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## BWM CONVENTION 2004 – NEW CHALLENGES FOR MET INSTITUTIONS

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**Abstract.** The International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention) is expected to enter into force within next five years. Despite significant efforts paid meanwhile a number of measures and requirements are still not clearly defined as they should be for a proper interpretation and full implementation.

The most prominent "grey areas" yet to be resolved include actions in case of "polluted" ballast water or a malfunctioning treatment system on board, actions in case of early warnings declared by the destination port, sampling techniques and port state control procedures, sediment management, risk assessment and intra-regional voyages, more stringent standards that was or may be implemented by certain countries, costs and legal responsibilities in certain cases, etc.

It is quite clear that for efficient ballast water management and proper implementation of new requirements ships' crews need additional competencies. These competencies and related knowledge, understandings and proficiencies still have to be defined, eventually to be included into the STCW Convention. Moreover, it is recognized that seafarers, more than often, are not aware of risks the harmful aquatic organisms or pathogens (HAOP) and nonindigenous species (NIS) pose to environment. Consequently, learning outcomes dealing with the subject and associated learning modes designed to effectively and rather quickly ensure appropriate level of knowledge and training still have to be identified.

In the paper the findings and challenges related to ballast water management training are discussed. Particular emphasize is paid to programs delivered at higher MET institutions for seafarers with management responsibilities

Main findings and outcomes are based on the research and results of the Ballast Water Management System for Adriatic Sea Protection project (BALMAS) [3,5,6]. BALMAS project, worth approximately 7 million Euros, is financed by the EU AdriaticIPA Cross Border Cooperation 2007-2013 program. It involves 17 different beneficiaries (ministries, governmental and scientific institutes, universities, foundations and maritime associations) from 6 partner countries (Italy, Slovenia, Croatia, Bosnia and Herzegovina, Montenegro and Albania).

The project integrates all activities aiming to ensure sound implementation of the BWM Convention measures in the Adriatic Sea. The main objective is to establish a common cross-border system linking all Adriatic research, experts and national responsible authorities to avoid the introduction of HAOP or NIS organisms into Adriatic Sea,

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through the control and management of ships' ballast water and sediments. The Faculty of Maritime Studies Rijeka is currently involved as project external expert institution.

**Key words:** ballast water management, ballast water and sediments, maritime education and training, Adriatic Sea.

## 1 INTRODUCTION

Processes and procedures related to ballast water management are operational in shipping for a while. They are defined mostly in the BWM Convention [2] and associated regulations and guidelines. Although the Convention is not in force yet, a number of requirements and standards are already implemented worldwide, sometimes significantly different in different regions or by different national authorities. Countries like Australia, Brazil, Canada, Norway, Ukraine, USA have already implemented national regulations related to ballast water management.

Sufficient number of ratification instruments is expected to be soon collected. According to the IMO database [18], the BWM Convention presently has 44 signatories representing 32.86% of the world fleet tonnage (June 2015). Since, some of the countries have confirmed that ratification process is in progress (Argentina, Indonesia, Philippines, Belgium and Finland) it seems that the required percentage of the world tonnage (35%) could be reached in 2015 or more probably in 2016.

Proper implementation of the BWM Convention requirements are still under continuous consideration among stakeholders and it seems as a quite challengeable process. Several well-known "grey areas" are still not clearly answered, such as sediment management, risk assessment, sampling techniques and port state control procedures, proper control mechanisms, equipment installation, intra-regional voyages, legal issues related to responsibilities, etc. Up to now, it seems that the most important area tackled is development of the shipboard equipment capable to perform as required by the Convention. The area next to the one mentioned where significant efforts that have been paid in development of the national legal frameworks and strategies on ballast water management.

On the other hand, one of the very key issues for the proper implementation of the new requirements is up-to-date education and training of persons operating and maintaining equipment to be installed. Beside ships' crews a wide range of shore-based personnel directly or indirectly involved with ships' operations also need to be informed and/or trained.

The BWM Convention provide various technical and procedural provisions related to control of the transfer of Harmful Aquatic Organisms and Pathogens (HAOP)

through ships' ballast water and sediments but not clear and usable education nor training requirements to assist and support stakeholders in the implementation.

The training requirements are presented very generally. The Article 13 of the Convention is the only article where training is explicitly mentioned. And even there it is only an option for countries requesting technical assistance from the IMO or other international bodies "to train personnel". In addition, the Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens (IMO Resolution A.868(20)) in Chapter 6 provide more detailed instruction on BWM training and education for ships' master and crews. According to the guidelines, marine training organizations should include in their study programmes the following content:

- instructions on the application of processes and procedures concerning ballast water and sediment management,
- application of treatment procedures,
- knowledge of duties regarding the control of pollution of the sea by HAOP.

Aforementioned training requirements could be considered as not mandatory because the guidelines "should be viewed as a tool which, if correctly applied, will help to minimize the risks associated with ballast water discharge". Training on BWM has not been visibly implemented in the STCW Convention [14] so appropriate competencies and related knowledge, understandings and proficiencies of the ships' crews related to BWM are still not clearly identified.

Furthermore, the implementation of the BWM procedures requires adequate knowledge on the topic by shore-based personnel involved in BWM planning and implementation. These personnel consist of, but are not limited only to, stakeholders involved with ship operations such as employees of maritime administrations, ports, shipyards, shipping companies, classification societies, marine laboratories or different ship inspectors.

Following aforesaid, it can be stated that effective implementation of the BWM Convention provisions, once it enters into force, need to be followed with adequate and appropriate training on BWM procedures.

Consequently, the main goals of the article are to provide picture on issues related to BWM training developing processes and challenges which MET institutions will face. Also, the training requirements for the personnel employed by different stakeholders are discussed.

## 2 BWM TRAINING – CURRENT STATUS

Introduction of harmful organisms and pathogens by ballast water has been considered as one of the major threat to marine environment, marine resources

and human health [4]. Training on ballast water management measures and procedures can be considered as one of several education streams required in the future in order to ensure the proper level of marine environmental protection.

Education and training on environmental issues, most notably the prevention of pollution from ships, is partially regulated in the STCW Convention. The STCW Code, as a part of the function "Controlling the operation of a ship and care for persons on board at the operational level", contain among other competences the following: "to ensure compliance with prevention pollution requirements". In addition, the competence "Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea, security and the protection of the marine environment" describes the function at the management level related to marine environment protection; at the supporting level the relevant requirements are included in the competence "Apply precautions and contribute to the prevention of pollution of the marine environment".

Provisions of the Chapter VIII on protection of marine environment require crew members to take all possible precautions to prevent accidental pollution of the marine environment, particularly within the framework of relevant international and port regulations.

In addition, the minimum standards in personal safety and social responsibilities (as a part of the Basic training course), include the competence „Take precautions to prevent pollution of the marine environment".

Following STCW requirements on marine environment protection, the IMO Model Course on Basic training in Marine Environmental Awareness has been developed [Model Course 1.38]. The Model Course is designed for masters, senior officers and officers in charge of a navigational or an engineering watch and in Part 8 "Introduction of invasive species" outline teaching objectives related to transfer of invasive species via ballast water and possible influence to marine environment and associated pollution prevention measures. Teaching syllabus recommends for lectures, including video presentations, only one hour.

As it is already noticed, provisions of the BWM Convention neither STCW Convention do not unequivocally require training for non-crew personnel. However, the IMO Marine Environment Protection Committee (MEPC) has adopted list of Guidelines (G1 - G14) with a main purpose to provide standardized implementation of different provisions of the Convention. Training is required for the following personnel:

- ships' masters and crews (G4 and G6),
- personnel in charge of and those employed in the provision of a ballast water and sediment reception facility including the treatment and disposal of ballast water and sediment (G1 and G5),

Training for ships' masters and crews should cover topics on the requirements of the BWM Convention, the ballast water and sediment management procedures and the Ballast Water Record Book as well as topics on the safety issues associated with the ballast water exchange procedures. Training should follow information from the relevant guideline.

Training for personnel of the reception facility should be organized internally and delivered by competent and skilled professionals.

It should be also mentioned trainings on ballast water management which are developed and implemented by the GEF-UNDP-IMO GloBallast Partnerships Programme throughout GloBallast Partnerships Projects for the period 2007-2016 [17].

According to the project objectives several training activities have been undertaken. Introductory and more advanced training packages have been developed and dedicated to agencies, port and shipping personnel as well as to those responsible to develop national and regional legislation, enforcement and compliance monitoring.

In addition, the GloBallast Partnerships Programme created a dynamic e-learning platform on operational aspects of the ballast water management accessible through a web-based learning portal.

In general, organisation of BWM training and education have been, up to now, much more carried out for various shore-based personnel. Classification societies and various MET institutions already offered different training courses for shore staff mainly for those who are or will be responsible for the BWM Convention implementation, for the shipping companies' personnel as well as for shipyard and port personnel.

It is obvious that there is quite a large gap between presently required marine environmental training and training required by relevant procedures outlined in BWM Convention.

Despite the fact that BWM Convention is not yet mandatory, numerous regional and national mandatory provisions on BWM management already demand appropriate skills and knowledge for responsible personnel. In that respect, beside competencies required from ships' crews, additional competencies have to be required from shore based personnel involved in application of BWM measures, in particular those dealing with control and monitoring measures.

### 3 ISSUES AND CHALLENGES REGARDING BWM TRAINING

The competencies required to efficiently implement the BWM Convention can be broadly divided in two main characteristics: essential competencies required

from shipboard personnel and specialized competencies required from shore-based personnel.

Competencies required from shipboard personnel, as it may be assumed for the time being, are mostly those dealing with equipment operations, operational limits and equipment maintenance. Presently, crew members are initially trained during the Basic Environmental Awareness Course. It is more than obvious that recommended duration of training in BWM, according to the Model Course [12] (1 hour) does not satisfy the needs and does not cover quite comprehensive knowledge and skills required, especially knowledge and skills required by crew members with management level responsibilities

Taking into account the fact that presently numerous technical solutions exist (within the BALMAS project 116 different equipment sets have been identified as approved or expected to be approved soon [6]) additional knowledge and understanding is required to cover peculiarities of the set installed (or to be installed) on board. This additional knowledge is expected to be offered through dedicated training courses offered by the companies (so-called "in-house" trainings). So far, due to limited experience with actual equipment, it is not easy to estimate the minimal coverage of this additional training.

The MET institutions, particularly higher MET institutions, have to cope with even more complicated task. They have to offer generalized training providing adequate competences for any possible technology that may be found on-board ships, including ballast water management, treatment procedures and equipment, familiarisation with the regulations, guidelines and reporting procedure.

In both cases the main issues to be resolved are:

- What should be the appropriate duration of the training?
- Should the training be part of the already existing marine environmental protection course or should it be delivered as new standalone course?
- What should be competences of the lecturers and do they need to have additional individual training on BWM management and Convention requirements?
- What should be ratio of theoretical and practical training, if any? What equipment should/may be used?

The most straightforward solution would be development of harmonised training programme, eventually adopted as a Model Course by the IMO. However, for the time being there is no such model course developed and experience of the IAMU members could help a lot in that respect.

Competencies required from shore-based personnel are even more diversified. Training requirements range from very basic (for example, for staff operating shore BW reception facilities) up to highly specialized training (for example, PSCO responsible for control and monitoring procedures or actions in case of a breach of rules). In all these cases various technologies and their characteristics significantly impact design of respective curricula.

The areas where a number of unsolved issues are identified during BALMAS project development are briefly presented in the following paragraphs.

**Early warning system.** The coastal states may establish an early warning system (in accordance with Regulation C-2) in order to notify mariners of areas under their jurisdiction where ships should not uptake ballast water due to known conditions. To be effective, early warning systems need to support at least on-demand risk analysis, monitoring procedures, warning communication channels and response capabilities. There are no international standards in that respect and it is not clear what should be done on board when warning is issued. Consequently, procedures applied by systems developed in different regions may differ significantly, thus making quite demanding to train seafarers on proper actions to be implemented in such cases.

**Sampling techniques.** It is assumed that shipboard BW treatment equipment is delivering ballast water in accordance with respective standards. However, simple and straightforward methods to confirm that ballast water satisfies the requirements are still not widely available. Consequently, it is very much questionable whether seafarers should be trained and equipped in sampling procedures to verify the proper operations of the equipment.

**Port State Control procedures.** It is a duty of the PSC officers to ensure the proper implementation of the relevant international maritime conventions. Consequently, it can be assumed that BWM Convention will be included in a list of maritime conventions whose implementation is controlled through PSC mechanism. In that respect it is still not clear to what extent the PSC officers will be required to investigate ballast water on board (for example, when water from various sources are pumped in different tanks), how many times the ship will be required to sample ballast water and what will be the outcome in case when limits prescribed in Regulation D-2 are infringed.

**Risk assessment.** Baseline studies and associated risk assessments are the necessary preconditions for any relaxation procedure, in particular the exemptions in case of intra-regional voyages. Such exemptions are as a rule connected with fixed routes and reflect the local peculiarities. In order to be able to operate in such

circumstances ships' crews, particularly those members with management responsibilities, have to be knowledgeable on applicable procedures, limits and requirements. At the moment it is not clear to what extent the knowledge and understanding of risk assessment procedures is appropriate and needed to be included in the training.

**More stringent standards.** BWM Convention in Regulation D-2 clearly sets a standard of ballast water quality. However, even before the Convention enters into force the USA administration already announced more stringent standards to be satisfied from ships calling in their ports. It means that seafarers, particularly those with management responsibilities, are obliged to be familiar with different modes of operations and related outcomes. If such practice is followed by other countries additional workload on seafarers will be created, requiring additional knowledge and understanding needed to properly implement different requirements.

**Responsibilities.** The new requirements and their mandatory implementation (once the Convention enters into force) will definitely create new legal responsibilities for masters and responsible seafarers. These responsibilities will create additional workload but also will add additional punitive measures against those who infringe the respective rules and regulations. Consequently, one can easily assume that seafarers should know the consequences of certain actions and possible legal courses of actions that may follow. However, it is not clear to what extent such knowledge is required.

As it is presented in the previous paragraphs, there are still a number of open questions that may impact the effectiveness of the BWM Convention and that require additional knowledge, understanding and skills. However, it seems that most of them are still not yet defined to the point that make possible to develop appropriate training modules. Consequently, as soon as BWM Convention enters into force and industry and MET institutions acquire the necessary experience, additional training programs will be needed, either as a standalone courses or as a part of the regular training for students at MET institutions. In that respect IAMU member institutions should provide the necessary educational support.

#### 4 CONCLUSION

Effective and harmonized implementation of BWM Convention requires that cooperating administrations follow relatively uniform development path. One of the most important part of that path is development of training capabilities based on common and harmonised approach on ballast water management. In general, for efficient implementation of the BWM

Convention, the training should be developed for two distinctive group of personnel employed by different stakeholders. Shipboard personnel need to be trained for essential competences while specialized competences are required from shore-based personnel.

Current status of the BWM training and education evidently indicate that there is a disproportion between currently required marine environmental trainings and required competences relevant to procedures outlined in BWM Convention and in numerous regional and national mandatory regulations on BWM procedures. Currently, trainings on BWM are commonly developed and offered by classification societies and various MET institutions solely to shore-based personnel involved in the legislative implementation of the BWM Convention.

In addition, it seems that there are a number of unsolved issues concerning proper implementation of the BWM Convention which causes challenges for the appropriate training development. Through the work on BALMAS project the most prominent issues have been identified and elaborated. These issues are summarized in the following areas of ballast water management: Early warning system, Port State Control procedures, risk assessment, implementation of more empowered standards and responsibilities in particular countries.

Effectiveness of the BWM Convention implementation, once it enters into force, inevitably will depend on the development of appropriate training and education. Based on acquired experience and considering all identified issues, MET institution, particularly higher MET institutions, should be prepared for development of appropriate and harmonized training programme on BWM. This is certainly a challenging process where IAMU members could significantly help providing the necessary support.

#### REFERENCES

- [1] Anstey F, Ballast Water Management: A time for action, International maritime Lecturers Association 16 Proceedings, Izmir, Turkey, 2008.
- [2] Ballast Water Management Convention 2004, International Maritime Organisation, London, 2004.
- [3] Castriota L., David, M., Gosar, L., Kocijančič U., Maggio T., Muha T. P., Orlando- Bonaca M., Silvestri C. and E. Magaletti. 2014. Review of MSFD national reports for Descriptor 2. Final report. BALMAS project Work package 6.2, p. 27.
- [4] David M., Gollasch S., Pavliha M., Global ballast water management and the "same location" concept: a clear term or a clear issue?, *Ecological Applications*, 23(2):331-338, 2013.
- [5] David M., Gollash S., Set and test of rapid response BWM uptake measures based on different impact categories from early warning system for vessels – EWS DSS, Final Report, BALMAS project Work Package 7.4., 11 pp, 2015.

- [6] David M., Gollash S., Ballast water management options for vessels, Final Report, BALMAS project Work Package 4.2., 74 pp, May 2015.
- [7] Faculty of Maritime Studies Rijeka. 2015. Report on Ballast Water Management options for ports. Final Report. BALMAS project. Work package 4. Activity 4.4.
- [8] GEF-UNDP-IMO GloBallast Partnerships Programme and GESAMP IMO/FAO/UNESCO-IOC/ UNIDO/WMO/IAEA/UN/UNEP/UNDP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection, 2011. Establishing Equivalency in the Performance Testing and Compliance Monitoring of Emerging Alternative Ballast Water Management Systems (EABWMS). A Technical Review. GEF-UNDP-IMO GloBallast Partnerships, London, UK and GESAMP, GloBallast Monographs No. 20, GESAMP Reports and Studies No. 82.
- [9] GEF-UNDP-IMO GloBallast Partnerships Programme and WMU, 2013. Identifying and Managing Risks from Organisms Carried in Ships' Ballast Water. GEF-UNDP-IMO GloBallast Partnerships, London, UK and WMU, Malmö, Sweden. GloBallast Monograph No. 21.
- [10] Guidelines for the uniform implementation of the BWM Convention (G1 – G14), International Maritime Organisation, London.
- [11] IMO Res. A.868(20), Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens, International Maritime Organisation, London, 1997.
- [12] Marine Environmental Awareness, IMO Model Course 1.38), 2011 Edition, International Maritime Organisation, London, 2011.
- [13] Ninčević Gladan Ž., Magaletti E., Scarpato A. et al. 2014. BALMAS Port Baseline Survey Protocol. Protocol. BALMAS project. Work package 5.1. p. 23.
- [14] STCW Convention, International Maritime Organisation, London.
- [15] Tamelander J., Riddering L., Haag F., Matheickal J., 2010. Guidelines for Development of National Ballast Water Management Strategies. GEF-UNDP-IMO GloBallast, London, UK and IUCN, Gland, Switzerland. GloBallast Monographs No. 18.
- [16] Understanding ballast water management, Guidance for shipowners and operators, Lloyd's Register Marine, 2015.
- [17] <http://globallast.imo.org/the-globallast-partnerships-project-2007-2016/>
- [18] <http://www.imo.org/en/OurWork/Environment/Ballast-WaterManagement/Pages/Default.aspx>