

WÄRTSILÄ

**Ballast Water Management**

**WÄRTSILÄ AQUARIUS®  
BALLAST WATER MANAGEMENT SYSTEMS**





At Wärtsilä we strive constantly to do what is best for you. This includes optimising the lifecycle value of your installations by offering precisely what you need; a promise we can deliver on since we provide the marine industry's most complete portfolio of products, integrated solutions and global services. By prioritising operational efficiency, environmental excellence, fuel flexibility and 24/7 support, we work with you to find your shorter route to robust growth, greater profitability and regulatory compliance. This is why today, every third vessel in the world has a Wärtsilä solution onboard.

## BALLAST WATER CONVENTION

At any one time ballast water can naturally contain an estimated 7000 different species of organisms comprising of plankton (microscopic plants and animals), bacteria and viruses. It is estimated that approximately 7 billion tons of ballast water is transferred globally each year.

Once discharged some species can withstand a wide range of environmental conditions and may not have natural predators. In such cases these organisms can become invasive species causing a change in the ecosystem balance. These 'nonnative species', if they become established, can have a serious ecological, economic and public health impact on the receiving environment.

The Ballast Water Convention (BWC) was introduced by the International Maritime Organisation in 2004 to address the Control and Management of Ships' Ballast Water and Sediments, and applies to all sea going ships greater than 400gt that use ballast water. The BWC will be considered ratified when a minimum of 30 IMO member states representing no less than 35% of world gross registered tonnage sign up to the convention. The BWC ultimately requires ships to fit a ballast water treatment system conforming to Regulation D2 discharge performance standard. As an interim measure the BWC requires ships to manage their ballast water in accordance with Regulation D1.





## REGULATION D1 AND D2

Regulation D1 requires ballast water carried by a ship during its voyage to be exchanged 3x their ballast tank volume to achieve at least a 95% volumetric exchange. Regulation D2 is a standard governing the treatment of ballast water at uptake to ensure that strict ballast water quality standards are met at the point of discharge.

| Year of Construction       | Ballast Water Capacity              | '09 | '10 | '11 | '12     | '13 | '14 | '15<br>EIF | '16 | '17 | '18 | '19 | '20 | '21 | '22 |
|----------------------------|-------------------------------------|-----|-----|-----|---------|-----|-----|------------|-----|-----|-----|-----|-----|-----|-----|
| After 2009 but before EIF  | Less than 5000                      | #   |     |     | D1 / D2 |     |     |            | D2  |     |     |     |     |     |     |
| After 2009 but before 2012 | Greater than 5000                   | #   |     |     | D1 / D2 |     |     |            |     | D2  |     |     |     |     |     |
| After 2012 but before EIF  | Greater than 5000                   | #   |     |     | D1 / D2 |     |     |            | D2  |     |     |     |     |     |     |
| Before 2009                | Between 1500 and 5000               | '05 |     |     | D1 / D2 |     |     |            | D2  |     |     |     |     |     |     |
|                            | Less than 1500 or greater than 5000 | '04 |     |     | D1 / D2 |     |     |            |     | D2  |     |     |     |     |     |
| New Builds                 |                                     |     |     |     |         |     |     | D2         |     |     |     |     |     |     |     |

# : Example year of construction  
 '05/'04 : Example year of construction  
 EIF : Entry Into Force (Assumed 2015)  
 ■ : Vessel BWMS install date based on first IOPP certificate renewal date survey after EIF or year of compliance as applicable (example)

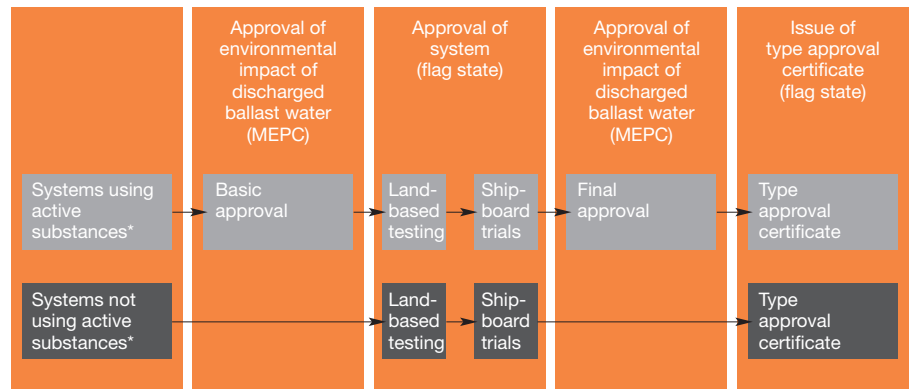
## IMO REGULATION

Technologies developed for ballast water treatment are subject to approval through specific IMO processes and testing guidelines. The testing procedures follow the process outlined in the table (right) and the following IMO guidelines:

- Guidelines for Approval of Ballast Water Management Systems ('G8 guidelines'). IMO resolution MEPC.174(58)

In addition, for systems employing active substances:

- Procedure for Approval of Ballast Water Management Systems that make use of Active Substances ('G9 Guidelines'). IMO resolution MEPC.169(57)



## US REGULATIONS

The USCG have published a regulation framework, which defines a performance standard numerically equal to the IMO D2 and dictates that ships trading in US territorial waters should be fitted with a USCG approved ballast water treatment system.

The rules make a provision for the installation of an AMS (alternate management system), which is a ballast water treatment system already approved by a foreign administration in accordance to IMO type approval requirements. A system that has been granted USCG AMS status can be installed on ships trading in US

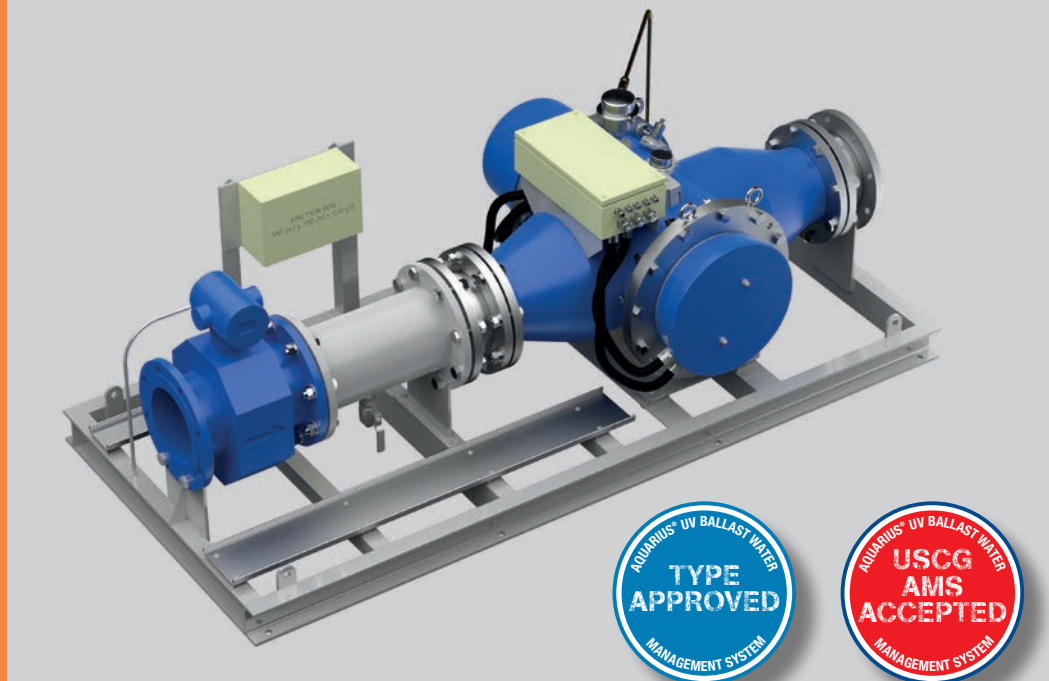
territorial waters and employed on such ships for a period no longer than 5 years from the date they would otherwise be required to comply with the rules (shown in the table below).

| USCG IMPLEMENTATION SCHEDULE |                                  |                              |   |
|------------------------------|----------------------------------|------------------------------|---|
|                              | Ballast tank capacity            | Date constructed             | Compliance date                               |
| New Vessels                  | All                              | On or after December 1, 2013 | On delivery                                   |
| Existing Vessels             | Less than 1500 m <sup>3</sup>    | Before December 1, 2013      | First scheduled docking after January 1, 2016 |
|                              | 1500 - 5000 m <sup>3</sup>       | Before December 1, 2013      | First scheduled docking after January 1, 2014 |
|                              | Greater than 5000 m <sup>3</sup> | Before December 1, 2013      | First scheduled docking after January 1, 2016 |

## TECHNOLOGY CHOICE

In recognising that no one solution will be suitable across all ship types, sizes and environmental conditions, Wärtsilä uniquely offer a choice of ballast water management system solutions to meet the specific requirements of individual owners and their vessels;

- Wärtsilä AQUARIUS® EC
- Wärtsilä AQUARIUS® UV



Wärtsilä AQUARIUS® UV

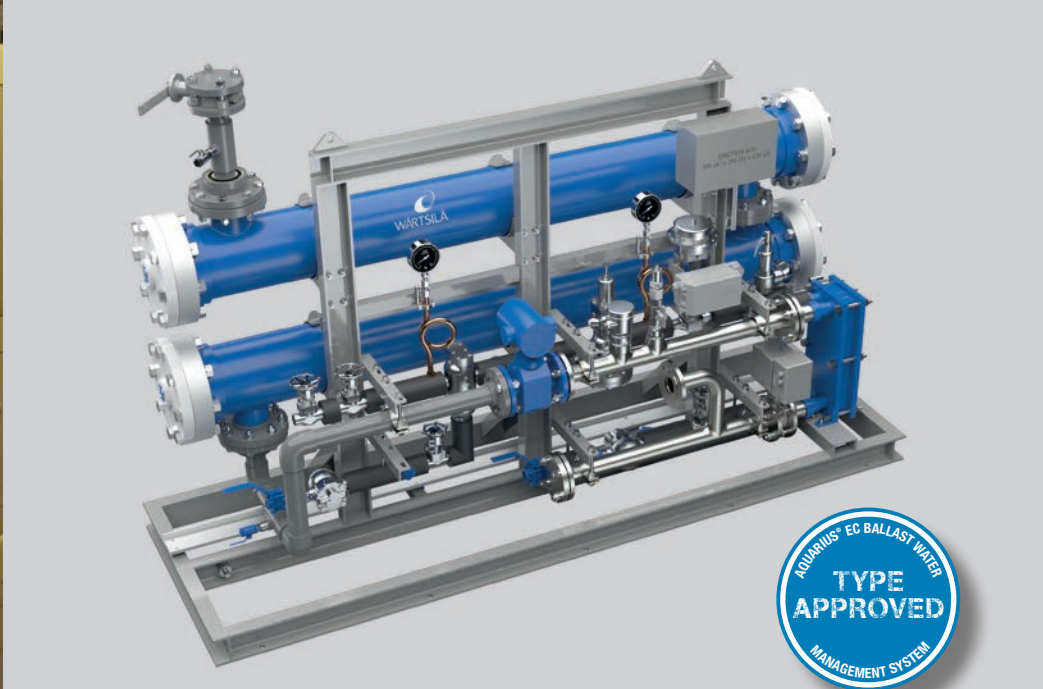
The Wärtsilä range of ballast water management systems (BWMS) involve a simple two stage process involving filtration and electro-chlorination (EC) or UV irradiation. During uptake, seawater is first passed through a 40 micron back washing screen to remove particulate, sediment, zooplankton and phytoplankton.

Disinfection of the filtered sea water is then carried out using medium pressure UV lamps, or carried out using hypochlorite generated from the side stream EC process, and

controlled by the BWMS control system. Upon discharge, the filter is by-passed and in the case of the Wärtsilä AQUARIUS® UV the ballast water is again disinfected with UV treatment before safe discharge back into the sea. In using the Wärtsilä AQUARIUS® EC system the ballast water also by-passes the filter and any residual active substance is neutralised using sodium bisulphite, to ensure that the ballast water is safe to discharge back to the sea in full compliance with MARPOL requirements.

By virtue of its modular design, each system's inherent flexibility allows application across the full range of ship types and sizes, for both the new build and retrofit markets. Wärtsilä offers customers a range of flexible supply options, from the BWMS equipment only, to a full turnkey service covering all phases, from the initial survey through to the supply, installation, and commissioning of the hardware, and continuing with lifecycle after sales service and support.





Wärtsilä AQUARIUS® EC



WE WORK IN CLOSE PARTNERSHIP WITH OUR CUSTOMERS THROUGHOUT THE LIFECYCLE OF THE VESSEL BY OPTIMISING EFFICIENCY AND PERFORMANCE





THROUGH-LIFE SUPPORT FROM  
A CREDIBLE, WORLDWIDE  
SUPPLIER – WHENEVER AND  
WHEREVER YOU NEED US



## VALUE ADDED SERVICE THROUGH EXPERT RETROFIT CAPABILITIES

Wärtsilä offers tailored turnkey solutions to meet all our customers needs. Moreover, these solutions also help minimize your environmental footprint, improve operational efficiency and enhance reputation.

Wärtsilä supports customers throughout the lifecycle of a retrofit project by providing excellent engineering capabilities, low risk appliance, minimised downtime, reduced customer project management costs - in addition to regulatory compliant, environmentally sound solutions.

As a professional project organization we are capable of managing all kind of retrofit projects

wherever you are in the world, including EPC (Engineering Procurement and Construction), class and statutory approvals, commissioning, and crew training. After completion of a retrofit project, Wärtsilä's global services network supports customers throughout the lifecycle of the ship.

Key advantages for a ship owner:

- Wärtsilä is flexible: depending on customer's needs our retrofit project scope can vary from a simple equipment delivery to a complete turnkey project.
- As a total solution provider; Wärtsilä is able to manage the entire retrofit project in its turnkey delivery - from the selection

and configuration of the equipment - to class and flag approvals – to engineering the installation and supervising the construction.

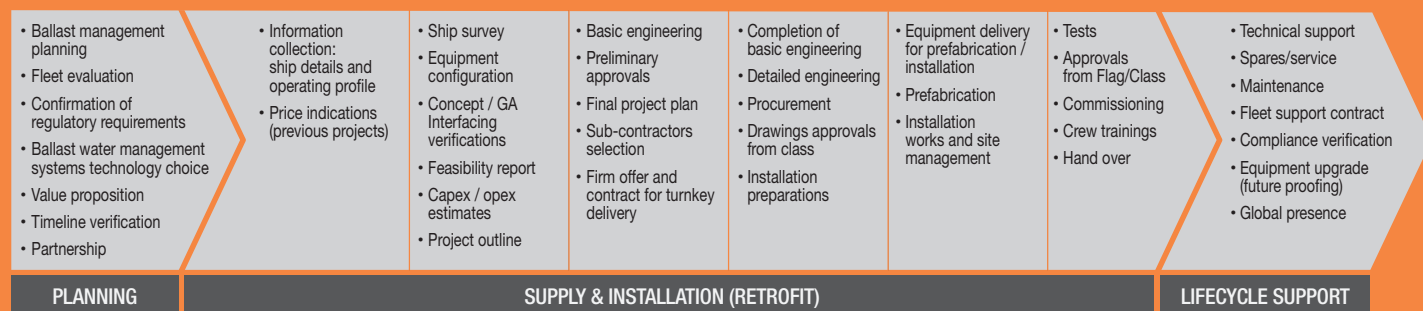
- We deliver high quality installation; minimised downtime and risk; performance guarantees and regulatory compliance.
- By choosing Wärtsilä ship-owners have a single point of contact reducing project management costs in coordinating with equipment providers, yards, engineering companies and class / flag societies.





## WÄRTSILÄ PARTNERSHIP PROGRAM

Wärtsilä works in close cooperation with the customer - from the very first enquiry, until the system is successfully delivered and the project complete. The main phases of our partnership program for a ballast water management system are:





Wärtsilä is a global leader in complete lifecycle power solutions for the marine and energy markets. By emphasising technological innovation and total efficiency, Wärtsilä maximises the environmental and economic performance of the vessels and power plants of its customers. Wärtsilä is listed on the NASDAQ OMX Helsinki, Finland.

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