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Ballast water management – a way forward

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Ballast water management, a process that started with so much hope about ten years ago, has fallen into a black hole. Only a radical approach seems likely to extricate this important process from the numerous difficulties it currently faces. This brief article will attempt to: (1) summarize why the process is important; (2) identify some of the major difficulties preventing implementation of the process; and (3) suggest a fresh approach to jump-start the process.

Importance

Ships have carried water as ballast for many years, but two developments changed the dynamics and impact on the environment. First, ships have gotten much larger. Large ships require larger ballast capacity to maintain stability when they are not carrying cargo (or carrying less that their full capacity). Secondly, ships have gotten faster.

A modern ship has the capacity to uptake large quantities of water at the harbor from which it departs and that water may contain any number of locally indigenous aquatic species. The ship can then transit to a far-distant port (with a significantly different ecosystem) rapidly enough that a portion of the unintended passengers (now known as nonindigenous aquatic species) remain alive and capable of establishing homes in the new ecosystem. Because the species are strangers to the area, they may have no natural predators and may have a major adverse impact on the local ecosystem. One only has to look at the billions of dollars expended to counter zebra mussel infestations in the Great Lakes of North America to realize that the threat is real. There are numerous other nonindigenous aquatic species that are causing ecological problems. While ballast water is not the only vector for this problem, it is a major vector.

It is thus necessary for ships to undertake ballast water management techniques so as to significantly and meaningfully reduce the risk of inadvertent transfer of aquatic species to ecosystems where they might cause significant problems.

When the ballast water issue was first identified, the only technique available to reduce the risk of such inadvertent transfer of aquatic species consisted of high seas ballast water exchange. Everyone knew that it was only an interim solution, both because it is not always effective and because it places the ship and its crew at risk due to operation of the ship on the

high seas with little or no ballast while the exchange process is undertaken. The recent near-loss of a car carrier off the Aleutian Islands provides a stunning example of why high seas ballast water exchange is not a long-term solution.

It was clear that a technological solution was necessary. Numerous companies and individuals stepped forward with proposals, but each defined the problem differently. It was apparent that a standard needed to be developed to define how free of potentially deleterious life-forms the ballast water had to be to allow discharge into the receiving body of water. The International Maritime Organization (IMO) was quickly recognized by most as the appropriate entity to establish the technological standard for this international problem.

Major difficulties

The IMO, though, has gotten itself wrapped around the bureaucratic axel. It took years for party states and other stakeholders to come to an agreement on the technological standard and to incorporate that standard into the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004. The Convention will come into force one year after it has been ratified by at least 30 nations representing at least 35% of the world's ocean-going commercial tonnage. To date, only ten nations representing 3.42% of the world's tonnage have ratified the convention. It is unclear when (or if) the convention will come into force.

The technological standard adopted by the convention presents three major problems. First, the convention was adopted based on the assumption that it would quickly be ratified and come into force. Thus, it includes fixed dates by which ships are to be constructed or modified to include equipment that will meet the standard. The first of those dates is rapidly approaching. Secondly, the convention was adopted based on the assumption that the technology to meet the new standard was just around the corner. To date, while numerous contenders have come forward, not one proposal has been certified as meeting the convention's standards of acceptability and availability. Thirdly, the convention has the usual provisions relating to amendment. While these provisions may be appropriate for most diplomatic matters, they have proven inadequate to address the moving target presented by the ballast water management issues. A recent meeting of parties and stakeholders at IMO failed miserably in its attempt to address the real-world problems presented by the common three-year gap between execution of a ship construction contract and delivery of the ship juxtaposed against the fixed deadline in the Convention.

Various nations, including the United States, have grown frustrated with the IMO process as regards ballast water management. Legislation has been introduced in Congress to establish a national standard for ballast water technology. Because of its federal-state government system, the various states of the United States have the authority, for most purposes, to regulate their local environments. California has been the most expansive in this regard, but other states, including Michigan, have also stepped forward with their own approaches. The Golden State of California proposes to adopt regulations establishing stringent (some would say impossible) technological standards for ballast water management. A brief comparison of the IMO, proposed

federal, and proposed California standards will follow, along with a discussion of related standards.

Standards, proposed standards, and related standards

There are numerous existing and proposed ballast water treatment standards (including Michigan's sterilization provision). So as to not tax the sanity of the reader, this semi-technical discussion will be limited to a cursory analysis of the IMO standard, the proposed federal standard found in the Coast Guard Authorization Act of 2007 (H.R. 2830), and the proposed California standard. It is not intended to parse the details too finely, but principally to contrast and compare.

The IMO standard requires that discharged ballast water contain less that 10 viable organisms of a size greater than or equal to 50 micrometers per cubic meter of water and less than 10 viable organisms of a size between 10 and 50 micrometers per milliliter of water. It also limits the presence of Escherichia coli (e-coli) to less than 250 colony-forming units (cfu) per 100 milliliters and the presence of intestinal enterococci to less than 100 cfu per 100 milliliters of water.

The proposed federal standard requires that discharged ballast water contain less than 0.1 viable organisms of a size greater than or equal to 50 micrometers per cubic meter of water and less than 0.1 viable organisms of a size between 10 and 50 micrometers per milliliter of water. It also limits the presence of e-coli to less than 126 colony-forming units (cfu) per 100 milliliters and the presence of intestinal enterococci to less than 33 cfu per 100 milliliters of water.

The proposed California standard prohibits the presence of any living organisms of a size greater than or equal to 50 micrometers and requires that discharged ballast water contain less than 0.001 viable organisms of a size between 10 and 50 micrometers per milliliter of water. It also limits the presence of e-coli to less than 126 colony-forming units (cfu) per 100 milliliters and the presence of intestinal enterococci to less than 33 cfu per 100 milliliters of water.

Given that no equipment manufacturer to date has been able to demonstrate conformance to the IMO standard, it would appear that the proposed federal standard – 100 times more stringent for both the larger organisms and the smaller ones – is not grounded in science. The proposed California standard prohibiting the presence of <u>any</u> living organisms of a size greater than or equal to 50 micrometers and establishing the standard for the presence of smaller organisms at 1,000 times as stringent as IMO appears to be grounded only in science fiction.

While the goal of limiting nonindigenous aquatic species is unique, that of minimizing the presence of e-coli and intestinal enterococci is not. There are two common water standards for these ubiquitous organisms – drinking water and bathing/recreational water. No one suggests that ballast water will be utilized as drinking water. Turning to bathing water, there are two basic standards: fresh water and coastal water. Since ballast water relates to ships engaged in oceanic voyages, it is apparent that the coastal or marine water standard is the most analogous.

In 2004, the US Environmental Protection Agency promulgated bacteriological standards for recreational waters under the Clean Water Act. The geometric mean for fresh water is 126 cfu per 100 milliliters for e-coli and 33 cfu per 100 milliliters for intestinal enterococci – but this standard is for fresh water at designated bathing beaches. For marine waters, the EPA uses intestinal enterococci as the sole standard. The desired geometric mean for marine waters is 35 cfu per 100 milliliters. More significantly, the EPA's single sample maximum for marine waters involving infrequent use as coastal recreation waters is 501 cfu per 100 milliliters.

In 2006, the European Union promulgated its own standard for bathing water quality. Its standard for coastal and transitional waters (as opposed to inland waters) has been segregated into three categories – excellent quality, good quality, and sufficient. Coastal and transitional waters may be deemed sufficient for purposes of bathing if they are found to have no more than 500 cfu of e-coli per 100 milliliters of water and no more than 185 cfu of intestinal enterococci per 100 milliliters of water.

It is interesting, to say the least, that the IMO ballast water standard for e-coli and intestinal enterococci is higher that either the EPA standard for recreational marine waters or the EU standard for coastal or transitional bathing water. It is almost unbelievable that the proposed federal and California ballast water standards for these ubiquitous organisms are even higher. It would appear that proposed federal and California standards may have erroneously utilized the EPA geometric mean for fresh water. It also causes one to wonder about the genesis for the standards for large and small nonindigenous aquatic species.

A possible way forward

Ballast water management is too important an issue to allow it to become the centerpiece in a game of political correctness. The goal is not to demonstrate that any particular proposal is the most eco-friendly. Rather the goal is (or should be) to devise and implement a ballast water management regime that does the most reasonably possible to protect maritime ecosystems from degradation by nonindigenous aquatic species transported by ballast water and to make that regime flexible enough to accommodate new technology as it becomes proven and commercially available. The current standards and proposed standards fail to achieve that goal. The IMO system is too bureaucratic; the proposed federal and California standards are too idealistic.

It is proposed that the United States Government take the lead in moving ballast water management forward – not by rejecting the IMO standards, but by unilaterally adopting them! The federal government should enact a law authorizing and directing the US Coast Guard and the Environmental Protection Agency (EPA) to implement the technology standard found in the Ballast Water Convention. The effective date for such implementation should be for all new ships delivered three years after the two agencies certify that technology to comply with that standard is proven and commercially available. The agencies should be required to revisit the issue every two years and establish new, higher standards as proven and available technology improves. Retrofitting of older ships should be allowed, but not required. Older ships that do

not have ballast water treatment technology installed should be subject to careful scrutiny to ensure that they have undertaken proper high seas ballast water exchange – no exceptions should be allowed, unless the ship elects to not discharge any ballast water.

The rationale for this unique approach is that something has to be done and quickly. The approach has to be flexible, otherwise it will lock in old technology. The administering agencies must be both agile and powerful: agile enough to rapidly accommodate new technology and powerful enough to force its adoption by the regulated industry. As proven by the double-hull mandate in the Oil Pollution Act of 1990 (OPA 90), the United States has the capacity get international marine environmental protection issues off top-dead-center. To be effective, this capacity must be used sparingly. Now, though, is another situation when the status quo is unacceptable. The time has come for the United States to fundamentally alter the equation from debate over how clean is clean to a competition among engineers and manufacturers over how to deliver useful technology to eager buyers. Debates will not resolve the ballast water management problem; commercial incentives will.