

# Onshore RayClean™

Landbased Ballast Water Treatment System

PROVEN TECHNOLOGY

**DESMI**

# RayClean™ Now On Shore!

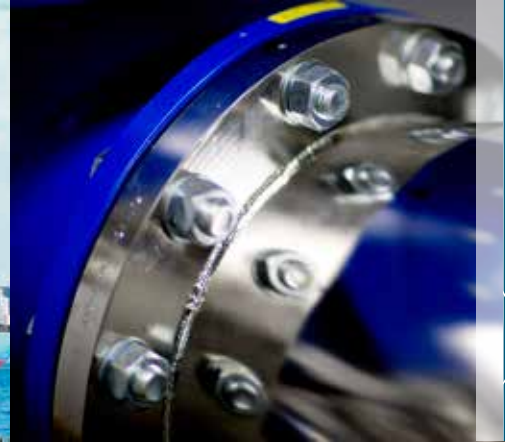
The RayClean™ ballast water treatment system is developed by DESMI Ocean Guard A/S and type approved by IMO and DNV GL

Ports that want to accommodate vessels need ballast water treatment, and we offer a containerized system with flowrates from 200 – 850 m<sup>3</sup>/h. The system is based on mechanical treatment and does not involve any use of chemicals or active substances.

First treatment step is filtration, second step is UV treatment.

The system can be delivered in special EX-version suited for installation in hazardous areas.

# Single Treatment - Or Double?



The complete system can be built into a standard shipping container.

Depending on where in the world the system is to operate, the container can be equipped with heating or cooling for the operators' convenience.

The system has been tested at 55°C and a humidity level of 98% in order to achieve type approval.

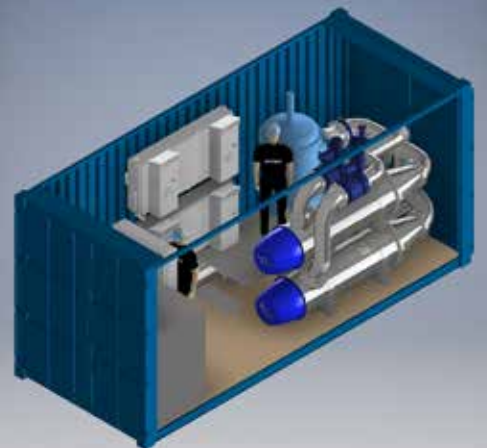
DESMI Ocean Guard offers a complete plug-and-play solution including own power source - a diesel powered generator. This enables the users to move

the system on a truck and park next to the vessel that needs its service.

Alternatively, the port can dedicate a building for the ballast water treatment system and construct pipelines around the port area.

The vessel can be connected via hoses in sizes matching the flow of the system.

In order to achieve full compliance with ballast water regulations and protect the local marine environment, the RayClean™ system is used for ballasting and deballasting. If a vessel arrives in a port and is unable to document that the ballast water on board has been treated on ballasting, the water has to be treated twice to ensure full compliance. This could either be achieved with a holding tank on shore or two systems in series.



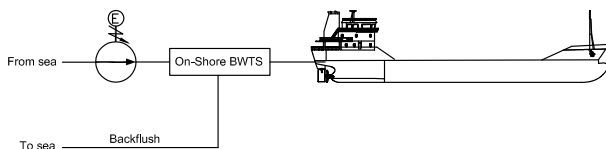
## Proven effective in all water salinities with UV-T (UV-Transmission) as low as 0.33 which sets the industry benchmark

The treatment method of RayClean™ is a combination of mechanical filtration and UV radiation. First the water will enter the filter, and the large particles and organisms will be removed from the water. The filter automatically cleans itself and the backflush water from the filter is pumped back into the sea in ballast operations. In de-

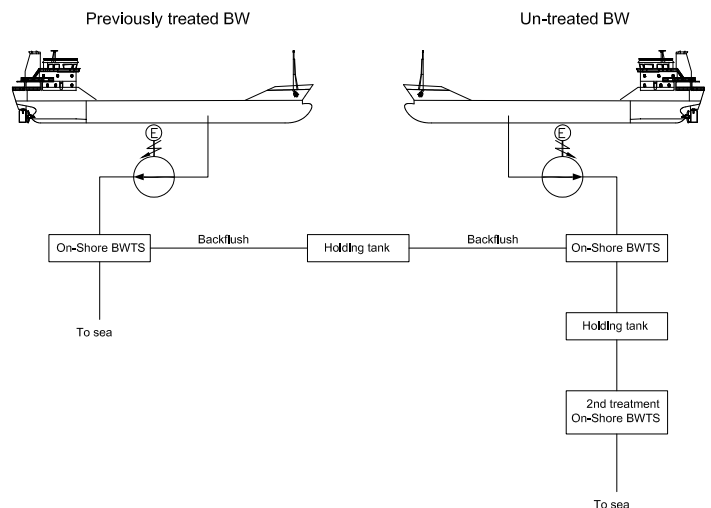
ballast operations the backflush water should be led to a holding tank.

The RayClean™ system's type approval is based on two treatments to ensure full compliance with ballast water regulations.

### Ballast



### De-Ballast



The RayClean™ system automatically adapts the treatment to the water quality.

In very clear water the UV lamps are dimmed in order to reduce the energy consumption and in very dirty and unclear water the flowrate is reduced. This means that the system can cope with more challenging water conditions than any other system - and with the lowest energy consumption in class!



The DESMI RayClean™ UV-lamps have a very long lifetime, approx. 12,000 hours

This keeps your operational expenses down

### Reasons why vessels would use the onshore BWTS:

- Emergencies, if the vessel's own BWTS malfunctions.
- Small vessels that are unable to have a system on board.
- Ferries with fixed destinations – one owner could share one system with several ferries.
- Once the IMO convention enters into force, it may prove difficult for the limited number of approved manufacturers to meet the great demand for retrofit.
- New business opportunity - publicly available BWTS



Needed container size for RayClean™ system with power pack:

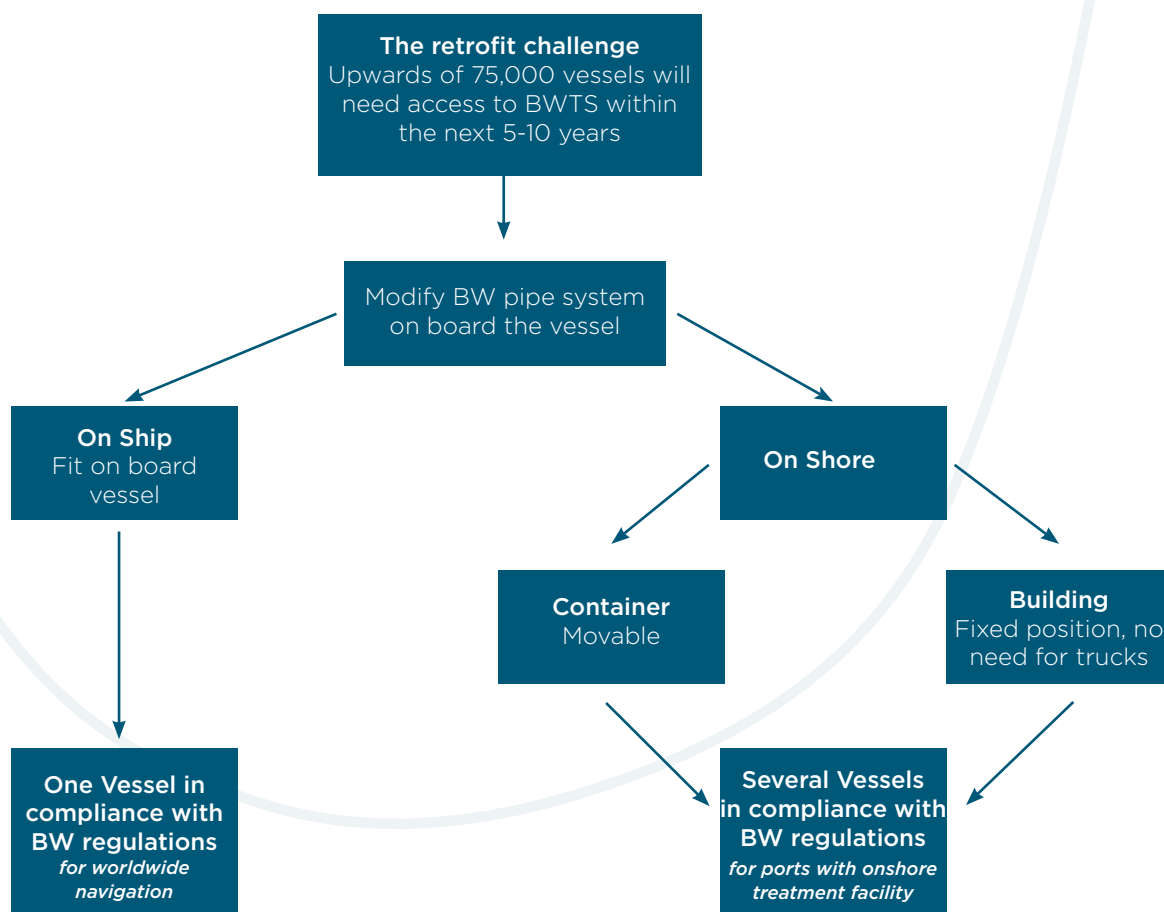
Container Size	RayClean™ System Size (m³/h)				
	200	300	450	600	850
20 ft.	+	+	N/A	N/A	N/A
20 ft. High-Cube	+	+	+	+	N/A
40 ft.	+	+	+	+	N/A
40 ft. High-Cube	+	+	+	+	+

Connections	RayClean™ System Size (m³/h)				
	200	300	450	600	850
Main	DN150/6"	DN200/8"	DN250/10"	DN250/10"	DN300/12"
Backflush	DN100/4"	DN100/4"	DN100/4"	DN125/5"	DN125/5"

RayClean™ System Size (m³/h)	200	300	450	600	850
Power Needs (kVA)	22	22	44	44	66

The UV-unit is a mechanical self-cleaning unit  
No use of chemicals

This saves you a lot of maintenance time, and no chemicals are needed on stock for UV-unit cleaning





UV-T 0.33 means that RayClean™ can handle water from anywhere in the world

A ship's own BWTS is not in compliance with ballast water regulations when operating in waters with a lower UV-T than the one specified in its type approval. Since RayClean™ has the ability to handle one of the lowest UV-T in the industry, it is the perfect choice for ports that want to offer vessels access to emergency equipment.

Port	UV-T (%)
Shanghai, China *)	49
Skagen, Denmark	92
Tanjung Pelepas, Malaysia	83
Brisbane, Australia	92
Melbourne, Australia	87
Lisbon, Portugal **)	41
Zeebrugge, Belgium	85
Bremerhaven, Germany	60
Porto Grande, Cape Verde	92
Brunswick, GA, USA	51
Wallhamn, Sweden	91
Vera Cruz, Mexico	94
Houston, USA	74
New Orleans, USA	54
Shanghai, China *)	55
Hong Kong, China	80
Antwerp, Belgium	66
Rotterdam, Netherlands	93
Lisbon, Portugal **)	53

\*) and \*\*) measured on different dates

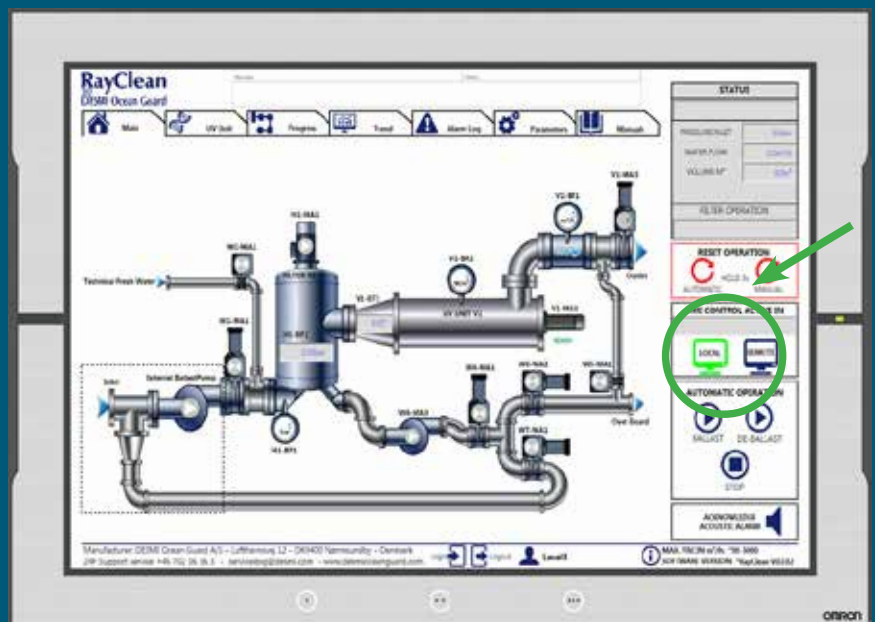
### Maintenance

To improve the lifespan of filter and UV-unit, we offer connections for fresh water flushing and internal draining of the system, which ensures that the system can be cleaned.

The filter candles should be replaced after 5,000 hours of service. The UV lamps are expected to operate for 12,000 hours.

### Controls

RayClean™ is easy to operate and highly automated. Once the system has been powered up, only one button on the built-in touch screen (HMI) needs to be pressed for the system to be ready for treatment. Everything on this touchscreen can be accessed by a remote computer via 3g or wi-fi. The built-in log system stores all relevant information, for example the quantity of treated water.



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