



Zinc Removal from Compensated Fuel Ballast Water

Background

Compwater is a common term used for compensated fuel ballast water, which is basically seawater loaded to stabilize ships designed with a Water Compensating Fuel System (WCFS). During refueling, compwater is displaced by the incoming fuel. This involves overflowing the compwater to outside the ship's fuel tank, generally into a harbor or at sea. Since the compwater is in contact with the fuel in a WCFS, discharging it directly into the ocean during refueling can pose an environmental risk due to the presence of small but measurable amounts of oil. Under the Uniform National Discharge Standards (UNDS) being promulgated for vessels of the Armed Services under the Clean Water Act, compwater has been identified as a waste stream requiring some type of management measure. While these national standards are being developed, direct discharge of compwater into the harbor during fueling is currently prohibited in some parts of the United States. The Puget Sound area of Washington state, Alaska, and some ports on the east coast are currently enforcing "zero-discharge" standard.

Technology

In 2003, Naval Facilities Engineering Service Center (NAVFAC ESC) developed a Compwater Collection and Management (CCM) System, which was designed to be a cost-effective, shore-side treatment procedure for compwater. Consisting mainly of a collection barge (converted fuel barge) with two progressive cavity pumps and a hydrocyclone oil-water separator (OWS), the system was implemented at NAVSTA Everett, Washington. The system has successfully processed over two million gallons and removed the amount of fuel oil in compwater down to less than 7 parts per million (ppm) (sewer discharge limit is 50 ppm). More recently, it was determined that some of the newer Navy destroyers (Arleigh Burke class) yielded considerably high levels of zinc in their compwater. To resolve this new issue, a zinc-filtering unit equipped with an absorption media was integrated into the CCM system. The zinc filter is used after the OWS unit or at the end of the CCM treatment process.

Technology Benefits

The Compwater Collection and Management System captures compwater from refueling operations and later removes the oil contaminants, allowing discharge of the effluent into a sanitary sewer system. Benefits of the technology include:

- Performs removal of oils from the waste stream at a fraction of conventional treatment costs
- Permits in-port refueling operations
- Allows compliance with federal, state and local regulations for compwater discharge, where applicable

With the addition of a zinc removal filter to the CCM system, local sanitary sewer discharge limits for zinc by removing the dissolved (or ionic) zinc concentration in compwater to the levels of small parts per billion (ppb).

Costs

Estimated costs to implement a CCM system are:

- Capital Equipment - \$100K to \$300K
- Design, installation and training - \$70K
- Site preparation - \$20K

This system requires that a collection barge be provided by the implementing site. The desired barge capacity should be 400,000 gallons or larger. Most refueling operations displace about 200,000 gallons of compwater, so a barge of this capacity could hold compwater from two refueling operations for most classes of ships serviced.

Availability

NAVFAC ESC will design the CCM system and zinc removal filter using commercially available components. Once the desired system capacity has been determined and the design completed, procurement, installation, and checkout of the system can be completed in approximately 12 months.



Compwater Collection Process



Compwater Treatment System



Zinc Removal Filter

Points of Contact

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