



Yardtech S.A. proudly presents DAMEN GREEN SOLUTIONS



Green Solutions Priorities

- Evaluate the solutions available in the market
- Establish partnerships with the leading manufacturers
- Create retrofit service packages that cover every aspect of the design, installation and compliance process
- Design a mobile in-port ballast water treatment unit
- Make the systems and services available throughout DAMEN's global network

Inside This Issue

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- Ballast Water Treatment Port Solutions
- Ballast Water Treatment Retrofit Solutions
- SOX Scrubbing
- Contact Damen Green Solutions and Yardtech Marine Services S.A.

About Damen Green Solutions



Damen Green Solutions is a member of the Damen Shipyards Group (1927), an international shipbuilding, repair and conversion group with more than 9,000 employees working at 32 yards worldwide.

Since 1959 Damen has built over 5.000 vessels and annually delivers around 160 vessels across a wide range of types and capabilities.

Taking the lead in cost-effective solutions for ballast water management Damen recognised the need to start addressing the ballast water management challenge several years ago when it began investing in the development of ballast water treatment products and solutions.

This led to the establishment of a new company Damen Green Solutions B.V. located next to Damen's headquarters in Gorinchem, the Netherlands.



“Wherever you are,
Whenever you need us,
DAMEN GROUP is there”

WORLDWIDE SOLUTIONS

Installation of a SOx scrubber system can be done at one of our Damen shipyards conveniently located worldwide. We can also install or supervise at a location of your choice or even during operation.



BALLAST WATER TREATMENT PORT SOLUTIONS

There are many reasons why proper ballast water treatment can't take place onboard a vessel in the traditional way Damen Green Solutions recognized this very early and developed the world's first and only mobile, single-pass, ballast water management system: the InvaSave 3C0.

BALLAST WATER TREATMENT RETROFIT SOLUTIONS

Damen Green Solutions offers comprehensive and cost-effective total BWT solutions that cover the entire process of choosing and installation. The stages involved include system selection, survey &

3D scanning, engineering, procurement, installation, commissioning and training.

SOX SCRUBBING

Damen Green Solutions offers shipowners a smoother transition towards compliance with new environmental regulations and cleaner sailing. The synergy between Damen Green Solutions and DSC provides owners and operators the very realistic benefits of proven project management skills, reduced downtime and informed product selection in relation to Exhaust Gas Cleaning systems, exhaust after-treatment, NOx reducer systems and LNG conversions.

Our Advantages

- Central co-ordination
- Cost effective total package
- Optimized turnaround times
- Leverage Damen buying power
- Partnerships
- Secured supply chain
- Totalcare
- Logistics support
- Experience, flexibility & trust
- Worldwide service network
- In depth SOx scrubbers knowledge

DAMEN: YOUR GLOBAL PARTNER FOR BALLAST WATER COMPLIANCE

ONE STOP SHOP RETROFIT WORLDWIDE

Ballast water treatment. Many rules, many things to do. At Damen you will find one-stop-shop solutions for the retrofit market. Our clients ask for compliant operation and life cycle support – so that's what we deliver.

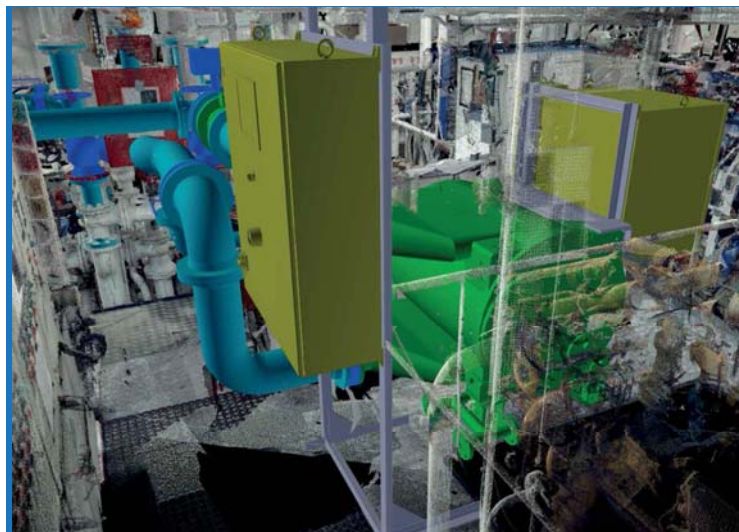
RETROFITTING

We understand that retrofitting a ballast water treatment system is not simple and that many factors have to be taken into account, such as:

- Footprint & maintenance space
- Power consumption
- Piping & tie-ins
- Pressure drop & ballast pump capacity
- Integration of controls
- Internal transportation
- Approvals and class requirements
- CAPEX & OPEX

TAKING CARE OF BOTTLE NECKS

With thousands of vessels needing to comply with ballast water regulations, the market will face practical bottle necks. How will you deal with equipment supply, the engineering capacity, availability of (yard) facilities, class capacity and other related issues? How will you ensure one time right?



RETROFIT SOLUTIONS



COMBINING CAPABILITIES TO HELP U

Damen can help you. Damen has over 85 years of experience in shipbuilding and marine related conversions. We offer worldwide, comprehensive and cost effective one-stop-shop retrofit solutions. Either as a single turnkey project or as a step by step process - whichever best fits your operation and schedule.



PARTNERSHIPS

Damen's focus on standardization is undoubtedly one of its core capabilities when it comes to delivering ballast water compliance. We work with several selected major system makers in order to provide competitive efficient retrofit packages.

LIFE CYCLE SUPPORT

Our services do not stop after installation. We provide systems maintenance and deliver spare parts for retrofitted ballast water treatment systems.

PEACE OF MIND

Avoid high cost and avoid the rush. Be prepared and let us handle your ballast water treatment retrofit in a timely and co-ordinated way.

A STAGED APPROACH - ONE TIME RIGHT

Preparation is key for a successful retrofit project, onetime right. Damen is following a well defined process which includes:

- ✓ **System selection**
- ✓ **On board survey, 3D scanning & basic engineering**
- ✓ **Detail engineering**
- ✓ **Purchasing & delivery of material packages**
- ✓ **Full installation or supervision only**
- ✓ **Commissioning, start-up and training**

DAMEN BALCON EC 1500



EASY TRANSPORTATION

Fitting BalCon in a standard container means transport couldn't be easier. From your doorstep to your vessel in the smallest possible timeframe and at the lowest cost.

EXPLOSION PROOF

BalCon is also well-suited to tanker vessels (with submersible ballast pumps), where the deckhouse is installed on the weather deck. As an option, BalCon can be delivered as an explosion proof version.

PLUG AND PLAY

BalCon is an ideal 'plug and play' solution, with the absolute minimum of installation downtime for the vessel. It can also be used as a temporary system on barges/pontoons, or for example on vessels that are nearing the end of their life and need only to bridge a short period before being taken out of service and scrapped.

CLASS

Standard

- The Deckhouse is designed for placement on open deck
- Designed according to the rules of the major classification societies
- Designed for wave impact

Restricted to placement aft of the forward perpendicular, avoiding the bow area. When placed on a vessel exceeding the Aframax Class, the distance forward of the aft perpendicular is to be decreased in order to meet class approval.

Special deckhouses are designed on client request.



DAMEN: YOUR GLOBAL PARTNER FOR BALLAST WATER COMPLIANCE

DAMEN GREEN SOLUTION OFFERS EVERYTHING, IN HOUSE!

DGS acquired new systems to collection like *Electrolysis* and *Chemical Injection*.

This makes sure that DGS is also capable to offer complete solutions to larger vessels and tankers besides *UV techniques*.

DGS' current techniques are:

- ✓ *Pasteurization (heating water) (Bawat)*
- ✓ *UV & FILTER (desmi and bio sea)*
- ✓ *Chemical Injection (onetank & intank)*
- ✓ *Electrolysis (Ermafist & Ecochlor)*

BIO-SEA B02-0300 modular retrofit installation



MECHANICAL FILTRATION

- **20µm screen** to retain suspended solids and zooplankton
- **Sized to scale** depending on the flow rate to treat
- **Automatic backwash**
- **Additional suction pump** as standard to allow a complete and performing backwash
- **No disruption of the filtration process** during the backwash cycle and no significant variation of the treated flow rate



UV DISINFECTION

- **Titanium reactor** equipped with a single polychromatic, medium pressure, **high intensity UV lamp for optimum treatment results**
- High-quality quartz sleeve protecting the UV lamp
- Reactor designed with **only one lamp per reactor** minimizing the total number of lamps per system, resulting in lower operational costs
- Optimized design by CFD (Computational Fluid Dynamic) taking into account water quality (UV transmittance) and fluid speeds, **allowing for easier cleaning and maintenance**
- Lamp driven by electronic ballast allowing precise management of the UV lamp power to optimize its intensity, **reduce the power consumption** and prolong its life
- Monitoring through UV sensor to **adjust the intensity** for a compliant water treatment



MONITORING AND CONTROL

- **Standard fully automated operating modes** for ballasting, de-ballasting, cleaning and stripping
- Monitoring through sensors and PLC: UV and temperature sensors, flow meter, pressure transmitters, automatic valves
- **Touch screen interface** for easy friendly use, control and visualization
- **Recording of operations** and alarms covering 24 months, automatic generation of PDF reports
- Bus communication for remote control, integration to vessel automation system and control command

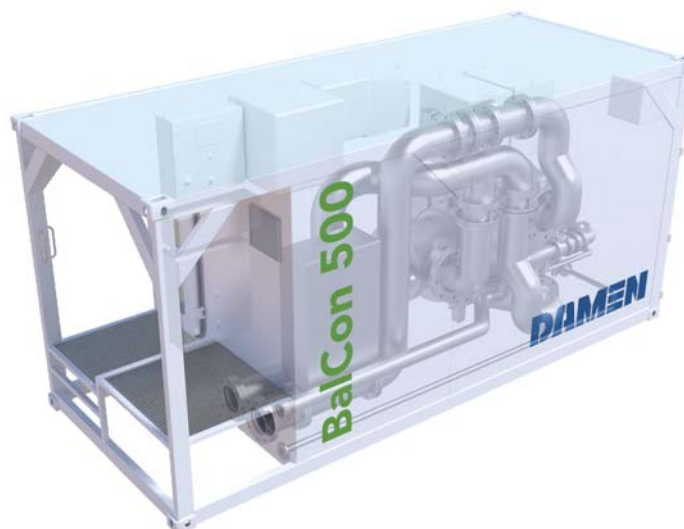
Option for an ultimate experience: remote control panels (7" or 15" auxiliary touch screen), RS 485 communication cabinet, BIO SEA Clean (automatic quartz sleeve cleaning system)

References:

NORTHSOUTH MARITIME Vessels for BWTS installation in DAMEN with UV BIOSEA SYSTEM.

ABDALA
LEONOR
MANUELA
MARIANA
CELIA
LIDIA
HAYDEE
CLODOMIRA
GERTRUDIS
JOSEFA

DAMEN BALCON EC 1500



GENERAL

Basic functions
Description

Ballast Water Treatment
The container is fitted with the NaOCl production part of the approved Desmi Ocean Guard BWT system. This solution is plug & play and suitable for placement on a weather deck.

BWT system
Treated rated capacity
Technology
Cleaning system EC

Filter & UV or Filter & Hypochlorite BWT 1500 EC
30-2000 m³/h ballast water
UV and sodium
Self-cleaning CTE cells

Power consumption

440Vac, 150 kW, 60 Hz

DECK HOUSE

Dimensions

20 ft container
•length 20ft
•width 8ft
•high 9'6ft

Gross Weight

± 8.000 kg

Wall thickness

6mm steel

Painting

Intershield, marine type

Detection

Fire detection

Lighting

230 V and a 24 V emergency lighting

Safety equipment

Portable dry powder fire extinguisher

Insulation container

60mm

Doors

Two watertight doors

Hatches

Watertight hatches for ventilation

SHIP CONNECTIONS

Power connection

Rotec cable entry

Seawater connection

DN50 (2")

Chlorine connection

DN50 (2")

Pneumatic Connection

80Psi 5. 5Bar, Instrument Air

COMPONENTS

Valves, operation

HVAC

Piping

Flowmeters

AMBIENT CONDITIONS

Sea water temperature

Ambient temperature

Air

Heating and ventilation

PVC-C

Siemens

Max. 40^o C

Min. -1.9^o C

Max. 45^o C

Min. -10^o C

APPROVALS AND CERTIFICATES

Desmi Ocean Guard

Container

Classification society

IMO Type approval from BSH Germany
Type approval number 0800S41-4443/000/4
USCG AMS acceptance AMS-2014-
Desmi Ocean Guard

DNV-GL Type Approval 14 887-15HH

Lloyds Register TA TBC

CSC and DNV-C deckhouse

Major class societies

FEATURES

AND BENEFITS AT A GLANCE

Wide operating parameters

Reduced Power, Cost

Degassing

Reliability and performance

Simplified installation

- Approved treatment of all water types – fresh, brackish and sea
- Operates in water temperatures from -1.9 to 40^o C
- Can be fitted to any size and type of ship
- Side stream treatment on uptake
- Proprietary control logic optimizes dose levels and power requirements
- SAFE – no hydrogen gas in ballast tanks
- Based on Chloropac[®] system
- 40+ years impeccable shipboard record
- Reducing vessel downtime during retrofit installation

SO_x SCRUBBING - TURN KEY RETROFIT SOLUTIONS

ONE STOP SHOP RETROFIT WORLDWIDE

Exhaust SO_x scrubbing. Many rules, many things to do. At Damen you will find one-stop-shop solutions for the retrofit market. Our clients ask for compliant operation and life cycle support - so that's what we deliver.

TURN KEY RETROFITTING

We understand that retrofitting a SO_x scrubber system is not simple and that many factors have to be taken into account, such as:

- Footprint & maintenance space
- Power consumption
- Piping Sc tie-ins
- Pressure drop & pump capacity
- Integration of controls
- Internal transportation
- Approvals and class requirements
- CAPEX & OPEX
- Return on Investment

TAKING CARE OF BOTTLE NECKS

SO_x scrubbers are designed to comply to the most stringent regulations when using regular HFO fuels. With thousands of vessels needing to comply with the IMO sulphur regulation, the market will face practical bottle necks. How will you deal with equipment supply, the engineering capacity, availability of (yard) facilities, class capacity and other related issues? How will you ensure one time right?

REFERENCE LIST of Damen Green Solutions

The latest significant Damen Green Solutions' Project in the Greek Shipping Market is the installation of BWT systems (BIOSEA, UV systems) on **10 vessels** (B/C) of **NORTHSOUTH MARITIME** Company. The installation of the systems of 5 of the above vessels was carried out in **DAMEN Shipyards: Dunkirk, Vlissingen, Curacao and in Mangalia.**



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A STAGED APPROACH - ONE TIME RIGHT

Preparation is key for a successful retrofit project, onetime right. Damen is following a well defined process which includes:

- ✓ **System selection: Open loop, closed loop or hybrid**
- ✓ **On board survey, 3D scanning & basic engineering**
- ✓ **Detail engineering**
- ✓ **Purchasing & delivery of material packages**
- ✓ **Full installation or supervision only**
- ✓ **Commissioning, start-up and training**

DAMEN GREEN SOLUTIONS



170+
green projects



80+
surveys & designs



160+
material packages



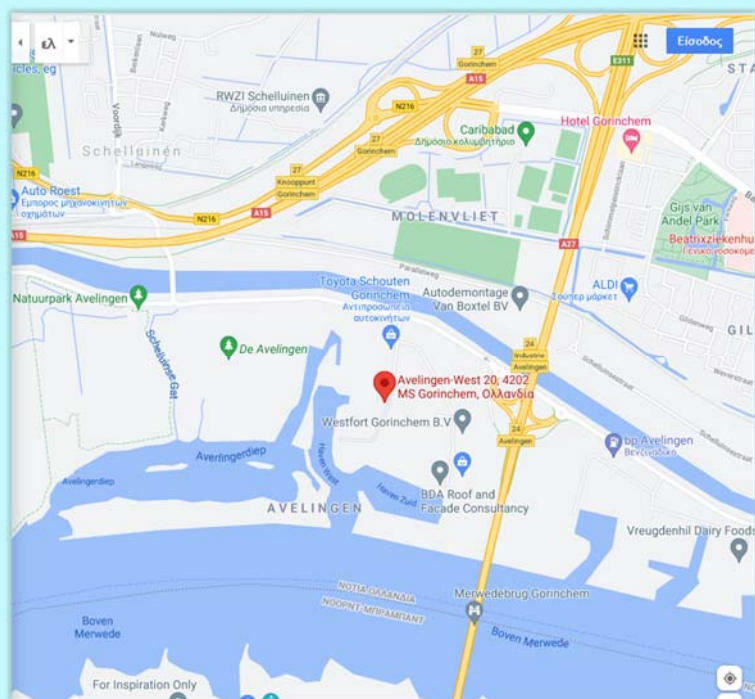
40+
assisted building
projects



80+
installations

Breaking News

For the Tanker Market and Vessels with big capacities we provide Filten & Hypochlorite Systems



Visiting and Postal Address:

Avelingen-West 20
4202 MS Gorinchem
The Netherlands

Contact Details:

Phone: +31(0)6 83 80 98 32

Fax: +31 (0) 183 63 21 89

Email: info@damen.com

YARDTECH MARINE SERVICES S.A.

Exclusive Agents of DAMEN SHIPREPAIR & CONVERSION Yards
in North Europe, West Europe, Curacao and Black Sea Area

Land Lines: +30 210 4538692, 4538838

Mobile Lines: +30 6976550359, 6944146015

Fax Line: +30 210 4538663

Email: yardtech@otenet.gr Official Web Site: www.yardtech.gr

