

Protecting Our Coastal Ecosystems



Great Lakes Ballast Water Collaborative July 2010

Charlie Miller, CEO

Installed Full Scale Systems



Ecochlor was founded in 2001



M/V Atlantic Compass

System installed in 2004

Swedish Flagged

2500 m³/hr.

Operates in Europe, NA East Coast



M/V Moku Pahu

System installed in 2006

US Flagged

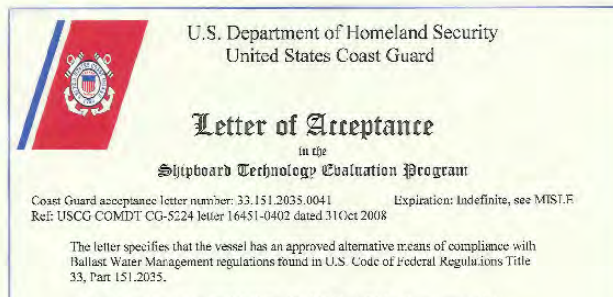
1500 m³/hr.

Operates in Hawaii, CA, Africa, Asia

STEP Approved



October 2008



First Commercial Cargo Vessels with Large Scale Systems Accepted into STEP by the USCG!



Chlorine Dioxide (ClO₂)



Proven and well understood technology

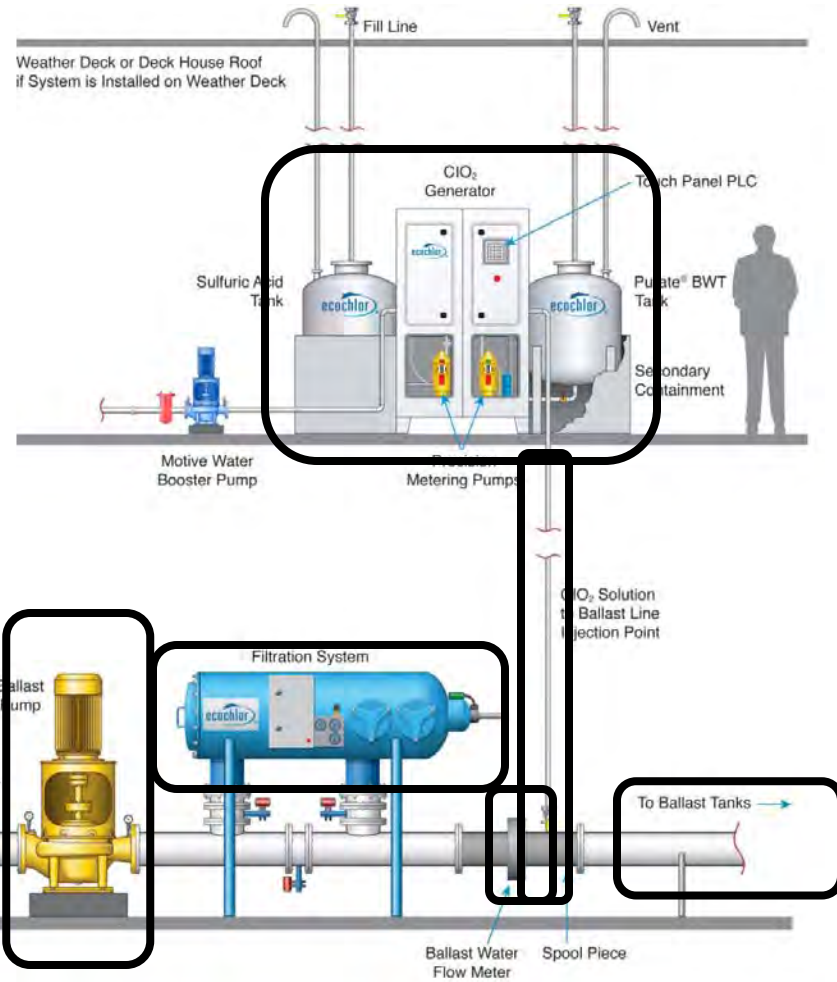
- Chlorine dioxide has been used globally in numerous industrial water treatment applications for over 50 years.
- Ecochlor has exclusive rights to Eka Chemical's technology for ballast water treatment.
- Not Chlorine! Does not form chlorinated byproducts.
- Dosage is not affected by organics or salinity.
- Chlorine dioxide is a highly soluble gas in water and rapidly disperses in a water system for maximum effectiveness.
- Completely and immediately effective on all organisms and is highly effective on bio-film.
- Safe to discharge in 24 hours or less.
- FIFRA registered for BWT.

Simple Two Step Process

Pre-filtration and ClO_2



Purate® + Acid = ClO_2



Ecochlor[®] BWTS



- Designed for marine use
- Exceeds international standards
- Fully automated
- Alloy 20 & 316L construction
- Scalable
- No modifications to existing ballasting operations
- Small footprint, low power

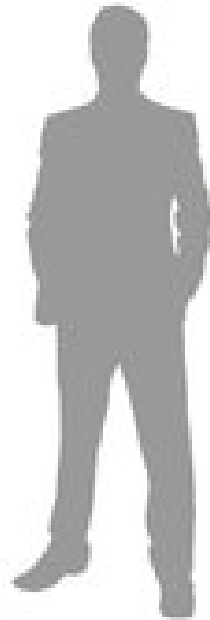


Secondary containment not shown

Chlorine Dioxide Generator



The Heart of the System



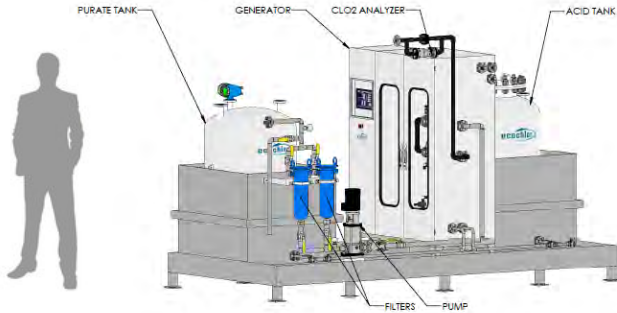
Simple

Reliable

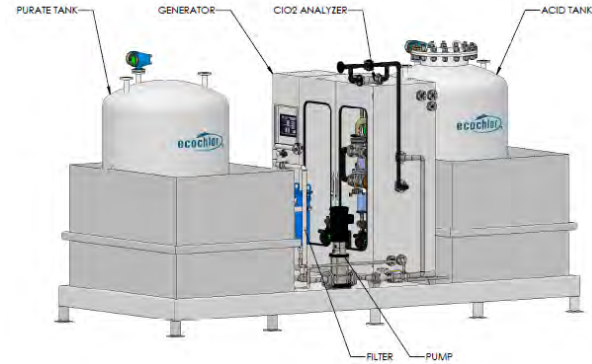
Proven

**Chlorine dioxide generation system with few moving parts.
Common to all size systems.**

Ecochlor Systems



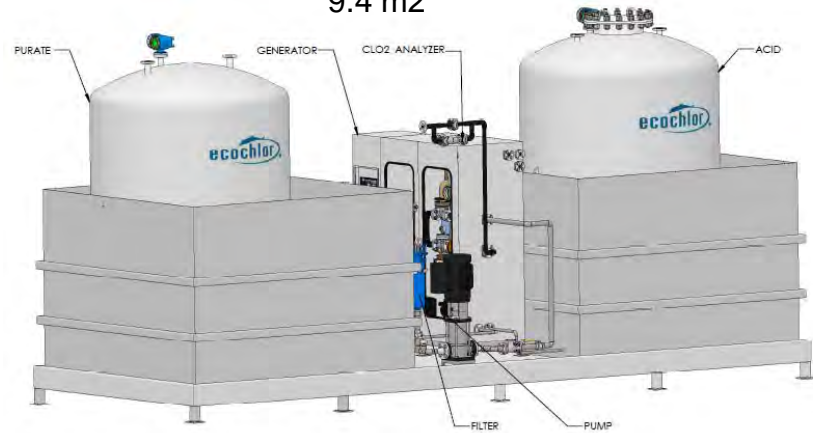
ES 400-05
7.8 m2



ES 1600-15
9.4 m2



ES 3400-25
11.2 m2



ES 8000-50
17.8 m2

Ecochlor Systems



Ecochlor has completed design packages with major shipyards for the world's largest bulkers and tankers.

Filtration – a must for all systems



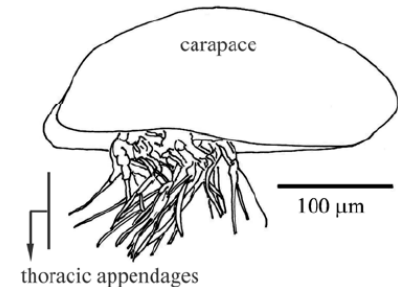
Now a word about filtration.

Those of us who have conducted land-based testing at NIOZ and did not think we needed filtration have since learned otherwise.

Filtration – a must for all systems

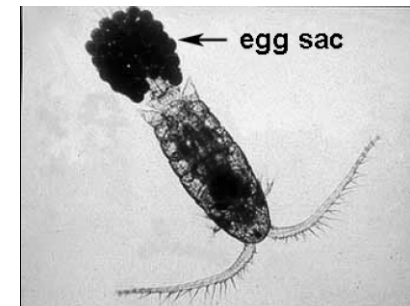


- Many organisms have evolved a capacity to endure stressful environments such as low dissolved oxygen concentration, desiccation, or toxins.
- Larval stage hard shell organisms (mussels, clams) can hide for days in their impermeable shells and avoid treatment.



- Treatment coatings **To meet US standards, pre-filtration is a requirement for any technology!**

- The zebra mussels can release over one million eggs in a single spawning event.
- Spawning of well over 20,000 bi-valve organisms/m³ is not uncommon.
- Even 99.9% effectiveness leaves 20 organisms/m³.



Ecochlor[®] Pre-Filtration

- Unique 40 micron weave wire screen technology.
- Fully automatic self-cleaning handles heavy sediment loads.
- Long service life due to anti-corrosion coatings and 904L SS screens.
- Minimal flow during cleaning.
- Low operating pressures meet ballast pump parameters.
- Small footprint and low cost.
- Unique design allows for vertical or horizontal installation.

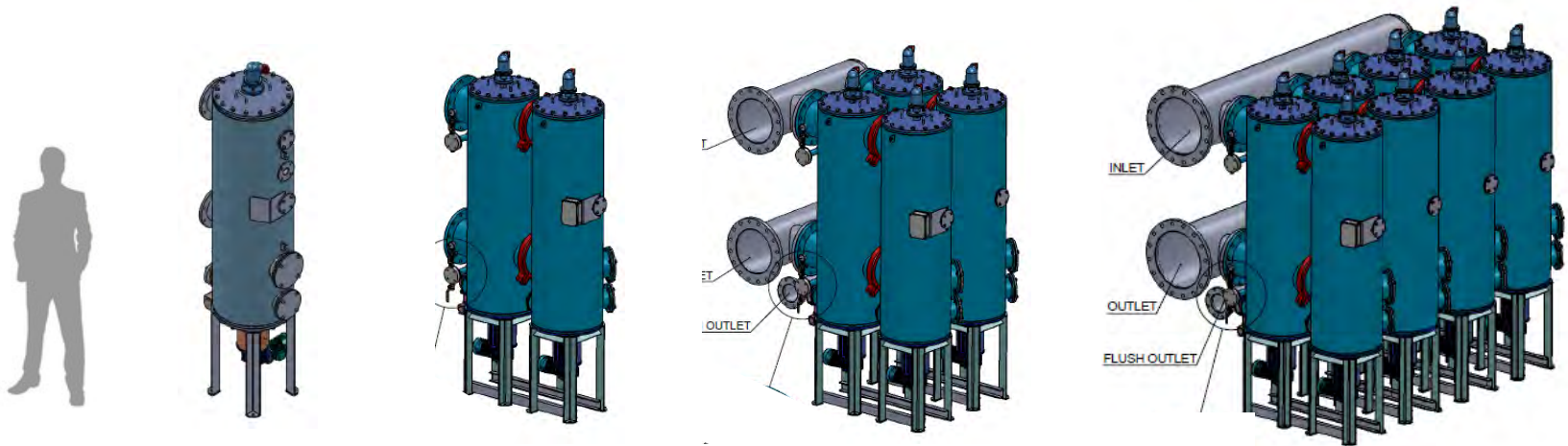


Successfully tested on the Yangtze River !

Modular Filtration



Filters can be installed vertically or horizontally



Capacity (m ³ /Hr)	500	1000	2000	4000
Footprint (m ²)	0.4	0.8	1.6	3.2

NIOZ – Land-Based Testing



Royal Netherlands Institute for Sea Research



Exceeds all Requirements



NIOZ Test Results - Summer 2008

Size	50 microns	10 to 50 microns
Units	Organisms/m ³	Organisms/ml
Control	177,000	1,447

Ecochlor average

IMO Standard
Proposed US

Notes:

Treatment at 5 ppm
Results from 10 sequential ballasting operations
Average of 30 m³ samples
No salinity effect



Royal Netherlands Institute for Sea Research

Exceeds all Requirements



NIOZ Test Results - Summer 2008

Size	50 microns	10 to 50 microns
Units	Organisms/m ³	Organisms/ml
Control	177,000	1,447
Ecochlor average		
IMO Standard	10	10
Proposed US		

Notes:

Treatment at 5 ppm
Results from 10 sequential ballasting operations
Average of 30 m³ samples
No salinity effect



Royal Netherlands Institute for Sea Research

Exceeds all Requirements



NIOZ Test Results - Summer 2008

Size	50 microns	10 to 50 microns
Units	<u>Organisms/m³</u>	<u>Organisms/ml</u>
Control	177,000	1,447
Ecochlor average		
IMO Standard	10	10
Proposed US	0.1	0.1

Notes:

Treatment at 5 ppm
Results from 10 sequential ballasting operations
Average of 30 m³ samples
No salinity effect



Royal Netherlands Institute for Sea Research

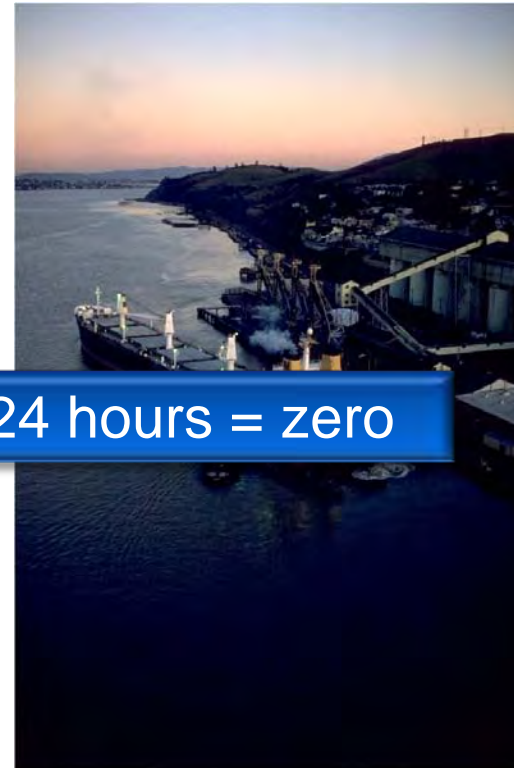
Shipboard Testing

July 10-14, 2010



Crocket, CA

M/V Moku Pahu



Viable organisms after 24 hours = zero



Tested by internationally recognized German scientists

International Approvals



■ IMO

- Working with German Authorities (BSH)
- Basic Approval granted at MEPC 58 (October 2008)
- Full environmental assessment – hydrodynamic modeling
- GESAMP review scheduled for July 2010
- Final Approval expected at MEPC 61 (September 2010)



■ Type Approval

- Through German Authorities
- Shipboard testing (G-8) began in July 2010
- Type approval expected early 2011



State Approvals



- California State Lands Commission
 - Reviewed test facility, scientific team, protocols.
 - Believes data represents “non-detect”.
 - CSLC letter of acceptance available.

 - Washington State Department of Ecology, Fish & Wildlife
 - Department of Ecology: technology environmentally acceptable.
 - First technology approved under the new regulations issued in July 2009.

 - Additional discharge approvals
 - New Jersey, Maryland, Virginia.

 - Currently in discussions with New York.
-

Established Global Partners



Exclusive Chemical supply



Engineering and manufacturing
(US and china)



Rolls-Royce

Naval architecture /
marine engineering



Distribution new ships



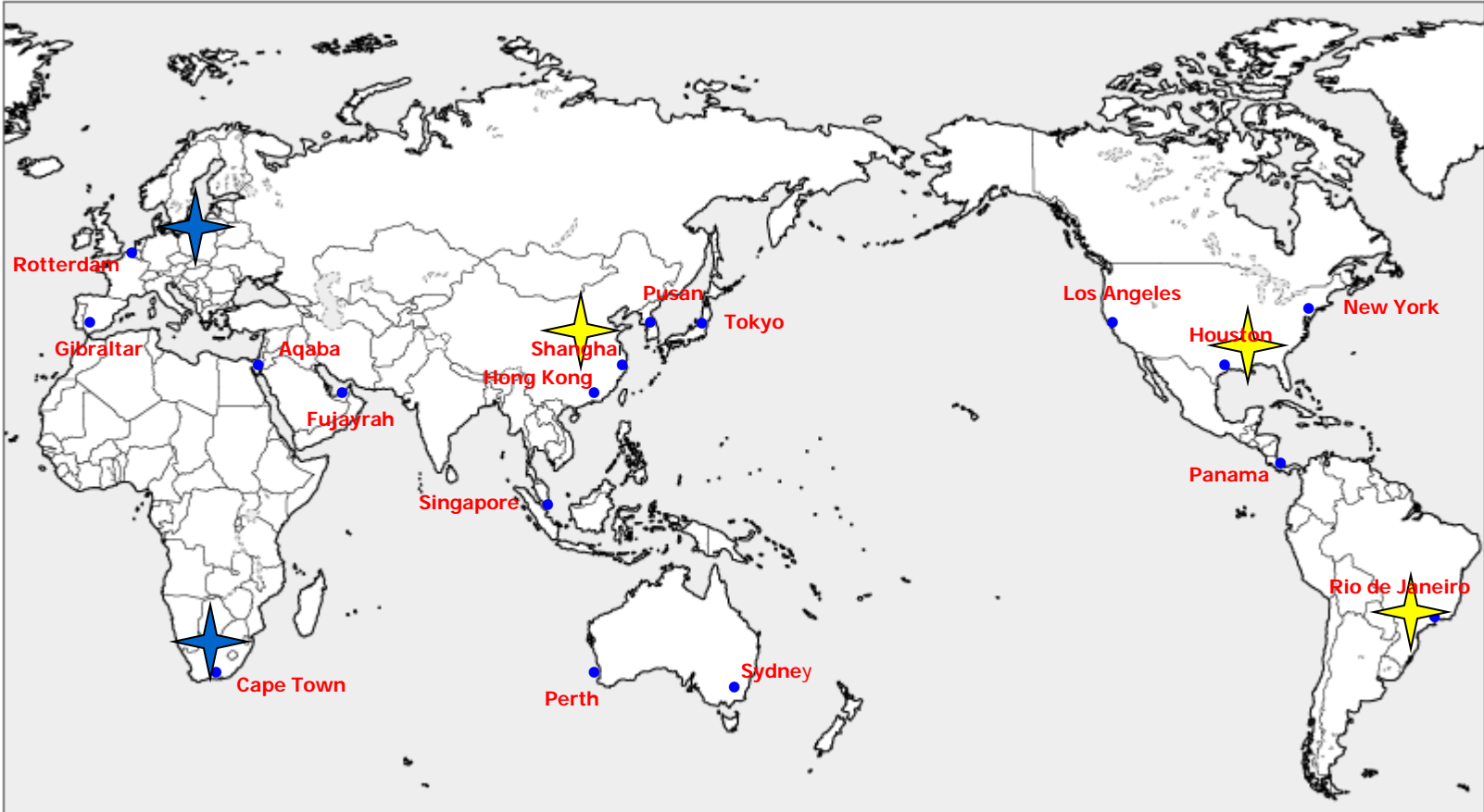
Distribution retrofits and service

Global Supply and Service



 **Purate Manufacturing**

Global Supply and Service



Service Ports

 **Purate Manufacturing**

Protecting Our Coastal Ecosystems

