https://doi.org/10.53656/ped2023-5s.01

IMPLEMENTATION OF BALLAST WATER MANAGEMENT CONVENTION REQUIREMENTS IN MARITIME EDUCATION

Prof. Dr. Blagovest Belev
Nikola Vaptsarov Naval Academy (Bulgaria)

Abstract. Ballast Water Management Convention entered into force on the 8th of September 2017. Nevertheless, six years later, many problems are still waiting for their solution. Despite International Maritime Organization Guidelines, IMO HTW 7/12, Resolution MEPC.173 (58) and others, some details are still open questions that are waiting to receive their answer from the practice. The maritime society still discusses the correct way of collecting samples from ship's ballast tanks, laboratory accreditation and licensing regulations, ballast water treatment systems maintenance. Another important issue is education and training of the personnel in charge of systems' operation and repair. Education and training processes are already in the focus of the International Maritime Organization (IMO) but still waiting for Member states' decision. The idea for such kind of activities appears in some particular educational institutions and training centers but the subject is not in the syllabi. Ballast Water Management Convention and related knowledge and skills are the new challenge for the shipping in all respects. The aim of this article is research regarding implementation of Ballast Water Management Convention in maritime education worldwide and in Bulgarian education and training institutions. The method of information analysis is used in order to compare what the leading maritime institutions propose in respect to Ballast Water Management Convention.

Keywords: Ballast Water Management Convention; maritime education and training; distance learning; computer based training; STCW Convention

Introduction

The expansion of trade by sea caused the International Maritime Community to pay attention to a problem that permanently gripped the entire World Ocean. Along with transporting goods, ships transport biological organisms from one climate zone to another. In this way, permanent disruption of the habitat of both native and introduced organisms is caused. A large part of the invasive species adapts to the new living conditions, but causes changes to the host eco-system.

Research on bio invasion in various marine areas has been done for centuries. Such statistics are collected in the administrations and research institutes of the designated shipping regions. Statistics for the Black Sea, for example, report registered invasive species at 217. Almost half of them (102) have permanently established themselves in different parts of the sea. This high proportion of invasive species assumes a serious impact on the biodiversity of the Black Sea, with negative consequences for human activities and economic interests (Kasapoglu et al. 2011; Yankova 2011; Băncilă et al. 2022).

In 2004, at a diplomatic conference in London, initiated by the International Maritime Organization (IMO), the Member States of the Organization, in the presence of representatives of associated countries and non-governmental organizations, adopted the International Convention for the Control and Management of Ship Ballast Water and Sediments (Ballast Water Management Convention, BWMC). The Convention applies to all ships designed or constructed to carry ballast, of over 400 gross tonnage, flying the flag of a State that has ratified the Convention. In addition, ships flying the flag of another country but visiting the ports of a country party to the Convention must also comply with the requirements of the BWMC[1, 2]. The Convention requires provision of scientific developments and research in the field of ship ballast water control, as well (David and Gollasch 2015).

The scientific research is one part of the ballast convention's effect on the overall maritime transport system. Another indispensable part is maritime education, for the development of which there are also indications from the IMO. The application of the provisions of the BWM Convention raises a number of educational issues. The performance requires common efforts of the entire crew – bridge and engine. The International Maritime Organization has introduced a competency in the Standard of Training, Certification and Watchkeeping Convention – 78/95 (STCW – 78/95) which requires ship officers to have knowledge of maritime environmental protection. Nikola Vaptsarov Naval Academy delivers to the students a new subject in the syllabi of deck and engine students – "Environmental protection awareness". The course is mandatory as per Manila amendments to the STCW Convention. A small part of the program is also dedicated to the problems caused by invasive species carried in ballast water (Belev and Daskalov 2019).

Purely environmental topics in the subject are not enough. The application of the D-1 and D-2 standards raises the following problems, related to the ship's operation, which need to be solved by education (Phanuwat 2018):

– ensuring stability of the vessel when ballast water exchange operation in different sailing conditions is in progress;

– legislative aspects for ballast water exchange and treatment;

– risk assessment of ballast water changing and treating operation in different sailing conditions;

– taking samples from the ballast tanks and analyzing the water in a specialized laboratory;

– working with various ballast water treatment systems on board.

Application of the D-2 standard requires a ballast water treatment system to be installed on board ships. The different ways of applying the standard allow systems of different types and constructions. Safe and effective work with them requires good technical knowledge and understanding of the principles of the treatment process.

The article discusses the entire maritime education and training process, related to BWM Convention. A number of educational institutions were observed and proposed courses were analyzed in order to assess their compliance with IMO proposed amendments to the Seafarers' Training, Certification and Watchkeeping Code related to ballast water management. The methods of information analysis and method of comparative analysis are used to present the current place of Ballast Water Management culture in the behavior of maritime educational institutions. The article presents current and potential gaps in maritime education and training in this respect.

1. IMO education and training strategy related to BWMC

IMO has established a precise procedure for initiating and conducting any training in the maritime industry. It is the usual practice of the organization that innovations in shipping, resulting from decisions of the Organization's committees and subcommittees, be discussed by the SUB-COMMITTEE ON HUMAN ELEMENT, TRAINING AND WATCHKEEPING (HTW) before they become recommended or mandatory standards of the STCW Convention[3].

At the 7th session in 2020, the HTW sub-committee included in its agenda a proposal for an amendment to the Ballast Water Management Convention Code[4]. The proposal was made by China and the International Chamber of Shipping (ICS), based on a number of documents of the Maritime Environment Protection Committee, adopted at the 72nd and 73rd sessions of the Committee. The document details how the Code to STCW – 78/95 Convention should be amended and the competencies for all seafarers on ships added. In this activity, IMO is also encouraged by the global trade organizations in the maritime industry, called co-sponsors. Their proposals are:

1. To develop and supplement the STCW code in Chapter II and III by including competencies, related to BWMC.

2. To create a new model course and to amend the existing model courses, thereby supporting the implementation of BWMC.

At its next session, held on March 18, 2022, the HTW also included Japan's proposal, which is directly related to the one made at the 7th session by China and the ICS[5]. Thus, the idea of including the BWM Convention in maritime education

already acquires precise dimensions and scope. HTW document 7/12 included a template for supplementing Chapters 2 and 3 of the STCW-78 Code to facilitate the IMO Assembly in making a final decision on this matter. The HTW 7/12 document also makes specific proposals to the existing model courses which form the basis of maritime education – Model Course No. 7.01 "Master and chief mate", Model Course No. 7.02 "Chief engineer officer and second engineer officer", Model Course No. 7.03 "Officer in charge of a navigational watch", Model Course No. 7.04 "Officer in charge of an engineering watch", Model Course No. 7.08 "Electro-technical officer", Model Course No. 7.15 "Electro-technical rating", Model Course No. 7.10 "Ratings as able seafarer deck", Model Course No. 7.16 "Ratings as able seafarer engine".

An overview of Model Course No. 7.01 "Master and chief mate", Model Course No. 7.02 "Chief engineer officer and second engineer officer", Model Course No. 7.03 "Officer in charge of a navigational watch", Model Course No. 7.04 "Officer in charge of an engineering watch" indicates that BWMC is present in the minimum educational requirements, but an understanding of ship ballast handling must be comprehensive with a focus on the operation of the ship and ensuring its sustainability. In fact, this issue is of the greatest degree of risk in the handling of ballast during transition and deserves the most serious attention from training institutions. For this reason, the amendment of Model Course No. 7.01[6] and Model Course No. 7.02[7] is particularly important because of the focus of the training on the management level of the ship's crew.

2. Analysis of Current Education and Training relevant to BWMC

Until the entry into force of the BWM Convention, 13 years have passed since its adoption. During this period, especially as the process of its ratification by most of the IMO member states progressed, a number of qualification courses were created at the request of the shipping companies concerned. Lee and Ha have conducted a study on the development of ballast water management training under the STCW-78 convention (Lee and Ha 2016). In it, they have analyzed which training centers have created a training program without emphasizing the content. In the conclusions to the publication, the authors have proposed to supplement Part A of the code to STCW-78 by creating Section VI/7. However, they did not add substance to their proposal, thus leaving open the question of how to engage STCW-78 with the BWM Convention.

Lee and Ha's research turned out to be unique in its substance and dates back to 2016. Almost all training institutions included in it have either been converted or non-existent, and the courses offered by them have been significantly changed.

To solve the research task, an extended search was conducted in the global network INTERNET for training of any kind related to the implementation of the BWM Convention. The results are divided into two categories – training for initial

maritime education and qualification training activity. The keywords Ballast Water Management Convention, Maritime Education and Training, Distance learning, Computer based training, STCW Convention, IMO Model course were used in the search. 22 websites were shown with training information related to the BWM Convention and the application of its rules. In addition to the information from websites, curricula for the Bachelor and Master degree at the Maritime Faculty of the University of Split and curricula for the same degree and specialty at the University of Tallinn were examined.

Of all the internet sources and the above mentioned curricula, only one showed that training for BWM Convention implementation was taking place as part of an academic program at a maritime university – the website of the Faculty of Marine and Fisheries Sciences at the University of Ghana[8]. The course offers students an in-depth introduction to the requirements of the BWM Convention, as well as the specific application in the safe operation of the ship and the reduction of risk in ballast operations. The course is a subject in the Master's program only for students who are training to work on merchant ships.

17 websites contain information about a qualification course, related to the implementation of the BWM Convention. The names of the training institutions and basic information about the training they offer are shown in Table 1.

Table 1. Training centers, offering training courses on Ballast Water Management Convention

No	Provider	Name of the course	Duration	Conducting the course
1	Learn America	Ballast Water Management (BWM)	No info	online
2	Lloyd's Maritime Academy	Develop a Clear Understanding af Ballast Water Management Whilst Addressing its Implications Upon the Environment	12 weeks	No info
3	Ocean learning	Ballast Water Management Training Course	No info	online
4	RINA	Ballast Water Management | Marine training course	1 day	online
5	Seably	Ballast Water Management Awareness	50 minutes	CBT online
6	Maritime trainer	Ballast Water Management Systems	1 hour	CBT online
7	Training portal	Ballast Water Management	4 hours	E-learning
8	United Marine Training Center	Ballast Water Management	No info	No info
9	SQE Marine	Ballast Water Management (office staff) Course	No info	No info

10	BVS eAcademy	Ballast Water Management	4 hours	eLearning
11	DESMI Ocean Guard	Compact Clean Ballast Water Management Systems	No info	CBT online
12	Alfa Lava	No info	No info	CBT online
13	Cleanship Solutions	Introduction to Ballast Water Management	No info	E-learning
14	GloBallast	GloBallast e-learning portal on Operational Aspects of Ballast Water Management	No info	E-learning
15	Mariner skills	Ballast Water Management (BWM)	30 Hours	E-learning
16	Erma First	Ballast Water Treatment System	2 or 3 days	E-learning
17	Warsash Maritime School	Ballast Water Management	2 days	Training at school

Source: Google search by author

Almost all training centers offer online computer-based training (CBT) or e-learning, which use the same facilities. Only one institution uses classical education – classroom training under instructor's supervision.

Another interesting point is course duration. Suppliers offer different duration and formally it doesn't depend on the type of training – e-learning or training at school. It mostly depends on the course content. The survey states that training institutions' syllabi are also different and in this respect their training is categorized as basic, advance and professional.

The content of basic training and education category consists of the following topics in table 2[9,10]:

Table 2. Typical content of basic courses

Step	Content
1.	Overview of IMO Convention Requirements
2.	USCG Regulation
3.	Ballast water convention and management
4.	BW Treatment Systems
5.	Installation onboard common criteria
6.	Developments (G8 revision)

Source: Author's research

It is obvious that the basic course is designed to inform trainees about the current status of the regulations and some practical solutions regarding BWM Convention.

Usually, the duration of such category courses is between 50 minutes and 4 hours. The course ends with certification of the participant. The certificate is issued by the specific training center and approval by Maritime authority or classification society is optional.

Advanced training and education cover more topics and the syllabus is designed to deliver to trainees some practical skills. The participants upgrade their knowledge if they have preliminary training on BWMC. The content of advance courses is shown in table 3[11,12]:

Table 3. Typical content of advanced courses

Step	Content
1.	BWMC 2004
2.	Ballast Water Management Plan
3.	Ballast water exchange and hazards
4.	GloBallast
5.	Ballast Water Reporting Requirements
6.	Active substances
7.	BW Compliance monitoring and testing
8.	Ballast Water Treatment methods on board
9.	BW Treatment Technologies
10.	Ballast Water System and Energy Efficiency
11.	Updates on USCG BWM Requirements
12.	The BWM- current issues and challenges
13.	Sampling and monitoring
14.	Port state control of BWM
15.	Installation, retrofitting and surveys
16.	Ballast water risk assessment

Source: Author's research

The duration, proposed by training institutions for advanced courses, is between one and three days. The majority of centers deliver e-learning or CBT online education. Tradition says that practical skills are acquired when students have face-to-face contact with their instructors. That is why it is highly recommended that such kind of education and training to be delivered in the classroom.

The courses end with certificate issued by the educational institution.

Professional courses are more or less similar to education. Such a course is delivered by Lloyd's Maritime Academy and its duration is twelve weeks. The syllabus consists of six modules and covers BWM Convention requirements and rules, implementation and responsibility of Ballast Water Management, Ballast Water Treatment and technologies used, technique for taking samplings and

monitoring and ballast water risk assessment. Almost the same is the content of the syllabus of the Department of Marine and Fisheries Science, which is an education syllabus for Bachelor's degree.

Conclusions and summary

The research conducted shows that there is a worldwide interest in seafarer's training, related to the implementation of the BWM Convention. The entry into force of the Convention was a long-awaited act and it caused significant changes in the cargo ship's equipment. In addition, the Safety Management System, related to International Safety Management Code (ISM Code), was supplemented with new procedures for the operation and maintenance of the ship's ballast handling system.

The past six-year period shows that further training of ship's crews on the rules of the Convention is required, as well as a number of technical issues relating to the operation of equipment and the risk assessment of the entire process of ballast operations. Until now, the IMO has always faced the problems of maritime education and qualification and regulated the process with adequate measures and requirements. The proposals of some member states and co-sponsors are a good indicator that the maritime community is concerned about the implementation of the BWM Convention. The next steps should be towards supplementing the STCW-78 convention and creating a model course. In this way, the process will be improved and the training of marine personnel will be standardized.

NOTES

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✉ **Prof. Dr. Blagovest Belev**
ORCID iD: 0000-0001-9458-6070
Web of Science Researcher ID: E-3692-2012
Nikola Vaptsarov Naval Academy
Varna, Bulgaria
E-mail: bl.belev@naval-acad.bg