

## THE ENVIRONMENTAL ASPECTS OF THE BALLAST WATER CONVENTION ON MARINE ENVIRONMENT

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### ABSTRACT

Ballast water is required for the safety and stability of the ship. Ballast known as “any solid or liquid placed in a ship to increase the draft to change the trim”. Ballast water contains viruses, bacteria, protozoa and microalgae which are three fields with high densities in natural water, able to form resting stages, and pathogenicity. The international maritime organization (IMO) has actively taken regulated measures to minimize the species transfer by adopting the international convention for the control and management of the ships’ ballast water and sediments 2004. But till now doesn't into force which will enter into force 2016. Many countries started implementation the convention for example Canada implement the convention by way of amendment to the regulation from 2010. Canada made ballast water control and management regulation to be effective on the great lakes. The paper will discuss the effect of the convention, how Canada implemented this convention and how Egypt will prepare for implementation of this convention.

**KEYWORDS:** Environmental Aspects, Ballast Water

### INTRODUCTION

Ballast water, it is very important for the vessel stability during the loading and discharging as 80 million tons per year are discharged. Although it is very important for the vessel, it is very harmful for the marine environment as it contains several viruses and bacteria that lie in the water and harm the human health. In 1982, the United Nations convention on the law of the sea (UNCLOS, 1982) provided that states shall take all measures necessary to prevent, reduce and control the marine environment pollution. As a result, the international maritime organization (IMO) made the International Convention for the Control and Management of Ships’ Ballast Water and Sediments, 2004 to reduce the water ballast pollution. This paper will explain these procedures and requirements using Canada and how it applied the convention on its ports, Canadian-flag vessels and vessels that enter its ports as an example.

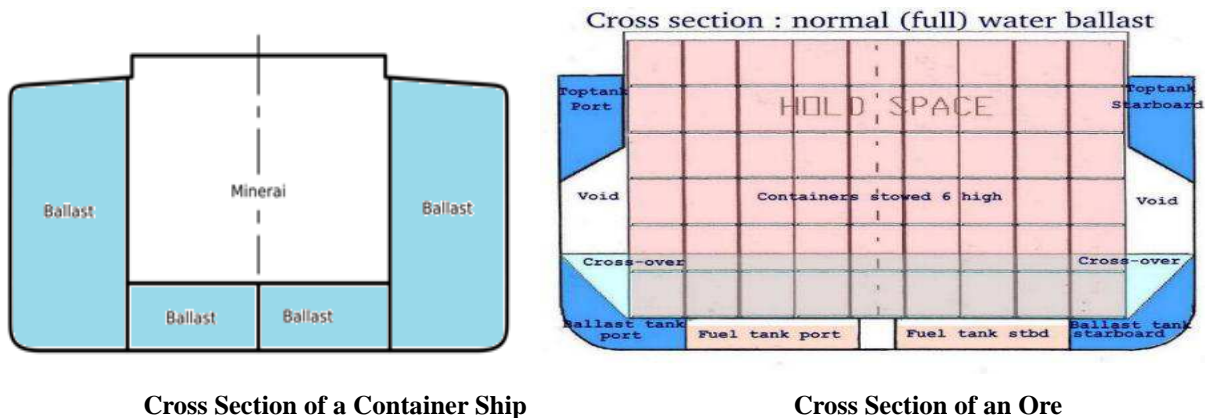
### BALLAST WATER

What does ballast mean? Ballast water is any material used to weight and /or balance an object. (BWM, 2004) Ballast is known as placing any solid or liquid in a ship to increase the draft to change the trim, to manage the stability or the maritime stress loads within reasonable limit (.Armstrong, 2001) Ballast water gives the safety and stability to the vessel while loading and unloading cargo, as ballast is transferred from one place to another.



**Figure 1: Cross Section of Ships Showing Ballast Tanks and Ballast Water Cycles**

Ballast tank arrangements on board in different types of vessels are to meet the requirements of ballast water on board. The figures below give the structural arrangements and ballast capacities on different classes of vessel. (Tzankova, 2001)



**Cross Section of a Container Ship**

**Cross Section of an Ore**

**Figure 2**

**Source:** Australian Quarantine & Inspection Service 1993. Ballast Water Management. Ballast Water Research Series Report No. 4 AGPS Canberra

### The Problem of Ballast Water

Shipping moves over 80% of the world's commodities and transfers approximately 3 to 5 billion tons of ballast waters internationally each year (Andersen, 2002). A similar volume may also be transferred nationally within countries and regions each year. Ballast water is completely necessary to the safe and efficient operation of modern shipping, providing balance and stability to un-laden ships. However, it may also face a serious ecological, economic and healthy threat.

The problem is that ballast water includes bacteria, microbes, small invertebrates and the eggs and cysts. Figure 1-3 as a result, this will be compounded by the fact that virtually all marine species have life cycles that include planktonic stage or stages (RECSO, 2002). Even species in which the adults are unlikely to be taken in ballast water. For example, because they are too large or live attached to the seabed, may be transferred in ballast during their planktonic phase. (Goballast, 2009)

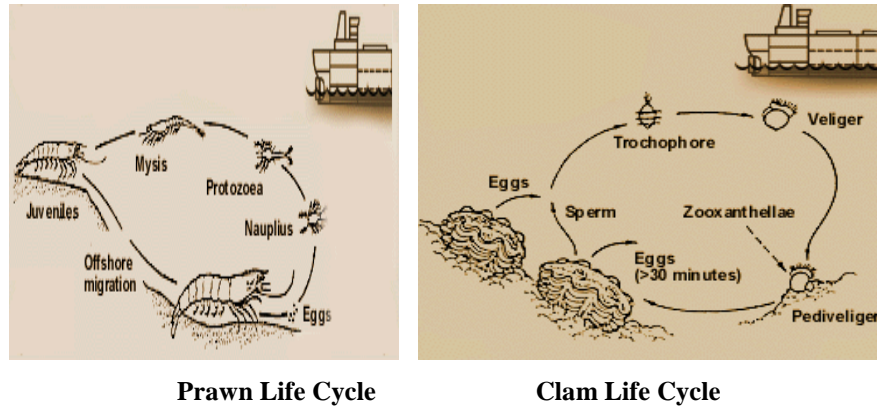


Figure 3

Clam and prawn life cycles showing examples of planktonic stages that can be entrained when ship takes on ballast water (Source: GloBallast Programme, IMO) As a result, it is estimated that at least 7,000 to possibly more than 10,000 different species of marine microbes, plants and animals may be carried globally in ballast water each day (Carlton, 1999). That affects water components and marine environment, ocean current will transfer water from place to another place.

## THE INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS' BALLAST WATER AND SEDIMENTS

### Standards for Ballast Water Management

There is a ballast water exchange standard and a ballast water performance standard. Ballast water exchange could be used to meet the performance standard:

Regulation D-1 Ballast Water Exchange Standard - Ships performing Ballast Water exchange shall do so with an efficiency of 95 per cent volumetric exchange of Ballast Water (BSH, 2013). For ships exchanging ballast water by the pumping-through method, pumping through three times the volume of each ballast water tank shall be considered to meet the standard described. Pumping through less than three times the volume may be accepted provided the ship can demonstrate that at least 95 percent volumetric exchange is met. This regulation built for remove any ballast water which contains stones, sediment and living species.

Regulation D-2 Ballast Water Performance Standard - Ships conducting ballast water management shall discharge less than 10 viable organisms per cubic meter greater than or equal to 50 micrometers in minimum dimension and less than 10 viable organisms per milliliter less than 50 micrometers in minimum dimension and greater than or equal to 10 micrometers in minimum dimension; and discharge of the indicator microbes shall not exceed the specified concentrations.

Ballast Water Management systems must be approved by the Administration in accordance with IMO Guidelines (Regulation D-3 Approval requirements for Ballast Water Management systems) (NK, 2012). These include systems which make use of chemicals or biocides; make use of biological mechanisms or organisms; or which alter the chemical or physical characteristics of the Ballast Water.

### Prototype Technologies:

Regulation D-4 covers Prototype Ballast Water Treatment Technologies. It allows for ships participating in a program approved by the Administration to test and evaluate promising Ballast Water treatment technologies (ultraviolet technology) to have a leeway of five years before having to comply with the requirements of Regulation D-2.

### Review of Standards

Under Regulation D-5 Review of Standards by the Organization, IMO is required to review the Ballast Water Performance Standard, environmental acceptability, not causing more or greater environmental impacts than it solves; practicability, compatibility with ship design and operations; cost effectiveness; taking into account a number of criteria including safety considerations (NBIC.2010); and biological effectiveness in terms of removing, or otherwise rendering inactive harmful aquatic organisms and pathogens in ballast water. The review should include a determination of whether appropriate technologies are available to achieve the standard, and an assessment of the socio-economic effects specifically in relation to the developmental needs of developing countries, an assessment of the above mentioned criteria, particularly Small Island developing States.

### How to Manage and Control Requirements for Ships

The Ballast Water Management Plan is specific to each ship and includes a detailed description of the actions to be taken to implement the Ballast Water Management requirements and supplemental Ballast Water Management practices. Ships are demanded to have on board and implement a Ballast Water Management Plan approved by the Administration. Ships must have a Ballast Water Record Book to record when ballast water is taken on board, treated for Ballast Water Management purposes; and discharged into the sea (DNV, 2013). It should also record when accidental or other exceptional discharges of Ballast Water and Ballast Water is discharged to a reception facility. The specific requirements for ballast water management are as the following:

- Ships constructed before 2009 with a ballast water capacity of between 1500 and 5000 cubic meters must conduct ballast water management that at least meets the ballast water exchange standards or the ballast water performance standards until 2014, after which time it shall at least meet the ballast water performance standard.
- Ships constructed before 2009 with a ballast water capacity of less than 1500 or greater than 5000 cubic meters must conduct ballast water management that at least meets the ballast water exchange standards or the ballast water performance standards until 2016, after time it shall at least meet the ballast water performance standard.

Ships constructed		Periods of applicability of standards									
BEFORE 2009		2009	2010	2011	2012	2013	2014	2015	2016	2017	
Ballast water capacity (m <sup>3</sup> )	Between 1500 and 5000	D-1 or D-2						31.12.2014	D-2		
	Less than 1500 or more than 5000	D-1 or D-2						31.12.2016			D-2

**Table 1: The Ballast Water Performance Standards (Ships Constructed before 2009)**

- Ships constructed in or after 2009 with ballast water capacity of less than 5000 cubic meters must conduct ballast water management that at least meets the ballast water performance standard.
- Ships constructed in or after 2009 but before 2012, with a ballast water capacity of 5000 cubic meters or more shall conduct ballast water management that at least meets the ballast water performance standard.(ABS,2011)
- Ships constructed in or after 2012, with a ballast water capacity of 5000 cubic meters or more shall conduct ballast water management that at least meets the ballast water performance standard.

Ships constructed <b>IN or AFTER</b> 2009			Periods of applicability of standards							
			2009	2010	2011	2012	2013	2014	2015	2016
Ballast water capacity (m <sup>3</sup> )	Less than 5000	Ships constructed in or after 2009	D-2							
	Equal to or more than 5000	Ships constructed between 2009 and 2012	D-1 or D2							
	Equal to or more than 5000	Ships constructed in or after 2012	D-2							

31.12.2016  
↓  
D-2

**Table 2: The Ballast Water Performance Standards (Ships Constructed in or after 2009)**

Because there were uncertainties on the immediate availability of ballast water treatment technology to ships to which regulation B-3.3 would first apply, i.e. ships constructed in 2009, the International Maritime Organization (IMO) Assembly adopted, on 29 November 2007, Resolution A.1005 (25) with the aim of postponing the starting date (1st January 2009) set in the Convention for the application of the Regulation D-2 standard. The Resolution established a new deadline, that is, 1st January 2012. In the Resolution, the IMO Assembly recommended that States ratifying the Convention should join with their instrument of ratification a declaration or otherwise communicate to the Secretary-General their intention to apply the Convention on the basis of the following understanding:

“A ship will not be required to obey regulation D-2 until its second annual survey subject to regulation B-3.3 constructed in 2009, but no later than 31 December 2011”

Other methods of ballast water management may also be accepted as alternatives to the ballast water performance standard and ballast water exchange standard, provided that such methods ensure at least the same level of protection to the environment, property or resources, human health, and are approved in principle by IMO’s Marine Environment Protection Committee (MEPC).

Under Regulation B-4 Ballast Water Exchange, all ships using ballast water exchange should:

- If possible, conduct ballast water exchange at least 200 nautical miles from the nearest land and in water at least 200 meters in depth, taking into account Guidelines developed by IMO;

- In cases where the ship is unable to conduct ballast water exchange as above, this should be as far from the nearest land as possible, and in all cases at least 50 nautical miles from the nearest land and in water at least 200 meters in depth.

When these requirements cannot be met areas may be designated where ships can conduct ballast water exchange. All ships shall remove and dispose of sediments from spaces designated to carry ballast water in accordance with the provisions of the ships' ballast water management plan (Regulation B-5).

#### **Additional Measures**

A Party, individually or jointly with other Parties, may impose on ships additional measures to reduce, prevent, or Pathogens through ships' Ballast Water and Sediments and eliminate the transfer of Harmful Aquatic Organisms.

In these cases, the Party should consult with nearby States that may be affected by such standards or adjoining or requirements and should communicate their intention to establish additional measures to the Organization at least 6 months, except in emergency situations, prior to the projected date of implementation of the measures. When appropriate, Parties will have to obtain the approval of IMO.

#### **Survey, Inspection and Certification Requirements for Ballast Water Management**

Survey gives requirements for initial renewal, annual, intermediate and additional surveys and certification requirements. Appendices give form of Ballast Water Management Certificate and Form of Ballast Water Record Book. Ships are demanded to be surveyed and certified in the international convention for the control and management of the ballast water and sediments and may be inspected by port state control officers who can verify that the ship has a valid certificate, inspect the Ballast Water Record Book, and/or sample the ballast water. If there are concerns, the party carrying out the inspection shall take such steps as will ensure that the ship shall not discharge ballast water until it can do so without presenting a threat of harm to the environment and a detailed inspection may be carried out, human health, property or resources. All possible efforts shall be made to avoid a ship being unduly delayed.

#### **PROPOSED BALLAST WATER MANAGEMENT UNDER CANADIAN IMPLEMENTATION OF THE CONVENTION**

Canada implementation of the convention from 2006, vessels operating in water under Canada jurisdiction complies with provisions must be:

- Meet survey requirements and carry a valid Ballast Water Convention Certificate,
- Have a ballast water record book on board,
- Have an approved ballast water management plan, and
- Meet the exchange and performance standards of the Convention as appropriate.

#### **Ballast Water Performance Standard and Timeline:**

The Convention gives vessels time to obey its performance standards. Once the vessel starts using the convention,

a Canadian-flag vessel covered by the Convention must not discharge any ballast water anywhere in the world unless it meets the performance standards. A foreign-flag vessel must not discharge any ballast water in Canada unless it meets the performance standard. Under the Convention, it is the responsibility of the vessel to obey this requirement. (Transport Canada, 2012a)

**Table 3: Latest Date for Compliance with the Performance Standard**

Ballast Water Capacity	Date of Construction	Vessel Must Comply with Performance Standard
Less than 1500 m <sup>3</sup>	Before January 1, 2009	by its first intermediate or renewal survey on or after January 1, 2016
	On or after January 1, 2009	upon coming into force of the Convention
1500-5000 m <sup>3</sup>	Before January 1, 2009	by its first intermediate or renewal survey on or after January 1, 2014
	On or after January 1, 2009	upon coming into force of the Convention
Greater than 5000 m <sup>3</sup>	Before January 1, 2012	by its first intermediate or renewal survey on or after January 1, 2016
	On or after January 1, 2012	upon coming into force of the Convention

Under the Convention, Canada has a limited right to grant extensions to the installation timeline pursuant to the Convention. Such extensions require consultation with other affected states and notification to IMO. Where extensions are granted, they are only to the date of applicability for the performance standard, cannot exceed a period of five years, must take into account risks involved in specific trading patterns and can only be granted based on a list of ports or locations that exhaustively covers a vessel's trade.

#### **Ballast Water Management Plan:**

Under the Convention, each vessel is required to carry a ballast water management plan approved by its flag administration. This plan puts the method by which the vessel will obey the regulations of the Convention, including methods for ballast water exchange if necessary. The plan must employ a shipboard officer who has the responsibility to ensure that the plan is properly implemented.

The Convention requires that the specific Treatment System to be installed should be identified in the Management Plan. Treatment Systems must be appropriate for the ballast water to be treated (e.g. fresh water, cold water). (Transport Canada, 2012b)

For Canadian-flag vessels, Transport Canada is proposing to grant approval of Management Plans through recognized organizations. The plan must be revised over time as needed and revisions would require re-approval.

It is important to note that the vessel's obligation to maintain and implement an approved Management Plan is independent of the vessel's obligation to meet the exchange.

### **Ballast Water Specific Surveys and Convention Certification**

The Convention requires that vessels suffer from ballast water surveys that show clearly compliance with its ballast water management method. Based on these surveys, an international Convention Certificate is issued, to be carried onboard the vessel in order to legally operate. For foreign-flag ships, Canada will accept Convention Certificates as evidence of the required surveys. For ships whose flag is not a party to the Convention, an equivalency Certificate is required that shows the vessel has been surveyed and has an approved Management Plan that obeys the Convention method.

### **Transport Canada's Planned Approach to Compliance and Enforcement**

Transport Canada proposes to achieve compliance and enforcement activities in accordance with its *Policy on Compliance and Enforcement of the Canada Shipping Act*. This Act provides significant penalties for violations of the Regulations.

Transport Canada's experience is that education of vessels and masters is the best way to ensure good compliance with the Regulations. One important reason that Canada requires 96 hours of notice before a vessel arrives is to ensure that enough time still exists for the master to undertake remedial ballast water management in cases where non-compliance would otherwise occur.

Transport Canada expects to direct vessels to remedy deficiencies in equipment or procedures before discharging ballast water. Transport Canada is considering adding an additional provision to the Regulations that would require a vessel to take corrective action if directed by a marine safety inspector to remedy a violation, thus preventing the release of potentially invasive species.

Other than for scientific purposes, Transport Canada anticipates performing full scale biological sampling of vessel discharges only in cases where there are specific grounds to suspect violation of the Regulations.

Pursuant to the Convention's Guideline, a Treatment System can include bypass valves that allow the system to be isolated in an emergency. The proposed regulatory method would require that, where a vessel is so equipped, operation of the valves must trigger an alarm and be logged in the control system of the Treatment System; if this were not the case then no discharge would be allowed in Canadian waters.

### **CONCLUSIONS AND RECOMMENDATION**

Ballast water is very important for the vessel stability but contains several viruses and bacteria that affect the water and harm the marine environments and human health. As a result, IMO put procedures to put the pollution caused by the ballast water under control by the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 which confirm on the procedures and requirements for ballast water pollution. This convention will come into force 2016.

Canada applied this convention from 2006 at its ports, Canadian-flag vessels and all ships that enter its ports in order to take all the required procedures to keep away from the ballast water pollution.



Egypt should apply this convention before 2016 to keep up the world development to control the ballast water pollution in order to save its ports and human health. Egyptian-flag ships must apply the convention to be able to enter the ports that have already applied cooperate with the neighboring countries to save their water from pollution and put the convention in the national law to be applied on all the ships that enter its port. Also, the consultants should take courses in the Egyptian authority for maritime safety to make surveys on ships and issue the certificates to make port state control.

## REFERENCES

1. Armstrong, Alison. The national invasive species, 2001
2. Bundesamt forseechahrt und hydrogrphie (BSH), 2013  
[http://www.bsh.de/en/Marine\\_data/Environmental\\_protection/Ballastwater/index.jsp](http://www.bsh.de/en/Marine_data/Environmental_protection/Ballastwater/index.jsp)
3. Carlton, J. T. Marine Bioinvasions of New England. Maritimes, 1999
4. Det Norske Veritas (class DNV)  
[http://www.dnv.com/industry/maritime/servicessolutions/maritime\\_environment/ballast\\_water/index.asp](http://www.dnv.com/industry/maritime/servicessolutions/maritime_environment/ballast_water/index.asp)
5. Goballast, 2009 <http://globallast.imo.org/>
6. National Ballast Information Clearinghouse (NBIC), 2010 <http://invasions.si.edu/nbic/managementpract.html>
7. Nippon Kaiji Kyokai (class NK), 2012 <https://www.classnk.or.jp/hp/pdf/activities/statutory/ballastwater/g4.pdf>
8. Regional Clean Sea Organization (RECSO) / IMO Joint Seminar on Tanker Ballast Water Management & Technologies, 2002
9. The American Bureau of Shipping (class ABS), 2011 [http://www.eagle.org/eagleExternalPortalWEB/ShowProperty/BEA%20Repository/Rules&Guides/Current/187\\_BWT/Guide](http://www.eagle.org/eagleExternalPortalWEB/ShowProperty/BEA%20Repository/Rules&Guides/Current/187_BWT/Guide)
10. The international convention for the control and management of ships' ballast water and sediments (BWM), definition, 2004
11. The United Nations convention on the law of the sea (UNCLOSE), 1982
12. Transport Canada, Canadian Implementation of the Ballast Water Convention, 2012
13. Tzankova, Z, Ballast Management and the cruise ship industry operating in California waters, 2001

