PANCLOR[™] BROCHURE

www.cumberlandec.com

CLEAN AND SAFE WATER FOR MUNICIPAL, INDUSTRIAL AND RECREATIONAL APPLICATIONS.

With an emphasis on process design and a commitment to research and development.



ELECTROLYTIC HYPOCHLORITE GENERATION

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Many industries today use large quantities of water for process cooling. Power generation plants, chemical plants, refineries, LNG facilities, paper mills, steel works etc. In addition, in many areas of the World, desalination of seawater and brackish water by flash evaporation or membrane process is commonplace.

In most cases, the presence of biofouling such as molluscs, algae or slime, cause numerous problems for plants and equipment. Fouling can adversely affect system hydrodynamics, restricting flow, increasing pumping pressures and accelerating corrosion potential. Such problems not only shorten the life of pumps, screens, heat exchangers and other plant items but also increase the operation and maintenance costs.





BIOFOULING

The treatment of biofouling problems is generally acceptably controlled by the addition of a disinfection process into the system. Commonly, gas chlorination has been the historic choice. However, increasingly the more efficient and environmentally sustainable technology of electrochlorination is being chosen.

Electrochlorination also known as Hypochlorination Electrochlorination is the 'onsite' instantaneous production of sodium hypochlorite solution at a safe, dilute concentration suitable for direct injection into process. The elimination of transportation and storage of chlorine gas or other disinfection chemicals means electrochlorination is now a more viable, cleaner, safer technology for today's industries.

WHY CUMBERLAND?

Cumberland has a heritage in electrochemical processes since 1912 when Elliott Cumberland established **The Cumberland Engineering Company** to provide corrosion and scale control in industrial boilers and in 1916 launched cathodic protection systems for locomotive engines.

Cumberland is one of the Worlds leading electrochlorination manufacturers.

With an emphasis on electrochemical process design and a commitment to research and development in our field we have been at the leading edge of electrolyser technology since our formation in 1949. Our World-renowned '**PANCLOR**[™]' brand of electrolysers and systems are installed in hundreds of locations throughout the World.

Our new generation cell technology is the culmination of our dedication to continuing product development, engineering excellence and quality assurance.



WHAT IS ELECTRO CHLORINATION?

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The electrolysis of seawater or artificial brine in an electrochemical cell produces sodium hypochlorite by a combination of electrochemical and chemical reactions. At the anode the oxidation of chloride ions to produce chlorine takes place:



$2Cl^{-} \rightarrow Cl_2 + 2e^{-}$

At the Cathode the reduction of water to produce hydrogen takes place;

$2H_2O + 2e^- \rightarrow H_2 + 2OH^-$

The electrolysis takes place in an undivided cell with a slightly alkaline pH so that as soon as chlorine is liberated at the anode it immediately reacts with water to produce hypochlorite:

$CI_2 + H_2O \rightarrow HOCI^- + H^+ + CI^-$

The overall process therefore can be summarised as the reaction of salt with water according to:

$NaCl + H_2O \rightarrow NaOCl + H_2$

Hypochlorite is a powerful biocide and although it eventually decomposes back to chloride ions and oxygen it has the advantage over other biocides in that it is relatively stable. Electrolytic production of hypochlorite satisfies the instantaneous requirement for biocide.

CUMBERLAND'S PANCLOR[™] TECHNOLOGY

Cumberland has been at the forefront of electrochemical cell design for over 50 years. From our original and unique 'Rotaclor' cells, many of which are still in operation after 20 years of life through to the initial launch of the **PANCLOR[™]** system in 1989, Cumberland have invested heavily in research and development and product improvement programmes culminating in the new generation of **PANCLOR[™]** electrolysers and systems.

The **PANCLOR[™]** electrolyser is the heart of any **PANCLOR[™]** system, each electrolyser consists of a series of electrolytic cells, typically 10 cells in series arranged as a multi-fingered bipole, the number of fingers in each cell specifically sized for the output capacity of the electrolyser.

The electrodes are mounted in a carrier, which is housed in a tubular PVC body. Sufficient potential is applied to the electrolyser terminal connections to induce current flow through the cells. The carrier prevents stray current flow ensuring maximum efficiency. All fasteners used for the carrier assembly and the umbilical connections are of titanium construction. Each **PANCLOR[™]** electrolyser is connected in hydraulic series and the cells in electrical series. Inter electrolyser connections are manufactured from solid copper. **PANCLOR[™]** electrolysers operate normally under constant seawater flow rate. The DC current applied to the cells is adjusted to control the chlorine output so as to instantaneously match the treatment requirements. **PANCLOR[™]** electrolyser is configured utilising the lowest current density and energy consumption in the industry. **PANCLOR[™]** systems operate at below 4.0 kWh/kg of active chlorine with many achieving 3.5 kWh/kg.

CUMBERLAND'S PANCLOR[™] ELECTROLYSERS

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All Cumberland electrolysers are manufactured from the highest quality materials;

- A range of Electrodes Platinised Titanium, or special coated Titanium dependent on application.
- DSA Anodes Dimensionally stable anodes
- Internal carriers and fixings made from Titanium or plastic materials
- Casing made of high quality PVC or GRVE
- External fixings made from hot dip galvanised steel / SS316.
- Electrical connectors made from solid copper

PANCLOR[™] electrolysers operate on a once through basis without the need to recycle, consequently there are no moving parts which together with wetted components specified in plastic or corrosion resistant materials results in minimal maintenance.

Electrodes carriers can be withdrawn from the outer casing without the need of special tools or specialist engineers.

MAIN COMPONENTS OF A PANCLOR[™] **SYSTEM**

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The main components of the **PANCLOR[™]** system are:

- Seawater booster pumps (optional)
- Seawater strainers (optional automatic backwashing filters)
- **PANCLOR[™]** electrolyser skids
- Transformer Rectifier Units
- Motor control centre (MCC)
- System control panel (PLC)
- NaOCI storage and degassing tank
- Hydrogen Dilution Blowers (optional)
- Continuous NaOCI dosing Pumps
- Shock dosing pumps (optional)
- Instrumentation
- Acid Cleaning system skid
- Interconnecting wiring
- Interconnecting pipework

PANCLOR[™] systems are modular in design and are manufactured on pre-assembled, pre tested skids suitable for ease of installation and commissioning at site.

All systems are PLC controlled with man machine interface (MMI) as standard.

All systems are designed and constructed for continuous unmanned operation, with only periodic planned monitoring and maintenance required.

ADVANCED TECHNOLOGY IN PRACTICE

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Cumberland is dedicated to quality and environmental awareness. Our quality and environmental awareness systems are accredited as meeting the requirements of ISO 9001:2015.

Electrochlorination provides today's industry with an efficient and safe disinfection technology, which provides significant benefits;

- Hydrogen Dilution Blowers (optional)
- Continuous NaOCI dosing Pumps
- Shock dosing pumps (optional)
- Instrumentation
- Acid Cleaning system skid
- Interconnecting wiring

Today Cumberland has over 500 **PANCLOR[™]** electrolysers in operation around the World.

PANCLOR[™] electrochlorination systems are supporting many of the World's leading Companies in the following industries.

- Power Generation
- Petrochemical Industry
- Desalination
- Municipal Water Treatment
- Coastal Based Industry

Cumberland Electrochemical is at the cutting edge of electrochlorination and manufacture.

Our world-renowned '**PANCLOR**[™] ' brand of electrolysers and systems are installed in hundreds of locations throughout the world.

Our new generation cell technology is the culmination of our dedication to continuing product development, engineering excellence and quality assurance.

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