ years with an expected life of up to 10 years – twice the life of some competitor anodes
- Rigid electrolyzer assembly resists wear damage due to flow induced vibration

Low Operating Cost

- Lowest power consumption in the industry at 4 kWh/kg of chlorine
- Routine acid cleaning prevents formation of calcareous deposits and keeps electrodes at optimum efficiency

Continuous Operation

- Entire cell assembly is fully enclosed in a high-pressure GRP housing
- Any leaks at anode/cathode pairs are fully contained within the housing

Compact Footprint

- ChlorGen compact electrolyzer design uses less space than other electrochlorination systems of similar capacity
- Electrolyzers can be installed in vertical or horizontal position to suit specific space constraints



Professional Practical Experience

Chlorgen Water Technologies' management and technical teams truly understand electrochlorination. With an average of 15-20 years of industry experience in design, development, engineering, installation, commissioning, and technical support, each member of our team is dedicated to serving the needs of our valued clients worldwide.

Spares and Technical Service

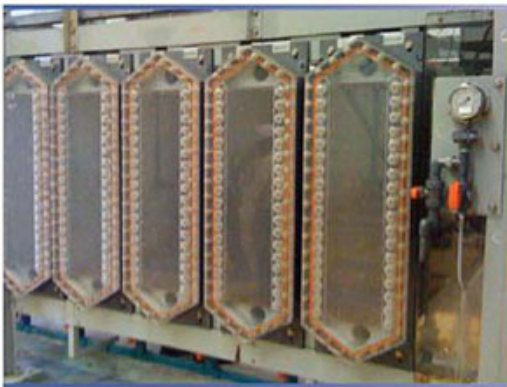
Water Technologies offers replacement spare parts and technical service support to existing electrochlorination plants, including:

Electrolyzer Replacement – Chlorgen Water Technologies can perform site surveys to replace existing outdated technology with OPTIChlor™ electrolyzers for lower capital cost, maintenance and overall life cycle cost.

Spare Cell Components – Chlorgen Water Technologies supplies competitively priced spare parts for OPTIChlor™ systems and replacements for other competitor systems for both parallel plate cells and concentric tube (CTE) cells.

Anode Coating – Chlorgen Water Technologies' affiliated company, Optimum Anode Technologies, is a leading supplier of anode coating and plating technology through its new modern facility located near Los Angeles, California.

Commissioning and Technical Support – Our team of experienced service engineers and electrochemical technology specialists have the knowledge and know-how to successfully commission systems and solve complex technical issues.



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