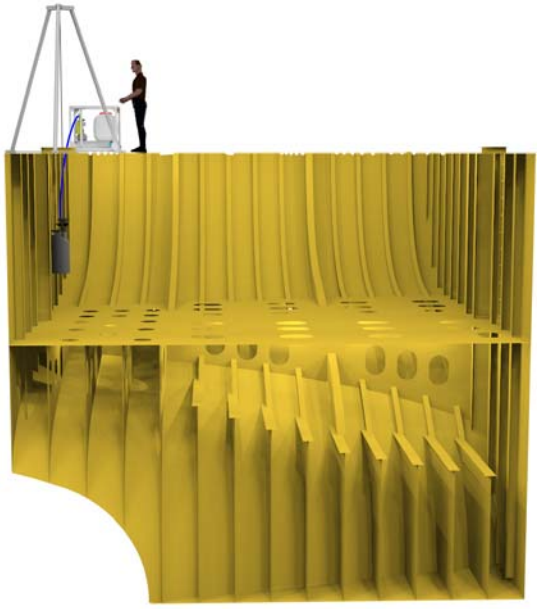
Ballast Responder

Emergency and Contingency Measures for Ballast Water Treatment

Overview

The Ballast Responder is a mobile kit developed for the emergency and contingency treatment of full or partially full ballast water tanks on marine vessels. This prototype system has been designed to treat vessels that arrive in port with unmanaged ballast water, or are grounded and need to discharge unmanaged ballast water.

The National Park Service pioneered the emergency treatment of marine vessel ballast water with the *M/T Igloo Moon* casualty in 1996, and as interim treatment on the *Ranger III* in 2007. In 2008, the US Geological Survey and The Glosten Associates began development of rapid deployment methods.



Cut-away view of Ballast Responder deployed into a ballast tank from the deck

The Ballast Responder is the result of this work. The team is continuing work to expand the response tool kit and leverage the developed technology for interim treatment solutions. These solutions include port or canal based solutions for vessels that only discharge ballast water in small quantities or intermittently, as well as interim contingency solutions to bridge the time gap before wide-scale refitting with permanent, type-approved systems can occur.

Deployment Process

The Ballast Responder consists of a chemical delivery unit and a tank mixing unit. A single kit can typically be set-up and deployed by a crew of two in about two hours. It is recommended that response efforts include a crew of four and two kits when multiple tank treatment is needed.

First, a mixing device is lowered into a full ballast water tank, either through an existing manhole or, in emergencies, through a cut opening. Initial trial results indicate that large and complex ballast water tanks can be mixed in less than one hour.

Next, an active substance is added to the ballast tank being mixed. The cognizant authority overseeing the operation must determine the active substance concentration and hold time.

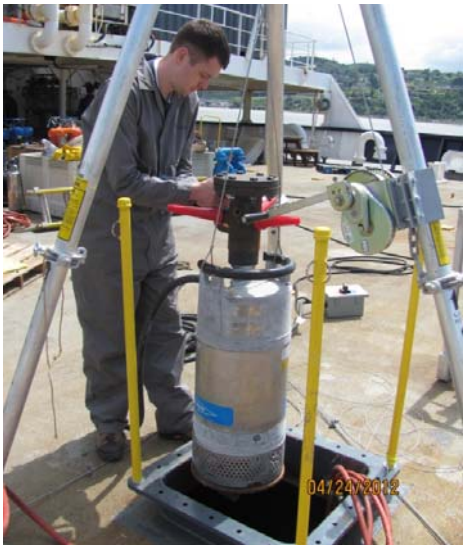
Finally, a neutralizing agent is added in the same manner as the active substance to render the treated ballast water as safe for discharge to local waters. Again, the cognizant authority would need to direct the required neutralization chemicals.

Development and Prototype Trials

A series of development trials were performed on the *M/V Indiana Harbor* in the Great Lakes in cooperation with the American Steamship Company. These trials developed multiple in-tank mixing technologies specifically for ship's ballast water tanks, and demonstrated that large and complex ballast water tanks can be effectively mixed. In addition, the *Emergency Response Guidance for Handling Ballast Water to Control Aquatic Invasive Species* was published by the National Park Service.

A series of demonstration trials were performed in cooperation with California Maritime Academy, US Maritime Administration, and Great Ships Initiative on the *Training Ship Golden Bear*. These trials demonstrated that the Ballast Responder could be readily deployed by a crew of two, and could evenly distribute a chemical throughout a highly partitioned ballast water tank in less than two hours.

Chemical metering unit deployed on *Golden Bear*



Nozzle mixing system deployed on *Golden Bear*

Continuing Development and Partnerships

The development team is continuing work to increase the number of tools available to emergency responders, increase the efficiency of the available tools, and meet the need for port-based and interim ballast water treatment solutions. Biological efficacy trials are now underway, with plans to transition into further on board demonstration trials.

Additional partnerships are being sought to support additional research and development, deployment demonstrations, and implementation. Efforts include:

1. Demonstrate application as an alternative to onboard ballast water treatment:
   - Relieve or delay the need to install and maintain an onboard treatment system.
   - Consider port-based control measures without logistics of off-loading ballast water to reception barge or facility.
2. Demonstrate applications with exchange:
   - Enhance exchange efficacy and reduce sediment accumulation in tanks.
   - Use in combination with ballast water exchange to improve water quality, reducing the amount of biocide required.
3. Demonstrate flexible models for port or canal based applications, including:
   - Shift costs away from vessel capital expenditures and vessel-based maintenance, to shore-based services.
   - Create flexibility on when and where to treat depending on the vessel's situation. Treatment could take place at a port, or while moving through a canal, or while underway before or after exchange.
   - Design the treatment schedule to minimize hold time after treatment to reduce the re-growth of organisms and improve compliance with discharge requirements.
   - Support port-based treatment that can be designed for either land-based or barge-mounted units, depending upon the most optimal situation for the port, vessel, and/or canal.
   - Increase treatment effectiveness to meet higher standards that may be required by some port states.

Project-related reports and guides can be viewed at:

The National Park Service http://www.nps.gov/isro/naturescience/handling-ballast-water-to-control-non-indigenous-species.htm
The Glosten Associates http://glosten.com/index.php/paperspress/papers/

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