

UNWANTED!

New Regulations or Invasive Species?

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Excerpted From:



One of the most divisive current maritime regulatory issues is establishing standards for ballast water management. International, federal and state regulations are being developed that will establish these standards. The U.S. Coast Guard and Environmental Protection Agency (EPA) have estimated that annual compliance costs for U.S. requirements will exceed \$170 million annually.

Ballast water is water, including sediment suspended in it, taken aboard a vessel to control trim, list, draft, stabilities, or stresses of a vessel. Ships uptake and discharge ballast water from dedicated ballast tanks to maintain safe operating conditions throughout a voyage by compensating for weight lost due to fuel and water consumption. Ballast water capacities on ships range from several hundred gallons to millions of gallons.

While ballast water is essential for safe and efficient vessel operation, it may pose serious ecological, economic and health problems due to the multitude of marine species carried in it. As ballast water is taken aboard a vessel, a variety of aquatic organisms may be present in the intake and may become entrained in the water brought onto the vessel. Aquatic organisms that have the potential to be entrained include species that reside in sediments, the water column, water surface, or any combination thereof, and span the range of life

stages from larval to adult. These can include: plankton, bacteria, viruses, macrofauna, small invertebrates, eggs, cysts and larvae of various species.

The growing problem of invasive species in ships' ballast water is largely due to expanded trade and traffic volume over the last few decades. The effects in many areas of the world have been devastating. Data show that the rate of bio-invasions is continuing to increase at an alarming rate and new areas are being invaded all the time. Chinese mitten crab, hydrilla, European loosestrife, and zebra mussels are a few well-known examples of aquatic nuisance species that have been introduced to U.S. waters.

According to the U.S. Geological Survey, zebra mussels originated in the Caspian Sea and their presence in the U.S. now costs an estimated \$1 billion annually. These invaders can latch onto any hard surface and change an ecosystem. They block water intakes, costing industry significant funds to clear them, and they consume vast amounts of other organisms, which has resulted in the disappearance of some species in the Great Lakes.

Regulations

In 1988, Canada reported to the International Maritime Organization (IMO) Marine Environment Protection Committee the harmful effects of aquatic

nuisance species (also known as invasive species) in the Great Lakes. The report resulted in the first voluntary guidelines for preventing the introduction of invasive species from the release of ballast water and ballast sediment.

After more than fourteen years of complex negotiations among IMO Member States, the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) was adopted on 13 February 2004. The Convention requires

Figure 1: Ballast Water Convention Timeline

Ballast Capacity (m ²)	Build Year	Year and Applicable Regulation								
		2009	2010	2011	2012	2013	2014	2015	2016	2017
New Vessels										
< 5000	In or after 2009	Exchange (D-1) or Treat (D-2)			Treat (D-2)					
≥ 5000	2009 - 2011	Exchange (D-1) or Treat (D-2)							Treat (D-2)	
≥ 5000	In or after 2012	Exchange (D-1) or Treat (D-2)			Treat (D-2)					
Existing Vessels										
< 1500		Exchange (D-1) or Treat (D-2)							Treat (D-2)	
Between 1500 and 5000		Exchange (D-1) or Treat (D-2)					Treat (D-2)			
> 5000		Exchange (D-1) or Treat (D-2)							Treat (D-2)	
*Compliance is required at the first intermediate or renewal survey										

all ships to implement a Ballast Water Management Plan, carry a Ballast Water Record Book, and follow specific management requirements. Vessels are required to either perform ballast water exchange or treat ballast water to specific standards, depending upon their ballast water capacities and their build dates. Figure 1 shows the Ballast Water Convention compliance timeline. By 2016, all ships will be required to install and operate treatment systems by their first intermediate or renewal survey.

The Convention will enter into force 12 months after ratification by at least 30 states representing 35 percent of world merchant shipping tonnage. As of now, the Convention has been ratified by 31 countries but still lacks approximately 8.5 percent of the required world merchant shipping tonnage.

The U.S. has not ratified the Convention (and is not expected to do so), but it does require ships to follow ballast water management practices listed in the 33 Code of Federal Regulations (CFR) Part 151. Currently, two competing regulatory schemes have developed in the U.S. for ballast water: Coast Guard requirements and Environmental Protection Agency (EPA) requirements. In 2009, the Coast Guard proposed revisions to the existing standards (74 FR 44632). Phase-one of the proposed rule reflected IMO requirements, but phase-two established requirements that are potentially one thousand times more stringent and would be in effect by 2016. To complicate matters, EPA published ballast water requirements around the same time (as part of the Vessel General Permit) that required ballast water management, but not treatment, and permitted states to establish more stringent requirements. California and New York established requirements one thousand times more stringent than IMO standards. The state requirements have resulted in much confusion for ship owners and operators. The New York requirements, if implemented, would essentially stop most traffic through the St. Lawrence Seaway and greatly impact traffic in the Great Lakes.

On November 30, 2011, the EPA published an updated draft Vessel General Permit which revised the ballast water requirements to reflect IMO and Coast Guard phase-one regulations. The final version of the Coast Guard rule is currently under re-



view at the Office of Management and Budget prior to publication. It is assumed that the Coast Guard regulations will align with EPA and international requirements and thus reduce confusion.

Impact fo BWM

Once in force, all vessels carrying ballast water, including those whose countries did not ratify the BWM Convention, will be required to be in compliance with it. In 2010, Japan estimated that 75,000 vessels worldwide will be impacted by the Convention (MEPC 61/2/17). Figure 2 shows the projected installation schedule estimated by Japan.

Regardless of international ratification, USCG and EPA regulations will establish treatment requirements, similar to the Convention, to become effective in 2014 or 2016, depending upon the ballast capacity of the ship. The total cost for vessels to comply with U.S. requirements is estimated to be over \$1.2 Billion by the Coast Guard (74 FR 44632).

Ballast Water Treatment Systems

Ballast Water Treatment (BWT) systems are expensive to purchase and install. Planning and engineering are essential to effectively and properly integrate systems into existing spaces. IMO has established guidelines and requirements for the approval of treatment systems.

In general, three types of ballast water treatment systems are being developed or already in use:

- Mechanical Systems for removal of sediment and particles, such as disk and screen filters, cyclonic separation, or electro-mechanical separation that injects a flocculent to attach to organisms and sediment to aid removal via magnetic separation and filtration;

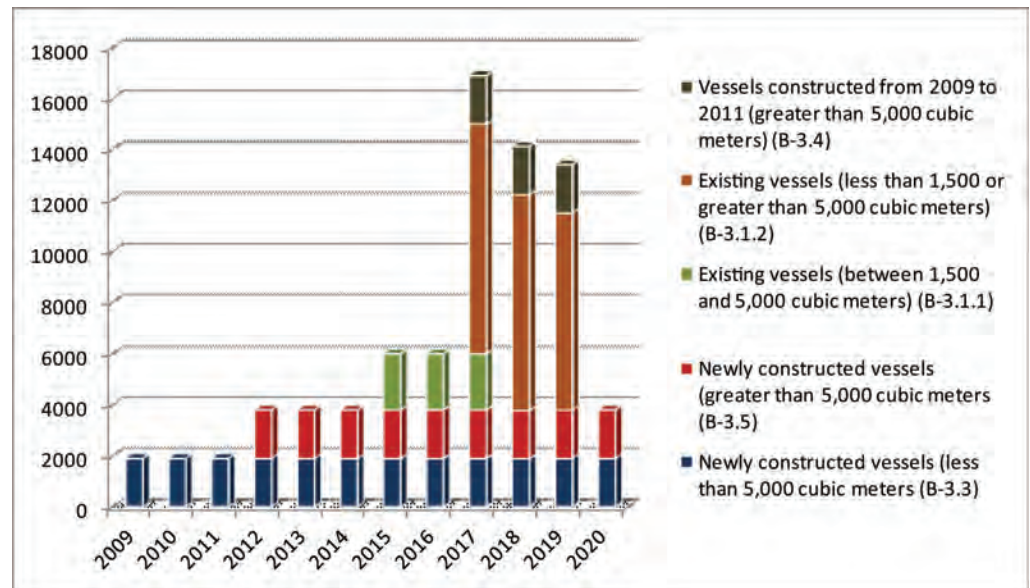
- Physical Disinfection, which may include ultraviolet radiation, cavitation, ultrasound, and de-oxygenation systems; and

- Chemical Treatment that includes the addition of chemical biocides for killing organisms.

Most BWT systems use a combination of these technology types, and the ballast water may be treated one time upon uptake or additionally treated upon discharge.

According to the Convention, BWT systems are required to be approved prior to installation. IMO has established guidelines for systems to receive Type Approval. The process for approval varies depending upon whether or not a system uses active substances (i.e., biocides). At this time, 17 systems have received IMO Type Approval. Over 50 systems are being tested and are in the approval process.

Figure 2: Installation schedule of ballast water treatment systems estimated by the government of Japan (MEPC 61/2/17)



The Future

The next year will clear up many of the questions regarding compliance with Ballast Water Management. In that time, ratification of the BWM Convention is expected and U.S. requirements should be published. Greater numbers of ships will begin modifying systems to curb the problem of aquatic nuisance species. The sooner that problem is curbed, the less damage aquatic nuisance species will do to the shipping industry and the world's ecosystems.

About The Author



Debra DiCianna is the Principal Environmental Engineer for The Columbia Group's Rosenblatt Ship Design Division. She has over 20 years experience with waste treatment technologies, regulatory compliance and the development of environmental regulations.

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