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Challenges For The Effective Implementation Of BWM Convention

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Abstract:

Challenges faced by the shipping industry for effective implementation of the BWM Convention are identified in this technical paper and also proposals are provided to address those challenges.

1. Introduction

The ballast water is carried by ships to stabilize them often contains organisms, e.g. small fishes, benthic organisms or plankton, or pathogenic bacteria, which are released into the environment when the ballast water is discharged. With continued growth of shipping traffic, the probability increases that such organisms survive the transport in ballast water. In this way, numerous invasive alien species have already established populations, e.g., in the North and Baltic Seas. In the Baltic Sea, the shipworm (*teredo navalis*) has damaged coastal defence structures, e.g. groynes made of local types of wood, by boring into the wood and destroying it. The damage caused by such invasive alien organisms is rarely expressed in figures, and its origin mostly is not traced back to the discharge of ballast water.

For quite a long time, this aspect of marine environmental protection lacked adequate international regulations. To address the situation in February 2004, the Ballast Water Convention was adopted during a diplomatic conference at IMO. Once in force, from 2009, but not later than 2016, the Convention requires the establishment of a ballast water management system on board ships which will replace the uncontrolled ballast water uptake and discharge operations common until then. In future, ballast water has to be treated on board before being discharged into the marine environment, in compliance with the ballast water performance standard in Regulation D-2 of the Ballast Water Convention.

2. Ballast Water Management Convention

The Ballast Water Convention has been developed to regulate discharges of ballast water and reduce the risk of introducing non-native species.

2.1. Applicability

BWM Convention applies to all vessel types > 400 GT operating in the aquatic environment which are designed to carry ballast water and are entitled to fly the flag of a Party to the Convention. This includes submersibles, floating craft and platforms including floating storage units (FSUs) and floating production storage and offloading units (FPSOs), although the applicable requirements may vary.

2.2. Treatment Standards

The Convention includes two regulations that define ballast water management standards; Regulation D-1 addresses the Ballast Water Exchange standard and Regulation D-2 details the Ballast Water Treatment Performance standard.

Ballast water exchange is founded on the principle that organisms and pathogens contained in ballast water taken on board from coastal waters will not survive when discharged into deep oceans or open seas, as these waters have different temperatures, salinity and chemical composition. Similarly the deep ocean waters or open seas, when compared to the coastal waters, contain fewer organisms and pathogens and those that do exist are less likely to adapt to the new coastal or freshwater environment. Therefore the probability of organism and pathogen transfer through ballast water is significantly reduced. Ships performing ballast water exchange are required to do so with an efficiency of at least 95 percent volumetric exchange. Acceptable methods for ballast water exchange are the Sequential Method, the Flow-through Method and the Dilution Method. Noting that ballast water exchange presents significant operational concerns and challenges, and that it may not provide a totally effective solution to reduce the spread of unwanted aquatic organisms and pathogens from ships' ballast water over time, the Convention requires an upgrade to the installation of ballast water treatment systems in accordance with a specified schedule.

Regulation D-2 defines the performance standard for the ballast water treatment system. This criterion is in the form of specific limits on aquatic life in the ballast discharge: Ships conducting ballast water management in accordance with this regulation shall discharge:

- Less than 10 viable organism per m³ > 50 μ in minimum dimension, and
- Less than 10 viable organisms per ml < 50 μ and >10 μ in minimum dimension, and
- Less than the following concentrations of indicator microbes:
 - Toxicogenic *Vibrio cholera* less than 1 colony forming unit (cfu) per 100 ml, or less than 1 cfu per 1 gram zooplankton samples
 - *Escherichia coli* less than 250 cfu per 100 ml
 - Intestinal *Enterococci* less than 100 cfu per 100 ml

The D-2 standard is the metric used to measure the efficacy of the treatment system and it applies to the system as installed on board and used in actual operations. All treatment

systems must be type approved by an Administration under a robust protocol which requires that they satisfy this standard in full scale operations.

2.3.Entry Into Force

The Convention will come into force 12 months after the date by which not less than 30 states (the combined merchant fleet of which constitutes not less than thirty-five percent of the gross tonnage of the world's merchant shipping) have ratified it. Presently, it has been ratified by 36 states constituting 29, 07% of the world's merchant shipping fleet.

Once in force, it will require ballast water treatment to be used in place of ballast water exchange. This requirement will be phased in according to the timescales shown in the table below, and is based on ships' year of construction.

Construct (= Keel lay)	B.W. capacity V [m ³]	Dates on which only Regulation D-2 is applicable										
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Before 2009	$1500 \leq V \leq 5000$								*			
	$V < 1500$ or $5000 < V$									*		
In or after 2009	$V < 5000$		*									
In or after 2009 but before 2012	$5000 \leq V$									*		
In or after 2012												

Note *1: Application of Regulation D-2 is postponed until time of the second annual survey.
(but not to be after 31 December 2011)
*2: Ships shall comply with Reg. D-2 not later than the first intermediate or renewal survey, whichever occurs first, after the anniversary date in 2014.
*3: Ships shall comply with Reg. D-2 not later than the first intermediate or renewal survey, whichever occurs first, after the anniversary date in 2016.

Figure 1

3.Challenges For Ratification And Implementation

There are a number of issues that are affecting ratification and implementation of the BWM Convention that need to be addressed by the MEPC and the IMO Member States to ensure proper and effective implementation of the Convention. The purpose of this technical paper is to provide an overview of the major challenges that are working

against the ratification and effective implementation of the BWM Convention and to provide proposed ways forward to address these challenges.

The major concerns that are affecting ratification and effective implementation of the BWM Convention are the following:

- Need for revision of the Guidelines for approval of ballast water management systems (G8) to improve transparency and ensure appropriate robustness of Ballast water management systems (BWMS);
- Availability of BWMS and sufficient facilities to install BWMS;
- Survey and certification requirements for ships constructed prior to entry into force of the BWM Convention;
- Sampling and analysis procedures for port State control purposes;
- Ships with large ballast water capacities
- Specialist ship types;

The following is the detail of each of these concerns and proposals to address these concerns:

3.1. Need for revision of the Guidelines (G8) for approval of ballast water management systems

In many cases it is apparent that the Type Approval Certificate and its enclosures are insufficient in detail to provide a clear picture of whether a system may be adequate to meet the needs of the vessel being considered and its particular trade routes. The problem stems from the lack of limits provided in the Type Approval Certificate and its enclosures even though this is an aspect specified within the "Guidelines (G8)". In some examples the approval documentation may imply that the BWMS has no practical and operational limitations. However, the fact that no limitations are provided does not mean limitations do not exist.

Several Type Approval Certificates have been provided based on theoretical extrapolation of the system's maximum treatment rated capacity (TRC) as opposed to actual physical tests. However approval should be based on actual tests.

Additional questions arise as to limitations of a BWMS to meet the D-2 discharge standard under many other operational conditions. For example, problems have already been experienced in relation to the operability of certain system types in brackish or fresh water, e.g. electro-chlorination and electrolysis; in turbid or high-sediment-load

waters in the case of UV systems, and; systems using filtration in sediment-rich, muddy waters that may reduce the efficiency (treatment volume and rate) or increase maintenance requirements of the filters.

It is clear that an owner is not able to make a decision based purely on the Type Approval Certification and its enclosures. However, resolution MEPC174 (58) states that the Type Approval Certificate should specify any limiting conditions of the BWMS usage necessary to ensure its proper performance. Hence form of the Type Approval Certificate as well as its enclosures should be revised and standardized with the aim of improving the transparency and detail of information being provided to ensure the overall veracity of the certification and the certification process.

The "Guidelines (G8)" stress the importance of the equipment to be constructed with due regard for its purpose as well as the working and environmental conditions in which it is intended to operate. A number of issues are now coming to light which demonstrate that the approval process and the manner in which it is being interpreted does not always ensure that the equipment is fit for purpose, i.e. is robust enough for ship board installation and operation. The following examples indicate additional areas in which the "Guidelines (G8)" need to be strengthened:

Coatings; The current corrosion and coating impact tests undertaken by BWMS manufacturers frequently fall well short of the standards established in the Performance Standard for Protective Coatings PSPC.

Type approval tests undertaken so far have been limited in their scope. This limitation includes the doses that the coatings are subjected to, i.e. it does not take into account the probability of increases in doses due to more nutrient rich conditions, user error or dosage equipment failure. Another limitation is that of the time periods that the coatings are subjected to. Some coatings have only been subjected to the Active Substance doses over short (6 to 8 weeks) periods as opposed to a more thorough period of more than 6 months.

BWMS manufacturers should perform appropriate testing during the development phase of their equipment for compatibility tests with coatings.

Hence it is imperative that test protocols are standardized, described and thoroughly verified.

Filters; As a pre-treatment measure some BWMS use filters to remove larger organisms and particles. Some of the key challenges presented by the use of filters include but are not limited to:

3.1.1.Suboptimal Operation At Either End Of The Pressure Range

Some type approval certificates specify a minimum and maximum pressure. This indicates that at certain pressures the filters may not operate effectively. This is especially so at low pressures, such as during the last period of de-ballasting (tank stripping) when minimal volumes of ballast water will be pumped through the BWMS or simply when topping up the ballast tanks.

3.1.2.Back Flush Times May Be Extended In High Sediment Ballast Uptake Areas

This will result in increased back flushing being required and a consequential decrease in the capacity of the system overall. Such a variation in sediment or particle loading is rarely assessed during the type approval stage and as such actual treatment volumes in real-life situations may be greatly reduced. This will result in delaying vessels at certain ports with high sediment waters.

3.1.3.The Physical Nature Of Certain Organisms Also Presents Problems For Filters

In areas of rich phytoplankton experience shows that plankton grasses can easily disrupt and quickly limit the flow of water through filters. Such limitations are difficult to overcome as the back flushing is not always effective in removing the flora in their entirety, unlike say sediment or mud which is particulate in nature.

Hence BWMS which rely on filters are tested in situations where ballast water flow may not be linear or consistent. The results of the testing should then be provided on the Type Approval Certificates to indicate within which ranges the filters will operate effectively, which pumping rates the tests were undertaken and under what circumstances limitations in the filter's effectiveness may occur.

Hence there is a need to assess BWMS in a more credible and effective manner and also to revise the "Guidelines (G8)",

3.2.Availability Of BWMS And Facilities To Install Them

As the BWM Convention dates are progressively surpassed the number of ships to which the requirements apply 12 months after full ratification continually increases. This adds an additional pressure on facilities in terms of retrofitting capacity. Not only are the facilities under pressure to install systems, but BWMS manufacturers will be put under pressure to manufacture the systems and deliver these where and when required.

As per Industry estimate some 70,000 ships will be required to fit ballast water treatment systems within this decade, with the greatest numbers required in 2017, 2018 and 2019. With the delay in ratification of the BWMC, the timeline for fitting compliant treatment systems is continuously being shortened. It is now likely that the 2014 date for retrofitting existing pre-2009 ships will already be in force when the Convention itself enters into force and this must be coupled with approximately 9,000 ships that will be required to have BWMS fitted as "new" ships from 2009. The challenges inherent in the fitting of the numbers of BWMS to meet the requirements must not be underestimated. It will be a huge undertaking, made more serious by the need for additional repair yard capacity to undertake this work.

Hence it is now appropriate to reconsider the regulation B-3 timelines in a pragmatic way to enable a smooth implementation of the BWMC. One possible approach would be to treat all ships constructed prior to actual entry into force as "existing ships". This would alleviate concerns for ships constructed after the 2009 and 2012 treatment installation dates and provide a more natural application of the new regulatory requirements. One other appropriate measure could be to stipulate compliance for "existing ships" to be required at the first renewal survey rather than the first intermediate or renewal survey after the anniversary date of the ship in the year of compliance; this would effectively "smooth out" the demand over five years and provide additional time for fitting facilities to meet the already identified very heavy demand.

3.3. Survey and certification requirements for ships constructed prior to entry into force of the BWM Convention

The main concern is that the BWM Convention allows no phase-in period for ships constructed prior to the entry into force of the Convention to comply with the provisions relating to survey and certification for ships, resulting in all ships of 400 gross tonnage and above to have on board an approved BWM Plan and be surveyed and certificated immediately on the entry into force of the BWM Convention.

It would be impracticable to prepare, review and approve BWM Plans and survey and certify all ships of 400 gross Tonnage and above within the 12-month period between when the conditions for entry into force have been satisfied and the actual entry into force of the Convention. Hence the solution was to allow the issuance of Ballast Water Management Certificates prior to entry into force of the BWM Convention, endorsed to state that validity begins from entry-into-force date, combined with a statement issued to

the Company when the BWM Plan was received thereby allowing the vessel to trade for three months with an unapproved BWM Plan on board.

3.4. Sampling And Analysis Procedures For Port State Control Purposes

Harmonized standard operating procedure for ballast water sampling and analysis is not available as of date. Number of delegations expressed concerns regarding the relationship between the draft circular and the Type Approval testing of ballast water management systems according to the "Guidelines (G8)" during the consideration of the draft circular on sampling at BLG 16. In particular that there was the potential for properly used and maintained Type Approved systems being found non-compliant when assessed in accordance with the proposed circular.

Other concerns included the representativeness of samples, the lack of standardized procedures for conducting the sampling and analysis, and the limited level of confidence of the sampling process.

Hence a harmonised standard sampling and analysis procedure for ballast water is required & same is expected to be established during BLG 17 meeting.

3.5. Ships With Larger Ballast Water Capacities

There has been increasing concern about the availability of BWMS suitable for ships with a ballast capacity larger than 5,000 m³. This has become more relevant as the 1 January 2012 application date to apply the Convention D-2 standard to all new ships has now passed. This matter remains of particular concern for those ships that require large capacity ballast systems to operate effectively. Hence I.M.O. (MEPC sub committee) to determine how this issue may be appropriately addressed.

3.6. Specialist Ship Types

Specialist ship types require a different approach to deal with challenges in relation to the ballast water management.

These include seagoing unmanned barges, semi-submersibles and heavy lift crane vessels. Such challenges remain to be considered and satisfactorily addressed in need of urgent practical solution.

4. Ballast Water Management Convention Issues Discussed At MEPC 64

The IMO Marine Environment Protection Committee (MEPC) meeting, MEPC 64, held in the first week of October 2012, discussed several issues related to the Ballast Water Management Convention (BWM Convention), and reached the following conclusions:

4.1. Implementation dates of the D-2 Standard (Treatment)

It was agreed that a Correspondence Group (CG) is to examine whether Regulation B-3 should be looked at and what must be done with it in order to ease the entry into force of the BWM Convention for existing ships.

The correspondence group will prepare an Assembly Resolution addressing those issues.

The main two proposed actions on the table are the following:

Consider ships built before the entry into force of the Convention to be regarded as “existing ships” and postpone the requirement for those ships to install treatment systems until their periodical surveys after 2014/2016.

Remove the requirement to retrofit a treatment system at the intermediate survey after 2014/2016, and keep only the requirement that ships must retrofit a treatment system by the first renewal survey after the anniversary date of the delivery of the ship in 2014/2016.

4.2. Discussions Related To The Need To Amend The G8 Guidelines

The MEPC decided that the G8 Guidelines (type approval of treatment systems) do not need to be amended at the current stage. However, the MEPC requested submissions to the next BLG meeting in February 2013 to enhance BWM.2/Circ.28, which is guidance for Administrations on how to conduct type approval in compliance with the G8 Guidelines.

At the same time, the MEPC recognised that the treatment systems available in the market face challenges and agreed to enhance the type approval certificates so that they include more information on the treatment systems’ operational limitations.

The MEPC also called for papers illustrating cases where treatment systems are not working as approved and where the failures are due to principal faults in the technologies and not the wrong installation or wrong usage.

4.3. Availability of treatment systems

The MEPC agreed that there are enough ballast water treatment systems in the market, with 28 systems already type approved.

5. Conclusion

There are a number of issues as described above that are affecting ratification and implementation of the BWM Convention. These concerns need to be addressed by the MEPC and the IMO Member States to ensure proper and effective implementation of the Convention.

6. Reference

1. MEPC 63/INF.9, dated: 22/12/2011
2. MEPC 63/2/17, dated: 11/01/2012
3. MEPC 63/2/19, dated: 05/01/2012
4. MEPC 63/2/20, dated: 09/01/2012
5. BLG 16/16, dated: 09/03/2012
6. MEPC 63/23, dated: 10/04/2012
7. MEPC 64/2/16, dated: 07/08/2012
8. MEPC 64/2/18, dated: 09/08/2012
9. MEPC 64/23, dated: 26/10/2012