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CARE FOR OUR OCEANS

ENVIRONMENTAL TREATMENT OF BALLAST WATER





WHAT IS MAN'S RESPONSIBILITY TO THE OCEANS?

A THREAT: The introduction of non-indigenous species from discharged ballast water is a threat to the global environment. Norway is a seafaring nation – the ocean is important to our fisheries and aquaculture, and we recognized early on that all oceans are a source of food for the whole world. Norway has therefore been a strong advocate of implementation of the International Maritime Organization’s (IMO) Ballast Water Convention worldwide.

A PIONEER: Optimarin, a Norwegian company, was one of the first companies in the world to develop a system for environmentally friendly purification of ballast water. Although we recognized that there are various methods for purifying ballast water, both chemical and environmentally friendly methods, Optimarin chose to pursue a solution that does not use any chemicals and leaves no residual products that are harmful to the ocean or the environment. The world’s first ballast water system was installed by Optimarin on board the cruise ship Regal Princess in 2000.



CLEAN BALLAST WATER

- our responsibility to nature



The UN considers the introduction of non-indigenous oceanic species to be one of the top four serious threats to the global environment. At any given time, 35 000 ships are en route on the water of the Earth and more than 3000 species are being transported in their ballast tanks. The UN's International Maritime Organization estimates that ten billion tons of ballast water is transported around the world every year. The past decade has seen a marked increase in the spread of species to areas where they do not naturally belong. This creates an imbalance in ecosystems and is a serious environmental threat.

Many times the invader has no natural predator and the original species become extinct and the entire marine ecosystem is disrupted. This has dramatic consequences for biodiversity and for industries such as fishing and aquaculture.

- 1 Global warming
- 2 Pollution on land and at sea
- 3 Over-fishing
- 4 Non-indigenous species (in ballast water)**

IMO REGULATION

- protecting the marine environment



“International Convention for the Control and Management of Ships’ Ballast Water and Sediments, 2004”

In 2004, the IMO adopted an international convention for the control and management of ships’ ballast water and sediments. The requirements apply to all new vessels built from 2012 onwards, and they apply to older vessels as well, leading to a total ban on the transfer of harmful organisms from 2016.

IMO has through Resolution A.1088(28) implemented a recommendation for delay in set implantation schedule set forward in Regulation B3 of the Ballast Water Convention.

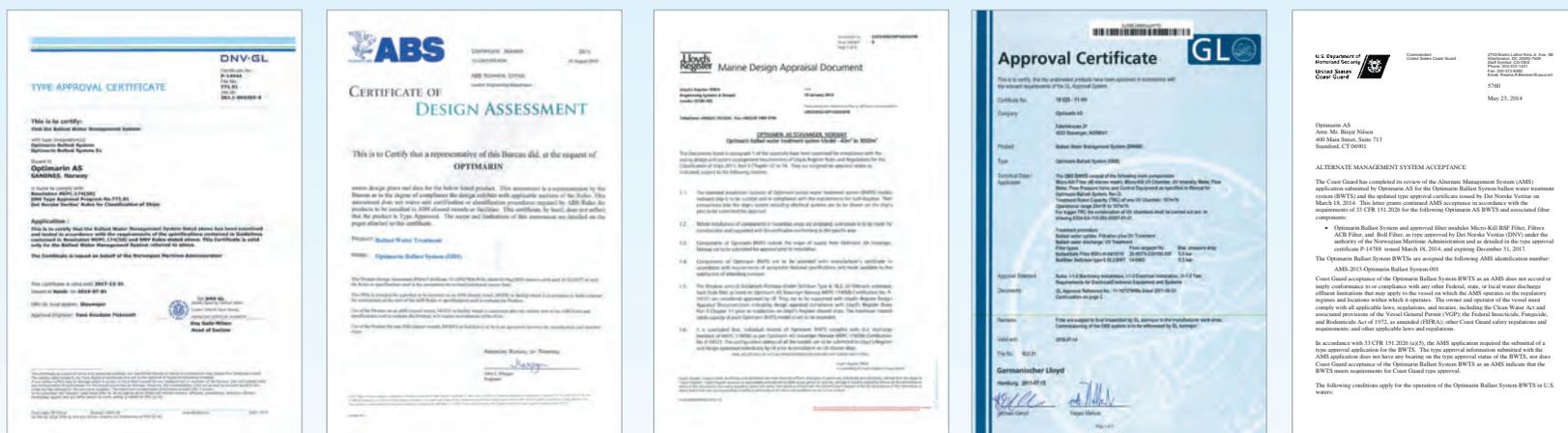
BEFORE 2009			2009 OR AFTER		
CONSTRUCTED YEAR	BW CAPACITY (M ³)	NEW SCHEDULE	CONSTRUCTED YEAR	BW CAPACITY (M ³)	NEW SCHEDULE
Before 2009	Between 1500 and 5000	1st IOPP renewal survey after entry into force of the Convention	2009 or after	Less than 5000	1st IOPP renewal survey after force of the Convention
	Less than 1500 or greater than 5000	1st IOPP renewal survey after the anniversary date of delivery of ship in 2016	Between 2009 and 2011	5000 or more	1st IOPP renewal survey after the anniversary date of delivery of ship in 2016
			After 2011		1st IOPP renewal survey after force of the Convention

IMO PERFORMANCE STANDARD AND OPTIMARIN TEST RESULTS		
CATEGORY	IMO, D2 PERFORMANCE STANDARD	OPTIMARIN TEST RESULTS - NIVA
Zoo plankton > 50 µm 10 ⁶ m ⁻³ , ≥105m-3Min. 5 species from 3 diff. phyla/divisions	< 10 off per m ³	0.39 per m ³ <99.999% removal
Phytoplankton 10–50 µm 10 ⁴ ml ⁻¹ , ≥10 ³ ml ⁻¹ Min. 5 species from 3 diff. phyla/divisions	< 10 off per ml	<0,2 per ml <99.99 % removal
Bacteria and Virus	Toxicogenic Vibrio cholerae E-coli Intestinal Enterococci	< 1 cfu/100 ml <250 cfu/100 ml <100 cfu/ 100 ml

DON'T WAIT - INSTALL NOW

It is estimated that at least 35 000 vessels in the existing global fleet will have to install systems for the purification of ballast water by 2016. In addition, 1200 new ships are built each year, and they will also need such a system. In the course of a few years, all the ships in the world that have ballast tanks must have installed systems to purify the ballast water.

After several years of testing, developing and patenting new technology, Optimarin finally obtained type approval for its purification system in 2009, in accordance with Guideline 8 and the 'INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004'. The Optimarin Ballast System (OBS) uses approved technology that significantly exceeds the stringent requirements set out in the IMO Convention. But for Optimarin, it is not enough to simply be approved. We operate in accordance with NS-EN ISO 9001:2008 & 14001:2004. And our vision is to have the most environmentally friendly ballast water purification system in the world.



IMO's regulations contain requirements that approved systems shall not constitute a hazard to personnel, the environment, or the ship, or cause uncontrolled discharges. The system safeguards the people who handle it, and monitors itself to ensure that it is operating properly.

Optimarin's Type Approval certificate was issued by Det Norske Veritas (DNV) on behalf of the Norwegian Maritime Directorate. Based on the information reviewed, Optimarin has also been assessed by the California State Land Commission, which stated that Optimarin has the potential to meet their standard for Best Available Technologies.

The OBS has been extensively tested at the Norwegian Institute for Water Research (NIVA) in accordance with IMO's G8 guidelines – with excellent results. (See page 7)

Optimarin's endeavours have also assured approval from a range of classification organizations, including Lloyd's Register, Germanischer Lloyd, Bureau Veritas, MLIT Japan, Russian Maritime Register of Shipping and American Bureau of Shipping.



THE INNOVATION

- simply pure light

Optimarin has developed the Optimarin Ballast System (OBS), an environmentally friendly ballast water treatment system, based on the use of filtration and UV light for the efficient removal and inactivation of marine organisms. The OBS is one of very few treatment options that does not use or generate chemicals or biocides in its treatment or cleaning processes. It is based on the idea that such systems should be environmentally sound, simple, flexible and easy to install, and capable of operating on both newbuilds and existing vessels.

SIMPLE & RELIABLE

- Ballast Operation



DURING BALLASTING: The ballast water flows through Optimarin's proprietary 40 filter. The filter removes larger organisms and particles and back flushes them overboard at the ballasting location. After passing the filter, the ballast water continues through the UV chambers on its way to the ballast tanks. The UV light kills or inactivates organisms, viruses and bacteria in the ballast water.

DURING DE-BALLASTING: The filter is automatically bypassed during de-ballasting, and the ballast water receives a second UV-treatment during discharge as a safeguard to ensure compliance.



UV SYSTEM

The UV system was developed based on 20 years' experience of water injection on offshore platforms, water treatment for fish farming and drinking water plants in Norway.

- High power UV for the efficient killing or inactivation of organisms, bacteria and pathogens in ballast water.
- One UV lamp per chamber (167 m³/h flow rate per chamber).
- Standardized UV chamber, installed in parallel on a single manifold for higher flows.
- Developed and manufactured for installation aboard ships.
- Optimized for minimum maintenance and ease of operation. It is self-cleaning, with no moving parts or need for chemical cleaning.
- UV and temperature sensor in each chamber.



FILTERS

Optimarin offers three different (40 micron) filters: B&K (candle type) FilterSafe (basket type) Filtrex (basket type). All three filter types have automatic back flushing and are self-cleaning.

- Removes large particles and organisms.
- Low pressure loss of only 0.1 – 0.5 BAR.
- Horizontal or vertical installation.
- Bypassed during de-ballasting.



CONTROL SYSTEM

The Ballast Control System allows easy operation of the Optimarin Ballast System.

- Custom made
- User-friendly interface.
- Touch screen operation.
- Interface with ship's main systems.
- Logging in accordance with IMO requirements.
- Option of integrating ballast pumps and valves.
- Interface developed by Optimarin
- Siemens PLC

SYSTEM RANGE (m ³ /h)*	FOOTPRINT SYSTEM COMPONENT (m ²)**			NUMBER OF UV CHAMBERS ***	AVERAGE POWER CONSUMPTION (kWh) ****
	FILTER	UV-MANIFOLD	UV-POWER SUPPLY		
< 167	0,4	1,5	0,5	1	20
< 334	0,6	1,5	0,9	2	40
< 500	0,8	1,6	1,4	3	58
< 1000	1,1	1,8	2,7	6	122
< 1500	1,6	2,0	4,1	9	178
< 2000	1,9	2,1	5,4	12	240
< 2500	1,9	2,3	6,8	15	295
< 3000	2,3	2,3	8,1	18	360

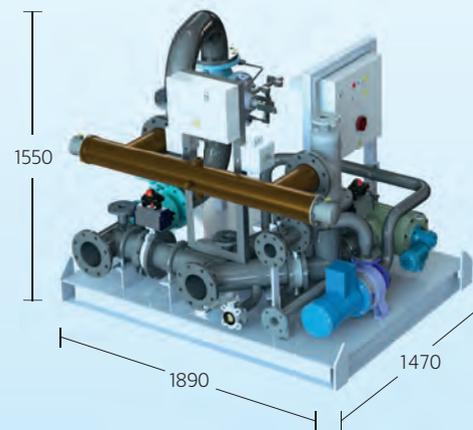
* The Optimarin Ballast System accommodates a wide range of ballast water capacities. The smallest standard system has a capacity of 20 to 167 m³/h. Thereafter systems are in steps of 167m³/h.

** The Optimarin Ballast System is very flexible and the system layout can be customized to fit each vessel. The footprint indicated above is for the system's main components. The piping footprint has not been included.

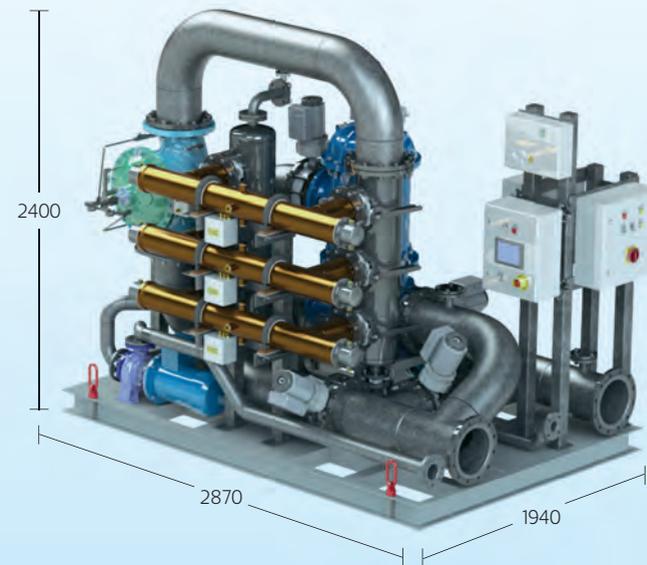
*** Inside each UV chamber is one UV lamp with a maximum power consumption of 35 kW. The actual power consumption of each lamp depends on sea water quality.

**** Estimated

OBS167 FX UNIT

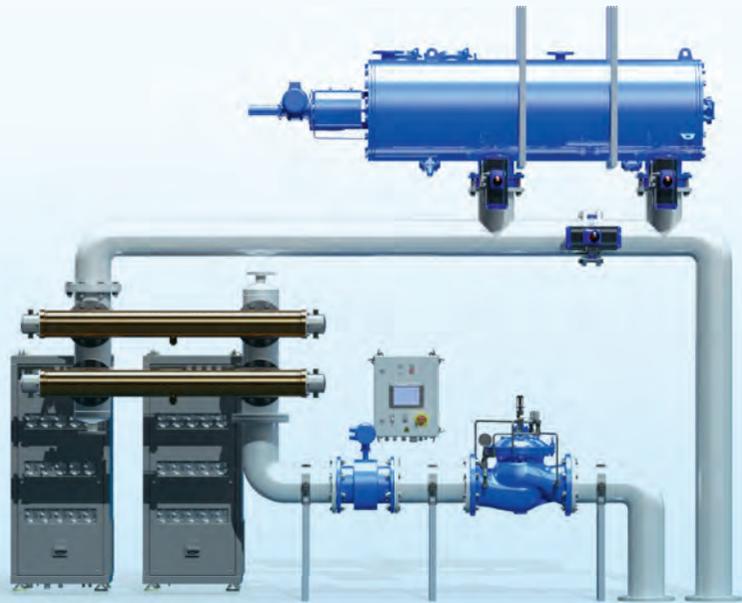


OBS 500BK UNIT



COST-EFFICIENT RETROFIT

- anywhere you want on the vessel



334 M³/H SYSTEM



500 M³ SYSTEM

The Optimarin Ballast System is normally installed in the pump or engine room and in close proximity to the ballast pumps. The OBS can be delivered in a container, on a skid or in separate pieces to allow for easy installation in most any available space. The equipment can be installed horizontally, vertically, on or suspended below deck, along the ship's side or in several separate locations. It is relatively low weight and adds no extra noise. The OBS utilizes every square meter and does not require much space, this makes it a cost-efficient solution.



1000 M³ SYSTEM



2000 M³ SYSTEM



OUR CORE VALUES

PROFESSIONALISM

- We keep our promises
- We make clear demands of one another, are truthful and act with integrity
- We are solution-oriented

INTERACTION

- We work together, share our experiences and improve one another
- We communicate clearly, and give and receive constructive feedback
- We are resourceful and loyal to the decisions made

CONTINUOUS IMPROVEMENT

- We are a force for constructive change
- We learn from our mistakes
- We are humble

TAILOR-MADE

The Optimarin Ballast System is configured specifically for each customer's requirements. The systems are typically sold as component-based solutions ready for installation by the customer, since having separate components allows the greatest flexibility and relative ease of installation. Customers can also order pre-assembled skids that are ready to be installed during vessel construction or when a ship is in port.

STANDARDIZED COMPONENTS

The Optimarin Ballast System is a modular system using standardized components for all flow configurations. All UV spare parts can be used for any system capacity which provides simple procurement and logistic operation for both owners and operators of large and diverse fleets. The filters are also standardized and within a large capacity range only a few filter sizes are utilised. Our customers will have easy access to spare parts such as UV lamps, replacement filter elements, etc, supplied by our partners around the world.

EASY MAINTENANCE

The Optimarin Ballast System is based on a simple and reliable design with few movable parts which requires little or no system maintenance and ensures operational reliability. The OBS has fewer parts and UV lamps in comparison with similar systems. The patented UV chamber in CuNi, the high water flow and high UV intensity make the UV lamps and the internals of the UV chamber self-cleaning and ensures a relative long service life. A self cleaning UV system combined with the automatic back-flushing filters results in a minimum requirement for system cleaning and maintenance for the ship's crew.

OPTIMIZING POWER CONSUMPTION

The Optimarin Ballast System is certified to adjust the power consumption according to UV intensity. The system will automatically optimize the power consumption pending UV intensity which is based on the water quality during ballasting (turbidity, etc). The system's extensive treatment capacity has shown that it is capable of meeting the more stringent California standard.

SATISFIED CUSTOMERS



FARSTAD SHIPPING

Optimarin Ballast System has been installed on board several Farstad vessels, amongst them the award winning ship Far Solitaire. Optimarin was chosen as the preferred supplier of ballast water treatment systems for Farstad's new build program.



GRIEG STAR

Grieg Star, the owner of one of the world's largest open hatch fleets, has chosen the Optimarin Ballast System for several of their new build vessels.

- that use Optimarin Ballast System



SAGA SHIPHOLDING

Since Optimarin signed a fleet agreement with Saga Shipholding, several systems have already been installed on board the new vessels. Saga's fleet adds another 28 ships to Optimarin's reference list.



GULF OFFSHORE

The first retrofit OBS was installed in 2009 on board the North Mariner. Since then several systems have been installed on board Gulf Offshore vessels, both retrofits and new builds.

AT YOUR SERVICE

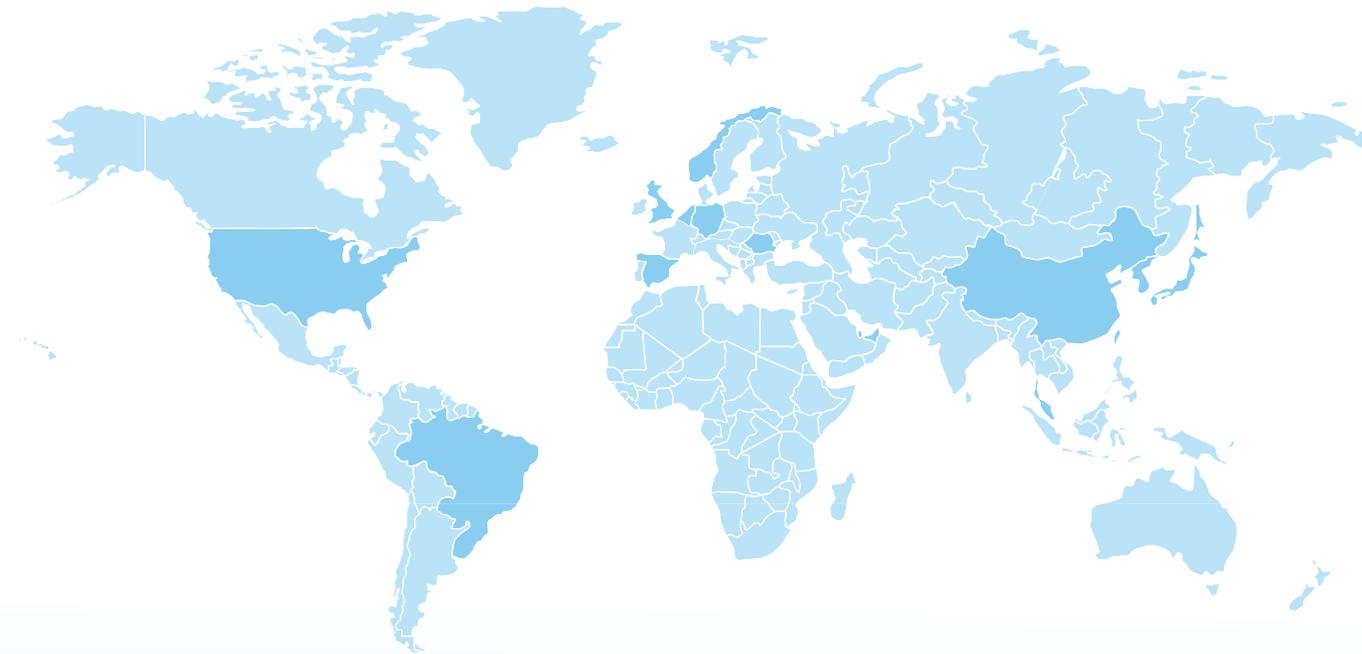


THE PEOPLE: Optimarin's personnel are specialists in purifying ballast water. Key Optimarin personnel have significant maritime expertise.

AGENTS: To ensure that we are locally available to our customers, Optimarin has a network of agents and service centers in key maritime locations around the world.

OPTIMARIN IS OFFERING STATIONED SERVICE ENGINEERS ALL OVER THE WORLD:

- Brazil
- China
- Germany
- Japan
- Korea
- Netherlands
- Norway
- Romania
- Singapore
- Spain
- UAE
- UK
- USA



Optimarin is service-minded and emphasizes the importance of good customer communication. It is important for Optimarin to help customers at any time needed.

For customers with the need of technical assistance Optimarin provides a 24-hours service line:
TEL +47 46 94 94 85 / service@optimarin.com

OPTIMARIN - all over the world



SALES OFFICES:

Stamford CT, USA
Newcastle, UK
Shanghai, CN
Japan, Tokyo
Varna, Bulgaria

SALES AGENTS

- Algeri
- Argentina / Chile
- Buenos Aires
- Brazil - Sao Paulo
- China North - Dalian

- Croatia - Rijeka
- Cyprus - Nicosia
- Denmark - Fredrikshavn
- Greece - Piraeus
- Hong Kong

- India - Chennai
- Israel - Ashdod
- Italy - Genova
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