WHITE PAPER

Biological commissioning testing of ballast water treatment system installations

Understanding the purpose and responsibilities

April 2022

Introduction

Effective as of 1st June 2022, biological performance must be assessed during the commissioning of any ballast water treatment system. Biological commissioning testing (frequently shortened to commissioning testing) is not a validation of the ballast water treatment system itself, as this is already provided by the system's type approval. Rather, it validates the performance of the specific installation on board, including the pipes, valves and other equipment surrounding the ballast water treatment system.

The demand for biological commissioning testing was laid out at MEPC 74 in an amendment to the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention). At MEPC 75, the procedures were clarified and finalized. Following a brief period when flag states could apply the regulation proactively, biological commissioning testing is now being mandated globally.

Although the requirements have been clarified since they first appeared, there has been a degree of confusion surrounding them. This paper explains what biological commissioning testing is, as well as why, when and how it should be done.

The commissioning testing regulation

A demand for biological performance testing during the commissioning of ballast water treatment systems first arose with Resolution A.1120(40) under the Harmonized System of Survey and Certification (HSSC). The demand was not part of the BWM Convention, however, which is why it was addressed at the MEPC 74 meeting in May 2019. There it was approved as a draft amendment to Regulation E-1 of the BWM Convention, which was adopted at the MEPC 75 meeting in November 2020.

The amendment requires a biological commissioning test as part of the operational testing of a ballast water treatment system once the installation is complete and finalized. As clarified at MEPC 77, this applies to both newbuilds and retrofits. The sampling for the test should be performed according to BWM.2/Circ.70/Rev.1, *Guidance for the commissioning testing of ballast water management systems.*

Between the amendment's adoption and its entry into force on 1st June 2022, biological commissioning testing could be implemented proactively by flag administrations. Testing procedures, either mandatory or voluntary, have therefore existed in a number of flag states for some time.

As of 1st June 2022, biological commissioning testing is mandatory for all newbuild or retrofit installations of ballast water treatment systems, all over the world.

- Amendment to BWM Convention Regulation E-1 adopted at MEPC 75
- Implementation voluntary prior to entry into force
- Biological commissioning testing mandatory worldwide as of 1st June 2022

What commissioning testing is – and is not

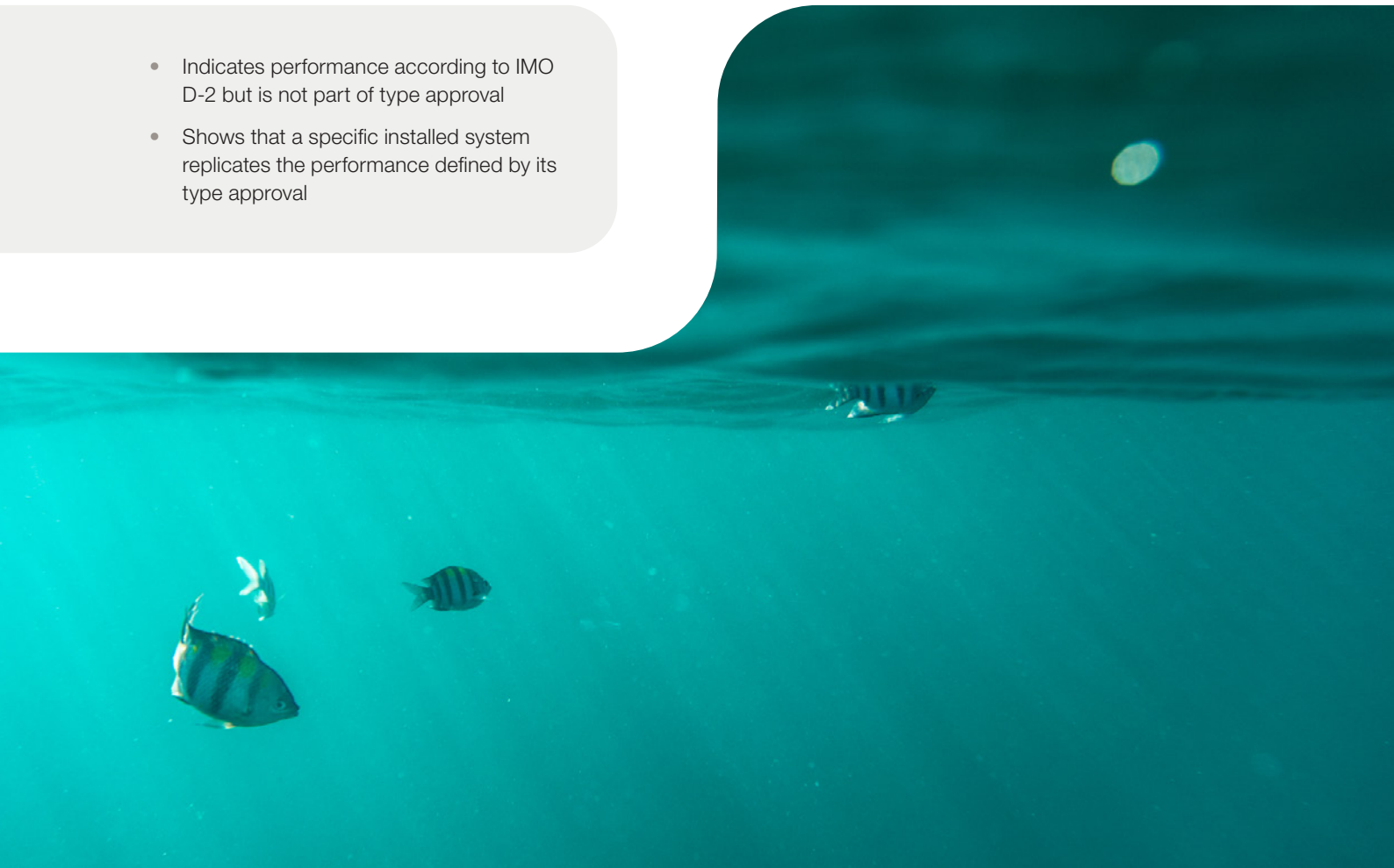
Biological commisioning testing is a response to demands from the market. Shipowners have requested proof that their installed ballast water treatment systems will perform according to type approval and meet the IMO D-2 discharge standard. It is important, however, to understand what a biological commissioning test actually validates.

Biological commissioning testing does not validate the ballast water treatment solution as such. That validation is provided by the type approval, which is an approval of the standard ballast water treatment system design. The design itself has already been shown to meet the IMO D-2 discharge standard – so this is not in question.

Rather, biological commissioning testing shows that the specific installed system replicates the performance defined in the type approval. It is a tool for spotting deviation from the type-approved performance, perhaps caused by a manufacturing defect or an installation error – which may be in a connected pipe or valve rather than the ballast water treatment system itself. The biological commissioning test is part of the wider commissioning survey that ensures all mechanical, physical, chemical and biological processes are working properly within the system.

The whole commissioning survey, including the biological commissioning test, is normally overseen by the flag state or by a classification society authorized by the flag state, to whom any discrepancies must be reported.

- Indicates performance according to IMO D-2 but is not part of type approval
- Shows that a specific installed system replicates the performance defined by its type approval



The commissioning testing procedure

Biological commissioning testing is a straightforward procedure that is defined step-by-step in BWM.2/Circ.70/Rev.1, *Guidance for the commissioning testing of ballast water management systems.* It should be carried out with local ambient water and should ideally be completed in the same location as the installation and the wider commissioning survey. The steps can be summarized as follows.

- **Sampling and analysis of ambient water (optional)**
  To characterize the ambient water, a sample may be collected during ballast water uptake. This can be done by any means practical, e.g. using an inline sample port or taking a sample directly from the harbour.
- **Sampling of ballast water discharge**
  When the ballast water treatment process is completed, a sample of the ballast water discharge should be collected in accordance with Resolution MEPC.173(58), *Guidelines on ballast water sampling* (G2). The sample should be representative of the whole discharge of ballast water from any single tank or combination of tanks being discharged. It should be collected as close as possible to the overboard discharge point and during ballast water discharge.
- **Evaluation of compliance with IMO D-2**
  The respective samples should be analysed by an independent laboratory to confirm ballast water treatment performance that indicates compliance with the IMO D-2 discharge standard. Both size classes included in the standard need to be evaluated:
  - Organisms ≥50 µm
  - Organisms ≥10 µm and <50 µm

  Although the regulation stipulates the use of reliable and accurate indicative analysis methods, none of the indicative methods defined in Table 3 of BWM.2/Circ.42/Rev.2 have been fully evaluated. Because the specified indicative methods are not yet validated, test organizations may instead recommend detailed methods they know to be reliable and accurate.

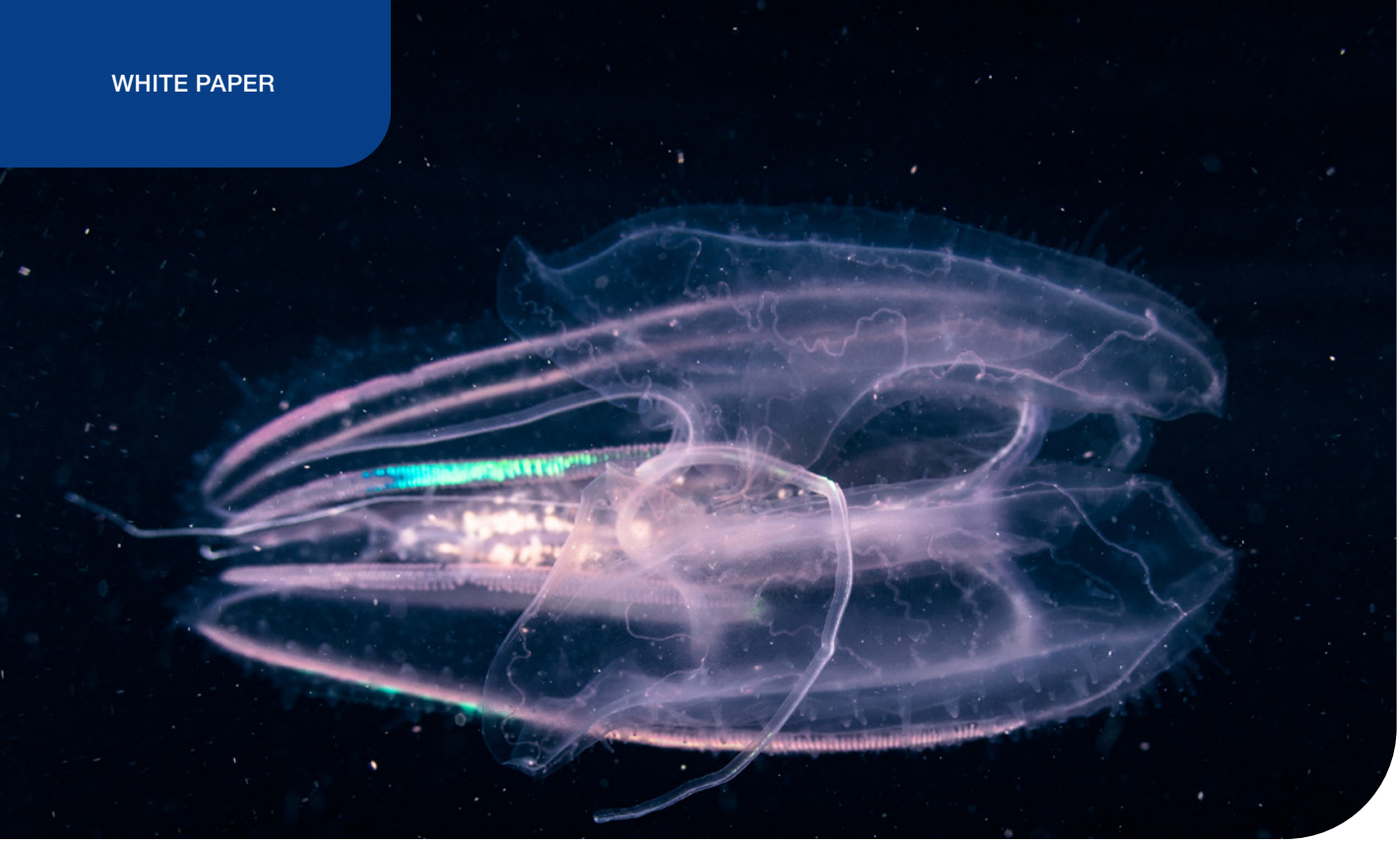
Detailed analysis methods can mitigate the risk of false positives leading to failure in the biological commissioning test. They are recommended, for example, by the members of Global TestNet, an association of testing organizations involved with the certification of ballast water treatment systems. In a position statement, the association writes:

> "The members of Global TestNet recommend the use of detailed sample analyses whenever possible to ensure high reliability and relevance of compliance data for the ship owner. The additional costs associated with detailed sample analyses is considered minor compared to the cost of representative sampling. Further, the time required for detailed sample analyses is comparable to that of indicative methods."
>
> *https://globaltestnet.org/getattachment/Discussions/GloBal_TestNet_Position_Statement_BWMS_Commissioning_Feb_2019.pdf*

- **Reporting**
  The sampling methods and analysis results should be documented for the flag state administration or the classification society authorized by the flag state as part of the written report on the wider commissioning survey.

The use of ambient water

Biological commissioning testing is to be done using local ambient water. According to the guidance, the ambient water should be accepted for testing regardless of the level of challenge it poses to the ballast water treatment system. This has implications that are discussed in the next section of this white paper, *Considering System Design Limitations.*



Considering System Design Limitations

As part of the commissioning survey, BWM.2/Circ.70/Rev.1 requires an assessment of the ballast water treatment system's applicable self-monitoring parameters, e.g. flow rate, pressure, total residual oxidants (TRO) and UV intensity. Not only should the correct operation of all sensors and related equipment be confirmed, the so-called System Design Limitations (SDL) of the ballast water treatment system should also be considered. Depending on the system's underlying technology, its SDL may include a minimum water salinity or a minimum value for UV transmittance or intensity. Likewise, there may be a required minimum holding time.

The consideration of SDL has an impact on biological commissioning testing as well. On the one hand, the guidance states that the local ambient water should be accepted for testing regardless of the challenge it poses to the ballast water treatment system. On the other hand, ambient water that is inappropriate with regard to the SDL will increase the likelihood of failure.

Failure is not certain when a ballast water treatment system is run outside its SDL. However, even a positive outcome will be open to interpretation. It is up to the flag state to decide if favourable results achieved with inappropriate water can be approved.

Similarly, there may be instances when a vessel's schedule prevents it from applying the SDL-mandated holding time. In such cases, a representative discharge sample cannot be collected in the same location. Once again, it is up to the flag state or the appointed classification society to decide how this should be handled.

In short, whenever there is a conflict between the ambient water's characteristics and the ballast water treatment system's SDL, it is up to the flag state to decide the course of action. The guidance states that the testing should be evaluated to the satisfaction of the flag state administration, but it remains to be seen how most flag states will deal with this in practice. A likely scenario is that flag states will require testing in more appropriate conditions after the vessel has left the yard. In this event, a short-term International BWM Certificate with a Condition of Authority would be issued, requiring testing within 2–3 months.

- Ambient water is to be accepted for testing, even if it falls outside system SDL
- Flag state determines the course of action if the ambient water is inappropriate for the system

Responsibilities associated with commissioning testing

Biological commissioning testing is required after the installation of any ballast water treatment system whose commissioning survey falls after 1st June 2022. This applies to both newbuild and retrofit installations.

The collection and analysis of representative water samples must be performed to the flag state's satisfaction by an independent laboratory, i.e. without the involvement of the ballast water treatment system manufacturer, the engineering company or the shipyard. Depending on the relevant classification society and its rules, it may also be necessary to choose the laboratory from that society's list of approved service providers.

Ultimately, it is the shipowner who is responsible for making testing arrangements with an appropriate independent laboratory. However, the guidance does not prevent a system supplier from recommending laboratories or acting as a go-between – so long as the supplier takes no part in the sample collection and analysis. It is also possible for the supplier to advise when running the system during the biological commissioning test.

If offered, such support services fall outside the system supplier's standard commissioning scope. Biological commissioning testing is not part of the system's technical commissioning, and its focus extends beyond the ballast water treatment system itself. As described earlier, the testing does not validate the ballast water treatment system as such, but rather the specific installation with all its valves, pipework and other connections.

Because the entire installation is involved, there are many factors that can influence the outcome of biological commissioning testing. Even a seemingly small oversight, such as not cleaning the ballast water tanks and piping prior to installation, can result in failure to indicate compliance with the IMO D-2 discharge standard. If the installation fails the biological commissioning test, it is the shipowner's responsibility to initiate fault-finding and corrective actions – and to arrange for testing again at an additional cost. Likewise, it is the shipowner's responsibility to apply for a short-term BWM Certificate in the meantime.

A knowledgeable system supplier can mitigate the risk of failure by providing recommendations and checklists prior to biological commissioning testing. If the supplier is also present when running the ballast water treatment system during the test, inadvertent errors by an inexperienced crew can be avoided. Together, such simple services can help ensure that the vessel leaves the shipyard with its international BWM Certificate in hand.

- Responsibility for arranging sampling and analysis by an independent laboratory rests with the shipowner
- System suppliers may assist with recommendations, laboratory coordination and running the system – but not the sampling and analysis
- Support in biological commissioning testing falls outside a system supplier's standard commissioning scope

For shipowners installing Alfa Laval PureBallast 3

Alfa Laval stays up to date with marine legislation, including the requirements for biological commissioning testing. When installing Alfa Laval PureBallast 3 ballast water treatment systems, shipowners should discuss preparations and support options with their Alfa Laval representative before contacting an independent laboratory.

This is Alfa Laval

Alfa Laval is active in the areas of Energy, Marine, and Food & Water, offering its expertise, products, and service to a wide range of industries in some 100 countries. The company is committed to optimizing processes, creating responsible growth, and driving progress – always going the extra mile to support customers in achieving their business goals and sustainability targets.

Alfa Laval's innovative technologies are dedicated to purifying, refining, and reusing materials, promoting more responsible use of natural resources. They contribute to improved energy efficiency and heat recovery, better water treatment, and reduced emissions. Thereby, Alfa Laval is not only accelerating success for its customers, but also for people and the planet. Making the world better, every day. It's all about *Advancing better*™.

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