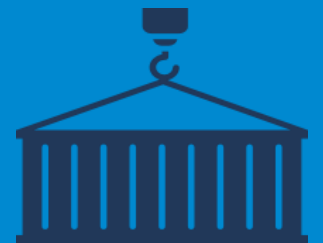


INNOVATIVE BALLAST WATER MANAGEMENT

Bawat's take on Ballast Water Management



INNOVATIVE BALLAST WATER MANAGEMENT

Bawat's take on Ballast Water Management by Kim Diederichsen, CEO

WELCOME



INTRODUCTION

PROJECT
STATUS

TECHNOLOGY

SHIP
BWMS

A GREEN
SOLUTION

MOBILE
BWMS

INTRODUCTION

Business Concept

Develop, type approve and bring to market optimal technologies for ballast water management

Ownership

- MP Investment Management A/S
- The Danish Maritime Fund
- Homarus Holding A/S
- Return ApS
- Management

Management

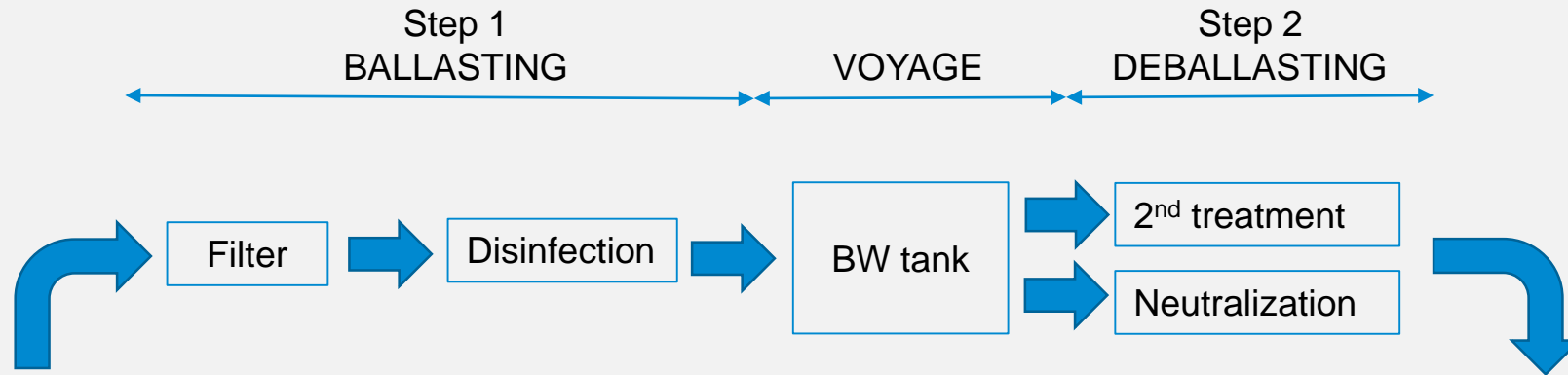
- Klaus Nyborg, Chairman BoD
- Kim Diederichsen, CEO
- Ole Lüthcke Christensen, CTO

Company established in 2011

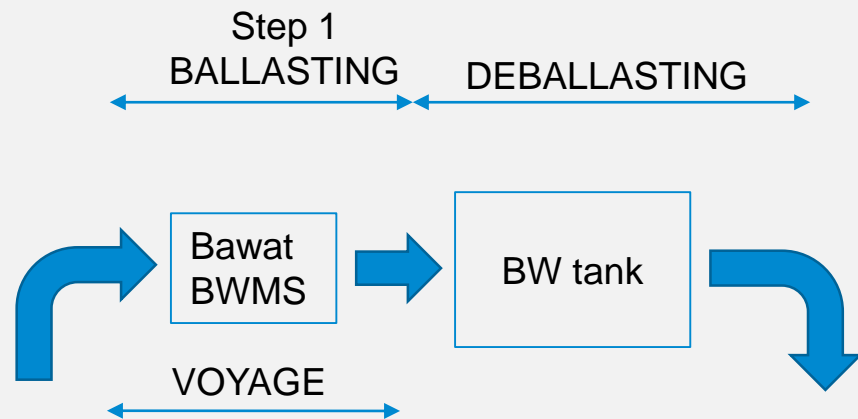
Certificates

- IMO Type Approval by DNV-GL - October 2014
- IMO Type Approval by BV - May 2015
- ABS Certificate of Design Assessment – June 2015
- U.S. Coast Guard AMS - February 2015
- U.S. Cost Guard Type Approval testing ongoing

IN-LINE BWMS VS BAWAT BWMS



**In-Line BWMS
Two Step Treatment
Process**



**Bawat
One step treatment
process**

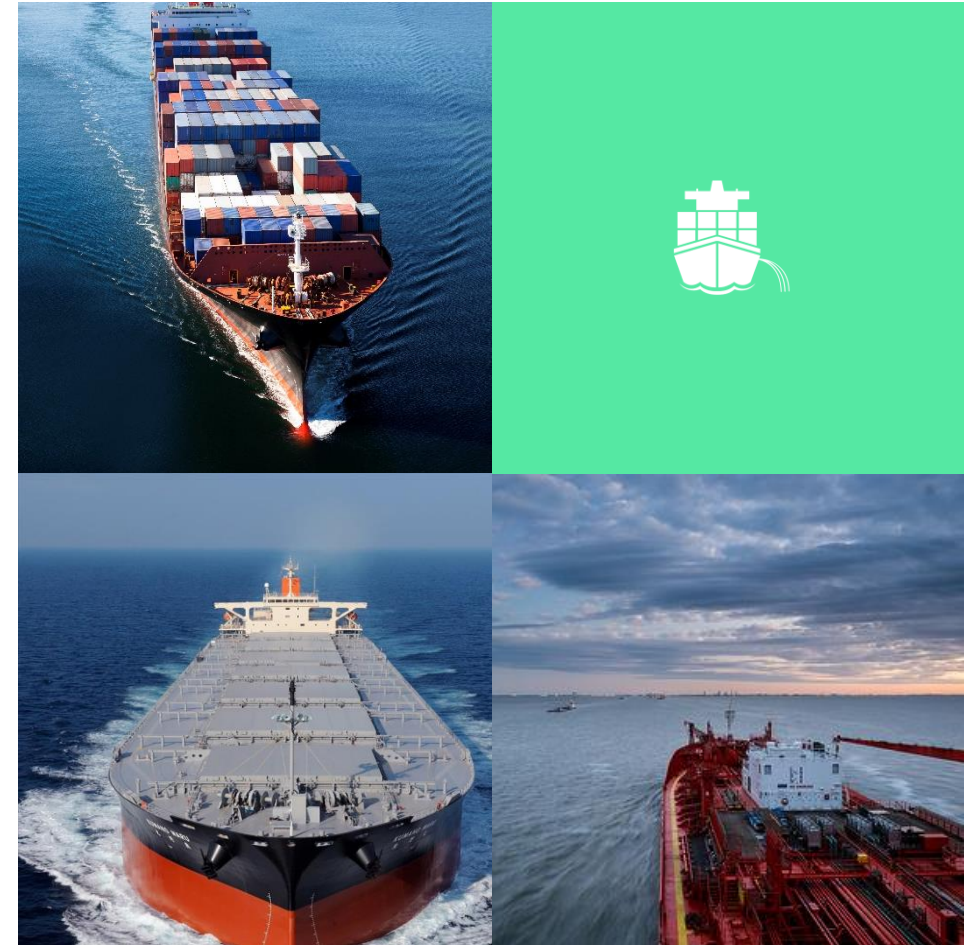
SEAMEN'S LIFE HAS CHANGED



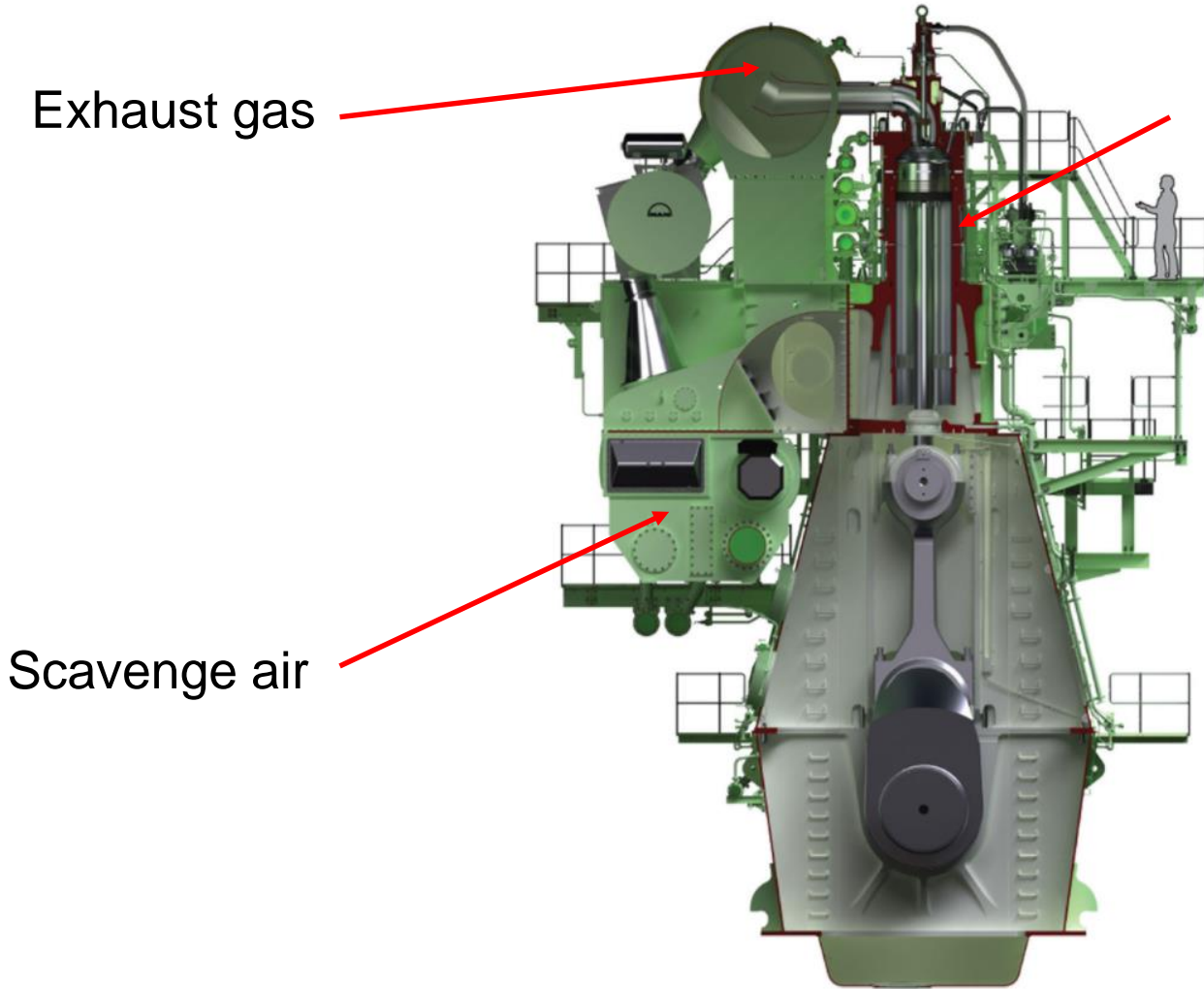
- Always busy while in port – cargo operation has priority and time is of essence
- Port State control and Vessel inspection by authorities
- Vessel bunker operation often conducted while in port – full attention required!
- Provision and spares are taken onboard
- Maintenance and service work conducted.

BAWAT BWMS

- Ballast water treatment is taken to sea and conducted while sailing – thus reducing risk and workload while in port.
- While sailing crew will prepare the vessel for upcoming cargo and ballast operations.
- Depending on the vessel type and trading pattern different operational treatment methods are valid.

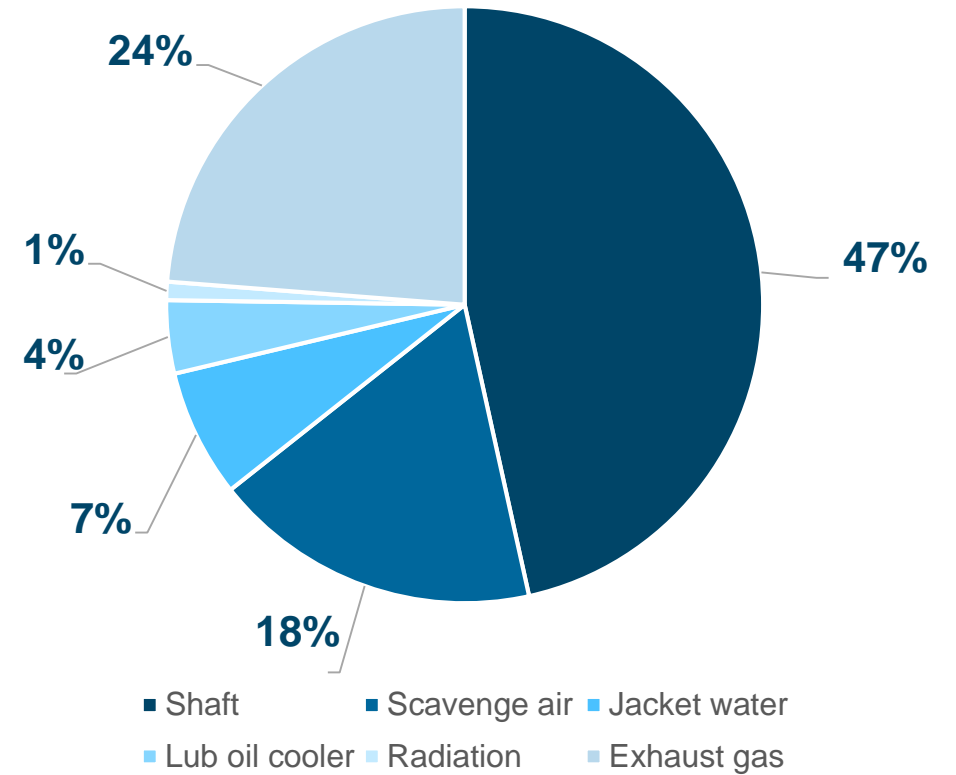


THERE IS ALWAYS HEAT AVAILABLE

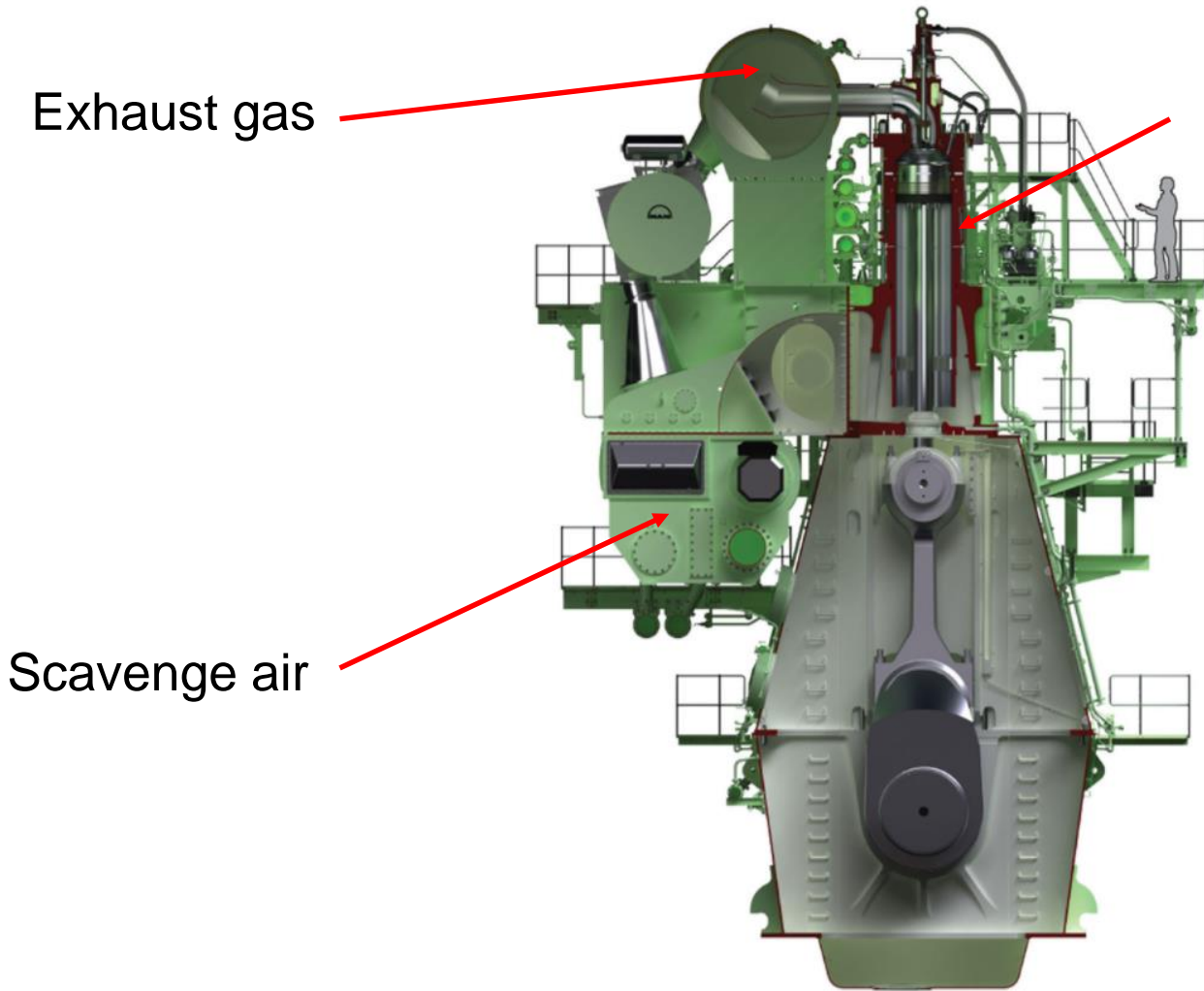


Jacket water

100 % Main engine power

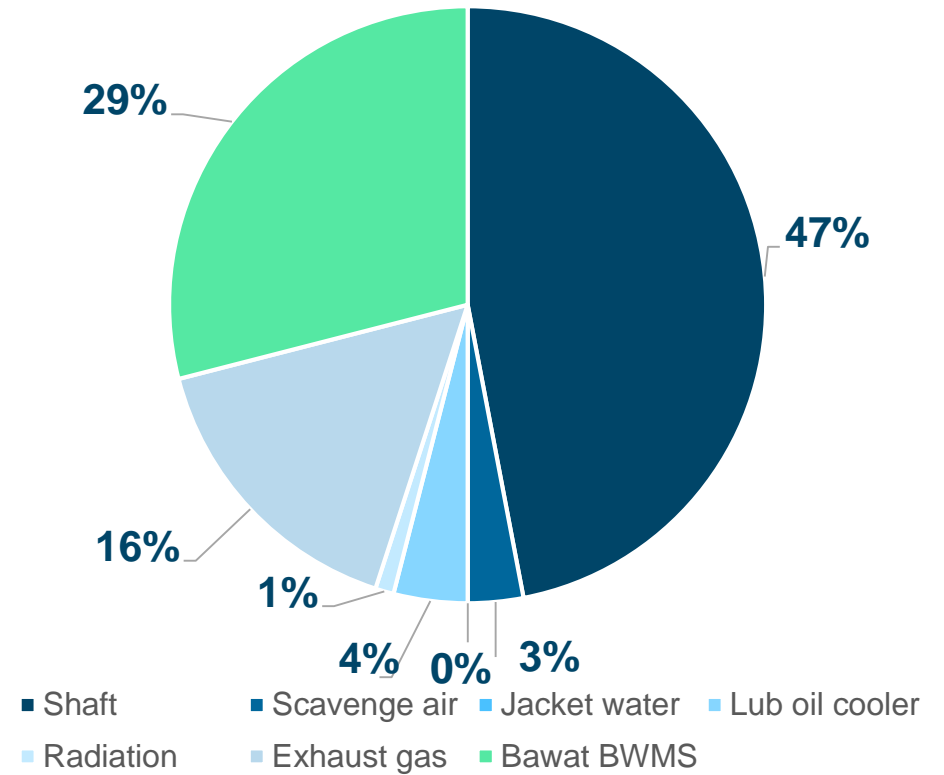


THERE IS ALWAYS HEAT AVAILABLE FOR BWMS

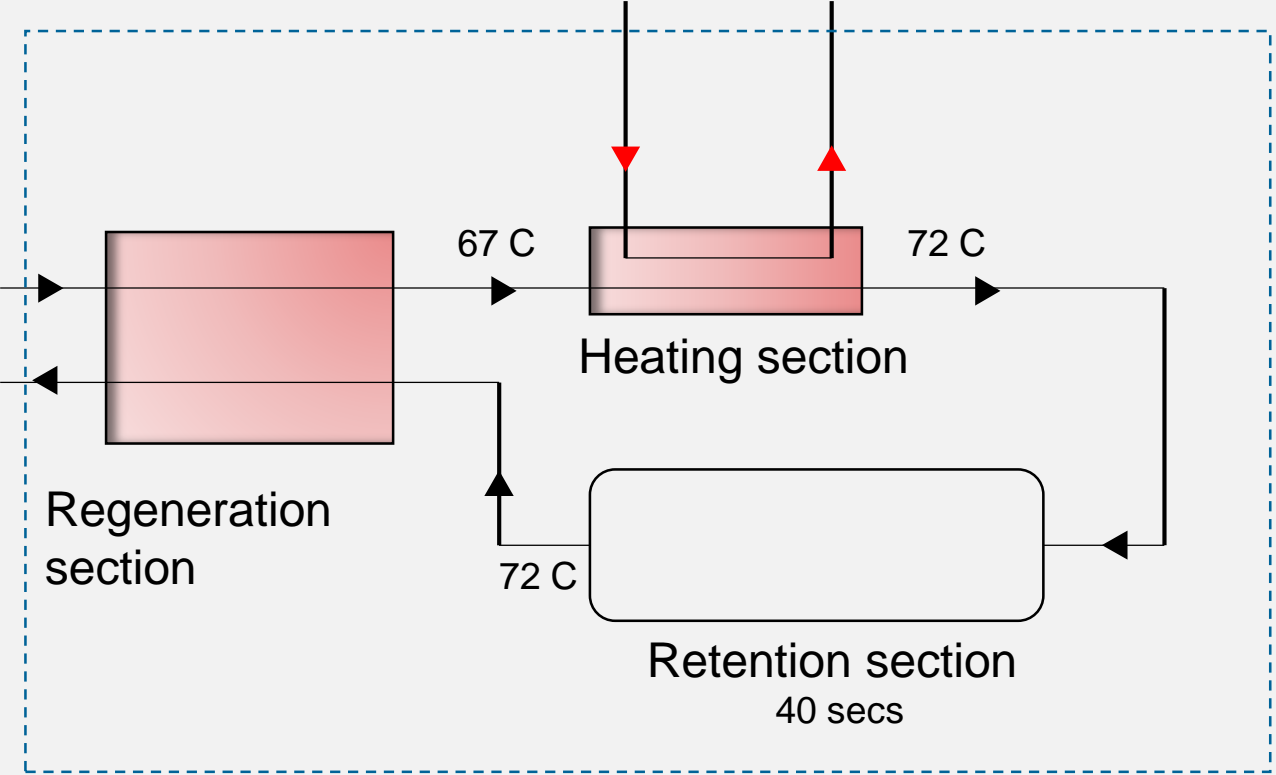


Jacket water

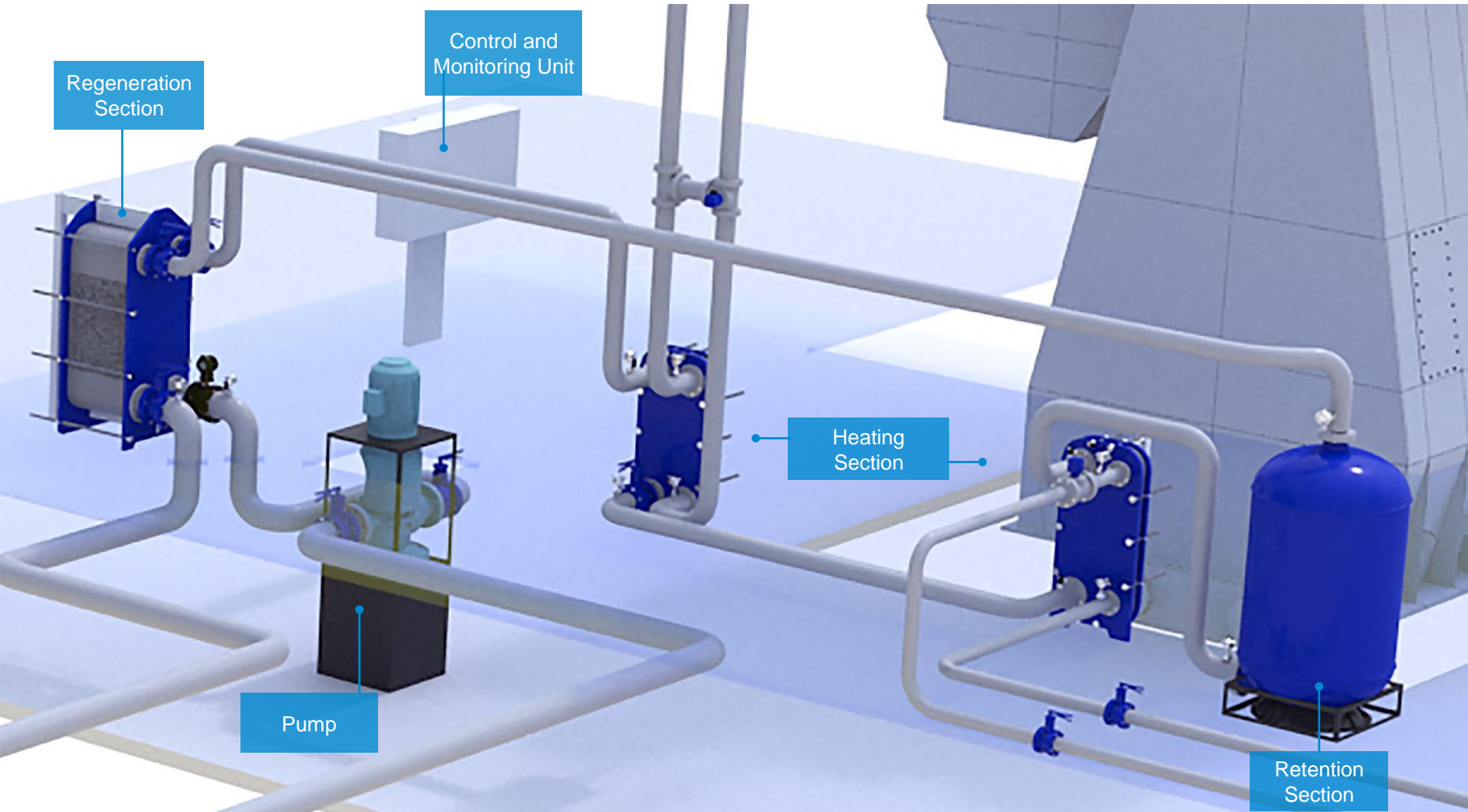
100 % Main engine power



BAWAT PASTEURIZATION TECHNOLOGY

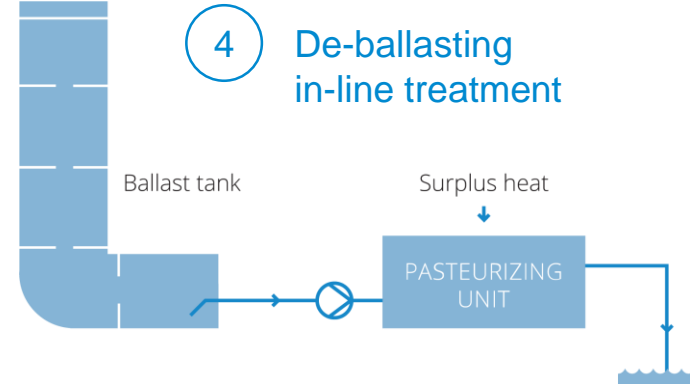
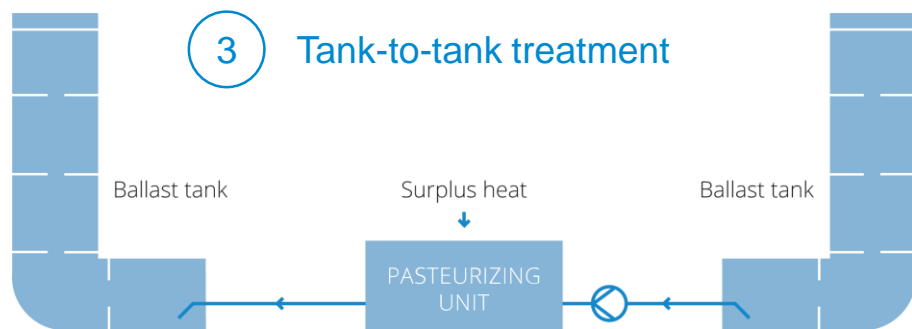
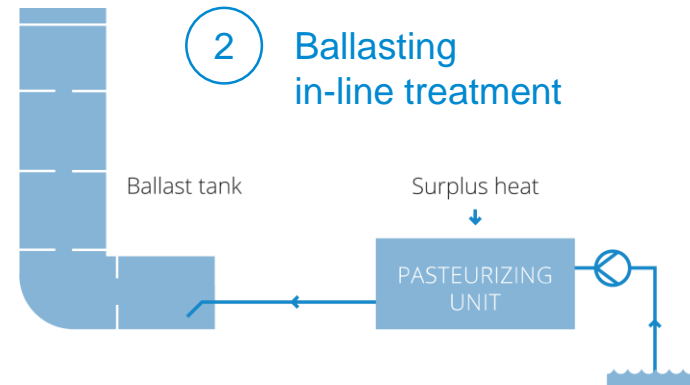
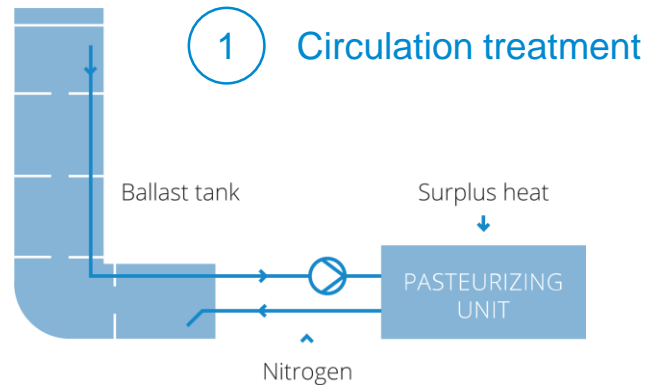


BAWAT BWMS



When ballast water has passed through the Bawat system ballast water can be discharged in compliance with BW discharge standards

OPERATIONAL METHODS



The Bawat BWMS can be applied in different configurations

- 'Circulation Treatment' within a ballast water tank.
- From sea chest to a ballast water tank.
- From one ballast water tank to another ballast water tank.
- From a ballast water tank to overboard.

GREEN TECHNOLOGY



NO UV



NO CHEMICALS



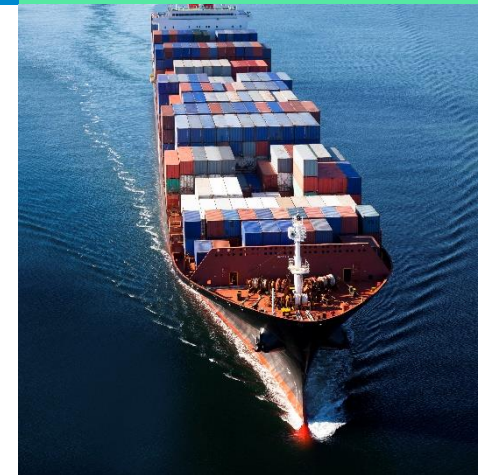
NO FILTERS



GREEN TECHNOLOGY

The Bawat BWMS is based on a unique technology that exploits on-board waste energy to treat ballast water in-voyage.

It is an effective and green technology based on pasteurization and it comes with marked benefits in ballast water management.



- Efficient in all water turbidities, salinities and temperatures.
- Proven standard marine components only.

UNIQUE BUSINESS MODEL

Bawat BWMS is 100% scalable

The system fits most vessel segments and sizes

Main components sourced from international high-end marine suppliers

NO in-house production reducing risk during peak of BWMS retrofit period

Partner set-up in 25 Countries and more to come...



STAKEHOLDERS



The Danish Maritime Fund

The Danish Maritime Fund was established in 2005. The Fund's objective is to offer financial support to initiatives that can serve to develop the Danish maritime industry. This is done through financial support for research, technology and product development, training, recruitment and other types of initiatives with a maritime focus.

www.dendanskemaritimefond.dk



The Danish Green Investment Fund

The fund is provided with up to DKK 5 billion of loan capital to invest in various projects facilitating the sustainable development of society. Environmental considerations and commercial business are two sides of the same coin.

gronfond.dk



The Market Development Fund

The aim of the Market Development Fund is to promote growth, employment and export, particularly for small and medium-sized enterprises in areas where Denmark has particular strength and potential. These areas include conversion to green technology, health and welfare solutions, design and other create professions, etc.

www.markedsmodningsfonden.dk



Miljø- og Fødevareministeriet
Naturstyrelsen

The Danish Nature Agency

Part of the Danish Ministry of Environment, the Danish Nature Agency implements the government's policies concerning nature and environment. The Nature agency aims to secure clean water, protecting and securing nature, planning for cities and landscape, outdoor activities and information to the public about nature, forestry and land management of the state forests, gaming and wildlife management.

www.naturstyrelsen.dk

BAWAT TECHNOLOGY VALIDATED BY HARD TO ACHIEVE EU INNOVATION FUNDING

Bawat's BWMS is being viewed as a most promising candidate to underpin Europe's competitiveness in the global marketplace.

The EU Horizon 2020 innovation grant, worth 2.4 million EUR, will enable Bawat to meet the goal of system type approval by the USCG.

"By having qualified for support from the European Union Research and Innovation Programme (Horizon 2020) we have become part of an exclusive group of innovators. We see this as a validation of our system and of our company. The EU Commission is trusting us to become a solid player in this dawning market," Kim Diederichsen, CEO, Bawat A/S.

- The target for U.S. Coast Guard approval is by Q1 2019.
- This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No N°756288.



USCG TA: TIMELINE



Pre-tests Readiness Evaluation

- Pre-tests successfully carried out during 2017 to optimize process parameters.
- Readiness Evaluation package submitted to USCG.



Land Based Tests

- 15 'bioefficacy' tests in 3 salinities.
- Test period: approx. 2 months. System operated by DHI personnel.
- Tests supervised by Lloyd's Register.

On-site record!



Ship Board Tests

- Hardware installed onboard X-Press Karakoram – commissioning ongoing.
- Tests to commence Q2-2018



- USCG TA Expected Q1-2019

WHAT TO DO IF EVERYTHING FAILS?



- Discharge anyway?
- Not really an option!

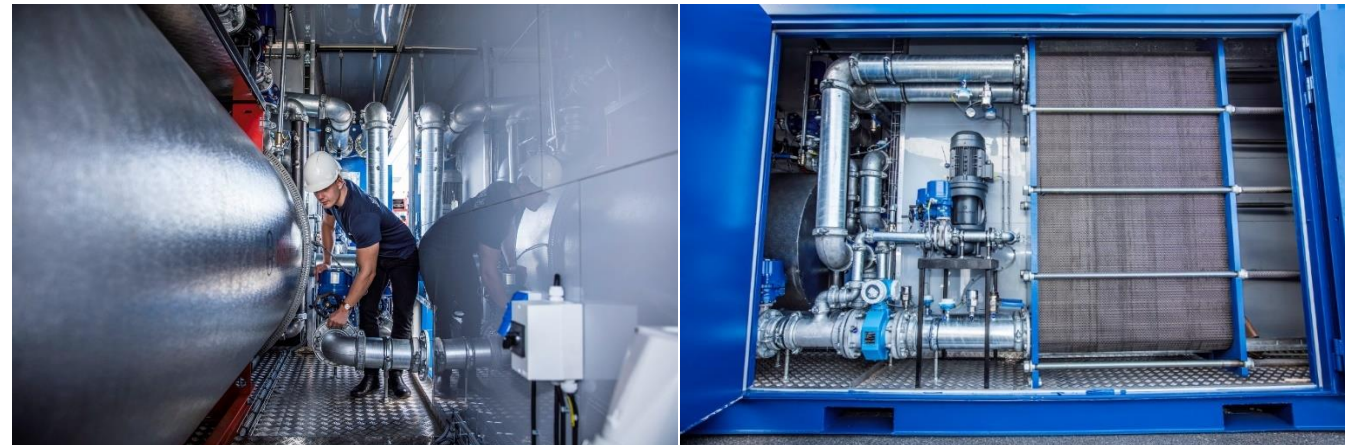
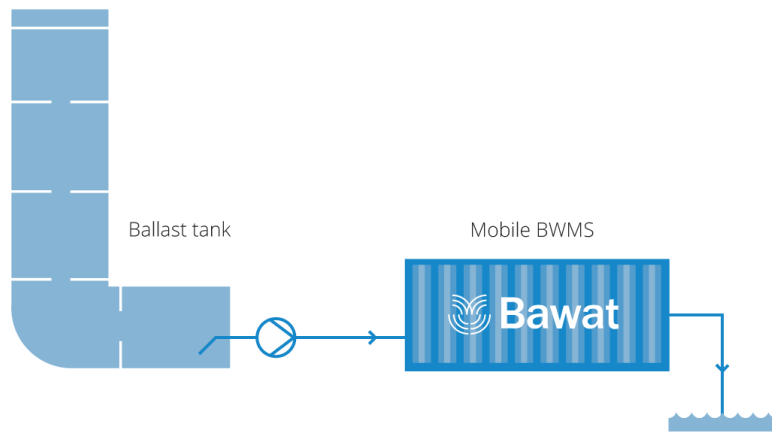
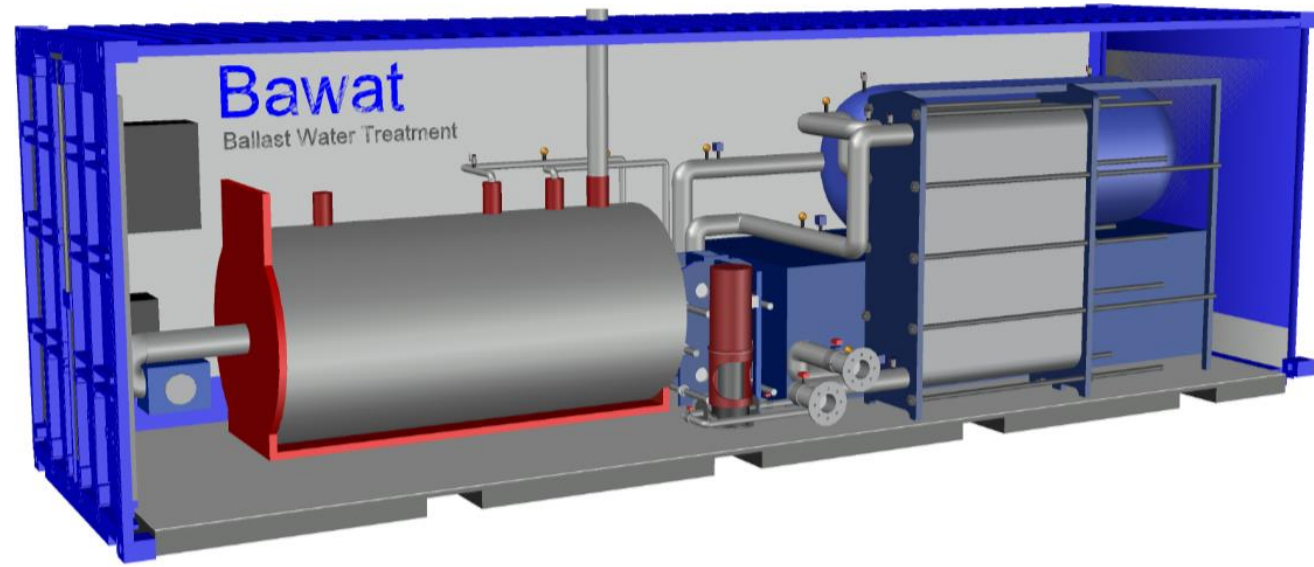
- If available use port reception facility?
- Expensive and not flexible on location

- Bawat's Mobile BWMS?
- Mobile, flexible and not expensive

MOBILE BWMS

Based on the innovative pasteurization technology Bawat offers a mobile containerized solution for ports, terminals and shipyards.

Treats ballast water in a one-pass operation from ship to harbor using the vessels ballast pump.



MOBILE BWMS



BAWAT BWMS INSTALLED LPG TANKER



INSTALLATION ONGOING TSH DREDGER



TURN-KEY IN-VOYAGE INSTALLATION - CONTAINER VESSEL



THANK YOU

www.bawat.com