DESMI Ocean Guard CompactClean

Ballast Water Management System

PROVEN TECHNOLOGY

DESMI

CompactClean

The Most Compact and Effective Ballast Water Management System on the Market!

DESMI Ocean Guard A/S is part of the DESMI Group and is one of Denmark's oldest companies.

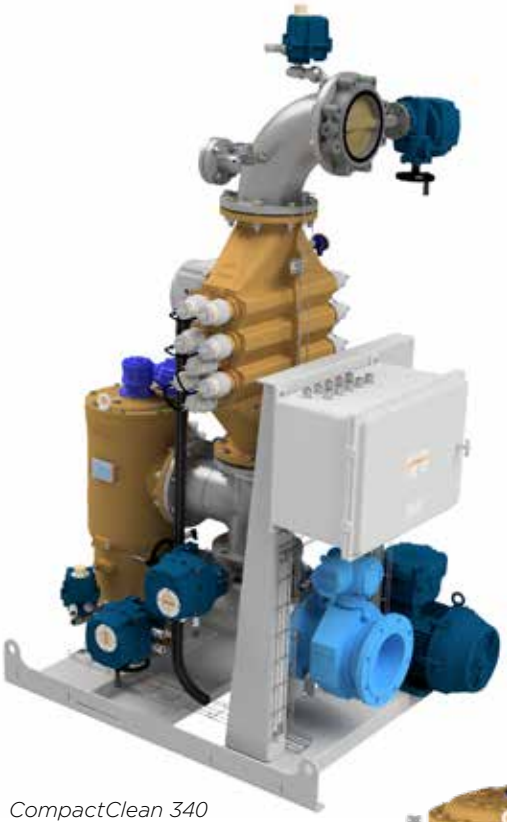
For decades DESMI has developed, sold, and manufactured pumps for marine applications, and today many DESMI pumps are used and installed on board ships all over the world.

Are you looking for a ballast water management system that can be **installed easily** and without relocating other equipment? CompactClean is the answer! Almost as easy as **plug and play**! It is the first ballast water management system on the market that combines very low space with large flow rates. A Skid Mounted CompactClean-500 capable of treating 500 m^3/h system has a footprint of only 2.36 m^2 (25.4 sqft) plus a main electrical panel, which needs 0.37 m^2 (4 sqft). The main electrical panel can be placed up to 100 m (328 ft) away from the system, if requested.

The operation of the system is based purely on mechanical treatment, and therefore, it **does not involve any use of chemicals** or active substances. This eliminates risks of hazards to crew, vessel, and the environment. CompactClean has **no salinity or temperature limitations.**

- ✓ IMO & USCG Approved
- ✓ Low holding time
- ✓ Chemical Free Treatment
- ✓ Down to UV-transmission of just 42% - Also in US territory!
- ✓ No salinity or temperature limitations
- ✓ Automatic flow control and lamp dimming
- ✓ Very low footprint
- ✓ Multipurpose Backflush/Recirculation/Stripping pump included
- ✓ No water cooling or compressed air system required
- ✓ Fully automated operation
- ✓ Automatic generation of PDF reports to authorities
- ✓ Easy to maintain and Worldwide Service Network available
- ✓ Computer Based Training and Service app available for download
- ✓ Short delivery time

SELECTING THE RIGHT CompactClean



CompactClean 340

CompactClean 135

CompactClean 1500

By choosing a CompactClean BWMS you will experience simplicity in the daily operation of your vessel. One global full flow mode worldwide – as simple as that! The solution has superior UV power to meet the strict requirements for ballast operation in US-waters. This means the risk of mixing IMO and USCG treated ballast water will be eliminated.

One global operation mode

The selection of either IMO or US mode can be very complicated, if the operator does not know at the time of uptake, where the ballast water is going to be discharged. With the CompactClean system you will not need a special mode to comply with USCG requirements. You just have one global mode for worldwide operation. The advantage of using a single operation mode globally is that it removes the need to know the de-ballast location at the time of ballast uptake. This means the ship can never get into a situation where the ballast water on board is compliant for discharge in one location, but not in another.

The CompactClean has been certified to treat ballast water with UV transmission at record-breaking 42% in its global mode. Most competing systems will go out of compliance as early as 70% UV-T in USCG waters.

The CompactClean BWMS is available in following sizes (treatment rated capacities):

CompactClean (model)	**Max flow** (Global mode) Ballast/De-ballast [m^3/h]
35	35
85	85
135	135
250	250
340	340
500	500
750	750
1000	1000
1500	1500

Max treatment: CompactClean-1000 (example)	
IMO Ballast	1000 m^3/hr
IMO De-Ballast	1000 m^3/hr
USCG Ballast	1000 m^3/hr
USCG De-Ballast	1000 m^3/hr

Specifications:	
UV reactor size	144 kW
Filter size	1000 m^3/hr
Main pipe dim.	DN350

CompactClean 1000

CompactClean OptIMO

The CompactClean OptIMO BWMS has been designed for vessels trading globally or primarily in IMO regulated waters. The CompactClean OptIMO BWMS provides optimized performance in IMO waters combined with reduced flowrate in US territories. If your vessel trades primarily outside of US waters in International Maritime Organization (IMO)-regulated waters, we can offer the CompactClean OptIMO system for ballast water management.

The CompactClean OptIMO system is designed and tested according to the MPN testing methods under IMO. It means that the ComapctClean OptIMO BWMS deploys an optimized and energy saving UV reactor to treat the ballast water, based on the same proven and high-quality technology as the well-known DESMI CompactClean BWMS. This is proved by the CAPEX and OPEX savings.

Dual mode software: IMO and USCG mode

Even though CompactClean OptIMO BWMS is optimized for full flow in IMO waters, it can still be used in USCG waters at approximately 75% of max flowrate. Thus, if the unit size handles 1000 m^3/h of water in IMO waters, it will handle 750 m^3/h of water in USCG waters. The dual-mode software takes care of the correct treatment scheme after the operator chooses the operation mode. The destination port will determine whether the system should operate in IMO or USCG mode.

CompactClean OptIMO can, like CompactClean, handle water with low UV transmissions rates of just 42% in US territory. Furthermore, CompactClean OptIMO has been certified to treat ballast water with UV transmission at record-breaking 35% in IMO mode.

The CompactClean OptIMO BWMS is available in following sizes (treatment rated capacities):

CompactClean OptIMO (model)	**Max flow** (IMO mode) Ballast [m^3/h]	**Max flow** (IMO mode) De-ballast [m^3/h]	**Max flow** (USCG mode) Ballast/De-ballast [m^3/h]
55	55	55	35
135	135	135	85
190	190	240	135
340	340	370	250
500	510	510	340
750	750	750	500
1000	1040	1200	750
1500	1500	1650	1000
2100	2100	2500	1500

Max treatment: CompactClean OptIMO 1000 (example)	
IMO Ballast	1040 m^3/hr
IMO De-Ballast	1200 m^3/hr
USCG Ballast	750 m^3/hr
USCG De-Ballast	750 m^3/hr

Specifications:	
UV reactor size	108 kW
Filter size	1040 m^3/hr
Main pipe dim.	DN300

CompactClean OptIMO 1000

The CompactClean Bulker BWMS is the CAPEX competitive choice for operators in the dry bulk segment. The CompactClean Bulker BWMS provides you exactly the flexibility that you need and deploys the same proven principles and quality as the CompactClean and CompactClean OptIMO.

Typically, it takes a bulk carrier longer to unload its cargo than to load it. Thus, the de-ballast operation is often carried out at a higher flowrate since two (or more) pumps will operate during de-ballasting while one pump is operated during ballasting. Since the mechanical filtration process is by-passed during de-ballast, the CompactClean Bulker is installed with a smaller filter compared to the UV capacity. This will have a significant effect on the CAPEX and OPEX.

The CompactClean Bulker system uses the same dual mode design as the CompactClean OptIMO solution and therefore offers the same treatment capacity down to 35% UV-T in IMO mode. Furthermore, the CompactClean Bulker solution offers all the same benefits as our usual, high quality solutions - from fully automated operation to low footprint and more.

The CompactClean Bulker BWMS is available in following sizes (treatment rated capacities):

CompactClean Bulker (model)	**Max flow** (Both modes) Ballast [m^3/h]	**Max flow** (IMO mode) De-ballast [m^3/h]	**Max flow** (USCG mode) De-ballast [m^3/h]
135-340	135	370	250
190-340	190	370	250
135-500	135	510	340
190-500	190	510	340
250-500	255	510	340
250-750	255	750	500
340-750	340	750	500
340-1000	340	1200	750
500-1000	515	1200	750
500-1500	515	1650	1000
750-1500	770	1650	1000
750-2100	770	2500	1500
1000-2100	1040	2500	1500

Max treatment: CompactClean Bulker 500-1000 (example)	
IMO Ballast	515 m^3/hr
IMO De-Ballast	1200 m^3/hr
USCG Ballast	515 m^3/hr
USCG De-Ballast	750 m^3/hr

Specifications:	
UV reactor size	108 kW
Filter size	515 m^3/hr
Main pipe dim.	DN300

CompactClean Bulker 500-1000

SYSTEM FEATURES

Smooth Port Operations

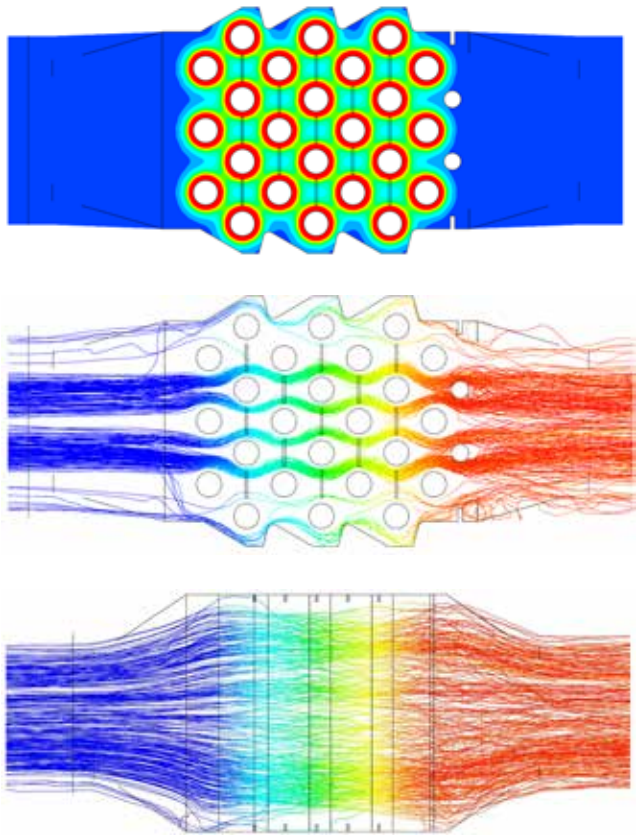
Automatic adjustment of treatment in order to cope with extremely challenging water, avoiding alarms and interrupted port operations in dirty and challenging water conditions.

CompactClean does not raise an “out of compliance” warning in very dirty water conditions, instead it automatically reduces flow through the system to ensure compliant treatment even under low UV-T conditions. This enables the vessel to carry on with its port operations instead of forcing the vessel to interrupt the ballast water discharge, and you will save costs relating to delays in harbour.

High Efficiency Keeps your OPEX Down

UV unit design with very high treatment efficiency reduces the power consumption.

The special shapes of the CompactClean UV chambers have been developed and optimised on the basis of hundreds of state-of-the-art CFD simulations. This ensures that each kW of generated UV light is utilized to the max, which enables lower power consumption.



Easy Reporting to Authorities

Automatic generation of PDF reports to authorities, documenting the performed treatment. With the IMO convention in force, vessel owners will experience increasing demands from authorities for documentation of performed ballast water management. Therefore, CompactClean features automatic generation of PDF reports that document the ballast water operations performed, including key parameters monitored during the treatment. The PDF files are automatically stored and can be transferred to a USB memory stick when inserted into the front of the electrical panel.

Integrated and Compliant Solution for Ballast Stripping Operations

The CompactClean filter back flush pump can be used as stripping pump during stripping of ballast tanks.

Use of ejectors for stripping of ballast tanks jeopardizes compliance with the IMO and USCG discharge standards, because untreated drive water is mixed with treated ballast water. In addition, the untreated drive water can introduce significant wear and tear of the system components. As the only system in the world, CompactClean ensures smooth start up and cool down by recirculating the water in the system, thus to avoid operating the ballast pumps when starting and stopping the system. Further, the same recirculation loop is used for cleaning of the system i.e. One system, one pump: four problems solved!

Fully Automated with Easy Integration into Ship Automation System

CompactClean is PLC controlled and supports all generally used main types of communication interfaces.

With CompactClean the crew on board the vessel will hardly notice that they are treating the ballast water. The system is fully automatic and can be seamlessly integrated with already existing systems on the vessel. When wanting to take ballast water on board, press the “Start Ballast” button on the touch screen, and when discharging the ballast water press the “Start De-ballast” button on the touch screen. That’s how simple it should be – that’s how simple it is!

Long Lifetime of Components Gives you Reliable Treatment and Low OPEX

UV unit made of Nickel-Alu-Bronze material with superior corrosion resistance and proven very long lifetime.

The CompactClean UV units are made of cast Nickel-Alu-Bronze with proven sea-water corrosion resistance. DESMI has decades of good experience with sea water pumps in the same material: Proven Technology keeps the downtime and maintenance costs to a minimum!

UV TRANSMISSION

The unique UV unit is designed and manufactured by DESMI. The special shape ensures the highest possible applied UV dose to all organisms in the treated water.

This enables IMO and USCG compliant management under even very adverse conditions with low UV transmission. The CompactClean UV unit is delivered in 6 sizes with max flow rate from 135 m^3/h to 1500 m^3/h.

UV unit for 750 m^3/h

UV unit for 340 m^3/h

UV-T

92%
Brisbane,
Australia

UV-T

74%
Houston, USA

UV-T

49%
Shanghai,
China

Port	UV-T
Istanbul, Turkey	95%
San Pedro, CA, USA	95%
Vera Cruz, Mexico	94%
Halifax, NS, Canada	94%
Rotterdam, Netherlands	93%
Port of Singapore	93 %
Skagen, Denmark	92%
Brisbane, Australia	92%
Porto Grande, Cape Verde	92%
Wallhamn, Sweden	91%
Houghton, MI, USA	91%
Melbourne, Australia	87%
Erie, PA, USA	87%
Zeebrugge, Belgium	85%
Gothenburg, Sweden	85%
Charleston, SC, USA	84%
Tanjung Pelepas, Malaysia	83%
Baltimore, MD, USA	83%
Hong Kong, China	80%
Houston, TX, USA	74%
Hamburg, Germany	69%
Antwerp, Belgium	66 %
Bremerhaven, Germany	60 %
Shanghai, China*	55 %
New Orleans, USA	54 %
Lisbon, Portugal*	53 %
Brunswick, GA, USA	51 %
Southampton, England	51 %
Shanghai, China*	49 %
Lisbon, Portugal*	41 %

** In the same port the UV-T can vary from day to day depending on tide, weather (rain and strong wind), and season. Source: DHI & DESMI Ocean Guard*

Down to UV-transmission of just 42% - Also in US territory!

The CompactClean BWMS has both IMO and USCG type approval, and the BWMS operates in the exact same way both inside and outside US Territory at record-breaking low UV transmission values! This enables compliant performance anywhere in the world in even very dirty and challenging water conditions. System optimized for IMO performance is also available. This superior performance comes from the unique shape of the UV chamber, which has been carefully developed and optimised through hundreds of state-of the-art CFD (Computational Fluid Dynamics) simulations.

What is UV transmission?

UV-T is a measure of the capability of UV light to penetrate water. When the UV-T is high, close to 100%, the water is very clear, and the UV light can penetrate deep into the water. On the other hand, when the UV-T is low, the water is very unclear, and the UV light can only penetrate a limited distance into the water.

Clearly, the UV-T of the water to be treated is of utmost importance. To kill or render an organism nonviable, a certain UV dose is required, and the applied UV dose is directly proportional with the UV intensity. Therefore, when the UV-T is low, significantly more UV power is needed to treat the water according to the required discharge standards.

Limitations of Ballast Water Management Systems

It should be acknowledged that all BWMS have limitations. Typically, chemical systems (e.g. electrochlorination) have limitations related to the salinity of the water to be treated, its temperature or the amount of organic material contained in the water; whereas UV based BWMS have limitations with regard to the UV transmission of the water to be treated. In other words, all BWMS have special circumstances under which they cannot be expected to treat the water according to the IMO and USCG discharge standard. The trick for the ship owner is to select a BWMS that will work under normal operational conditions.

UV Transmission of Ballast Water

The UV-T found in different ports around the world varies significantly. Some ports are located at river estuaries, which means that the water in the port is fresh water containing high amounts of sediments, organic particles, and dissolved organic compounds. This makes the UV-T very low. Other ports are located on islands in the middle of an ocean, and here the UV-T is typically high. In the same port the UV-T can vary from day to day depending on tide, weather (rain and strong wind), and season.

The CompactClean system has proven to work even in the most challenging conditions. An example is in the Yangtze river, where ballast reports from the system log that we are treating this extremely challenging water at 76% of the Treated Rated Capacity (TRC), meaning a CompactClean-1000 system will treat 760 m^3/h. BWMS reports can be shared on request.

SAFETY ON BOARD ANY SHIP

- INCLUDING OIL AND CHEMICAL TANKERS

The CompactClean BWMS is available in an ATEX and IECEX certified version, making installation in hazardous zones on board oil, chemical or gas tankers possible. The EX certification notation is:

Ex II 2G Ex IIB T4 Gb

and is based on the following components:

- UV sensor: Ex ia
- Temperature: Ex ia
- Pressure: Ex ia
- Water level: Ex ia
- Junction Box: Ex d
- Valves: Ex d
- Motors: Ex d
- UV lamp assembly: Ex d
- Pumps (mechanical ATEX approval)
- Flow meter: Ex d ia [ia]

DESMI guarantees a distance of up to 100 m / 328 ft. between the main panel and the Ballast Water Management System.

Safe Zone

Hazardous Zone

(zone 1)

The CompactClean is delivered with a standard electrical panel and HMI screen. Additional remote HMI screens, interfaces, and customized layouts can be added

The BWMS is delivered with an air-cooled main panel that can be placed in any convenient place. The main panel is equipped with an HMI screen, from which the system is controlled, and alarms visualized.
All operations can be done and monitored from additional remote HMI screens in the deck control office or from the bridge, if option for installing remote control screens is used.

Standard fully automated operating modes for treatment are:

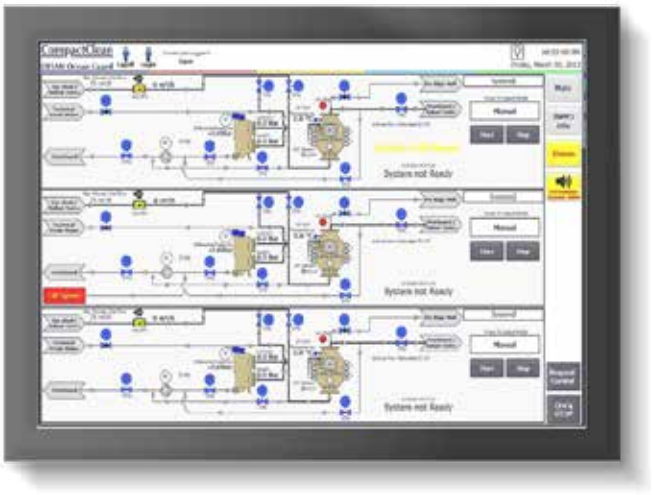
- Ballast
- Deballast
- Stripping
- Cleaning In Place

Other automated modes which can be selected are:

- Water Filling
- Recirculation

On the HMI screen, the operator can switch between several screen views (main page, active alarms, alarm history, P&ID page, and UV drivers) to display all relevant information. During operation, the status of all components and sensors can be monitored, and operational values such as flow, pressure, temperature and UV intensity can be viewed instantaneously; and trend curves can be displayed to see the development over time.

9" HMI Screen
– System in Ballast mode



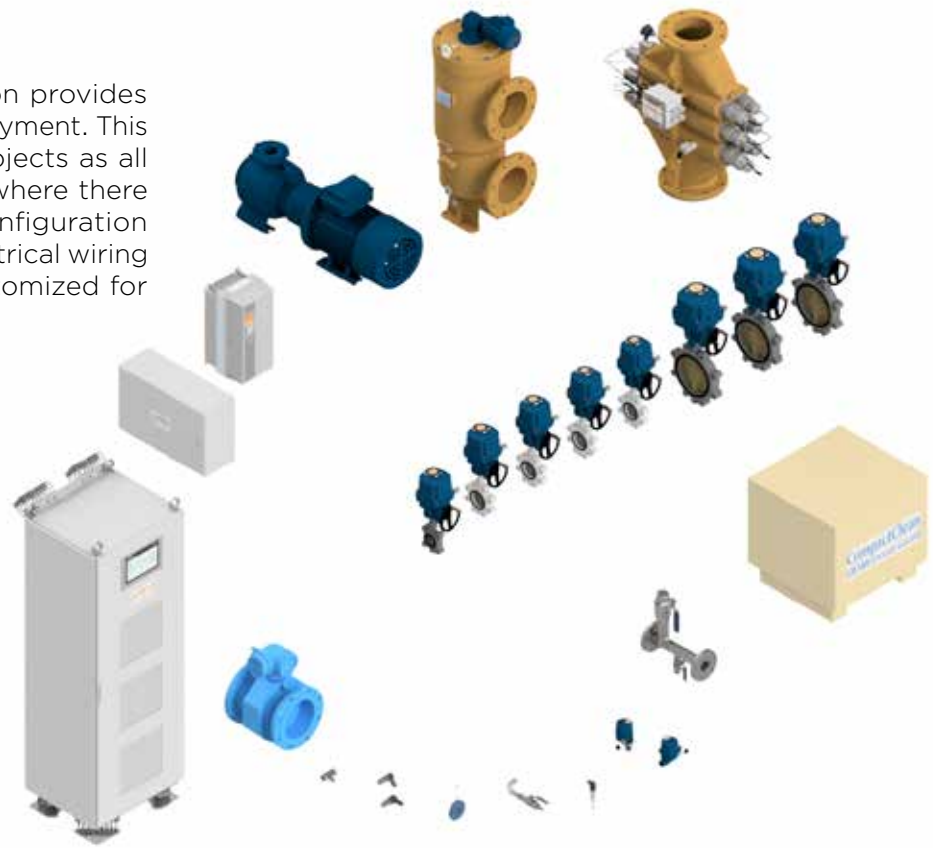
15" HMI Screen
– Split screen view, showing three systems

SYSTEM CONFIGURATIONS

The CompactClean system can be ordered in three different configurations as shown below. The three configurations are available in both a Non-EX type and an IECEx type of systems for safe zone and hazardous zone installations, respectively.

Loose Component Delivery

The loose component configuration provides maximum flexibility in terms of deployment. This is the typical choice for retrofit projects as all components freely can be placed where there is enough room for them. This configuration contains all components except electrical wiring and pipe spools, which will be customized for the vessel.



Skid Mounted Delivery

The skid mounted configuration is a fully assembled system installed on a skid. The system has been optimized for a very low footprint. This is a plug and play solution, which makes the installation seamless.

Deck House Delivery

The deck house configuration is designed for vessels with no room for a BWMS below deck. It is typically chemical tankers with submerged ballast pumps that has this challenge. The deck house can be delivered with or without a booster pump. This configuration is plug and play and can easily be installed on deck.

TRAINING PACKAGES

DESMI Ocean Guard offers various training packages for CompactClean Ballast Water Management Systems. It is of utmost importance that the crew has been familiarized with the system and has enough knowledge to operate and maintain the system - this ensures problem-free ballast operations.

The training can be tailored to specific needs and is available as onboard training modules, at our shore training facility and/or self-training with our Computer Based Training. Below an overview of various training packages for CompactClean BWMS. For further details please contact your DESMI sales representative.

✓

On board Training

During commissioning of the system or crew change

✓

Shore Facility Training

Classroom and hands-on experience for crew and shore personnel

✓

Computer Based Training

Offline self-training and simulation software

Service App

The DESMI Ocean Guard Service app has been designed to help the crew operating the CompactClean system. The app provides access to manuals, guides, and FAQ making it easier to maintain and operate the system.

Furthermore, it can give a 3D Augmented Reality View of the system. It then gives the technician the possibility to walk around and inspect a 3D model in front of him. The app is free for download in Google Play and AppStore.

Computer Based Training (CBT)

The CBT offline training tool allows you to get familiar with the operation of the CompactClean BWMS in a controlled environment on any PC. The CBT is offered free-of-charge to any customers and personnel handling the CompactClean system.

With the CBT training tool, customers have easy access to a complete training course with an inbuilt system simulation, which includes component and system descriptions and troubleshooting and maintenance manuals.

Our BWMS Services

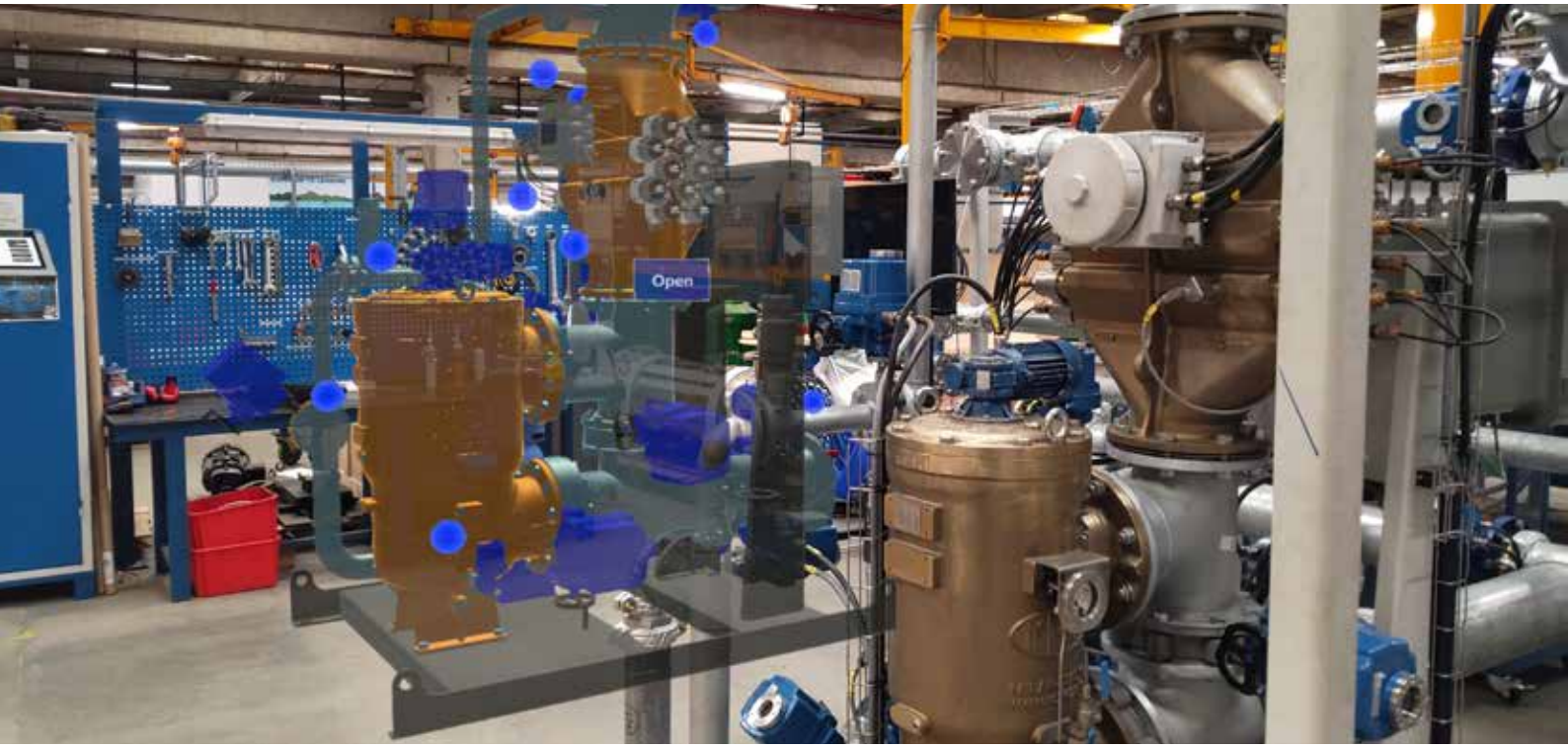
- ✓ Ship Inspections
- ✓ Engineering
- ✓ Delivery of systems
- ✓ Commissioning
- ✓ Service Agreements

We Offer Our Services Throughout the Projects

Besides our products, we also offer complete engineering including ship inspection, 3D laser scanning, preparation of drawings, and if needed, we can offer prefabrication of piping and commissioning plus service agreements, where we take care of keeping your ballast water management systems running flawlessly.

Engineering package

The engineering package includes finding space for and integrating our CompactClean™ BWMS on your vessel. This includes ship inspection, development of 3D CAD drawings, and generation of production drawings.



Phase 1: Scanning, processing and producing a 3D as built environment

- Work preparation
- Measuring on board (3D laser scanning, 1 day)
- Inspection of possible locations for installation of equipment
- Check tie-in location into existing piping
- Check wire routings, cable penetrations, available space for additional breakers in main switchboard
- Check for structural modifications in case required
- Processing of laser scans after shipboard visit

Phase 2: Engineering

- Concept model of proposed system, modeled in the available space. Delivered as screenshots in a .pdf file.
- First proposal of possible lay-out and installation
- Update ballast water diagram to new situation

Phase 3: After approval of location of the treatment system by Client:

- Preparation of documents for Class approval
- Material specification of piping and valves
- Updated ballast water diagram with treatment system included
- Updated Load Balance
- Updated Single Line diagram
- Additional Class requirements will be discussed on case by case basis
- Routing of piping
- Isometric drawings for fabrication of piping including material specification
- Production drawings for all necessary foundations
- Overview drawings for installation
- Part lists of all materials needed for the installation but outside the scope of supply of the CompactClean system, including cable lists, valves, bolts, nuts, gaskets, pipe supports.
- Installation guide with instructions.

TYPE APPROVALS

The CompactClean BWMS is type approved in accordance with the IMO BWMS system code (also referred to as the revised G8), USCG, and multiple classification societies. The BWMS system code has become mandatory for BWMS system installed on vessels after October 2020 and as such in force today!

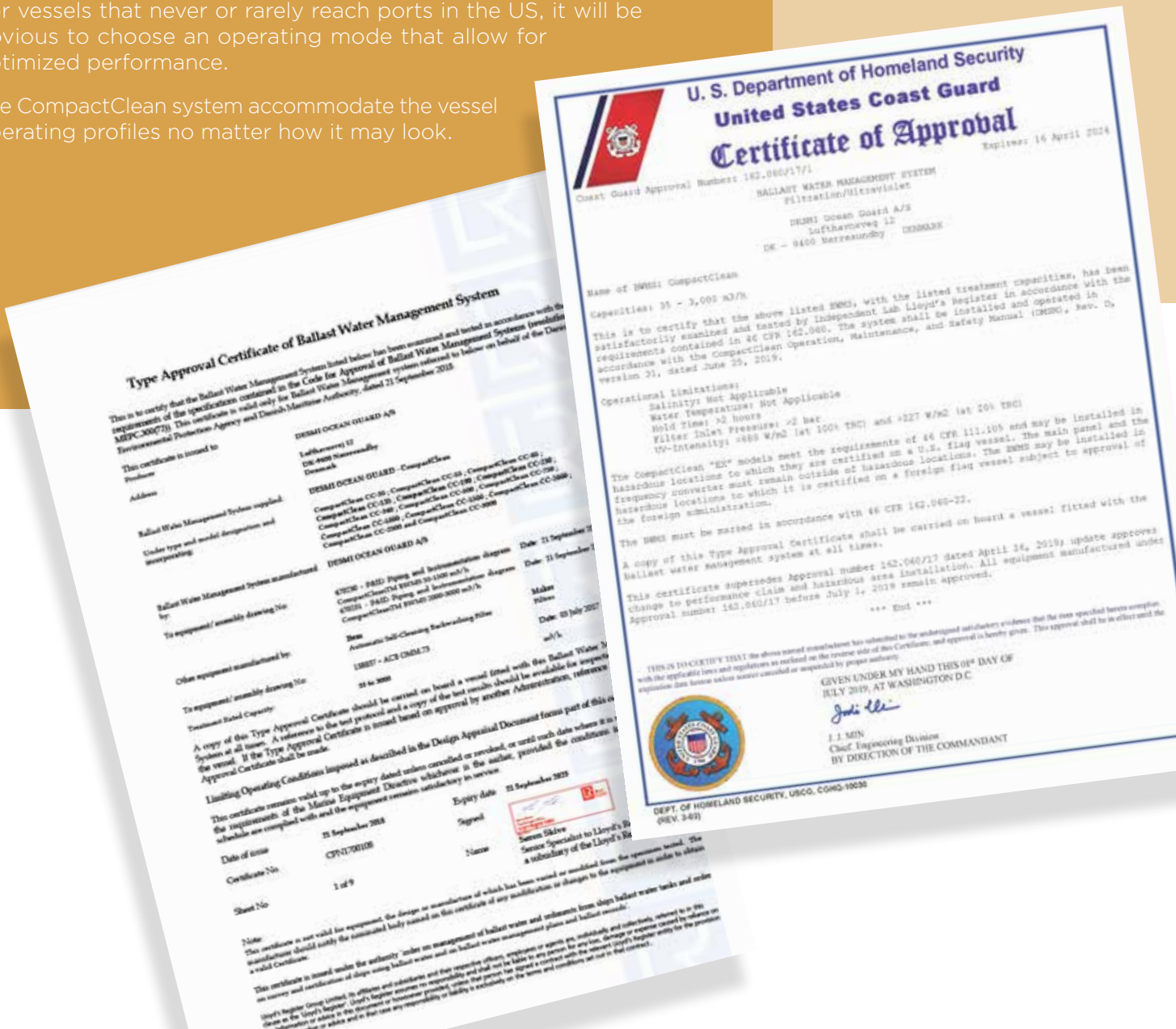
Same operating mode all over the world – or optimized performance outside US territory.

On the one hand, the CompactClean system does not need a special US operation mode to meet the USCG requirements in US territory, while the system also provides an option for optimized performance outside of US territory.

With just one operation mode used globally, there is no need for knowing the de-ballast location at the time of ballast uptake to determine if the BWMS should be operated in IMO or US mode. Naturally, the selection of either IMO or US mode becomes quite complicated if the operator does not know where the ballast water he is taking on board is going to be discharged. Having one mode used globally this issue has been solved.

For vessels that never or rarely reach ports in the US, it will be obvious to choose an operating mode that allow for optimized performance.

The CompactClean system accommodate the vessel operating profiles no matter how it may look.



CompactClean Installation on Board

PROVIDANA

The 1000 m³/h installation of DESMI Ocean Guard's CompactClean system was conducted in Chengxi Shipyard on the vessel Providana owned by Masterbulk Pte Ltd.

The installation was a full integration of the system, which included:

- A full 1000 m³/h CompactClean BWMS
- An additional valve package and control system
- Frequency converters on the ballast water pumps
- Deck office operative system
- Internet uplink system

Kevin Leach-Smith, Vice President, Operations, Master-bulk Pte. Ltd.:
"We chose DESMI's CompactClean system because of the very small footprint and our trust in DESMI as a well-established supplier of marine equipment. An installation like this is a large project and requires good cooperation between the owner, technical manager, shipyard, and system supplier. All parties did a professional job in making this BWMS installation a smooth and efficient process."

Ship's name	MV "PROVIDANA"
Ship type	General cargo/Container Carrier/(DNV) I.D. no. 26604
IMO number	9380788
Built	OSHIMA Shipbuilding Co.,Ltd.-Japan / Ship Hull No. 10508
Flag	Singapore
LOA	212.5 metres / 697 feet
GT	39,258 MT
DWT	54,810 MT
Ballast cap.	17,833 MT

WORLDWIDE SERVICE

DESMI has for more than 185 years serviced and supported our full product range. One of the key factors in being around for this long is: *Reliability and trustworthiness and having a profound respect for our customers and their needs.*

The DESMI Service Team operates globally and around the clock. We can offer all services from simple advice over the phone to full on-site maintenance and service programs. The team is highly experienced, factory-trained and fully capable of meeting both your technical and practical demands.

The DESMI DeServe Team can also offer customized programs to meet specific client requirements and be your preferred partner of choice. In case of emergency breakdowns or equipment life-time support.

We can send most equipment within 48 working hours or access our global parts database and ship out needed spare parts from one of our reginal warehouses often from day to day to ensure your DESMI equipment is always operational.

Our dedicated global DESMI Service Team delivering local service

Tailored services to your specific needs

DESMI always strives to provide our customers with the very best service!

That's why we have established DESMI DeServe - your guarantee for an excellent service 24/7/365.

DESMI DeServe offers a wide range of services to your DESMI BWMS system, to ensure easy and trouble-free operation of your system.

We know that not two customers are alike, therefore we also believe that understanding your needs and demands is the key to a long lasting partnership in servicing your DESMI equipment.

Our service program is therefore put together to offer our customers the highest flexibility to meet the expectations of keeping your BWMS system compliant in the most cost-effective way

Packages

- Pre-commissioning survey
- Yearly compliance survey
- 2,5 years' service
- 5 years' service
- Up-link support
- Training programs

Your DESMI Ocean Guard Contact for Ballast Water Management Systems

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