



Keppel

Offshore Technology Development

Partnering with



BALLAST WATER TREATMENT SYSTEM One Stop Solution

Wide range of Ballast Water Treatment Systems to suit varying vessels and rigs requirements

OTD assists Owners in selecting the right systems, getting regulatory approvals, and providing yard for installation or retrofit, testing, on-site commissioning, up to aftersales support



**DESIGN AND
CONSULTANCY**



**ONE STOP
SOLUTION**



**SYSTEMATIC
APPROACH**

Why Choose OTD

**INNOVATION
EASY INSTALLATION
COST EFFICIENT
AFTERSALES
SUPPORT**

HIGHLIGHTS

CHOOSE THE RIGHT SYSTEM

Ballast water treatment systems (BWTS) is to eliminate invasive organisms keeping in line with the BWM regulations. As such, ship owners need to exercise discretion, place trusts on BWTS suppliers and conduct full due diligence before selecting the right system.

NEW REQUIREMENTS FROM IMO

All ships in international trade have to manage their ballast water and sediments according to a ship-specific ballast water management plan. All ships will also have to carry a ballast water record book and an International Ballast Water Management Certificate. All ships will need to install an on-board system to treat ballast water and eliminate unwanted organisms.

THE TECHNOLOGY



FILTRATION



ULTRAVIOLET



**ELECTRO-
CHLORINATION**

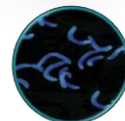
INVASIVE ORGANISMS



North Pacific
Seastar



European
Green Crab



Cholera



North American
Comb Jelly

What OTD provides

UNDERSTANDING CLIENTS REQUIREMENTS

- LEVERAGING KEPPEL OFFSHORE & MARINE CAPABILITIES
- GLOBAL PARTNERSHIPS WITH BALLAST WATER TREATMENT SYSTEM MAKERS
- COMPLETE PRODUCT LIFECYCLE SUPPORT
- EFFECTIVE PROJECT MANAGEMENT

ONE STOP SOLUTION

DESIGN AND
CONSULTANCY

PRE-INSTALLATION
SURVEY

ENGINEERING
WORKS

**USING LATEST
TECHNOLOGY**

We provide engineering consultancy to find the suitable BWTS system according to your vessel requirements. Using OTD 3D scanning, we provide high definition laser scanning and surveying techniques.

PRE-FABRICATION
WORKS

SUPPLY &
INSTALLATION OF
ELECTRICAL &
PIPING

BWTS EQUIPMENT
SUPPLY &
INSTALLATION

**PROCESS
SIMPLIFYING**

With our experience, OTD is able to make the process simple and easy for you. We provide project management and close supervision during the BWTS installation. You can be assured of the visibility and fully documented process.

AS-BUILT DRAWINGS
& OPERATING
MANUAL

COMMISSIONING
SUPPORT

TRAINING SUPPORT

WARRANTY
SUPPORT

AFTERSALES

**ASSURED
QUALITY**

We pride ourselves in providing our clients with quality products and services. Our range of support will cover various aspects that ensure you will always have a peace of mind and confidence in your equipment.

Your Trusted Partner

Track Records of Keppel Shipyard to install BWTS for different vessels since 2013

ADVANTAGES



THE TRULY GLOBAL SOLUTION

Our partnerships with IMO, USCG approved BWTS makers, and leveraging on the Group's network of 20 yards and offices worldwide, we are capable to bring our services nearer to you while providing effective logistics and service support.



SUPERIOR PRODUCT AND QUALITY

Understanding the requirements and your needs, we will propose equipment and specifications that are necessary. This includes advise on footprint and maintenance space, power consumption, piping and tie-ins, pressure drop and ballast pump capacity, and control integration.



FULLY COST EFFECTIVE SOLUTION

With the right BWTS product, detailed engineering, excellent project execution, we are confident in providing a cost effective engineered solution. Our experience and project management skills will ensure your total costs will be lower while turnaround times get shorter.

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Offshore Technology
Development



ENVIRONMENTAL TREATMENT OF BALLAST WATER



DURING BALLASTING: The ballast water flows through Optimarin's proprietary 40 micron 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.
- No reduction in flow while operating in USCG mode



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.
- USCG TA test according to CMFDA standard.



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 and USCG requirements.
- Interlock panel to monitor ships valves.
- Interface developed by Optimarin
- Siemens PLC

COST-EFFICIENT RETROFIT

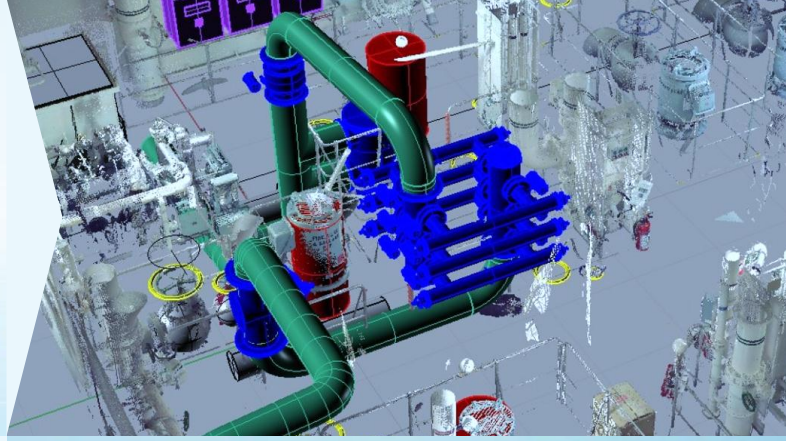
- anywhere you want on the vessel



334 M³/H SYSTEM



500 M³ SYSTEM



SIMPLE & RELIABLE

- Ballast Operation



A FLEXIBLE SYSTEM

- for any vessel



Optimarin key benefits

- Environmentally friendly
- Simple and Flexible design
- Ready for stripping operations
- Few movable parts
- Low need for maintenance
- Integrated ballast system
- No extra noise
- Low weight / small foot print
- Experience
- Proven in field
- Powerful enough for "instant kill", USCG

SATISFIED CUSTOMERS

- that use Optimarin Ballast System



DUTCH NAVY



GRIEG STAR



SAGA SHIPHOLDING



GULF OFFSHORE

Approvals & Certifications





ERMA FIRST BWTS FIT



Ballast Water Treatment Systems

OPERATION

ERMA FIRST BWTS is a full flow electrolytic system that operates only during ballasting

BALLASTING

FULL FLOW ELECTROLYSIS

During ballasting, the water goes through the filter, where organisms and sediment with a diameter larger than 40 microns are separated and further discharged overboard.

The filtered water then enters the Electrolytic Cell. From the chlorides of the water, free chlorine is produced through the electrolysis process at very low concentration (around 4-6mg/L). The treated water then, enters the ballast tanks

DE-BALLASTING

CONSIDERABLE GAINS

During de-ballasting, the system will only monitor the residual oxidants and will further intervene if necessary. The main stages of the system (filtration and disinfection) are bypassed.

A chlorine sensor samples the residual chlorine at the discharge line. If this is greater than 0.1 mg/L, then it drives a dosing pump for the dosage of a neutralizing agent (Sodium Bisulfite). The successful neutralization of the free chlorine is confirmed by a second chlorine sensor, installed at the far end point of the ballast discharge line.



FULLY CERTIFIED

IMO & USCG type approved, suitable for all water types



EFFECTIVE DISINFECTION

continuous R&D on electrochemistry for innovative applications



SMALL FOOTPRINT

developed to exceed all the special installation requirements



SMART SAVINGS

competitive CapEx & low OpEx for a system fit for your pocket

SYSTEMS

ERMA FIRST BWTS is an autonomous and reliable solution for all types and sizes of vessels

ERMA FIRST BWTS FIT

EXCELLENCE OF SIMPLICITY



SEPARATION

40 microns self-cleaning
automatic screen filter
(two options available)



DISINFECTION

Advanced Technology
Electrolysis Cells

ERMA FIRST BWTS FIT is an advanced modular system that was developed to exceed all the special installation requirements either for New Building vessels or any retrofit projects. Covering an extensive capacity range of 100-3740m³/h and having achieved the USCG type approval, ERMA FIRST FIT is an ideal solution for all types of ships.



IMO Final
Approval



USCG Type
Approval



LR
Lloyd's
Register

LR Class Type
Approval



Certification
ISO 9001



Certification
ISO 14001

Simple and Flexible

Suitable for all Pump Capacities

Suitable for all Available Spaces

Low Pressure Drop (0,5 bar)

Suitable for Fresh Water (0,9 PSU
Salinity) & Low Temp. Waters (-2°C)

Low Power Consumption in Various
Waters (1,8 kW/100m³ at 30 PSU)

