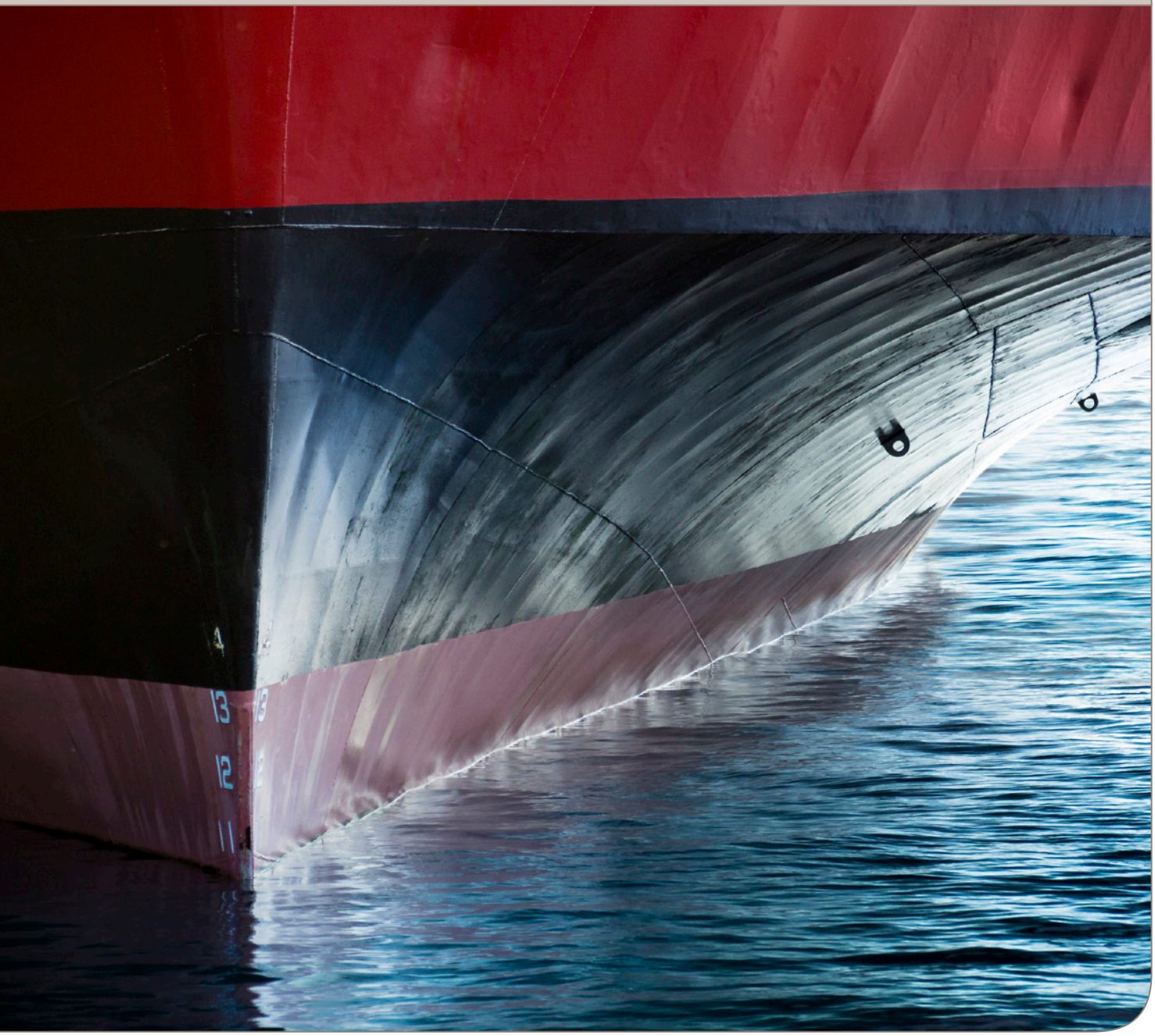
Preparing and retrofitting a ballast water treatment system

An excerpt from “Making sense of ballast water management”



Retrofit decisions should not be underestimated – or put off

Now that the IMO Ballast Water Management Convention has entered into force, more ship owners than ever before are looking into the installation of ballast water treatment systems. Retrofit requirements that once seemed far off are now rapidly approaching – and this leaves less time to prepare than many realize.

Implementing a retrofit is a lengthy and complex process, which means it must be initiated well before the vessel's actual compliance date. In addition to selecting the system itself, there are numerous technical obstacles to be overcome in equipping an existing vessel. Likewise, there is a large amount of coordination necessary, from making arrangements with the shipyard to cooperating with engineering and installation companies. In the end, there is also the work of commissioning and class approval.

This document provides a clear overview of the many challenges involved. The text is an excerpt from "Making sense of ballast water management", a comprehensive guide to regulations and compliance alternatives. Chapter 4, which is presented here in its entirety, details the steps in preparing and installing a ballast water treatment system, with special attention given to retrofitting.

If you find the information in this document useful, you can download the complete guide at: www.alfalaval.com/pureballast/knowledge/

Installing a ballast water treatment system

Properly planning the installation of a ballast water treatment system is as important to ensuring compliance and a low total cost of ownership as the choice of the system itself. Choosing a supplier who has extensive experience with both newbuilds and retrofit projects can pave the way for a smooth and successful installation.

Newbuilds

The engineering and installation of a ballast water treatment system on a newbuild is normally handled by the shipyard. The system is engineered into the vessel as a component during the vessel's design. The designer considers the space and power requirements from the beginning, which makes the final installation relatively easy.

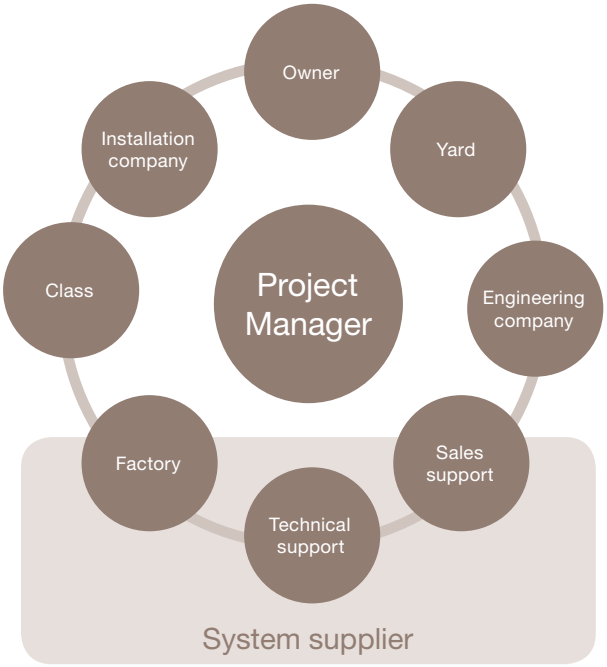
The possibilities for adapting the vessel are normally large, so the choice of ballast water treatment system is less consequential from an installation perspective, even if the cost and complexity may vary. The installation time is a period of months, which leaves room for adjustments and corrections if anything is done wrong from the beginning.

Planning a retrofit

Installing a ballast water treatment system on an existing vessel is typically more complicated than on a newbuild. Ballast water treatment was not considered during the original construction of most vessels, and as a result, there is no dedicated space for the new system. This means that the installation needs to be adapted to existing circumstances on board.

High flexibility, thorough preparation and strong cooperation from all partners are all necessary for a successful retrofit installation. Installing a ballast water treatment system affects many onboard systems, each of which has its own specific considerations. The typical dockyard timeframe for a retrofit is two weeks, and any delay means lost income for the vessel owner.

A retrofit is not simply the installation of new equipment, but the addition of a complete system that will demand a new way of managing ballast water. It therefore requires updates to the Ballast Water Record Book, as well as the Ballast Water Management Plan. Moreover, the implementation of new procedures will likely entail training for the crew.



Coordination and project management

A successful retrofit installation demands the involvement of numerous partners. In many cases this includes a shipyard and an engineering company in addition to the ship owner and the ballast water treatment system supplier. When selecting a supplier, the ship owner needs to consider not only the most credible system, but also the supplier's capabilities in ensuring as smooth an installation as possible.

The supplier's sales contact should be responsive to ship owner requests, proposing a system configuration that meets the needs of the vessel to the greatest degree possible. Technical support must be able to find solutions to the ship owner's specific demands, and the factory must have the capability to deliver the system on time and with the expected quality.

From time to time, however, there will be ship owner demands that the supplier cannot meet. System adaptations are typically possible, but only to a certain extent. The supplier is required to follow the Type Approval Certificate of the treatment system, which reflects its configuration during certification. To avoid non-compliance and other potential problems for the owner, the supplier must retain a certain level of control and only provide equipment that is within the constraints of the Type Approval Certificate.

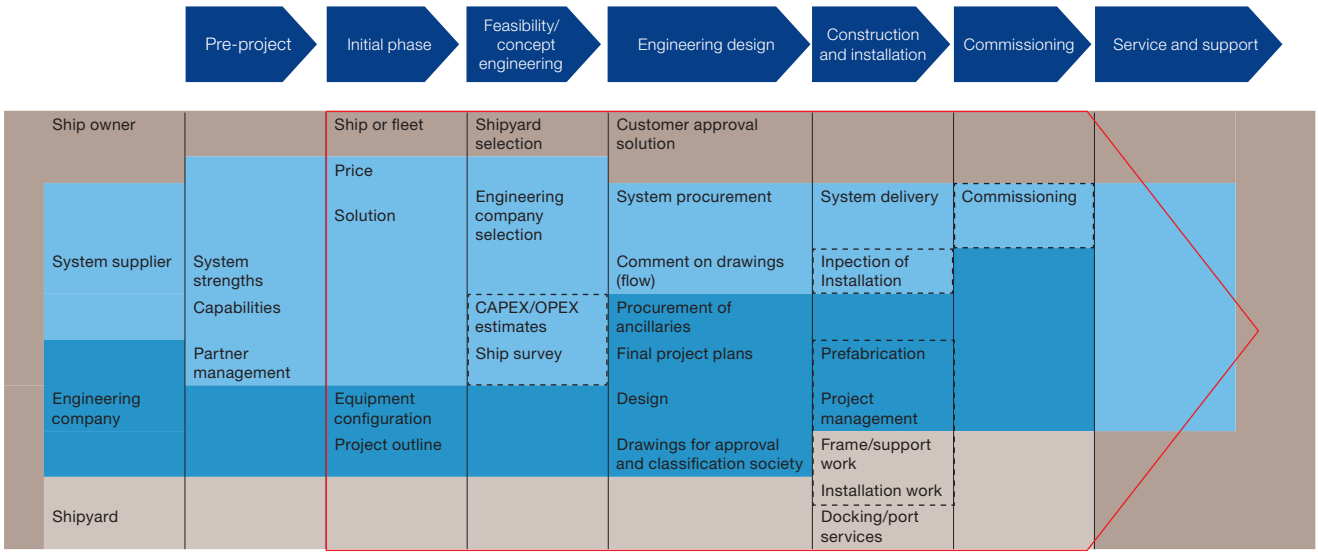
The ship owner's task is to provide the supplier with correct vessel documentation and to make decisions along the way. The ship owner is ultimately responsible for the vessel and must ensure that everything is handled in a safe and correct manner.

Pre-project

The pre-project phase focuses on the selection of the system. Four main considerations are involved:

- *The system*
  The ship owner should evaluate a range of suitable systems according to factors outlined in Chapters 2 and 3 of this book.

Phases of a retrofit project



- *Installation complexity*
  The complexity of the installation is an important factor. For example, many electrochlorination systems have limitations with regard to salinity, requiring onboard storage of high-salinity water in the peak tank or a similar location. This in turn makes installation and operation more difficult. Choosing a system that offers greater flexibility and a longer distance between components can minimize these types of problems.

- *Safety*
  Ballast water treatment systems that require special ventilation and chemical storage will impact an existing vessel's safety routines substantially. Management will need to provide adequate crew training to ensure that specific safety practices are followed at all times – even as the crew changes.

- *Supplier capability*
  In the short time frame of a retrofit project, the supplier must be able to deliver on time and with the necessary quality if additional costs are to be avoided. Flexibility is also important, not only because there are many partners to coordinate with, but also because sudden changes may arise due to high project complexity.

Initial phase
During the initial phase, the supplier and owner need to agree about the scope of supply and the manner in which the project will be executed. The better the specification at this early point, the less risk there will be of mistakes later on in the project.

Pre-survey and vessel documentation review
To determine how and where to install a ballast water treatment system on the target vessel, as well as the required characteristics of the system, a feasibility study needs to be conducted by the owner, the supplier or an engineering company. This phase involves the collection and review of vessel documentation. As previously noted, no single system offers a perfect fit for all vessel types, and this review helps establish the vessel's specific needs. The documentation for this review may include:

- Information on ballasting operations, such as the number of pumps used and the frequency of ballasting and deballasting
- Ballast pump specifications
- General arrangement drawings
- Piping and instrumentation diagram
- Amount of power available

Onboard survey and 3D scanning
To prepare for installation, the supplier or the supplier's engineering partner conducts an onboard survey to identify the best possible location for the equipment and to gather information on ballasting operations.

Onboard survey and 3D scanning

During the survey, it is important to determine if hatches are available for bringing system components on board. A report documenting the survey will provide a guide for the continued work.

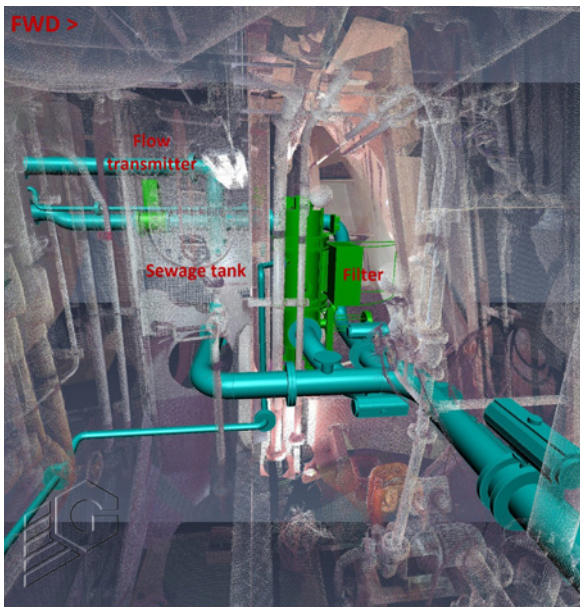
In some instances, the supplier or engineering partner will combine the onboard survey with 3D scanning, which offers several benefits over measurements alone. The scanner will make a 3D picture of the environment that will serve as the location for the treatment system, offering a clearer idea of the end result. Typically, scanning can be performed in the course of one working day without interrupting the vessel's normal course of operations. If performed in one of the vessel's ports of call, the disturbance to operations will be minimal.

It is useful to know the exact purpose of the scan in advance, since the accuracy of a 3D scan can vary greatly depending on how it is performed. If the goal is simply to produce a 3D picture, accuracy within a few centimetres is likely sufficient. However, if the intent is to use the scan for engineering and pipe manufacturing at a later stage, the accuracy should be within a few millimetres.

Image on this page courtesy of Goltens Green Technologies

Sister vessels
Many ships have sister vessels that look more or less the same. However, it is possible to find differences. The images above, for example, show two sister vessels with different overboard pipe configurations.

While the design for one ship can often be used for sister vessels, performing a collision check identifies important factors that may impact system installation.



Pre-engineering
After processing the information gathered in the 3D scan, it is possible to insert an image of the actual system into the picture to gain an impression of how the installation will look.

This pre-engineering visualization offers an opportunity to evaluate the suggested installation and determine how the piping should be routed, as well as the need for support of the components.

Images on this page courtesy of Goltens Green Technologies

A 3D visualization demonstrating how new ballast piping would interfere with the existing ventilation duct

Such visualization also shows if there are any collisions between the proposed placement of the treatment system and existing equipment. This offers an early possibility to prevent complicated corrections during installation.

In these ways, 3D visualization provides an excellent basis for discussion and planning. If there is a need for further changes, the visualization will allow them be made without conducting a new onboard survey.

Detailed engineering
In the detailed engineering phase, the supplier or engineering partner uses information from the 3D scan to make manufacturing drawings of all piping, supports and foundations necessary for a successful installation. The supplier or engineering partner also selects suitable material for the piping and produces a complete bill of material.

During this phase, it is necessary to update the specific vessel documentation that will be submitted and approved by the classification society.

Class approval
Approval from the classification society requires the submission of all requested documentation prior to the start of the installation process. An overview of common documentation needed for class approval can be found in Appendix E.

Prefabrication
The shipyard or installation company uses the manufacturing drawings to prefabricate system components. If the 3D scanning and engineering have been carried out with a high level of accuracy, the risk of components not fitting is minimal. Prefabricating components makes it possible to minimize the time for installation on board.

Installation
The installation of the ballast water treatment system can be performed either at a shipyard, while sailing or through a combination of the two.

- *While sailing*
  Installation is performed by a sailing crew during the vessel's normal operation, which can take from two to six weeks. If this option is chosen, crew safety must be taken into account. Ballast water piping cannot be modified during the voyage, since the ballast system is a part of the safety system on board.

- *At a shipyard*
  Installation during dry docking is more common than while sailing, as it allows for modifications of most systems without substantial safety risks. The time at the yard is normally around two weeks, during which time maintenance is performed on a variety of other systems as well. This generally leaves a maximum of ten days for installing the ballast water treatment system, which requires that most of the components are pre-manufactured.

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Verification of the installation
During or in connection with the installation, the installation must be verified and tested. Since the time at the shipyard is limited, it is important that all components are installed correctly from the beginning. There is very limited time to correct errors that can cause delay or result in an onboard system that does not work when the vessel leaves the yard.

Once the supplier has verified the installation from a technical perspective, its functions need to be demonstrated during a commissioning at which the owner representative and class surveyor are present. Having verified the installation from a class perspective, the surveyor can then approve the complete installation in the next step.

Approval of installations

After installation, the treatment system along with all its connections to ship piping, electrical systems and control systems is referred to collectively as a ballast water management system. A surveyor from the relevant classification society must verify and confirm that the system is properly installed and functioning correctly from a class perspective. When this is done, the system receives the necessary supporting documentation regarding compliance with:

- Rules for machinery installations
- Pressure vessels
- Piping systems
- Electrical installations

Flag State Administrations do not generally verify compliance with basic classification requirements. A recognized classification society must therefore check and approve the treatment system to ensure compliance with the ballast water regulations of national, regional and local authorities.