**Company Information**

- **Company Name:** Ecochlor, Inc.
- **Founded:** 2001
- **Headquarters:** Maynard, Massachusetts USA
- **Other Offices:** North Haven, Connecticut USA; Limassol, Cyprus
- **Website:** www.ecochlor.com
- **Treatment Technology:** Filtration + Chemical Injection (Chlorine Dioxide - ClO₂)

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**Certificates & Type Approvals**

- **IMO Type Approval**
  - Certificate Date: 2011  Renewal: 4 Sept 2018 (NMA)
- **IMO G9 Active Substance**
  - Approval Date: 6 Oct 2010
- **USCG Type Approval**
  - Certificate Date: 10 Aug 2017 Revision: 26 Apr 2018 Rev. 1
- **Class Approvals**
  - ABS; BV; LR; NK; RMRS; DNV GL
- **Flag State Approvals**
  - IMO Liberian Type Approval; IMO Cyprus Type Approval; IMO Hellenic Type Approval

**USCG Type Approval Limitations**

- **Flow Rates (TRC):** 500 - 16,200 m³/hr.
- **Chemical Dose:** 4.25 mg/L
- **US Flag Hazardous Approved:** Yes
- **Minimum Hold Time:** 24 hrs.
- **Temperature:** Not Applicable
- **Electrolyte Feed Temp./Salinity:** Not Applicable
- **Salinity:** Not Applicable
- **TRO:** Not Applicable - No neutralization or retreatment at discharge.
- **Maximum Allowable Discharge Concentration:** 0.2 mg/L MADC using in-tank sample

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**Additional Testing**

- **Tank Corrosion**
  - Corrosion Evaluation of Test Panels Exposed to ClO₂ Treated and Untreated Seawater (Corrosion Testing Laboratories, Inc.); Test of ClO₂ on Epoxy Ballast Tank Coatings (International Paint, Inc.); Laboratory Immersion Corrosion Testing of Ballast Panels in Chlorine Dioxide Treated Artificial Seawater (NovaChem).

**Ecochlor Components**

- **ClO₂ Generator skid**
  - Series 75, 100, 150, 200, 250, 300.
- **Filter**
  - FilterSafe (Standard option screen provided: 904L SST).
- **Chemical Storage Tanks**
  - Two self-contained chemical storage tanks. One is a vented carbon steel tank lined with Halar (ECTFE) for 78% Sulfuric Acid. The second is a vented 316L stainless steel tank for Purate™ BWT.
- **Motive Water Booster Pump**
  - Vertical, multi-stage centrifugal pump sized to supply motive water that ranges from 1.3 - 45.4 m³/hr.
- **System Control Panels**
  - Treatment System Control Panel (CP-1) is mounted on the same skid as the ClO₂ Generator, Filtration System Control Panels (CP-2 & CP-4 as required) are located local to the filters, Remote Panel (CP-3) is installed in the Ballast/Cargo Control Room or Deck Office for monitoring system operation.

**Piping/Components**

- Sulfuric acid piping is Alloy 20 or Teflon lined steel pipe. Purate piping is 316L SST. Chlorine dioxide piping is Glass Reinforced Epoxy (GRE).
Ecochlor BWMS Details

Maximum Flow Rate Capacity of an Ecochlor BWMS
One (1) BWMS required for a ballast flow rate of up to 16,200 m³/hr with an option for up to three (3) ClO₂ injection points.

Power Consumption
Power requirements include filter(s), filter cleaning suction pump, generator, control panel and motive water booster pump. Power requirements are slightly higher when including an aft peak filter in operation.

Power Consumption with Flow Rates from 500 - 3,000 m³/hr
Power requirements range from < 7 kW with maximum (based on continuous filter cleaning for tubid water) at < 30 kW.

Power Consumption with Flow Rates from 3,000 - 10,000+ m³/hr
Power requirements range from <14 kW with maximum (based on continuous filter cleaning for tubid water) at <60 kW.

Weight
Dry weight of an Ecochlor generator and chemical tanks range from 4,100 to 12,000 kg. Chemical tank size determined by total annual ballast volume to be treated.

Footprint*
*treatment System and FilterSafe Filter(s). Footprint ranges are based on the Ecochlor BWMS Model and varying filter sizes based on ballast flow rate.

Treatment System (Generator + Precursor Chemical Storage Tanks)
Range from 12.7 - 32 m²

One Filter (horizontal)
Range from 1.6 - 7.0 m²

One Filter (vertical)
Range from 0.3 to 3.1 m²

Filter Pressure Drop
1.6 barg is the baseline input operating pressure to support proper filter cleaning with 0.5 barg pressure drop.

Motive Water Source
Filtered sea water or fresh water.

Treatment System Precursor Chemicals
78% Sulfuric Acid and Purate™ BWT.

Chemical Cost
USD $0.08 per m³ of treated ballast water or one cubic meter of each precursor chemicals (priced at $6,000) to treat 75,000 of ballast water. Price includes the chemicals, transportation, technicians and travel for the re-supply activity.

BWMS Standard Delivery Timeframe
The standard delivery timeframe is 26 weeks from the signed purchase order and deposit, contingent upon receiving detailed integration engineering drawings within four (4) weeks, and does not include the delivery time (average 4-6 weeks) to the shipyard.

BWMS System Delivery Method
Treatment System is delivered as three skids that consist of the ClO₂ generator with CP-1 and two precursor chemical storage tanks. The filters, filter cleaning suction pumps, and associated valves/components are provided separately.

EcoCare™ Compliance Guarantee*
Guarantee of Ecochlor system efficacy as it pertains to system performance and treatment of ballast water for invasive species. Insures against financial penalties up to $1,000,000* relating to fines, port charges, delays and off-hire. *Terms and conditions apply.

Ballast Operation Data Storage
Up to two (2) years of operational ballast water treatment data.

Warranty
Two (2) years.

Training Options
Computer-based training program; Ecochlor Training Center; Portable HMI Simulator.

International Service Call Center
+44 131 322 1446 (24/7)