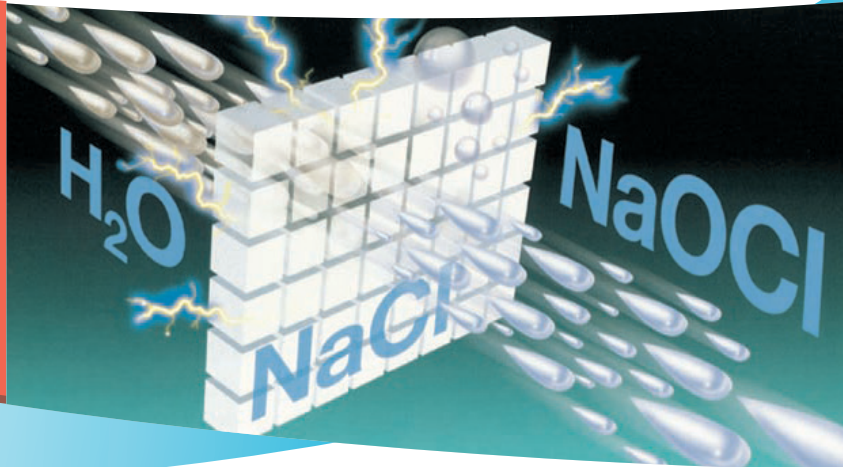




WALLACE & TIERNAN[®] SYSTEMS

OSEC[®] ELECTROLYTIC CHLORINATION SYSTEMS OVERVIEW

INTRODUCTION

WHAT ARE OSEC® SYSTEMS?

The OSEC® system is the On Site Electrolytic Chlorination system from Evoqua Water Technologies. This is a system for producing sodium hypochlorite on site and on demand through the electrolysis of a brine solution. It is available in standard unit capacities from 6 to 907 kgs of equivalent chlorine per day. The system capacity can be increased by the use of additional modular electrolyzers.

WHY OSEC® SYSTEMS?

OSEC® Systems eliminate dependence on commercial chemical suppliers and the concerns inherent in the transport, handling and storage of chlorine gas and purchased hypochlorite. Local regulatory and health and safety issues often limit the use of chlorine gas, requiring the use of more costly purchased hypochlorite. OSEC systems can produce hypochlorite at a cost that is significantly lower than purchased hypochlorite. In addition, since the OSEC system produces hypochlorite on demand, it does not degrade in storage resulting in loss of product strength. Hypochlorite solution at 1% or less is not classified as hazardous thus removing dangerous chemicals from site.

Wallace & Tiernan® systems are pioneers in the practice of chlorine disinfection with over 100 years of experience. Hundreds of OSEC systems installed worldwide over the past 30 years have had a reliable performance record with a down time of less than 0.001% with minimal maintenance requirements. Add to this an extensive sales and service support network and you have one of the most dependable disinfection processes available.

Key Benefits

- ATEX compliant
- Complete disinfection system supply
- Guaranteed system performance and customer satisfaction
- Virtually operator-free performance
- Safety alarm interlocks
- 5 year continuous use anode warranty
- Positive H2 dilution & removal
- Economical, reliable low maintenance operation
- Flexible installation configuration to fit available space



B8-200 Tubular OSEC® units

TYPICAL APPLICATIONS

	Municipal or industrial watertreatment	- Disinfection of potable water - Treatment of cooling water to inhibit biological growth and algae control in irrigation systems
	Municipal or industrial waste treatment	Disinfection of municipal sewage effluent and industrial waste streams
	Chemical processing	Treatment of industrial wastes from - metal finishing - pulp and paper operations - chemical plants - food processing plant discharges
	Industrial process water	- Taste and odour control in bottling plants and breweries - Tempering water treatment and bleaching flour mills High purity water in: - electronics - pharmaceuticals - cosmetic industries
	Recreational pools	Swimming pool disinfection

THE SMART SOLUTION FOR DISINFECTION CONCERNS

COMPLETE SYSTEM SUPPLY AND SERVICE

Evoqua Water Technologies manufactures and supplies the Wallace & Tiernan® hypochlorite generating system along with the analysers for measuring the chlorine residuals in the treated water, and the automatic control system to maintain the desired disinfectant residual. No other equipment supplier can provide this level of service.

FULLY AUTOMATED CONTROL

System operation is controlled and monitored through a central control panel with safety alarm interlocks to shutdown the system in the unlikely event of a malfunction. The system requires little operator interface; it is ideally suited for unmanned installations

POSITIVE HYDROGEN GAS REMOVAL & DILUTION

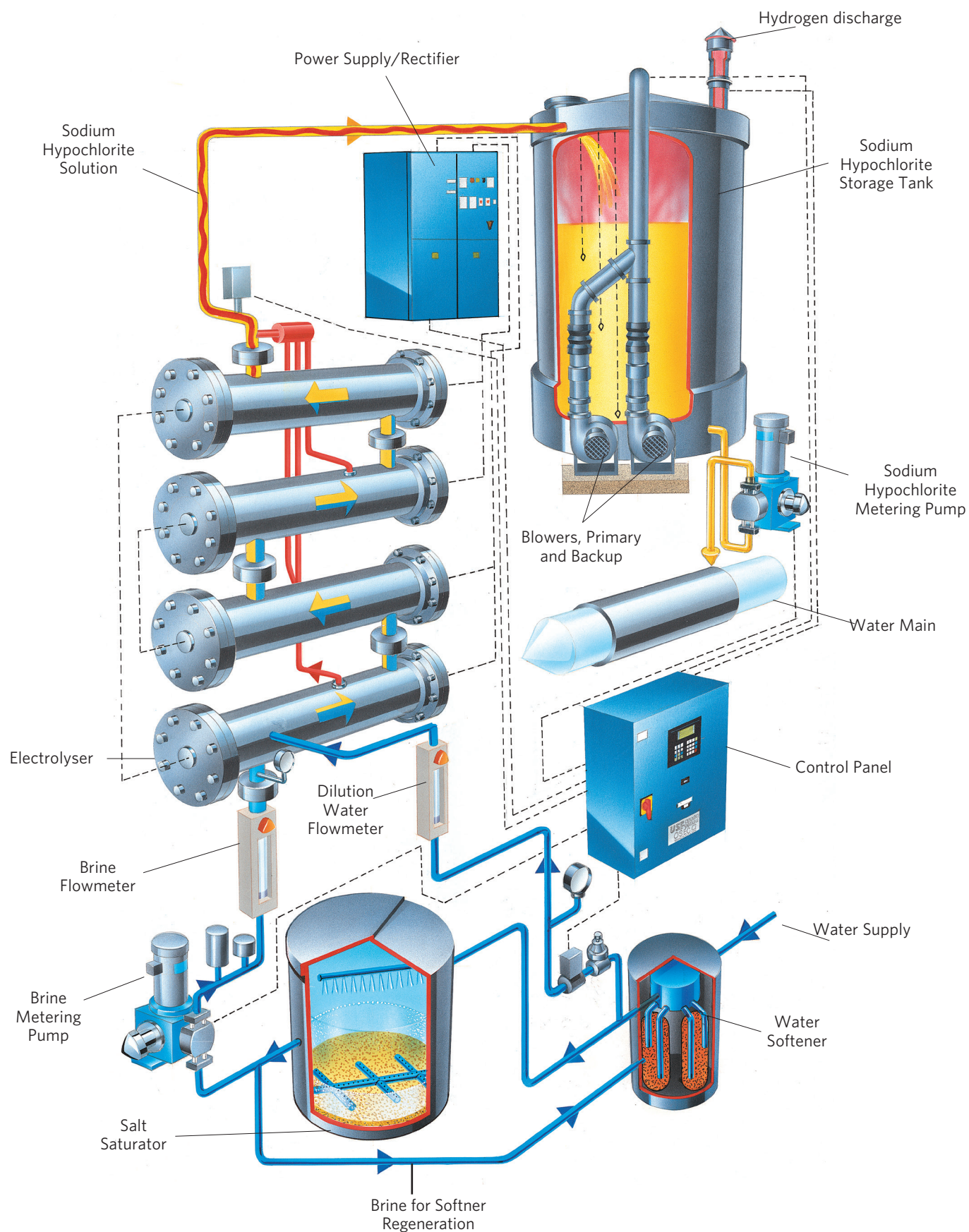
A by-product of any electrolytic chlorination process is hydrogen gas. To eliminate any concerns with the accumulation of this gas in potentially hazardous concentrations, all OSEC systems utilise an air blower to dilute any hydrogen to well below its flammability limit. Combined with sealed product tanks, the diluted hydrogen is force ventilated to a safe outdoor discharge point. Air flow monitors ensure proper blower operation. In no way is the handling of this gas left to chance through natural convection and open tanks.

LOW CONCENTRATION "HYPOCHLORITE" SOLUTION

The OSEC® System produces a 0.8% sodium hypochlorite solution, which is a very stable solution that will not quickly degrade. Commercial hypochlorite solutions, which are shipped in higher concentrations (10-15%), are subject to degradation and by-product formation over time.

Additionally, hypochlorite produced by the OSEC system falls below the 1% NaOCl concentration HazMat regulatory criteria to simplify handling and storage.

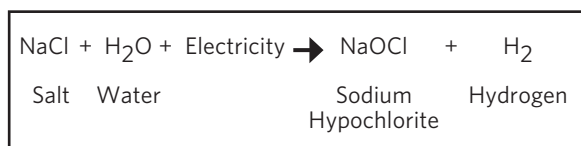
OSEC® HYPOCHLORITE GENERATION SYSTEMS AND COMPONENTS



THE OSEC® SYSTEM PROCESS

Supply water passes through the water softener (required if water hardness exceeds 17 mg/l) to remove any calcium, magnesium, iron and manganese present. This provides the make-up water for the salt saturator and the brine dilution water. The saturated brine solution is pumped from the saturator by a variable capacity metering pump through a flow-meter. Accurate brine flow, which is important to establish and maintain efficiency, is achieved with a calibration tube. The softened dilution water flow is indicated at a flowmeter with an integral rate valve for adjustment and an integral flow controller to maintain the set flowrate. The dilution water is combined with the saturated brine solution to form a 3% brine solution which enters the electrolyser.

Within the electrolyser, the brine solution – which is a good conductor of electricity – supports a current applied between the positive and negative electrodes, thus electrolysing the sodium chloride solution. This results in chlorine (Cl₂) gas being produced at the positive electrode (anode), while sodium hydroxide (NaOH) and hydrogen (H₂) gas are produced at the negative electrode (cathode). The chlorine further reacts with the hydroxide to form sodium hypochlorite (NaOCl). This reaction can be simplified as follows:



When the solution exits the electrolyser, it is approximately 0.8% strength hypochlorite. A float switch and a temperature switch monitor the conditions within the electrolyser to ensure the proper, efficient operation of the system. The hypochlorite solution, together with the hydrogen by-product produced during electrolysis, discharges into a solution storage tank. To ensure that the hydrogen produced is diluted and removed, a blower is used to force vent the storage tank. A flow-sensing orifice prior to discharge monitors the airflow. This is interlocked with the system controls to ensure that airflow is established before the electrolysis process is begun. The hypochlorite solution is fed to the point of application by a metering pump. Level probes in the storage tank start and stop the electrolyser to maintain a hypochlorite supply.

OSEC® SYSTEM COMPONENTS

Softener

The water used for the saturator and dilution of the brine solution must have less than 17 mg/l hardness, otherwise operating efficiency and maintenance-free operation will be compromised.

Salt Saturator

The saturator enables the salt supply to be stored indefinitely in sufficient quantity to provide production continuity and economical refill cycles. The salt is stored wet with the make-up water entering above the salt bed. The water passes through the salt bed forming a saturated brine solution of approximately 32% strength.

Transformer / Rectifier

A high quality transformer/rectifier is used to provide the necessary low-voltage DC power required to drive the electrolyser. Reliability and DC current control accuracy are provided to ensure high operating efficiency.

Electrolyser

The heart of the OSEC system, the electrolyser contains a titanium chassis to which the cathodes and anodes are fixed in a configuration that ensures maximum operating efficiency. The anodes are DSA type and manufactured from a titanium substrate with a precious metal oxide coating. The cathodes are made from a special grade of Hastelloy® C or Titanium depending on application and are fitted with PVDF spacers which maintain a critical uniform distance from the anode. Vertical orientation of the anodes and cathodes provides for the quick removal of hydrogen from the anode to ensure the maximum efficiency. Each electrolyser tube contains four cells electrically connected in series, containing sufficient anodes and cathodes to produce the desired quantity of chlorine. The anodes are warranted for five years after installation and start up, provided correct operating conditions are maintained.

Storage Tank

The hypochlorite storage tank serves two purposes: to store sufficient hypochlorite for ready use and to provide for the release and removal of hydrogen produced by the generation process. Generally storage is provided for 24 hours of operation, though this can be increased or decreased depending on available space and site conditions. Level probes or transducers in the tank provide start/stop control of the OSEC system to maintain a continuous supply of hypochlorite. Air blowers mounted near the tank dilute the hydrogen below the flammability limit and force ventilate the tank to an outside discharge.

Control Panel

The entire OSEC system is automatically operated and monitored by a central control panel. Operational functions are continuously monitored to ensure that the system is operating correctly and it provides alarm functions and a shutdown sequence in the event of a malfunction. Larger systems can be programmed to make use of “off-peak” power (available from many power companies) to take advantage of lower power costs.

OSEC® SYSTEM CONFIGURATION

OSEC® LC System

A low capacity system available in capacities of 6 and 12 kgs of equivalent Chlorine per day. Standard components are available for wall mounting to custom fit in any location from boreholes to replacing small gas feed systems.

The OSEC® LC system can be configured with 100, 200 or 500 litre tanks in an ATEX compliant pre engineered package if required, or simply as components.

Tubular OSEC® Systems

B1-150

One 150mm tubular casing. Available capacities range from 21 to 67 kgs Cl₂/day (0.8 to 2.8 kgs/hr). Also available as a skid mounted package.

B1-200

One 200mm tubular casing. Available capacities range from 71 to 113 kgs Cl₂/day (2.9 to 4.7 kgs/hr).

B2-200

Two 200mm tubular casings. Available capacities range from 118 to 227 kgs Cl₂/day (4.9 to 5 kgs/hr).

B4-200

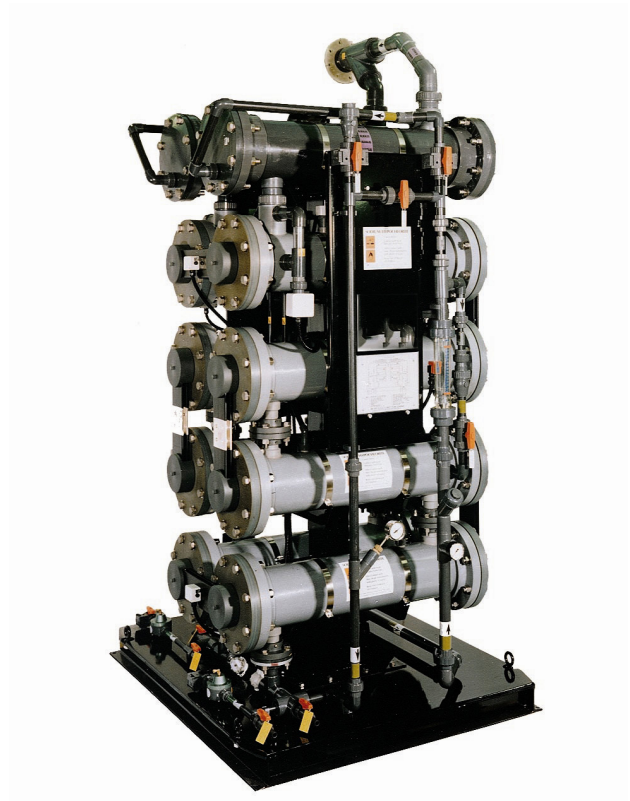
Four 200mm tubular casings. Available capacities range from 235 to 454 kgs Cl₂/day (9.7 to 18.9 kgs/hr).

B8-200

Eight 200mm tubular casings. Available capacities range from 470 to 907 kgs Cl₂/day (19.5 to 37.8 kgs/hr).



OSEC® LC System



B8-200 Tubular OSEC® unit

TECHNICAL INFORMATION

Power Requirements

Control Panel:	120 - 240 VAC, 50/60 Hz, single phase
Transformer/Rectifier:	380/440 VAC, 50/60 HZ, 3-phase
OSEC-LC system:	120/240 VAC, single phase
Typical Power Use at Electrolyser	4.5 kW-hr per kg. of available Cl ₂

Feed Water Requirements

A softener will be provided unless the water is less than 17mg/l calcium carbonate hardness. The operating temperature of the feed water should be between 10° and 25° C. Temperatures outside this range may require additional conditioning. Low water temperatures will affect the anode surfaces and below 10° C, shorten their life. For this reason, heat exchangers may be fitted where cold water conditions are likely to exist. Water consumption is approximately 120 to 150 litres per kg of chlorine.

Salt Requirements

It is recommended that the salt be 99.8% pure, vacuum-dried. A food grade salt is recommended when treating drinking water supplies. Salt requirements for each kilo of equivalent chlorine produced will vary between 3.0 and 3.9 kg depending on feed water dilution, salt quality, and temperature.

ATEX Compliant

All OSEC® B Series systems have been examined by Sira Certification Services to assess its compliance with the Explosive Atmospheres Directive (ATEX) 94/9/EC.

Ambient Temperature Requirements

5° C to 50° C

Supporting Equipment

To complete the disinfection system, Evoqua offers a complete line of sodium hypochlorite metering pumps such as the Chem-Ad® Series Diaphragm Metering Pump.

Depolox® 5 or Micro/2000® Residual Chlorine Analysers measure chlorine levels in the treated water and in conjunction with V600™ or ChemTrim® or controllers, maintain the desired disinfectant residual. For industrial systems High Resolution Redox® control systems are available for demand-based disinfectant control.

An OSEC® system test kit is available for ease of maintenance and verification of operating parameters.

Acid clean kits and Hydrogen detectors are available for added security in your installation.



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