



## Eltron Water Systems

Science for the Blue Planet™

Tech Brief

### Treating Contaminated Ballast Water with the PeroxEgen™ Hydrogen Peroxide Water Treatment System

#### PeroxEgen™:

- Generates a small volume of concentrate to dose into the full ballast stream (small system footprint)
- Will not affect pressure or flow rate of existing ballast water
- Useful for other ship-board applications such as greywater treatment and galley cleaning
- Combines with existing UV or ozone treatment to create powerful organic destruction and microbial disinfection
- Creates short-lived residual of peroxide for mitigating live organisms that are not affected by UV treatment

Contaminated ballast water constitutes a major route for introducing invasive species into marine and fresh waters world-wide. When ships discharge bilge and ballast water, they can dangerously contaminate ecosystems. Also, grey/black water effluents often have bacterial counts that create high chemical oxygen demand and biological oxygen demand (BOD). These problems have been dramatically accelerated by the advent of modern, high-speed freighters and their methods of ballast water exchange.

The introduction of the zebra and quagga mussels into the St. Lawrence Seaway and the Great Lakes provides a widely publicized and sobering example of the economic and ecological costs associated with such invasions. It's estimated that the cost (as of May, 2007) just for dealing with zebra and quagga mussels since they were first discovered in North America is \$2 billion.

#### **PeroxEgen — On-site H<sub>2</sub>O<sub>2</sub> Delivery**

PeroxEgen generates H<sub>2</sub>O<sub>2</sub> on-site for water treatment, advanced oxidation and disinfection applications. PeroxEgen can mitigate numerous potentially invasive species by injecting controlled concentrations of H<sub>2</sub>O<sub>2</sub> directly into ballast water as it is loaded into a vessel. PeroxEgen can be mounted onboard, making H<sub>2</sub>O<sub>2</sub> and (optionally) peracetic acid (PAA) available on demand for cleaning and disinfection in addition to ballast water treatment.

PeroxEgen can be used either as a stand-alone system or combined with a UV system for advanced oxidation. Ballast water treatment using H<sub>2</sub>O<sub>2</sub> combined with a UV ballast water treatment system is expected to be the most effective approach for broad-spectrum treatment.



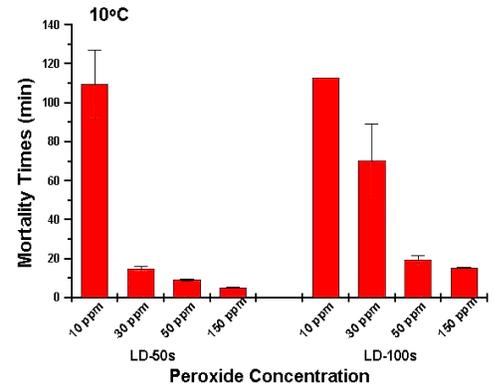
PeroxEgen can help control the proliferation of invasive species transported in ballast and bilge water.

The most problematic invasive organisms to be controlled are bacterial, planktonic, and egg or larval stages of higher organisms, since these are not removed during water intake pre-filtration.

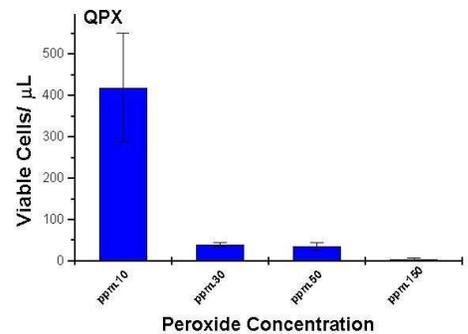
Introducing 10 mg/L  $H_2O_2$  into seawater provides effective treatment against a wide variety of biological organisms within the first 200–400 minutes of contact time. Efficacy tests conducted by the Marine Biology Lab (Woods Hole, MA) in collaboration with Eltron verified broad effectiveness of  $H_2O_2$  to kill algae, fish, invertebrates, planktonic species and bacterial microorganisms. (*Biol. Bull.* 201: p. 297–299, October 2001). The corrosiveness of seawater with this level of  $H_2O_2$  was also confirmed to not exceed that of natural dissolved oxygen – so it is safe for ship-board use.

### Simplifying the Logistics of Handling $H_2O_2$

PeroxEgen provides  $H_2O_2$  delivery at the point of use, simplifying the logistics, eliminating distribution costs, and minimizing hazards associated with handling and storage. There are also no known regulatory issues for this source of  $H_2O_2$  since the feedstocks are water and air and the  $H_2O_2$  concentrations produced are relatively low. PeroxEgen requires only water, air, and electricity as consumables for water treatment and allows pH to be controlled. PeroxEgen can be operated in flow-through mode for direct treatment at low  $H_2O_2$  concentrations (<100 mg/L) or in batch mode, recirculating  $H_2O_2$  to build up higher concentrations. Unlike bulk catalytic production methods, Eltron's electrolytic process is virtually insensitive to temperature. Furthermore,  $H_2O_2$  generated by PeroxEgen contains no organic residuals.



LD-50 and LD-100 Mixed plankton mortality times at 10°C.



Treatment of QPX (average of two trials at 20°C, 30 min contact time).

### Contact us

To learn more about PeroxEgen and innovative water treatment systems from Eltron Water Systems, visit [www.eltronwater.com](http://www.eltronwater.com).

To discuss the possibility of entering into a business relationship with Eltron, contact the Business Development Group at [business@eltronresearch.com](mailto:business@eltronresearch.com).



### Eltron Water Systems LLC

Eltron Water invents, develops and commercializes innovative, cost-effective water treatment systems that are valuable to industries, utilities, and government organizations.

Science for the Blue Planet™