

Ballast Water – Facts and Assessments

A project to dispel the present uncertainty about the requirements for treating ballast water of ships. Developed by a Nordic regional cooperation under the name NOVImaritim – a partnership between the Swedish Maritime Technology Forum, the maritime section of The Federation of Norwegian Industries (Maritim Bransjeforening) and Danish Maritime.



NOVImaritim

Background

IMO (the International Maritime Organization) has adopted rules to prevent and control pollution caused by ships, including, in 2004, a convention on control and management of ships' ballast water. Sweden, Norway and Denmark are among the countries that have ratified the convention, which requires more than 60,000 ships worldwide to take into account the marine environment when they discharge their ballast water. The convention has not yet entered into force. It will enter into force 12 months after 30 countries, representing 35% of the world merchant fleet, have ratified it. Only a few percent remain until that limit is reached, and we must assume that the crucial ratifications will come in the near future.

In December 2013, the IMO decided on an extension of the implementation of the convention, and this removed some uncertainty with regard to timing. However, there is still a need for individual decision makers to acquire tools to select not only the right time for installing a ballast water treatment system before the convention enters

into force, but also tools to select the right system on a suitable basis so as to fulfil the coming requirements of the convention. These requirements for ballast water treatment systems are determined by the date of construction of the vessel and its ballast water capacity.

The United States has not waited for the IMO convention to enter into force and has introduced national requirements, but they largely correspond to those adopted in the IMO.

In October 2014, the IMO decided on a future revision of the technical requirements, but it was decided that the 'first movers' who have already installed type approved equipment should not be penalized. How to ensure this will depend on the specific changes to requirements and test methods that will be agreed upon.

This brochure aims to make it easier to choose the right system in good time, in order that it can be in place when required



The Information Problem

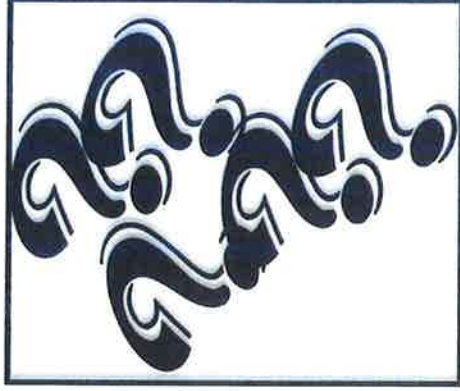
Every type of ballast water system has specific advantages and disadvantages. These include the question of different energy consumption and differences in installation costs. There may also be differences in suitability for new build or retrofitted ships. In addition, there may be differences between systems that rely upon the particular long or short start-up or turnaround times for the systems, risks connected with the use of (and storage of) chemicals, and training of crews in the operation of the individual systems.

A shipping company, with no in-house technical expertise, needs guidance on selecting the right system. Neither the individual manufacturer nor a classification society can be expected to provide the perfect, objective advice. Both manufacturers and classification societies may, however, provide information that is needed to choose correctly, if the requirements, which the actual treatment systems must fulfil, are known. The requirements will depend strongly on the area of operation of the ship. Many of the most well-known classification societies have issued guidance with

checklists, prepared on the basis of experience with the installations of ballast water treatment systems, which are updated with new experience as it is gained.

Guidance is available from other sources also, including the BIMCO/Fathom "Step by Step Guide to Ballast Water Management" and the IHS Maritime "Maritime Guide to ballast water treatment system 2013".

Any purchaser of an approved system must require information on any limitations of the system. This is material that could be derived from the tests carried out during the type approval.



Restrictions may apply, particularly to the water quality (salinity, turbidity/UV transmission and temperature). Such data is available for all type approved systems, but it may be difficult to obtain unless it is specifically requested.

It may be desirable to consider whether any chemicals require special precautions with regard to the information to the crew or compatibility with coating of pipes or tanks.

The Future



As demand and price levels are at the moment very low, there is a risk that only the cheapest systems can currently be sold. This may mean that less financially strong suppliers may be forced out of the market, regardless of the quality of their systems. It is likely that future prices will be higher, as the entry into force of the convention draws closer.

Many ships will prove to be excluded because of their pattern of operation, and some of the oldest vessels will be

scrapped rather than be retrofitted with ballast water treatment systems.

The long interval between adoption of the convention and its entry into force, as well as the postponement decided upon in December 2013 by the IMO, may lead to stagnation and may impede new technological developments for a few years. It is only the existence of a US market that ensures a certain outlet for the initial manufacturers.

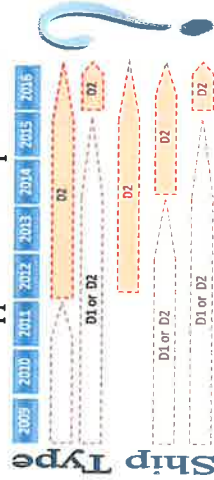
The Regulatory Framework

The rules developed by the IMO and the requirements imposed by the US overlap and are to a large extent identical. The US recognizes a number of "Alternate Management Systems" which are systems approved under the IMO regulations. These can be used in the US for up to five years, after which they are to be approved. The tests required to obtain a United States Coast Guard approval will by all accounts automatically ensure IMO approval, while the opposite may not necessarily be true.

IMO has decided to review the guidance on test procedures, but at the same time has undertaken that 'first

movers' will not be penalized. This means that those who have already installed a type approved system will not be forced to replace it as soon as the review of technical requirements is completed.

Foreseen Application of requirements



The Biological Problem

Worldwide, each year, five to ten billion tons of water is moved from one ocean to another when cargo ships empty their tanks of ballast water. Ballast water can be a problem for the marine environment if it is not treated before discharge, as living organisms can spread to ecosystems where they do not belong.

For years attempts have been made to prevent the alien species from en-

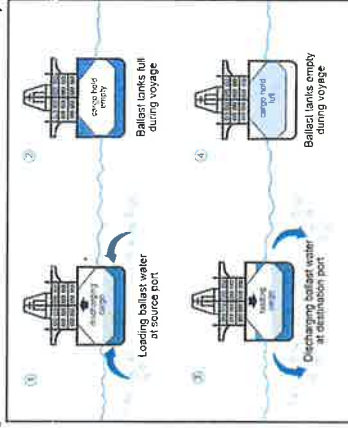
tering marine ecosystems. If a newly arrived organism grows to become an invasive species, it will be because it has no natural enemies and limitations that can prevent its spread in the new location. Invasive species in the marine environment are widespread all over the world, and they are already presenting problems in the form of disease, lowered bathing water quality, availability of fishery reserve and the impact on the overall ecosystem.

The Technical Problem

Ballast is necessary for vessels to operate. Most types of vessels cannot safely navigate without some weight on board. When cargo is offloaded at its destination, the ship will be unstable if the missing weight is not compensated for. It is usual to use the seawater surrounding the ship as ballast.

Many ships, typically oil tankers, will

be sailing half the time with empty cargo tanks and thus with full ballast tanks. To ensure that invasive species are not transported in ships' ballast water, cleaning of the water is necessary. It is a challenge, though, to ensure that alien life forms do not arrive in viable condition and simultaneously ensure that the water discharged does not wipe out life where it is discharged.



Solutions

The technical solutions for ballast water treatment initially were developed from known water treatment technologies, used on land for decades, and they include two main types of techniques:

1. UV (ultraviolet light)
 - a. low pressure
 - b. medium/high pressure
2. Oxidation (chloride/bromide)
 - a. with added chemicals
 - b. without added chemicals

Systems using UV radiation treatment irradiate the ballast water with ultra violet light which disinfects and eradicates the organism. The water is filtered and then subjected to the purifying radiation.

The systems using oxidation involve a chemical treatment. For several types of applications the necessary substances are extracted from the seawater. Others require the addition of chemicals that must be carried on the ship.



There are effective systems of both these types, with areas of application where each is particularly suitable. These two technologies, known from water to land, are mature technologies that are unlikely to change significantly in the near future. Many systems of

both these types are now type approved, but each type approval only demonstrates functionality under the specific terms the system is tested for, and there are some systems on the market that have been tested under unrealistic conditions

Other type approved treatments methods exist including heat treatment utilizing ship's waste heat for pasteurization during voyage.

Obstacles to Ratification

While some countries have seen the agreed deadlines as an obstacle to ratification, there are also several other factors that may be contributing to the delay in the entry into force of the convention. There may be bottlenecks in national legislative processes, and there is also continued uncertainty about conditions which have, however, already been answered by the IMO.

"Problem"	Comment
Economic impact	The current prices on ballast water systems are very low, some even below manufacturing costs. It is therefore expected that the systems will become more expensive as the entry into force of the convention draws closer.
Immature technology	The technologies are now well documented, but this is an area that for a typical ship owner will require external advice in order to ensure the correct system for the operational profile of a given vessel.
Type approvals	Type approval by the IMO guidelines are to be revised, but it will be ensured that those who have already installed the type approved equipment will not be penalized.
Port state control	In accordance with the IMO Circular BWM.2 / Circ.42, ship detentions cannot be expected during the first two to three years after its entry into force, and only then if IMO agrees on a proper and effective method of sampling.



About the NOVImaritim Workshop:



In 2013 NOVImaritim organized a workshop on ballast water treatment, which included contributions from Alfa Laval Aalborg A/S, Danish Marine Equipment & Services, DESMI Ocean Guard A/S, Idea Marine AB, IMO, MARCOD, MARTEC - Maritime and PolyTechnic college, North Sea Ballast Water Opportunity Project and Permascand AB, as well as the NOVImaritim project participants: Swedish Maritime Technology Forum, The Federation of Norwegian Industries (Maritime Bransjeforening) and Danish Maritime.

NOVImaritim is funded by the European Regional Development Fund (the Interreg program). The goal of the NOVImaritim project is to work for a common Scandinavian approach to maritime environmental regulations and technical rules in international maritime fora and to remove barriers exist to implementing such new rules.

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