Wallace & Tiernan® On-Site Hypochlorite Generation System OSEC® B1-200 System

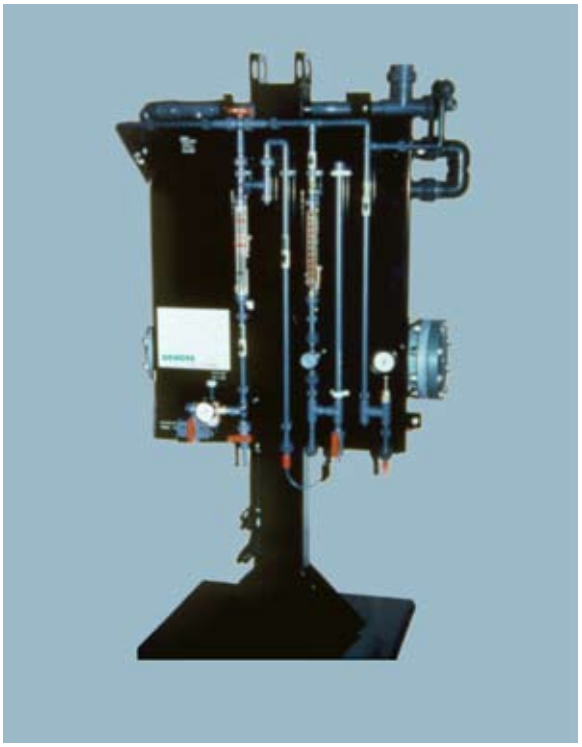
OSEC® Systems provide for on-site, on-demand production of sodium hypochlorite solution from salt, water, and electricity. This eliminates dependence on commercial chlorine suppliers and the problems inherent in the transport and handling of bulk hypochlorite. Additionally, OSEC® Systems can significantly lower operating costs, as well as disinfection by-products compared to the use of bulk hypochlorite. Operation is completely automatic, making the B1-200 system ideally suited for remote or unmanned locations.

System Components

The B1-200 OSEC® System can produce up to 113 kgs (250 lbs) per day of equivalent chlorine. The system includes all of the components to automatically generate sodium hypochlorite. This includes a salt saturator, water softener (if required), electrolyzer, transformer/rectifier, product storage tank and system control panel. To complete the disinfection process, Siemens Water Technologies offers a complete line of chemical metering pumps and packages to deliver the sodium hypochlorite to the point of application. Continuous, on-line residual analyzers for both free and total chlorine are available to measure chlorine levels in the treated water and compound-loop controllers to maintain the desired disinfectant level regardless of flow or water quality changes.

Key Benefits

- Economical, reliable, low maintenance operation
- Automatic, on demand production of sodium hypochlorite
- Major components mounted and pre-piped on a common pedestal
- Flexible installation configurations
- Positive Hydrogen gas dilution and removal



Product Sheet

Water Technologies

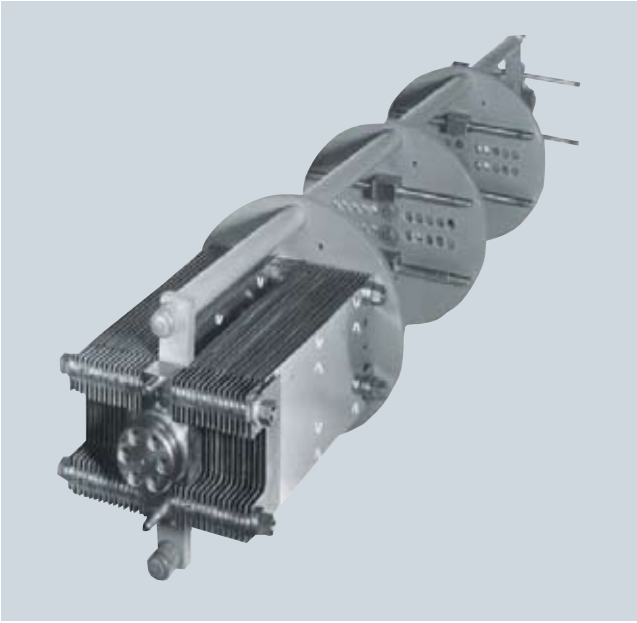
SIEMENS

Generator

The key component in any on-site electrochlorination system is the electrolyzer. This is where the salt or brine solution, water and power are combined to produce sodium hypochlorite. This critical function requires the latest anode technology and electrolyzer design to achieve consistent, reliable operation with efficient use of power and salt. As specialists in anode technology, Siemens Water Technologies maintains a complete "in-house" R & D facility for custom anode design, testing and evaluation of the optimum performance requirements for any application. In addition, a complete anode fabrication plant produces the OSEC® anodes in every configuration and size. Combined with the cell manufacturing and assembly expertise, Siemens offers complete system responsibility without the need to rely on sub-vendors for critical components.

The B1-200 OSEC® System consists of a single tubular electrolyzer casing, mounted on a sturdy, freestanding pedestal. This casing houses a titanium chassis to which the anodes and cathodes are fixed in a configuration that ensures maximum operational efficiency by providing simple, single-pass flow operation. The anodes are DSA-type and manufactured from a titanium substrate with a precious metal oxide coating. The cathodes are fitted with PVDF spacers that maintain a critical, uniform distance from the anode. The electrolyzer contains four cells electrically connected in series, containing sufficient anodes and cathodes to produce the desired quantity of chlorine 97 or 113 kgs/day (215 or 250 lbs/day.)

The internal electrolyzer design and vertical orientation of the anode and cathode plates provide for the quick removal of hydrogen from the inter electrode gap to ensure maximum efficiency. The partition discs have gas ports that pass the hydrogen through the compartments. Baffling effectively eliminates mixing between cells, thereby reducing competing electrochemical reactions. This design provides an efficient release of hydrogen, which results in electrical power and salt savings.



OSEC® Systems include a number of design features, which optimize operating efficiency, including:

Heat Exchanger

Reaction efficiency is greatly affected by the operating water temperature. Systems operating with incoming water temperatures below 7.2°C (45° F) often require electrically powered pre-heaters to elevate the water temperature to optimal conditions. OSEC® generators are offered with a heat exchanger, which is integrally mounted to the generator assembly. The optional heat exchanger uses the hypochlorite solution exiting the generator, which has been elevated in temperature due to the heat of reaction of the generation process, to heat the incoming cold water. When conditions dictate, the heat exchanger can be valved in service to allow the cold water to be heated in a counter-flow exchange manner with the warmer outlet solution. The use of the heat exchanger in typical installations results in a 2.8°C (5° F) increase in incoming water temperature, without any electric power consumption. With the piping manifold supplied, the heat exchanger can be bypassed during warm-season operation.

Split Flow Regime

OSEC® B-Series Generators employ a split-flow arrangement to further optimize overall process efficiency. The incoming dilution water is split into two streams before entering the electrolyzer. This provides a favorable brine concentration and enhanced operating temperature in the first cells allowing it to operate more efficiently. The rest of the cool dilution water is added to the downstream cells, which serve to maintain the operating temperature within the most efficient range, and achieves the final product concentration.

To maintain proper conditions for safe and efficient operation, OSEC® generators include sensors for brine flow, water flow, and electrolyzer level and inlet and outlet temperatures.

Control Panel

For supervision and monitoring of the safe generation of sodium hypochlorite, the entire OSEC® System is automatically operated by a central PLC-based control panel. The control panel includes an HMI (Human/Machine Interface) with an LCD screen to allow for immediate visual indication of complete system status and parameters. Status indications include rectifier on, water supply on, blower running, brine pump on, electrolyte inlet and hypochlorite outlet temperature, and storage tank level. There is a comprehensive list of alarms including storage tank overflow, high electrolyte temperature, improper voltage, and low brine flow. Any alarm condition that affects the consistent production of sodium hypochlorite shuts the system down. A last-200-event logger tracks all operating conditions and maintains a record for troubleshooting.

Transformer / Rectifier

Power for the electrolysis of brine is provided by a solid-state controlled, force-air-cooled transformer/rectifier. This unit takes the incoming AC power and converts it to the 32-volt DC power required for the electrolysis process. The rectifier is self-monitoring for cell voltage, thermal overload and internal faults. An alarm contact interfaces with the OSEC® System control panel to maintain proper system operation.

Product Tank

The freshly produced sodium hypochlorite solution is stored in a totally enclosed FRP tank. Storage is generally provided for 24 hours of operation, although this can be increased or decreased depending on site conditions. Level probes or transducers in the tank provide start/stop control of the OSEC® System to maintain a continuous supply of hypochlorite. A primary air dilution blower and a complete redundant standby blower is provided to force ventilate the product storage tank to reduce the concentration of hydrogen gas in the tank and the gas discharged from the system vent to 25% of the LEL, which is 1% in air. A differential pressure switch monitors the operation of the blower. If a decrease in air flow is detected, the standby blower is activated. Unless airflow is maintained, the OSEC® System is shutdown to prevent the accumulation of hydrogen above the LEL.

Salt Saturator

The salt saturator creates the brine solution that feeds the OSEC® electrolyzer. The saturated brine tank is constructed from FRP and features an automatic level control system to maintain a constant liquid brine level. The brine solution is made by passing the make-up water through the salt bed forming a saturated brine solution, which is then fed by a brine dosing pump to the electrolyzer. The saturator is typically sized for 30 or more days production to ensure sufficient salt quantity to provide production continuity and economical refill cycles.

Softener

The make-up water used for the salt saturator and the feed water used for the dilution of the brine must have less than 17 mg/l of calcium hardness, otherwise operating efficiency and maintenance-free operation will be compromised. For water supplies exceeding this hardness limit, a water softener is required. The softener is a twin tank design with automatic changeover for regeneration. One tank is in service while the other is regenerating or in standby-mode to assure a continuous, uninterrupted supply of softened water.

Anode Warranty

The anodes are warranted for seven years (two full years and five years prorated). This warranty is based on installation and start-up provided that the correct operating conditions of the OSEC® System are maintained.

Technical Specifications

Capacity: Two sizes available:
97 kgs/day (215 lbs/day) of chlorine equivalent
113 kg/day (250 lbs/day) of chlorine equivalent

Housing: Single 152.4 mm (6”) casing, nominal diameter tube with PVC end flanges

Anodes: DSA type with precious metal oxide coating

Cathode Spacers: Surface-mounted PVDF bushings

Chassis: Titanium construction

Dilution Water Flowmeter: Variable-area flowmeter with integral, adjustable alarm proximity switch

Brine Water Flowmeter: Variable-area flowmeter with integral, adjustable alarm proximity switch

Salt Requirements: Common solar grade salt. Salt usage is approx. 3 kgs per kg (3 lbs per lb).

Supply Water Requirements: Max. water hardness not to exceed 17 mg/l of $CaCO_3$ at the electrolyzer inlet

Water Pressure: 1.9 bar (29 psi) min.; 4.96 bar (72 psi) max.

Electrolyzer Inlet Temperature: Min. 7.2°C (45°F); max. 26.7° C (80°F)

Electrical Requirements: Main Control Panel 120/230 V 1 phase or 230/460 V 3 phase; Transformer Rectifier 230/460 V 3 phase

Electrical Power Consumption: 2.0 kWh AC per lb. of Cl_2 per day

Hypochlorite Strength: 0.7% to 0.85% concentration by weight

Pipe Connections: Inlet Water ¾”, Inlet Brine ½”, Outlet Product 1½”

Brine Pump: Premia® 75 ME 38 (See WT.460.150.003.UA.PS)

Generator Dimensions: 1.5m x 0.7m x 2.0m (3’9” x 2’4” x 6’6”)

Weight: 91 kgs (200 lbs)

Optional Equipment: Hydrogen Detector, Titrator, Acid Cleaning Kit, Integral Heat Exchanger

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