



# Chloropac<sup>®</sup> Systems for Seawater Electrochlorination

Water Technologies

**SIEMENS**

# Chloropac<sup>®</sup> systems by Siemens Water Technologies can be found in a number of electrochlorination applications on land and sea

- Oil and Gas – Offshore Platforms, FPSOs, LNG Terminals
- Refineries and Petrochemical Plants
- Wastewater Treatment Plants
- Power Plants
- Desalination Plants
- Mineral Mills
- Chemical Plants
- Marine – Naval Vessels, Ferries and Commercial Ships, LNG Vessels, Tankers, Bulk Carriers and Other Carrier Vessels
- Other Users of Seawater as Cooling or Process Water





## Chloropac® Systems are the number one choice of customers worldwide. Here's why.

### Recognized Global Leadership

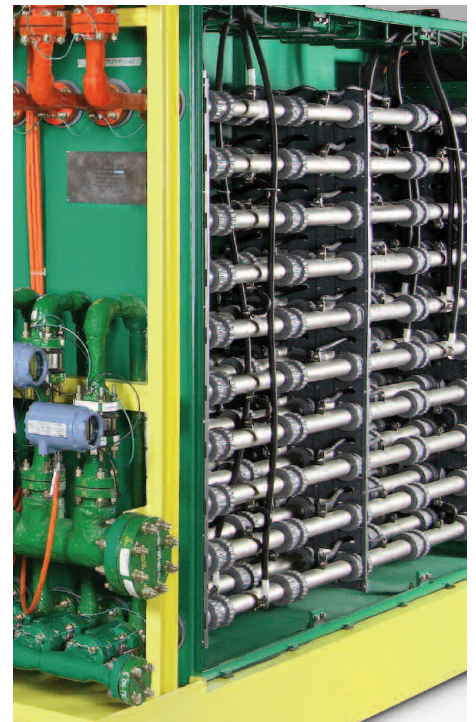
- More than 2,500 Chloropac® systems installed worldwide.
- Complete systems designed in-house – cells as well as associated electric power distribution.
- Anode and system development are our strengths – no customer's plant is ever obsolete.
- Experienced engineering team handles all requirements, including chemical, process, mechanical, electrical, instrumentation.
- 3D model design optimizes assembly and installation of complete systems.
- In-house coating and plating technologies.
- Professional product management team ensures smooth execution of projects.

### Worldwide Service

- Service staff, dedicated to customer satisfaction and strategically located throughout the world.
- Installation, commissioning and on-site staff maintenance services available worldwide, 24 hours a day, everyday.
- Regular factory training seminars held for both staff and customers.
- Factory parts stocked worldwide, available for immediate delivery.

### Unparalleled Quality

- ISO9001 accreditation.
- Total Quality Management is our philosophy.



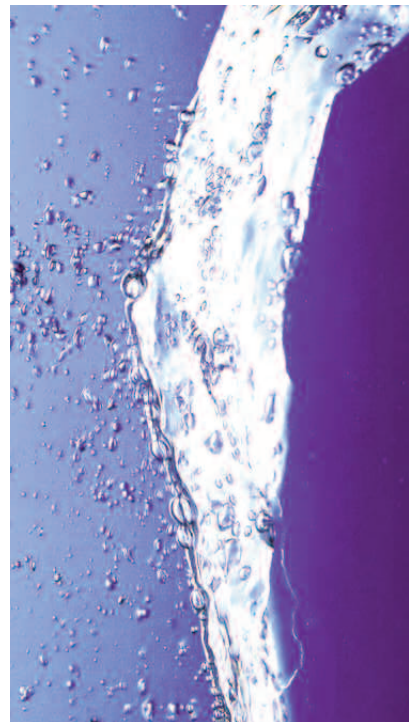
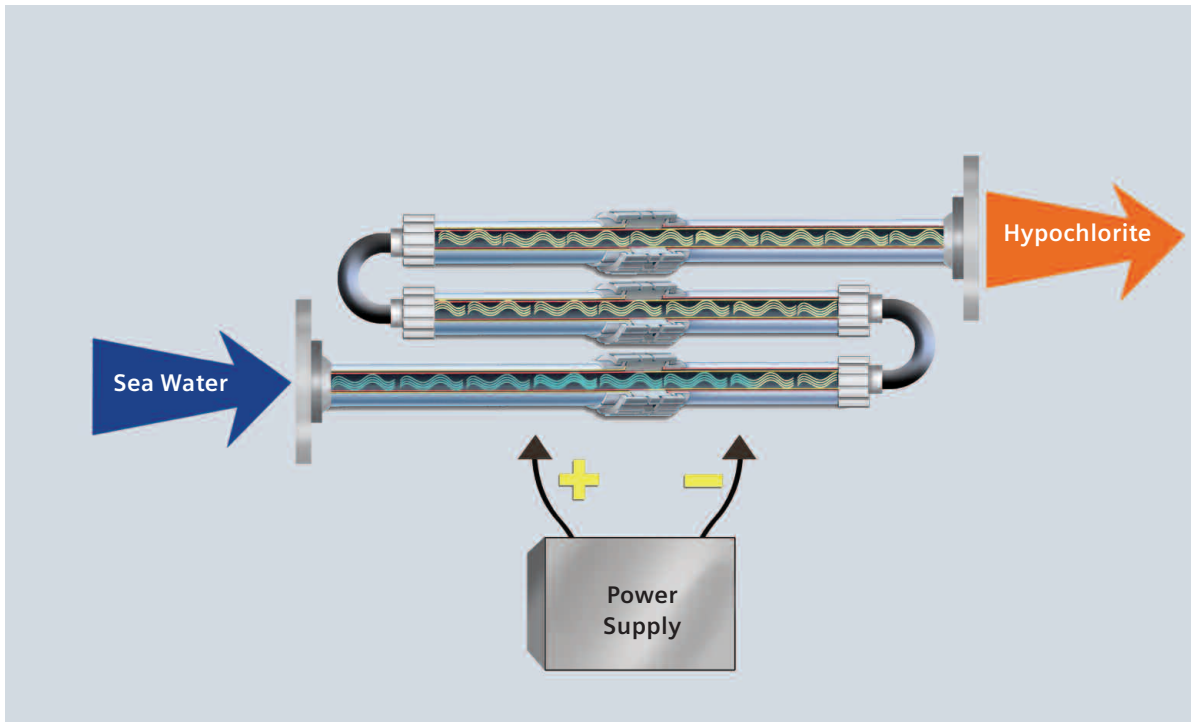
## Siemens Water Technologies

Siemens Water Technologies is a leading provider of hypochlorination and electrochemical equipment designed to control biological fouling and corrosion wherever seawater is used as cooling or process water – e.g. land-based power and petrochemical facilities; water treatment facilities; ships; and offshore facilities.

A Division of the Siemens Industry Solutions Group, Water Technologies capitalizes on the world class experience, technology, R&D support and manufacturing facilities of the group, which provides innovative solutions and services for improved lifecycle costs in processing and manufacturing industries and in infrastructure.

Industry standard Chloropac® systems provide the most effective, environmentally safe method of preventing biological fouling using technically superior equipment for energy efficient, long-term plant operation. Chloropac® systems combine our in-house anode technology with engineering, design, manufacturing and quality control to produce superior, reliable solutions. There are more than 2,500 Chloropac® systems installed around the world.





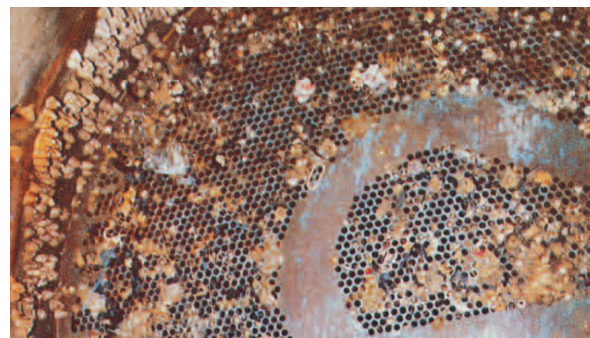
## Chloropac<sup>®</sup> Solutions Prevent Biological Fouling Safely and Cost-effectively

### No Hazardous Chemicals Required

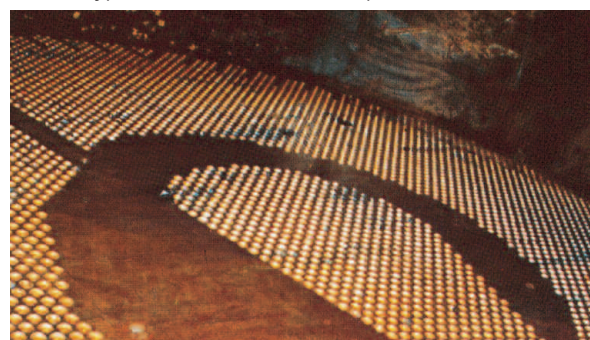
For seawater-based processes, the cost of fouling can be substantial. Macro-fouling from mussels, clams, oysters, sea anemones and barnacles, combined with micro-fouling from bacteria, slime and algae, greatly restricts the flow of cooling water to heat exchanger surfaces, accelerates localized corrosion by restricting oxygen diffusion, and causes destructive turbulence at inlets. This can severely shorten the life of affected equipment.

Chlorination is well-known to be the best solution for treating biologically fouled seawater. However, the manual use and bulk storage of chlorine is generally an unacceptable safety hazard on land or on water. For the same reasons, the handling of large volumes of liquid sodium hypochlorite is also impracticable.

Chloropac<sup>®</sup> systems produce, insitu, a dilute, safe solution of sodium hypochlorite for direct injection into the water circuit. Our advanced electrolyzer technology, available in a choice of basic cell designs – coupled with our long standing expertise in anode and system development – has freed thousands of customers worldwide from the cost of purchasing and the danger of handling harsh chemicals associated with other technologies.



Before - Typical fouled condenser tube plate



After - CHLOROPAC<sup>®</sup> system clean condenser tube plate

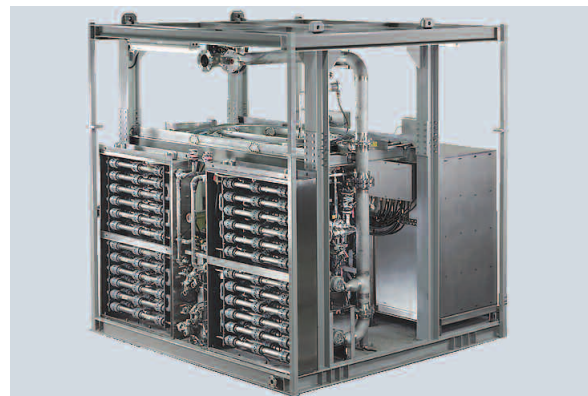


## CTE-Cell Technology for Low-to-Medium Capacity Hypochlorite Systems

For applications requiring small to medium size electrolyzers (0.1 to 89 kg/h of equivalent chlorine), the Chloropac® concentric tubular electrode (CTE) system is the most effective, time-tested solution.

Invented and refined by our engineers, the Chloropac® CTE system cell configuration is a proven design that reliably produces sodium hypochlorite from seawater. Seawater flows through the annulus created by the concentric titanium tubes that make up the anode and cathode assembly. Passing electric current through the seawater converts the sodium chloride into sodium hypochlorite: the active ingredient required for anti-fouling.

The “self-cleaning” Chloropac® CTE system does not require acid wash or other external electrode cleaning methods. This allows system users to operate at design output capacity at all times, providing the lowest lifecycle cost of any system. Standard designs are available for a wide range of chloride ion concentrations, including brackish water applications.



### Chloropac® CTE System Advantages:

- Unique, compact modular construction for adaptable installations
- Low maintenance – a design that looks after itself
- Full output availability – off-duty acid cell cleaning not required
- No acid cleaning required at any time
- Safety by design – no potential for production of hazardous chlorine gas
- Patented electrode monitoring
- Refurbishing available
- Environmentally safe



## PPE-Cell Technology for Medium-to-Large Capacity Water Systems

For large capacity seawater cooling systems, the Chloropac® Parallel Plate Electrode (PPE) system is the optimum solution. Like the Chloropac® CTE system, the PPE system is designed for the electrolysis of seawater. However, significantly higher electrolyzer capacity is provided as needed by cell modules assembled together and coupled with busbars to a power rectifier, forming a sodium hypochlorite generating train. Chloropac® PPE system capacities range from 40 to 500 kg/hr equivalent chlorine per generator.

The PPE cell is constructed from a tubular body housing parallel plates of titanium cathode and anode bipolar surfaces. The cell body is constructed from one spiral wound FRP tube with titanium end flanges designed to ASME VIII and BS5500 specifications to provide a high pressure cell design.

Electrolyte flow from the inlet to the outlet connections is forced vertically into the space between the parallel electrodes, and uniformly distributed between the anode and cathode surfaces. Each pair of electrodes passes electric current through the seawater, decomposing it and converting it into sodium hypochlorite. As with Chloropac® CTE systems, standard designs are available for a wide range of chloride ion concentrations, including brackish water applications.



### Chloropac® PPE System Advantages:

- Modular construction provides the electrolyzer capacity required
- Pre-designed standard systems available
- High-pressure cell rating provides superior back pressure
- Cell flow characteristics minimize cell cleaning
- No hazardous bulk chemical storage
- No hazardous chlorine gas required
- Cell refurbishing available
- Environmentally safe

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The information provided in this brochure contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract.

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OGS-CHLOROPAC-BR-0209  
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