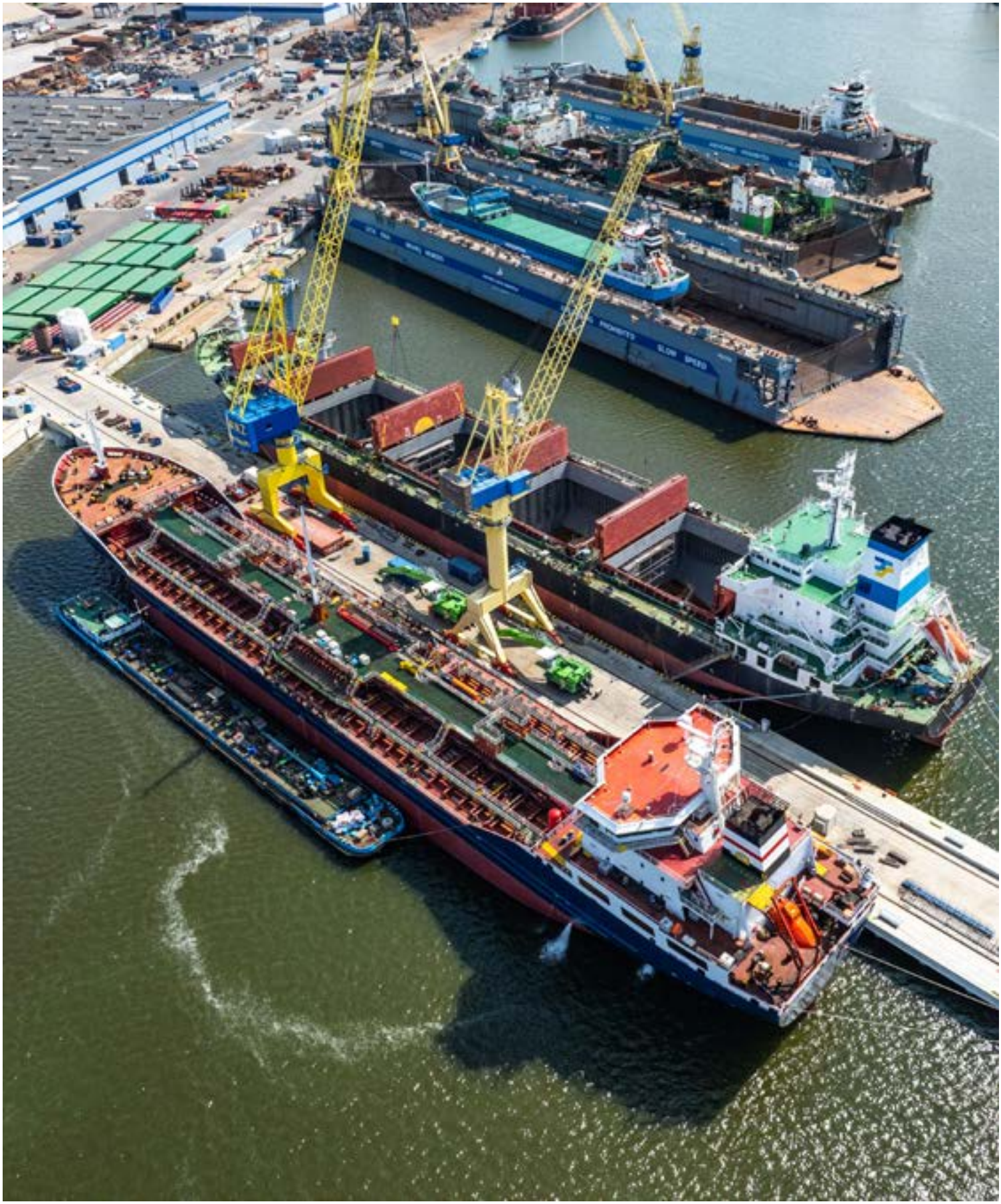
DRYDOCK MAGAZINE JUNE 2025



FACE THE FACTS: Hempel sets new standards for cruise coatings

ON THE LINE: Drydocks World powers the future of maritime repair

SPOTLIGHT: The spotlight is on Nordic countries for Nor-Shipping

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BLRT Repair Yard Klaipeda recently took on the ambitious task of converting the bulk carrier Zina.

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SETTING NEW STANDARDS FOR CRUISE COATINGS

As the maritime industry faces mounting pressure to decarbonise, cruise operators are increasingly turning to innovative solutions that balance operational efficiency with environmental performance – and Hempaguard Ultima, Hempel's groundbreaking new two-layer coating system, is helping meet this challenge.

John Mangano, Senior Sales Manager at Hempel A/S, has been in the marine coatings industry for 24 years and has spent the past six with Hempel. He previously worked for AkzoNobel for 12 years and International Paint before that.

Mangano leads a North American team of frontline professionals, and his one goal is to ensure a smooth sales process for both his team and customers. To do so, he also collaborates closely across multiple functions to forecast and set strategic financial goals, engaging in Hempel's product portfolio and taking part in technical discussions.

He has a Bachelor of Science (BS), Marine Environmental Science degree from State University of New York Maritime College and a Master of Business Administration (MBA), Corporate Finance from Dowling College.

Hempaguard Ultima combines the tried-and-tested performance of Hempaguard X7 with Hempel's revolutionary new biocide-free silicone topcoat, Hempaguard XL, preventing growth of marine organisms while ensuring long-lasting hull protection. It offers up to 21% fuel savings, enhanced fouling resistance and verified reductions in CO_2 emissions.

Q. Why is hull performance such a key focus in the cruise industry?

A. Hull performance is a critical factor in cruise operations due to the sector's unique operational profile. Cruiseships typically operate on short, repetitive itineraries, making frequent stops in warm, tropical waters where fouling pressure is high. If not properly managed, this results in biofouling, which increases hull resistance and fuel consumption, as well as the risk of carrying invasive species between ports.

The cruise sector also faces growing pressure to reduce its environmental footprint. Efficient hull coatings contribute directly to reduced biocides and emissions by improving fuel efficiency. As such, when we talk about hull performance in cruising, we're talking about something that directly impacts both operational cost and sustainability goals.

Q. How have silicone-based coatings helped cruise operators address these challenges?

A. The cruise industry has been a pioneer in adopting silicone-based coatings, primarily because they deliver a smoother hull surface and offer exceptional fouling resistance. Given the frequent port calls and warm-water routes cruiseships typically operate on, silicone coatings help to reduce friction, maintain speed and minimise fuel consumption.

Compared with other vessel types, cruise operators embraced these technologies early on. The benefits – better fuel efficiency, fewer unplanned drydocking expenses and more reliable schedules – were immediately clear. With high passenger expectations and tight operational windows, cruise lines need hull coatings that deliver consistent, long-term performance, and silicone coatings have proved to be the best solution for that.

Q. Now that you've introduced Hempaguard Ultima, what makes it stand out from previous coatings?

A. Hempaguard Ultima takes the performance of Hempaguard X7 to the next level. One of the most significant innovations is the separation of topcoat layers, which allows us to independently optimise each layer for better performance.

This unique two-layer system combines the trusted performance of Hempaguard X7 with a new biocide-free silicone topcoat, Hempaguard XL, which offers extended fouling protection. The result is a coating system that delivers up to 21% fuel savings, 160 fouling-free idle days, a 0.9%

average speed loss and 6% immediate out-of-dock performance increase.

These performance improvements help vessels stay cleaner for longer, spend more time in service and reduce fuel consumption – directly supporting both operational efficiency and sustainability.

Q. Is it safe to say that Hempaguard Ultima is as much about environmental impact as it is about operational efficiency?

A. Absolutely. Hempaguard Ultima addresses both environmental and operational goals. The improved fuel efficiency translates into reduced emissions, helping operators stay compliant with IMO regulations and achieve their ESG targets. Less fuel consumption also means lower operating costs and fees related to EU ETS – an essential factor in the cruise industry's competitive landscape.

Additionally, the extended fouling defence means longer intervals between drydockings, reducing maintenance costs and providing greater scheduling flexibility. Hempaguard Ultima aligns operational efficiency with environmental sustainability in a way that is truly synergistic.

Q. What kind of reception has Ultima received from cruise operators so far?

A. The response has been very positive. Cruise operators are increasingly looking for high-performing, sustainable coating systems and Hempaguard Ultima delivers exactly that. We've seen strong adoption on both newbuilds and retrofits, and the technology is helping operators improve fuel efficiency, reduce emissions and stay on track with their environmental commitments.

There's a clear demand for solutions that can help the industry transition to more sustainable operations without sacrificing performance, and Hempaguard Ultima is a perfect fit to meet that need. ■

POWERING THE FUTURE **OF MARITIME REPAIR**

As global shipping faces rapidly shifting demands and mounting pressure to decarbonise, Drydocks World is positioning itself as a key player in the transition. The company's approach combines technical expertise with a forward-looking strategy, and its performance in the first quarter of 2025 clearly indicated that commitment in action, says *Rado Antolovic, Chief Executive Officer.*

Rado Antolovic, Chief Executive Officer.

In less than four months, the yard completed more than 50 drydocking and repair projects, each one a reflection of its scale, diversity and technical depth. Among the highlights is the successful delivery of six out of eight pre-assembled units (PAUs) for a production and wellhead platform on the Norwegian Continental Shelf. This is the kind of work that demands more than engineering expertise. It requires seamless coordination across disciplines, strict adherence to deadlines and decades of offshore experience. Drydocks World delivered.

That same versatility was on full display in the range of vessels serviced. While tankers and containerships accounted for a major part of total ship repair volume, the list also included a wide range of vessels, including dredgers, cruiseships, jack-up rigs, naval ships and even a yacht. Some projects were straightforward, focusing on routine class survey repairs.

Broad work spectrum

A heavy-lift pipe layer arrived for machinery overhauls and departed with a newly-installed pedestal crane. Two jack-up rigs underwent major maintenance works on drilling equipment. The cruiseships underwent a full spectrum of work, including propulsion system servicing, steel and piping repairs, hull coatings, interior refurbishments and hotel-side upgrades. Every task was executed with meticulous planning and completed on schedule to return the vessels to service without delay.

Efficiency upgrades

Environmental responsibility is a central focus at Drydocks World. In the first quarter of 2025, the company implemented a series of efficiency upgrades designed to support long-term operational performance and align with tightening regulatory standards. These measures included the use of next-generation propellers, silicone-based hull coatings and redesigned bulbous bows.

Although technical in nature, the upgrades reflect a broader move toward

cleaner and more future-ready fleets. This direction is particularly relevant for European operators who are facing increasingly strict emissions regulations.

Innovation is also shaping the company's internal operations and workforce development. The roll-out of the IFS enterprise operating system has improved coordination and visibility across ongoing projects. At the same time, the launch of OneLearn, a digital training platform developed with Cornerstone, is modernising how technical knowledge is shared across teams. The platform includes structured learning modules along with virtual- and augmented-reality environments, helping Drydocks World prepare its workforce for the demands of a rapidly evolving maritime sector.

New infrastructure

Then there is the infrastructure. In Q1, a new CH 320 CNC pipe bending machine was brought online, integrating CAD inputs, anti-collision logic, and spring-back correction to deliver precision along with a 5-10% boost in productivity. Annual pipe output will now scale from 1.2 million to 1.5 million inch diameter.

The cruiseships visiting Drydocks World underwent a full spectrum of work

Add to that the newly-enhanced automatic shot blasting and priming line, on track to meet full IMO PSPC compliance by Q2, and it's clear: this isn't a yard standing still.

With a workforce of close to 18,000 professionals – 13,000 in-house and 5,000 subcontractors, Drydocks World is ready to take on complex projects and the speed to execute them efficiently. And it's not slowing down. Major investments are underway: a 5,000-ton floating crane set for delivery in 2026, four new rail cranes, robotic hydro-blasters and enhanced fabrication zones. These upgrades signal a new chapter of capability and competitiveness.

Next generation sustainability

As Drydocks World heads to Nor-Shipping in June, it does so not just to showcase its achievements, but to engage global partners in shaping what comes next for sustainable, large-scale maritime engineering.

These developments reflect Drydocks World's wider ambition to stay ahead of emerging demands in the European market and beyond. The company is exploring a broad set of technologies that align with global clean shipping goals. Among them are air lubrication systems, carbon capture solutions, hybrid battery installations and dual-fuel conversions. Rather than reacting to regulatory pressure, Drydocks World is proactively investing in and exploring solutions that will define the next generation of sustainable maritime operations.

Big ambitions

Drydocks World's ambitions extend beyond the UAE. A recently-signed Memorandum of Understanding with India's Cochin Shipyard signals a move toward regional growth, shared infrastructure development and new maritime opportunities in one of the world's most dynamic markets. This agreement reflects a global strategy grounded in technical strength and long-term capability development.

Drydocks World continues to advance its role in the global maritime industry. With each project, the company is helping to define what modern ship repair and offshore engineering should look like. The focus remains on precision, purpose, and building for the future.

Cruise & ferry REPAIR REVIEW

Underwater repairs, a new repair and modernisation agreement, a game-changing LNG project, LR launches its Cruise Centre of Expertise and PPG highlights the benefits of electrostatically applied silicone coatings at Seatrade Cruise Global.

The rudder cofferdam being lowered into the water

Lifting cofferdam for installation

When a Ro-Ro required an immediate thruster installation and rudder bushing repairs, Subsea Global Solutions stepped in to deliver a seamless in-water solution. The project on the 290m-long vessel took place at the port of Portland, Oregon in the US.

Originally scheduled for drydock, the repair was re-planned to accommodate the vessel's tight operational schedule. Subsea Global Systems used its extensive experience and advanced techniques to perform this critical operation entirely in-water, ensuring reduced downtime.

To facilitate the dry repairs for the rudder bushing, SGS's technical department designed and fabricated a custom reusable cofferdam, one of the largest known of its kind, directly at the repair location.

The cofferdam fully encapsulated the 45-tonne rudder with a unique removal door configuration to compensate for the shallow sea floor elevation under the vessel.

The cofferdam weighed in at 51.49 tonnes and exerted 300 tonnes of buoyant force when de-watered. It was specifically constructed to handle the environmental conditions of the Willamette River.

Installation and repairs

SGS's highly-skilled teams worked around the clock to install two thrusters entirely underwater, ensuring they were fully integrated and operational.

The rudder bushing was also replaced without removing the rudder blade, maintaining the vessel's structural integrity.

Overcoming challenges

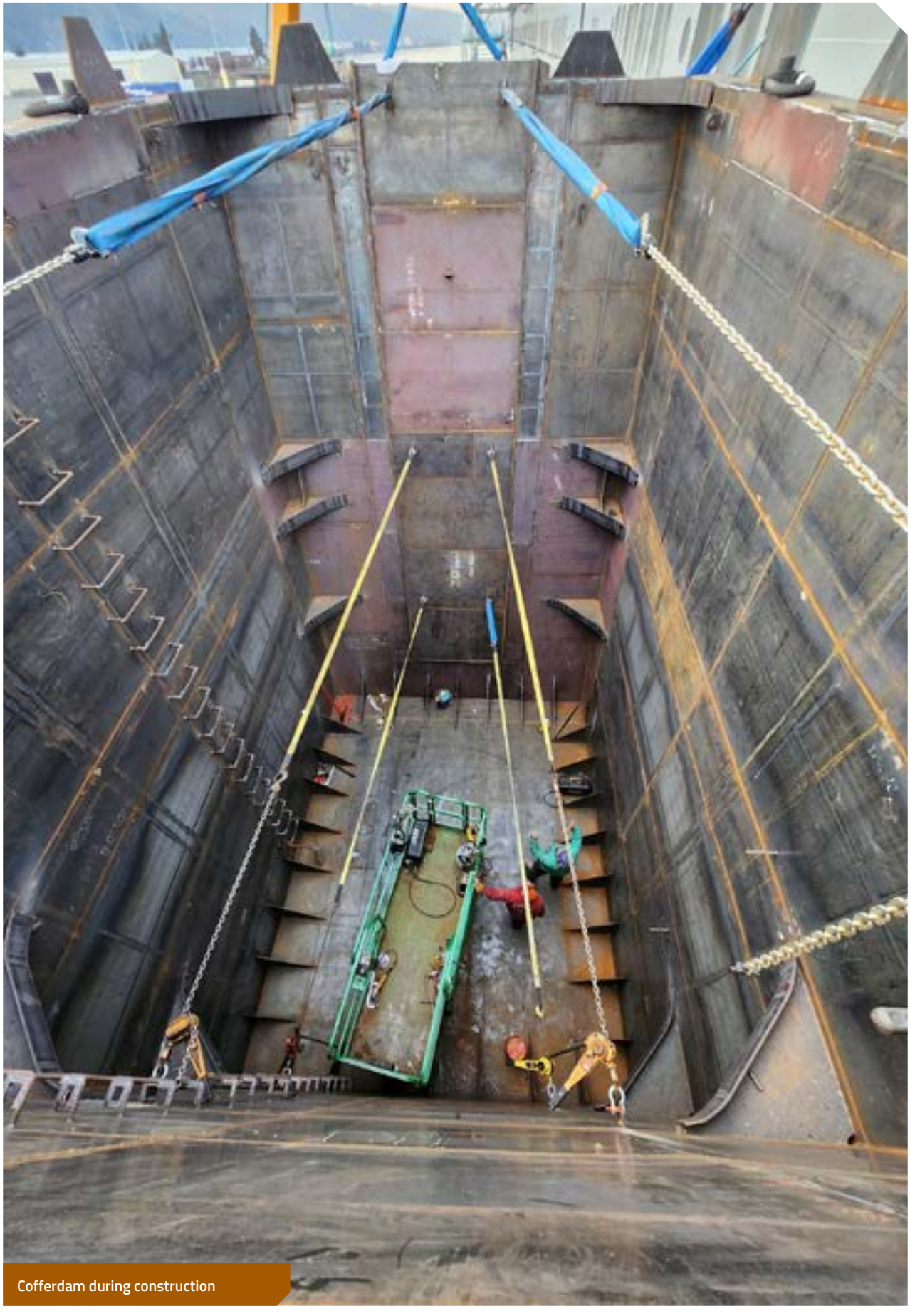
SGS adapted to the weather and in-water conditions, including rain, wind, strong currents and limited visibility. Despite these challenges, the project proceeded efficiently and was completed with precision and attention to detail.

Safety is at the core of everything the company does. For this project, by prioritising safety at every stage, it ensured a seamless and incident-free operation, reinforcing the company's commitment to protecting both its team and clients' assets.

NEW CRUISESHIP AGREEMENT

Navantia and Royal Caribbean Group have signed a strategic framework agreement, strengthening the long-standing partnership between the two companies, and setting the stage for future modernisation and revitalisation projects. The signing ceremony took place at Royal Caribbean Group's headquarters in Miami, attended by executives from both companies.

The relationship between Navantia and Royal Caribbean dates back to 2012 when Navantia successfully revitalised two Royal Caribbean ships in Cadiz.



Cofferdam during construction

Marcos Díaz and Anders Aasen signing the renewal agreement

Since then, 45 cruiseships from Royal Caribbean have been refurbished, modernised and revitalised at the Spanish shipyard, reinforcing its position as a leader in the cruiseship repair and revitalisation industry.

Marcos Díaz, General Director Ship Repairs of Navantia and Anders Aasen, Senior Vice President Global Marine Technology of Royal Caribbean Group, were present to sign the renewed agreement. "We are absolutely delighted to renew our frame agreement with Royal Caribbean and look forward to strengthening the already excellent relationship between our companies through safe and successful dockings of their fleet," said Diaz. "We appreciate the trust bestowed upon us over the past 14 years by such a key leader of the cruiseship industry."

Currently, Royal Caribbean's *Allure of the Seas* is undergoing a major revitalisation project at Navantia's Cadiz shipyard. The ship had previously visited Navantia in 2015 and 2020, further showcasing the excellent relations between the two companies.

GAME-CHANGING PROJECT

A Norwegian consortium has teamed up to develop a new solution for decarbonising maritime transport by capturing and storing CO_2 from LNG-fuelled Solid Oxide Fuel Cell (SOFC) power trains.

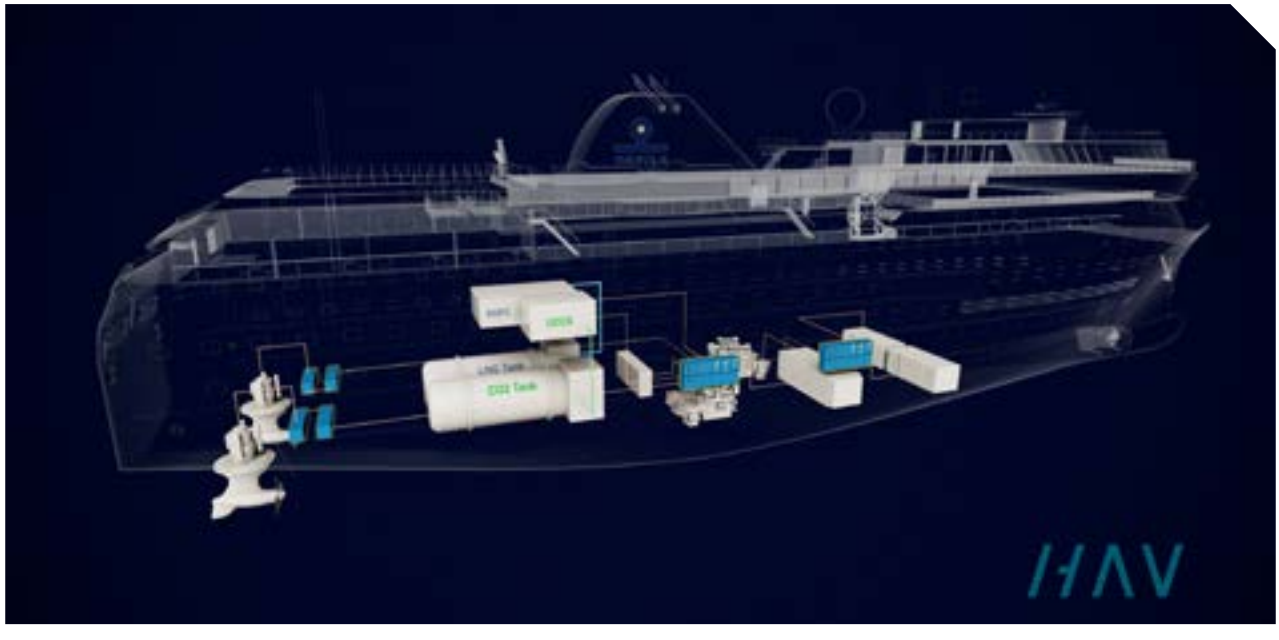
The project is called LNGameChanger and is led by maritime technology supplier HAV Group, plus coastal cruise operator Havila Voyages, natural gas company Molgas Norway (formerly Gasnor) and research institution SINTEF.

The potentially game-changing research project was unveiled at a recent press conference in Ålesund, Norway, held on board Havila Voyages' coastal cruiseship *Havila Capella.*

"The LNGameChanger project aims to create the basis of a new product in form of a low- or zero-emission solution for the maritime industry, strongly positioned for a growing LNG market and infrastructure with superior efficiency to alternative solutions," explains Gunnar Larsen, CEO of HAV Group. "If this objective is achieved, LNG can become not only a transitional fuel, but a permanently viable option in low-emission maritime transport, alongside for example hydrogen."

Given a successful outcome of LNGameChanger, project owner HAV Group has a clear ambition to further mature the solution towards commercialisation and include it in the company's growing portfolio of low- and zero-emission solutions to the maritime sector.

The LNGameChanger consortium is setting its sights on LNG-fuelled shipping with on-board CO_2 capture and storage



Project objectives

The LNGameChanger project's primary objective is to design an innovative, decarbonised maritime LNG-fuelled power train combining SOFCs and high-efficiency onboard CO_2 liquefaction and storage, resulting in a CO_2-equivalent intensity between the 2045 and 2050 emission limits.

Secondary objectives are to confirm energy efficiency and emission targets for the SOFC power train with CO_2 capture in stand-alone mode. The project also aims to establish a user case with a vessel design and relevant operational profile to extract load profile characteristics and perform voyage simulations for the vessel in study. The user case may be Havila Voyages' four coastal cruiseships. The performance of the SOFC power train integrated with the onboard CO_2 capture and storage (OCCS) will be determined. It will also evaluate overall space and weight requirements and adaptability for marine applications.

Havila Voyages' four coastal cruiseships all use LNG as fuel in combination with battery power today. As one of Norway's leading shipowners when it comes to innovative green shipping, the company takes great interest in the LNGameChanger project.

"We have clear ambitions to move towards carbon neutrality and eventually zero emissions, and that can be done with our current fleet," says Bent Martini, CEO of Havila Voyages. "This project is of great interest for us as our main power source today is LNG. We are eagerly awaiting the results and possibilities that lie ahead. To be able to meet future requirements and reach the goals for a greener future, we cannot lock ourselves in one direction. We have to investigate the possibilities available to find the best solution, both for the environment and from a business perspective."

LNG distribution

In addition to the required onboard processes, LNGameChanger will also address the infrastructure needs related to decentralised CO_2 collection and transport in port. This includes the potential for combining this logistically with LNG distribution.

"This technology could provide a clear pathway for a large-scale, low-emission solution that leverages well known and robust supply chain of energy to hard-to-abate sectors. Molgas Energy supports developments that aim to reduce emissions based on available technology and product availability," says Anders Torp Rød, Managing Director at Molgas Norway, which is a leading buyer, distributor and seller of natural gas to industrial and marine sectors in Norway.

Significant market potential

International shipping carries around 80% of traded goods and accounts for around three per cent of global greenhouse gas emissions. While LNG only accounts for about four per cent of the fuel supply, the number of LNG-powered ships is predicted to increase substantially as global shipping is embarking on a fuel technology transition.

According to DNV's Alternative Fuels Insights (AFI) platform, the number of LNG-fuelled ships in operation doubled between 2021 and 2024, with a record number of deliveries (169) in 2024. By the end of 2024, 641 LNG-powered ships were in operation. According to the orderbook, this number is expected to double by the end of the decade.

"It is also worth remembering that between 2024 and 2026, the EU Emissions Trading System (EU ETS) is gradually extended to include emissions in the maritime transport sector, and from 2025 the FuelEU Maritime regulation has entered into force. This gives extra incentives for the development and deployment of technologies for reducing or eliminating maritime CO_2 emissions," adds HAV Group's Larsen.

Financial and scientific support

The Norwegian Research Council has awarded LNGameChanger a grant of approximately NOK 5 million over the project's two-year duration, providing

> "BETWEEN 2024 AND 2026, THE EU EMISSIONS TRADING SYSTEM IS GRADUALLY EXTENDED TO INCLUDE EMISSIONS IN THE MARITIME TRANSPORT SECTOR, AND FROM 2025 THE FUELEU MARITIME REGULATION HAS ENTERED INTO FORCE."

ground for research activities by SINTEF. The project partners – HAV Group, Havila Voyages and Molgas Norway – will be actively involved in the project execution. For HAV Group, this includes involving technical experts for ship and systems integration, regulatory compliance and risk assessment as well as overall project management.

The first step of the LNGameChanger project is to conduct necessary feasibility studies and simulations to define the readiness to take the decarbonised SOFC power train solution to a subsequent prototype demonstration level in a successor project.

"We are excited to be a part of this project," says David Berstad, researcher at SINTEF. "SINTEF is involved in a growing portfolio of projects that focus on different solutions for decarbonisation of the maritime industry. A low-to-zero-emission concept that combines an established maritime fuel with innovative CO_2 capture technology is a promising solution that can be applied to many different vessel types."

NEW GLOBAL CRUISE CENTRE OF EXPERTISE

Lloyd's Register (LR) recently launched its Cruise Ship Centre of Expertise (CCoE) at Seatrade Cruise Global in Miami, US.

Operating globally, the CCoE integrates LR's classification, advisory and digital services to ensure that cruise operators benefit from enhanced safety, operational efficiency and sustainability guidance.

The centre brings together operational specialists, in-service and newbuilding SMEs, plan approval specialists and commercial experts to address unique industry challenges focusing on exceptional client care, technical support, accountability, global consistency and innovation.

This innovation includes advanced research into areas such as alarm management systems and human capital optimisation that help cruise lines manage crew deployment more effectively and improve onboard safety.

The CCoE's reach extends beyond traditional classification services to include strategic advisory on energy transition and comprehensive digital solutions that include voyage optimisation, personnel training and data analytics.

Virtual platform

Unlike physical centres, the CCoE operates as a global virtual platform accessible from anywhere in the world. This digital approach ensures that specialised knowledge, whether relating to existing ships or new construction, is readily available to clients whenever and wherever needed.

"For cruise operators, the CCoE offers measurable benefits: direct access to specialists with years of practical experience across multiple disciplines to support our clients with operational challenges, faster technical response times, consistent ruling applications across different regions, and proactive regulatory guidance that helps operators anticipate compliance requirements before they become mandatory," explains Joep Bollerman, VP Passenger Ships and Director of the CCoE. "We help our clients to get it right."

"Unlike traditional maritime services that operate in silos, our CCoE connects cruise operators directly with specialists in classification, technical operations and digital solutions simultaneously," said Francesco Ruisi, VP Global Passenger Ship Segment Director at LR. "This three-dimensional approach ensures our clients remain ahead of industry developments, while optimising their operations for efficiency, sustainability and passenger experience."

The CCoE operates through four interconnected teams: Strategy and Insights, which monitors regulatory changes affecting cruise operations; Client Experience, which provides single-point accountability for operators; Technical Delivery, offering 24/7 support for vessels, and Enabling Functions, ensuring consistent global standards across all LR services.

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Ariana Psomas, PPG Global Segment Director

PPG AT SEATRADE CRUISE GLOBAL

Also at Seatrade Cruise Global, Ariana Psomas, PPG Global Segment Director, New Build & Dry Dock, Marine Coatings, explained how adopting low-friction silicone coatings can help the cruise industry to meet sustainability goals.

Underwater fouling control hull coatings were once purely a commercial consideration for shipowners and operators. Now it is also a question of how they can help meet global goals to reduce greenhouse gas (GHG) emissions. A ship slowed by fouling means higher fuel consumption, which translates directly into higher emissions intensity.

IMO's GHG reduction strategy is constructed in the short term around the CII and EEXI measures, with more measures under development for the medium and long term. It calls for a reduction in GHG emissions by at least 20% compared with 2008 levels by 2030, and by 70% by 2040, as well as reducing total emissions to net zero by 2050.

For cruise owners and operators, the ability to achieve savings of this magnitude requires radical improvements in design and in operating efficiency, and selecting the right coating solution is of utmost importance. It is this realisation that is prompting leading cruise companies to adopt low-friction silicone coatings as the technology of choice as they can directly shift the speed-power curve and at the same time improve operational efficiency.

Increasing pressure

Increased sustainability pressure is coming from all shipping industry stakeholders. Consumers are increasingly demanding more sustainable practices, putting pressure on cruise lines to adopt new measures. Leading the way on sustainable practices can position cruise organisations as sustainable innovators within their industry.

To help meet these challenges, PPG offers PPG Sigmaglide 2390 fouling release hull coating, based on a 100% pure silicone binder system. This biocide-free product helps to reduce emissions by up to 35% compared with traditional antifoulings, supporting compliance with short-term and upcoming IMO GHG measures and providing a significant contribution to industry net zero targets. It provides up to 35% GHG savings, delivered through the combination of reduced power (up to 20%) and speed loss performance of less than one per cent.

Further sustainability benefits are provided by the innovative electrostatic coating application technique that PPG introduced to the shipping industry just over a year ago. This method offers

Electrostatic application of PPG Sigmaglide

significantly higher transfer efficiency compared to airless spraying, as the electrically-charged paint particles are precisely guided toward the grounded surface of the vessel. This leads to an exceptionally even distribution and formation of a uniform and ultrasmooth, long-lasting film layer, and also results in a significant reduction of overspray and waste, providing a considerably cleaner operation. PPG Sigmaglide fouling release coating's unique formulation makes it one of the very few hull coating technologies suitable for electrostatic application.

More advantageous

Silicone-based coatings have long been recognised by cruise owners as the most effective solution for demanding operations. When applied electrostatically, these coatings become even more advantageous for the cruise industry. In particular, it solves the issue of contamination of the accommodation areas during spraying. Electrostatic application significantly reduces coating overspray and therefore minimises the need for masking on the hull and accommodation areas.

The integration of electrostatic application with silicone-based coatings not only enhances operational efficiency but also aligns with the cruise industry's commitment to sustainability. This innovative approach ensures cleaner, more efficient coating processes, setting a new standard for environmental stewardship in maritime operations.


ROYAL ARCTIC LINE
DOCK 5
ORSKOY YARD

Spotlight on the Nordics

Nor-Shipping, ship repair and conversion at the Northern tip of Europe, Scandlines sees its hybrid ferry optimised, Wärtsilä signs an agreement with Viking Line and expands its state-of-the-art technology centre in Finland.

Over the past four years, Orskov Yard has increased activities by 50% – a direct result of a strategic expansion that included the addition of a new, larger floating dock

Nor-Shipping 2025 has arrived. The maritime exhibition runs from 2-6 June in Oslo and offers exhibitors from all over the world quality products from the entire chain of the maritime industry. Partnerships are initiated, business agreements are concluded and new contact networks are created. National pavilions present exciting suppliers and major international companies launch premise-based products.

The only constant in this world and in the maritime sector is change. In a rapidly evolving maritime and ocean industry, how can we work to find the strategies, solutions and partners to mitigate risk, maximise opportunity and meet ambitious climate goals? Understanding is key, collaboration is critical.

Nor-Shipping 2025 will gather industry leaders from across the world to debate pathways, share knowledge, showcase innovation, and help build the relationships necessary to navigate towards a future of sustainable success.

Conferences

When it comes to the conference programme, with so many innovators, visionaries, business leaders and key global decision-makers in one place, Nor-Shipping offers a unique mix of competence, expertise and insight.

The shrimp trawler Markus stopped by Orskov Yard for its five-year class survey

BUSY AT ORSKOV YARD

In 2024, more than 100 vessels visited Orskov Yard for refits and repairs, and 2025 is shaping up to be just as busy at the family-owned repair yard in Frederikshavn, Northern Denmark.

Frederikshavn is home to a strong and internationally-recognised maritime cluster that employs over 1,600 people, including nearly 240 at Orskov Yard. Here, ships arrive at an accelerating pace for maintenance, repairs and conversions, reflecting the region's growing importance as a hub for ship services.

Over the past four years, Orskov Yard has increased activities by 50% – a direct result of a strategic expansion that included the addition of a new, larger floating dock. With a draft of 8.5m, the new floating dock allows the yard to accommodate complex, specialised vessels that previously struggled to find suitable docking facilities in the region.

Today, with four docks – two floating and two drydocks – Orskov Yard offers the capacity and flexibility to meet the growing demand for comprehensive, one-stop service solutions.

Orskov Yard overhauled Horizon Maritime's anchor handling vessel *Horizon Arctic* in a tightly-scheduled 22-day docking period

Mechanical workshops

Overhauling critical ship equipment is a complex and demanding process that requires technical expertise, specialised tools and meticulous planning. At Orskov Yard, the mechanical workshops are located right next to the docks. The workshops have the capacity and equipment to handle multiple overhauls simultaneously, which is a significant advantage when managing large scopes, such as Horizon Maritime's anchor handling vessel *Horizon Arctic*. In a tightly-scheduled 22-day docking period, a wide range of critical equipment was overhauled and brought up to spec, ready to depart as planned.

The tunnel thrusters, retractable thruster, rudders, steering gear and main propeller shafts were all overhauled during the vessel's stay, as were the rack coolers and FIFI fire pump.

Improving efficiency

Orskov Yard continuously invests in new technology to improve efficiency in its workshop processes. One of the latest additions is a water-blasting machine for surface treatment. This eco-friendly solution significantly reduces abrasives while delivering effective and gentle cleaning of components. Previously, the crew used steel brushes and manual labour for these tasks. The new machinery increases speed and consistency while improving working conditions for employees.

When speed and time are critical

Thruster overhaul is a core specialty at Orskov Yard, once again proven when the service operation vessel (SOV) *Windea Jules Verne* recently arrived for its five-year class survey. The docking included maintenance of the vessel's work-to-work gangway and cranes, along with complete overhauls of the bow, swing-up and azimuth thrusters.

With *Windea Jules Verne* on a tight schedule to resume operations in the offshore wind sector, time was essential. While a job of this scope is normally scheduled for 15-16 days, the Orskov Yard crew completed it in only 12 days.

Drawing on years of ship maintenance expertise, Orskov Yard has refined several key procedures to improve efficiency during docking. One example is the approach to thruster handling and transport. Instead of relying on hoists and cranes, the Orskov crew deploys a specially adapted truck and crane arm directly in the dock to lift the thruster directly from the vessel, allowing for quicker, safer and less labour-intensive handling.

The docking of *Windea Jules Verne* included:

- Bow thruster overhaul
- Swing-up thruster overhaul
- Main azimuth thrusters overhaul
- Uptime 3D gangway 5-year maintenance and overhaul
- Red Rock 3D crane 5-year maintenance
- 5-year class survey (valves, safety equipment, switchboards, breakers, transformers)
- Painting of the bottom, sea chests and topside

Trawler rebuild

Fishing vessel maintenance is a continuous cycle of upgrades and modifications. Every time a trawler docks at the yard, some refitting is required. That was certainly the case when the shrimp trawler *Markus* stopped by Orskov Yard for its five-year class survey and a complete rebuild of the shrimp processing line. The new semi-automatic Japan line, delivered and installed by Carsoe, increases processing capacity to 19 tons of shrimp per day while significantly reducing the need for manual handling.

Replacing a shrimp processing line is a complex process that requires careful planning to minimise downtime and disruptions to fishing operations. To accommodate a new processing line, the vessel must often undergo structural changes, utility reconfiguration and safety and compliance improvements. In this project, Orskov Yard had to cut a hole measuring 4 x 2.2m in the hull to make room for the new factory, build an insulated room for the freezer and rework the ship's entire piping systems.

Nearly 240 people are employed at Orskov Yard

Above: *Fugro Synergy* was docked for a complete overhaul of its thrusters and propeller

Processing trawlers are subject to strict food safety regulations. To meet these demands, Orskov Yard carefully selected materials and interior solutions that comply with the highest hygiene, safety and durability standards. Examples include stainless steel, food-safe plastics and epoxy coatings for the flooring.

The docking of *Markus* included:

Preparations and modifications related to the replacement of the shrimp processing line (steelwork, piping, welding, plumbing, electrical installations, insulation, furnishing and painting).

5-year class survey, including the overhaul of the electric motor, generators, pumps, bottom valves, hydraulic cylinders and winches. The shaft seal was also replaced and the hull, trawl deck, winch deck, forecastle deck, lower bridge deck and boat deck were all painted. The cranes were tested and five-year inspection carried out. General repairs and scheduled maintenance were also undertaken.

Optimising for low-power operation

The *Fugro Synergy*, a multi-purpose drilling and well services vessel, was docked at Orskov Yard for thorough maintenance, including a complete overhaul of its thrusters and propeller. The comprehensive drydocking fully demonstrated the range of expertise at the yard, as it also involved servicing drilling equipment, onboard relocation of cranes and the installation of new bathroom flooring.

One of the most complex tasks was replacing the stern thruster, which required structural modifications to the vessel. The new, advanced thruster, supplied by Kongsberg Maritime, is optimised for low-power operation, enabling *Fugro Synergy* to maintain its position with minimal fuel consumption. This is a significant upgrade to the specialised vessel, which is designed to collect geotechnical data from the seabed and subsurface, often in challenging and remote offshore environments.

Work carried out during the docking of *Fugro Synergy* included:

- Azimuth thruster overhaul
- Bow tunnel thruster overhaul
- Propeller overhaul
- Drilling equipment service
- Bathroom flooring installation
- Crane relocation

Continuous investment

Orskov Yard continuously invests in its docks, quays, workshops and equipment to provide ship crews with the best possible facilities. The latest upgrade is a rail-mounted tower crane from Krøll Cranes, now in operation at Dock 5, enhancing lifting capacity and streamlining workflows in one of the yard's busiest areas.

With a total height of 78.1m, reach of 63.4m and a 120m-long rail track, the crane significantly improves operational efficiency at the dock and along the adjacent quay area.

Replacing several diesel-powered mobile cranes, the new electric tower crane offers greater flexibility, higher efficiency and a clear environmental advantage.

HYBRID FERRY OPTIMISATION

The Scandlines hybrid-ferry *Schleswig-Holstein* was on a scheduled yard stay at BLRT Western Shipyard in Klaipeda from 23 March to 6 April 2025 to carry out essential maintenance and repair work. The aim of the work was to ensure operational safety, optimise the ship's efficiency and further improve passenger comfort. "Thanks to the high motivation of the crew and the excellent cooperation with the shipyard, all the planned measures were implemented smoothly," says Anette Ustrup Svendsen, Head of Corporate Communications at Scandlines.

Propeller replacement

A central element of the work carried out was replacement of the propellers. Four overhauled propellers were installed as the previous ones had to be replaced due to wear and tear. The new propellers ensure better power transmission, reduce fuel consumption and improve the overall performance of the drive. Following a thorough inspection, all relevant seals were replaced at the same time to ensure smooth and efficient operation.

Another key project was the large-scale renewal of the fire extinguishing pipes. Due to material fatigue and signs of corrosion, comprehensive renewal was necessary in order to maintain the ship's safety at the highest level. Affected sections of pipework were replaced and the entire system was checked for functionality.

Class inspections

During the yard stay, various class inspections were also carried out by the classification society. Structural and safety-relevant components were checked. "All areas inspected met the required standards and were accepted without objection," explains Svendsen. "The close coordination between the ship's management, the shipyard and the inspectors ensured that these important inspections were carried out efficiently."

Schleswig-Holstein drydocked at BLRT Western Shipyard in Klaipeda

Visual and functional improvements were also made. The car decks were given a new protective coating to prevent corrosion and make the surfaces more resistant. In addition, the rubbing strake was partially renewed and reinforced to ensure long-term protection for the ship's side.

"Several fire doors were repaired or replaced in order to fulfil the highest safety requirements," says Svendsen. "In addition to the aforementioned safety-related work, preparations were also made for the expansion of the catering facilities. New coffee points were prepared, for which electrical installations were carried out and structural adjustments made."

Top: Wärtsilä has signed a five-year Lifecycle Agreement covering the *Viking Glory*

Above: Wärtsilä is expanding its Sustainable Technology Hub in Vaasa

In addition, new weatherproof and more durable benches were installed in the outdoor area.

"The successful cooperation during this yard stay has shown that a committed team and good coordination with the shipyard are crucial for a smooth process," says Svendsen.

EXTENDED OPERATIONAL SUPPORT

Wärtsilä has signed a five-year Lifecycle Agreement with Finland-based Viking Line covering the ferry *Viking Glory*. The vessel has been supported by an earlier Wärtsilä agreement since its launch in 2021, and this renewal further extends and expands the partnership and benefits provided by the agreement. This latest order was booked by Wärtsilä in Q1 2025.

The equipment covered by the agreement includes the ship's six Wärtsilä 31DF dual-fuel engines, six Wärtsilä Gas Valve Units and two Wärtsilä LNGPac fuel storage and supply systems. The agreement is designed to minimise unscheduled maintenance and ensure performance reliability, while providing cost predictability for budgeting purposes.

"We already have two ferries covered by Wärtsilä agreements, and we have been extremely pleased with the service and support they deliver," says Mathias Sundberg, Technical Manager at Viking Line. "The *Viking Glory* is one of the most environmentally sustainable vessels sailing today, and by maintaining the equipment we ensure efficiency of its operations. The Wärtsilä agreement represents an important contribution to improve the reliability and this helps us on our decarbonisation strategy."

The scope of the agreement includes maintenance planning, operational support, spare parts and services for the equipment covered and a 'one point of contact' through the contract manager. It also includes Wärtsilä's unique Expert Insight digital predictive maintenance service. Delivered through Wärtsilä's global Expertise Centres, Expert Insight leverages AI technology to identify potential failures before they occur, thus helping to improve asset efficiency and reduce both operating costs and emissions.

"We are delighted to renew and extend our collaboration and support for the *Viking Glory* and to continue our strong relationship with Viking Line," says Henrik Wilhelms, Director, Agreement Sales, Wärtsilä Marine. "Both our companies are committed to decarbonising shipping operations, and these agreements play an important role in this. By ensuring the highest levels of operational efficiency, Viking Line can continue its great work in minimising the environmental impact of its operations," Wilhelms continues.

Both the *Viking Grace* and *Viking Glory* are supported by Wärtsilä Lifecycle Agreements. *Viking Grace* was the first ferry to operate with dual-fuel engines, enabling it to operate with LNG fuel. The *Viking Glory* operates with the highly efficient Wärtsilä 31DF dual-fuel engine, which delivers the best fuel economy of any engine in its class. Both ferries operate between Finland and Sweden.

R&D expansion

Wärtsilä is also set to expand its state-of-the-art Sustainable Technology Hub in Vaasa, Finland, with a €50 million total investment.

Expanding the R&D testing capabilities and facilities will enhance Wärtsilä's ability to meet the growing demand for developing and delivering sustainable technologies in marine and energy and

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to support fuel applications needed in the future. Wärtsilä also anticipates that this investment will accelerate product development and time-to-market, reduce testing time and costs, cut test-related emissions, and create potential for future growth of manufacturing capacity and volumes at the Sustainable Technology Hub. The nearly 8,000 square metre extension is expected to be commissioned in 2028.

"The widely adopted target of reaching net zero in our industries in marine and energy around 2050 is the lifespan of a single vessel or power plant away," says Juha Kytölä, Director, R&D and Engineering, Power Supply. "Thus, the technology decisions for new assets are being made now. It is therefore crucial for our customers that our solutions are fuel-flexible and capable of running on sustainable fuels once these become more broadly available. This new investment in the Sustainable Technology Hub and new R&D testing capabilities will strongly support us in developing engines that can flexibly run on low- and zero-carbon fuels such as ammonia, hydrogen and methanol. These technologies and related services help our customers reduce emissions, improve efficiency and lower costs."

Since its opening in 2022, Wärtsilä's Sustainable Technology Hub in Vaasa has played a pivotal role in shaping decarbonisation of the marine and energy industries. The technology centre has a unique approach to collaboration and innovation, involving Wärtsilä experts, customers, technology partners, academia and the surrounding ecosystem. All Wärtsilä portfolio engines are manufactured in the technology centre, which also houses a training centre and one of Wärtsilä's remote monitoring centres serving customers globally.

PAINTING IN CHALLENGING CONDITIONS

Tallink's passenger ferry *Star I* was in drydock in early February at Turku Repair Yard in Naantali, where the vessel's hull and sides were repainted using Jotun products supplied by Nor-Maali. The seven-day docking took place outdoors, posing challenges to the progress of the work.

Star I returned to Tallink's service after a two-year break. As part of this, significant changes were made to the vessel's exterior, including colour update and the addition of company logos.

Since the drydocking was conducted outdoors, weather conditions presented significant challenges to the work schedule. During the repainting of *Star I*, temperatures ranged between -4 °C and +5 °C, with humidity occasionally reaching nearly 80%. Although precipitation was avoided, the cold temperatures and winds from the sea made painting more difficult.

In such conditions, epoxy coatings are particularly susceptible to amine blush, which can weaken adhesion and affect the quality of the paint surface. Additionally, polyurethane coatings may lose gloss in cold temperatures. For this reason, products that can be painted at low temperatures and that enable quick overcoating were chosen for the docking.

Thorough surface preparation

Before painting, the treated areas were high-pressure washed (min. 220bar) to remove water-soluble salts and other contaminants. After washing, the damaged areas were blast cleaned to Sa 2½. In addition, edges of existing paint

Tallink's *Star I* before repainting

were feathered in order to have the best possible corrosion protection at the overlap of old and new paint.

Due to temperatures fluctuating above and below freezing, blasting dust adhered tightly to the painted surfaces and had to be removed before overcoating. During this docking, freezing conditions prevented the outer surfaces from being washed with water, so they were cleaned with cloth rags before applying the topcoat.

Five-day completion

The drydocking focused on the maintenance painting of the vessel's exterior. The products used included the epoxy primer Jotacote Universal N10, the vinyl epoxy tie coat Safeguard Universal ES, the antifouling coating SeaQuantum Classic S, and the polyurethane topcoat Hardtop XPF. Jotacote Universal N10 was used for touch-up, while the other products were applied as full coat.

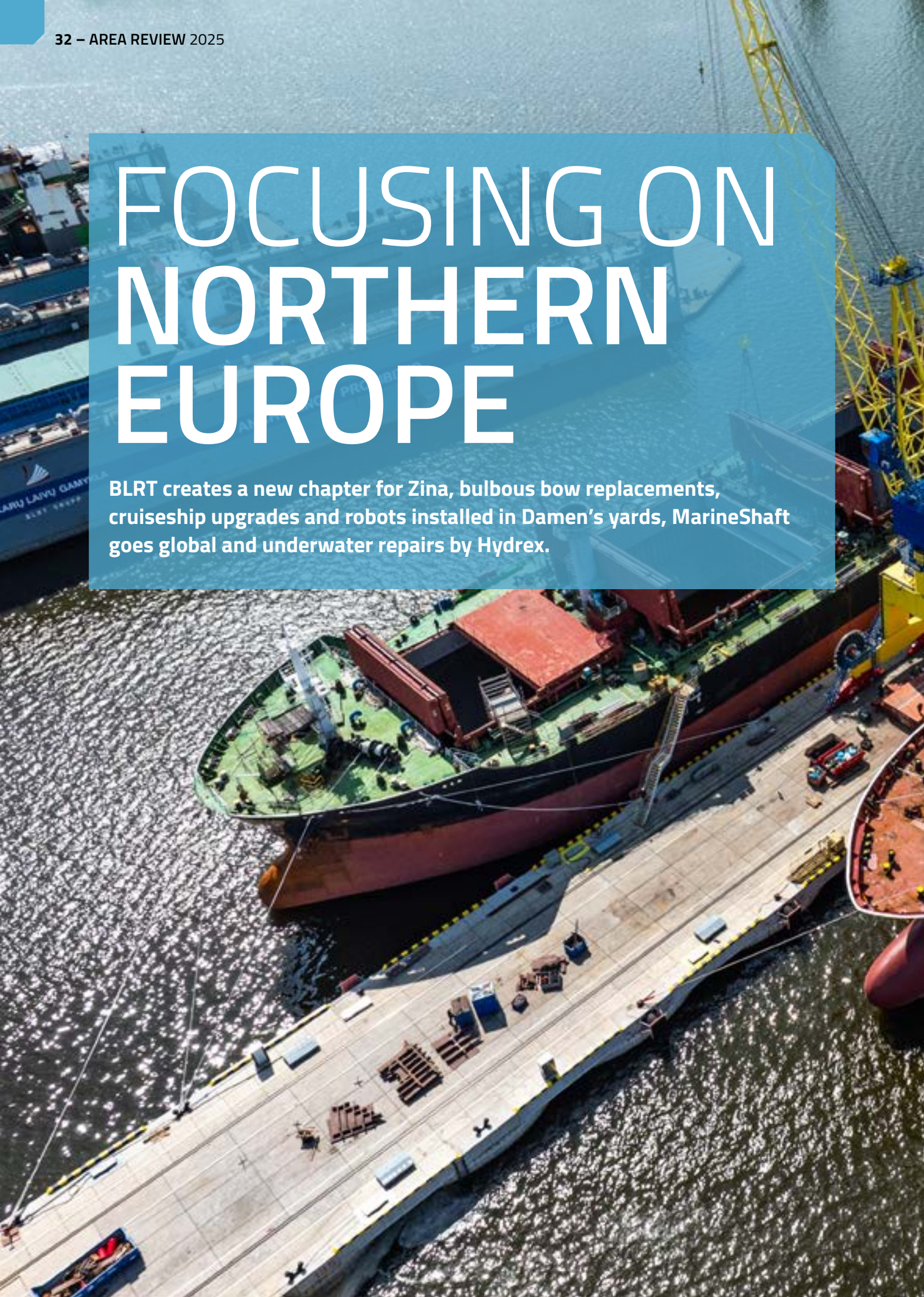
Star I received a new antifouling coating on its hull and a fresh topcoat on its sides. The flat bottom, side bottom, and boot top were painted with SeaQuantum Classic S. Before antifouling, the side bottom and boot top were first treated with Jotacote Universal N10, followed by Safeguard Universal ES. The topside was painted with Jotacote Universal N10 and Hardtop XPF.

Due to the tight schedule, coatings were selected that could perform in cold conditions and be quickly overcoated. The painting work was completed in five days, after which the vessel was ready to resume service.

Tallink's *Star I* after repainting in its new livery

FOCUSING ON NORTHERN EUROPE

BLRT creates a new chapter for Zina, bulbous bow replacements, cruiseship upgrades and robots installed in Damen's yards, MarineShaft goes global and underwater repairs by Hydrex.



VC Logistic Operations' bulk carrier *Zina* at BLRT Repair Yard Klaipeda

BLRT Repair Yard Klaipeda, Lithuania, recently took on the ambitious task of converting VC Logistic Operations' bulk carrier *Zina* for transhipment operations. This extensive project redefined *Zina*'s capabilities, preparing it for demanding new assignments. It required 313,000kg of steel structure fabrication, 14,230m of cables to be laid and fastened, 6,900kg of pipes to be fitted for the redesigned systems fitted and a considerable number of hours of hard work and expertise.

Structural and equipment upgrades

The journey began with disassembling four shipboard cranes, followed by installing barbettes, bulkhead reinforcements and specialised foundations. Simultaneously, the transverse coamings on cargo holds No. 2 and No. 4 were relocated to optimise cargo operations, and two hatchcovers were modernised to meet updated requirements. The advanced Liebherr CBG 360 cranes were later installed at the Liebherr plant.

Enhanced manoeuvrability and power

To improve the vessel's manoeuvring capabilities, a bow thruster and thruster tunnel were installed. Additionally, the ship was equipped with an extra mooring winch and twist locks for two container-type diesel generators on the upper deck, enabling increased functionality and operational flexibility.

Electrical and lighting innovations

A highlight of the project was the extensive electrical work. Over 14,230m of cables were laid and fastened to connect the diesel generators on the upper deck, cargo cranes, thruster and deck winch. Visibility and safety were also enhanced by the installation of additional floodlights, barbette lighting and step-down transformers to power crane systems with varying voltage needs.

To support the advanced crane installations and ensure seamless operations, BLRT relocated the radar antennas to the foremast, added new cables and moved the masthead lantern atop crane No. 1. The main steering station was also relocated to the wheelhouse starboard side for optimised control and navigation.

Cool system upgrades

The thruster room received additional fans, cooling pumps for the thruster motor and a thruster frequency converter, ensuring efficient operation under varying conditions.

It required a unified team effort, with engineers, electricians, welders, fitters and project managers all bringing their expertise to the table. "Every challenge was tackled with creativity, precision, and a shared dedication to achieving the best possible result," says Irina Kostina, Marketing and Communications for BLRT Repair Yards. "This is *Zina* re-imagined. With these upgrades, *Zina* is ready to take on a new chapter with enhanced efficiency, manoeuvrability and versatility. This transformation reflects the expertise and dedication of the team at BLRT Repair Yards Klaipeda, delivering solutions that meet the highest standards and setting vessels like *Zina* on a course for success."

MIXED BAG AT DAMEN'S YARDS

In 2024, as part of its commitment to cleaner operations, shipping and logistics company CMA CGM contracted Damen Shiprepair to perform refits on six of its vessels. The work, being undertaken by Damen Shiprepair Dunkerque (DSDu) and Damen Shiprepair Amsterdam (DSAm), improves the vessels' fuel efficiency by more than 10%.

Fulfilling its scope in the project, DSAm has completed the installation of three bulbous bows on the LNG-fuelled container vessels *Polar*, *Arctic* and *Aurora*. At 170m in length, the vessels were comfortably able to dock at the Amsterdam yard, which can cater to vessels up to 250m.

In addition to its ample capacity, DSAm also offers access to sister company Niron Staal. Located at the Amsterdam yard, the specialist steel construction, machining and piping company has gained extensive experience in steel works for the maritime and offshore sectors. Applying this knowledge, Niron Staal undertook the fabrication of the 120-tonne bulbs for the vessels.

The new bulbs are shorter than those they replaced, and have a less upstanding 'nose'. Niron Staal fabricated the bulbs in 70 days. After this, they were moved to a temporary on-site location for blasting and painting.

Single location

With that completed, the bulbs were transported to the drydock, where they were lowered into position using the yard's two 90-tonne-capacity cranes. From here, the constructions were driven precisely into position with the aid of two SPMTs to be welded and fastened to the vessels.

With fabrication and installation performed at a single location, the project attained optimal efficiency, resulting in minimal downtime of the vessels. Following installation of the bulbs, the vessels' fuel efficiency has been considerably improved, with fuel savings of 5-10%.

Additionally, Damen offered CMA CGM a range of additional modifications to further reduce fuel consumption. These included propeller upgrade, modification of the propeller nozzle and silicone paint

DSAm has completed the installation of three bulbous bows on the *Polar, Arctic* and *Aurora*

applied to the thruster blades. Each of these measures offers additional fuel savings of between two and five per cent, ensuring a return on investment in less than three years following the refit.

At the same time, the vessels' operation now produces significantly lower emissions, a result aligned with both CMA CGM and Damen's sustainability ambitions.

Cruiseship upgrades

Disney Dream was the latest Disney cruiseship to call at Damen's Brest repair yard. The 340m-long vessel underwent a significant scope of work featuring sustainability upgrade, major mechanical works, maintenance of lifesaving equipment and interior refurbishment – including creation of a new luxury suite of almost 200m^2.

At 28 days, this was the longest-lasting cruise project yet undertaken by the yard. Its completion required no less than 1,000 teu of materials and seven cranes working simultaneously. With precision planning, the yard completed the job on schedule, to the client's satisfaction. Later this year, the *Disney Fantasy* will dock in Brest for a similar scope of work.

The *Aurora* was also a recent visitor to Damen Shiprepair Rotterdam, drydocking at Schiedam repair yard.

The 333m-long cruiseship *MSC Preziosa* became the first MSC vessel to call at Damen's Rotterdam Botlek repair yard in nearly 10 years. During a stay of almost three weeks, it underwent a wide-ranging scope of work.

***Disney Dream* at Damen's Brest repair yard**

MSC Preziosa became the first MSC vessel to call at Damen's Rotterdam Botlek repair yard in nearly 10 years

> THE ROBOTS ARE ABLE TO UNDERTAKE COMPLETE HULL RESTORATION WORKS WITH A SCOPE SPANNING CLEANING, BLASTING AND PAINTING.

This included painting of the hull, removal and maintenance to its starboard shaft and rudder and maintenance to both stabilisers, as well as minor steel works throughout the vessel.

Robots at Dunkerque

Following extensive and successful trials, DSDu has taken delivery of five AMBPR Autonomous Mobile Blast & Paint Robots. The robots are designed for shipyard use and offer the combined benefits of increased safety, efficiency and sustainability, consistent high quality and reduced expenditure.

The robots are able to undertake complete hull restoration works with a scope spanning cleaning, blasting and painting. The different tasks are undertaken with the installation of exchangeable heads on a cherry-picker device.

Increased efficiency

The robots are able to clean a vessel's hull with high pressure washing at 400 bar, situated at the optimal distance from the hull. The system can undertake both abrasive sand blasting as well as ultra-high-pressure water sandblasting at 2,500 bar, ensuring the efficient removal of all pollutants.

Painting is performed both evenly and efficiently, with the robot able to cover 100m^2/h, resulting in reduced downtime for the vessel. The quality of the result is ensured with the ability to select the desired roughness of the blasting and paint thickness.

Added safety and reduced environmental impact

Added safety comes courtesy of the autonomous nature of the solution. The robot is operated by remote control, placing the operator at a safe distance from any hazardous pressure washing or blasting and ensuring there is no chance of paint inhalation.

The robots also make a significant contribution to sustainable operations. One way in which environmental impact is reduced is via a closed-loop water system. The water used for washing and blasting is vacuumed and cleaned, enabling 90% of it to be reused.

Additionally, the system uses considerably less paint. During a conventional painting operation, up to 50% of paint is lost as a result of overspray. The AMBPR solution is surrounded by a box that prevents any overspray from escaping into the atmosphere.

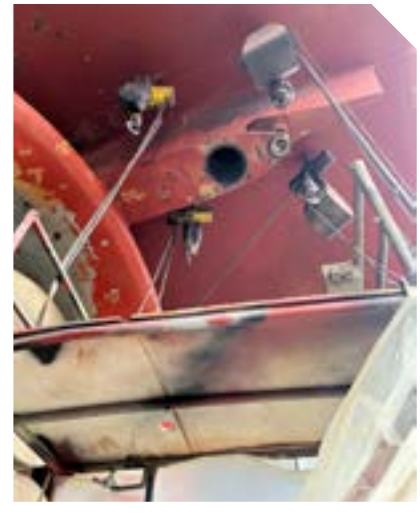
This also means that, during painting, other work can take place on the vessel simultaneously without the risk of anyone breathing in any harmful fumes, once again reducing project lead time.

Currently working on hybrid power, the robots have an eye on the future and are fully prepared to run fully electrically in the future for zero-emissions operations.

As a result of the reduction in material usage and increased project efficiency, the ultimate results of the robot system are both a boost for maritime sustainability and reduced costs for the vessel operator.

MARINESHAFT SHOWS WORLDWIDE CAPABILITY

MarineShaft recently showed off its talent by completing a successful on-site service job in Iceland and a comprehensive case involving both in-house repair and manufacturing of rudder components, combined with on-site technical supervision at a shipyard in Canada.



MarineShaft getting ready to carry out the alignment and machining of a rudder system in Iceland

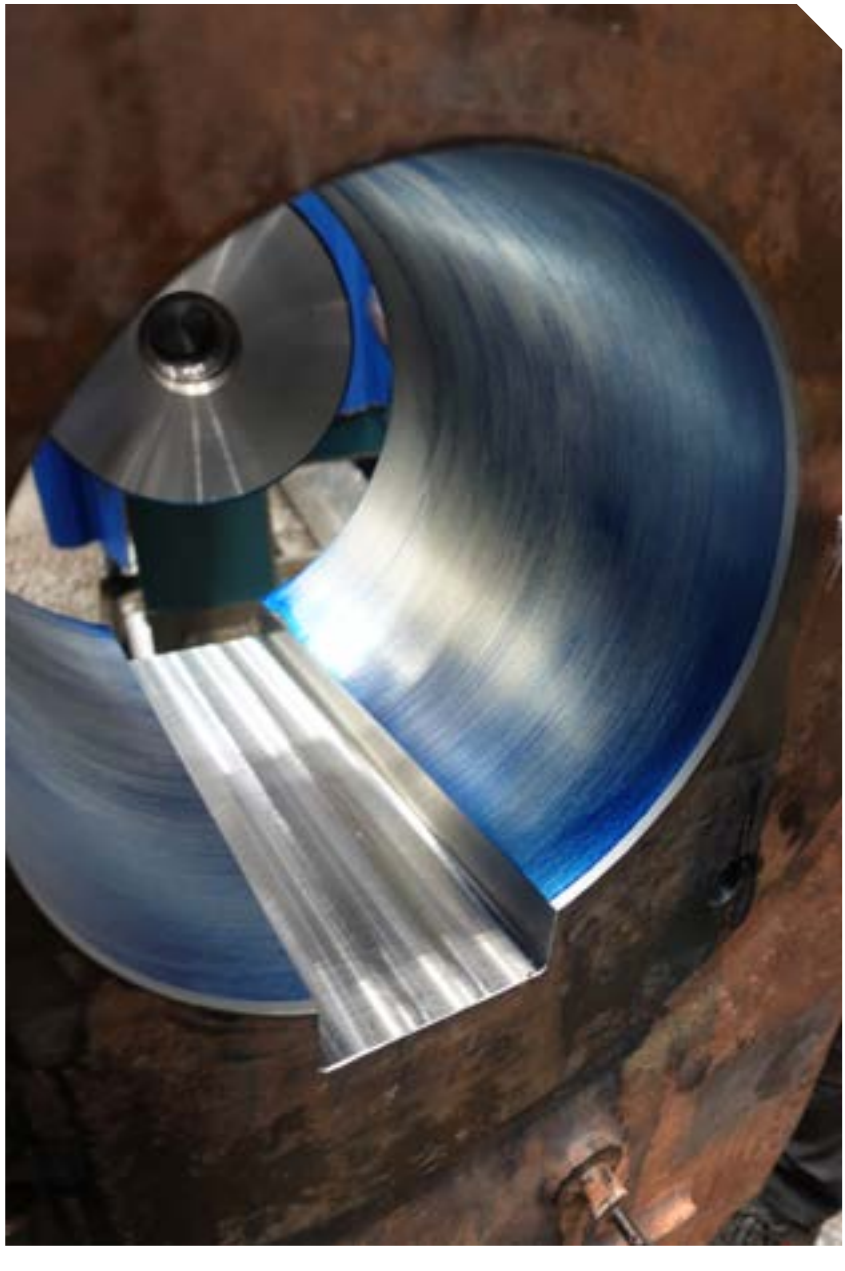
The job in Iceland was completed over the course of three days when two of MarineShaft's service engineers carried out precision alignment and machining tasks on a vessel's rudder system.

The rudder line was misaligned, so MarineShaft's team machined the rudder heel housing on-site to restore proper alignment, remove corrosion and correct the deviation. After realignment and precision machining, a new bush could be mounted securely in a clean seat, ensuring long-term performance and reliability.

The work scope Included:

- Mounting of laser alignment equipment
- Measuring the rudder line from steering gear to rudder heel
- Machining rudder heel housing to correct misalignment
- Re-measuring the rudder line after machining
- Machining the rudder flap bushing seat for proper fitting of new bushing.

Laser alignment of the rudder (top) and steering gear to rudder heal (bottom)



Manufacturing the new rudder stock

From workshop to shipyard in Canada

MarineShaft also recently completed a comprehensive case involving both in-house repair and manufacturing of rudder components, combined with on-site technical supervision at a shipyard in Canada. While many are familiar with MarineShaft's extensive workshop capabilities, fewer know that the company also offers expert on-site supervision and alignment services worldwide.

Providing full-scope rudder repair solutions – from initial inspection to final installation and blue-fitting – remains a core focus at MarineShaft. The company continues to invest in advanced mobile equipment to support these services efficiently across the globe.

A 191m-long bulk carrier suffered serious rudder damage after a grounding incident, requiring both repair and replacement of rudder components.

MarineShaft was tasked with measuring several existing rudder parts to prepare a quotation for manufacturing new rudder and steering gear components, as well as repairing the damaged rudder tiller. With raw materials already in stock, the company was able to offer a short delivery time for the required components.

Manufactured components included:

- One new rudder stock with shrink-fitted stainless-steel sleeve Ø1,260/500 x 4,325mm
- One new ram pin and ram
- One key carrier
- Coupling bolts and nuts.

The damaged rudder tiller was shipped to MarineShaft's workshop for full repair and precision blue-fitting with the new rudder stock. Upon arrival, the tiller – which had suffered deflection – was NDT tested, hot straightened and subsequently welded on the fork surfaces. Post-weld heat treatment was

Removal of the damaged rudder (right) and installation of the repaired rudder (left)

carried out, followed by a second round of NDT to verify structural integrity.

Coupling bolts and nuts were produced in oversize dimensions and delivered ready for final fitting on site.

MarineShaft supervision

At the request of the client, a senior MarineShaft service engineer travelled to Canada to supervise and assist with the installation of the rudder system, including the steering gear. The rudder blade had been previously removed for line boring and machining to adapt it to the new bolt dimensions and a new seal box delivered by the OEM. Final tiller alignment was completed by the equipment manufacturer.

Thanks to precise coordination and efficient execution, the full installation of the rudder equipment was completed within just eight days.

These operations highlight MarineShaft's ability to mobilise quickly and perform high-precision work directly on site, wherever its clients need. The company's specialised laser alignment equipment ensures accurate results when aligning rudder and shaftlines, contributing to reduced wear and improved vessel efficiency.

"We travel worldwide and bring the workshop to your vessel – reducing downtime and saving both time and costs," says Hanne Magnussen, MarineShaft's Marketing Manager.

EFFICIENT OVERBOARD PIPE REPAIRS IN FRANCE AND THE NETHERLANDS

Hydrex's expert diver/welders recently executed vital overboard pipe repairs on two tankers in Marseille and Rotterdam, demonstrating the effectiveness of afloat maintenance techniques. These repairs not only ensured vessel integrity but also offered the shipowners a cost-effective alternative to drydocking.

The first project took place in Marseille on a 136m-long tanker. Upon arrival, the team performed a thorough inspection of the damaged overboard pipes, assessing both the waterside and onboard areas of the hull. This provided the information needed for the repair strategy.

Inside the ship, preparations for welding commenced whilst divers installed a custom-designed cofferdam on the exterior hull to seal off the overboard pipe. This allowed the team to create a dry environment to carry out the repairs inside the ship.

A cofferdam was installed over the area to allow work on the pipe and the old scrubber overboard pipe was disconnected and removed. The hull plating and the new pipe were then prepared to ensure a correct fit. Using Hydrex's class-approved welding procedures, the new pipe was welded in place with a full penetration weld.

New overboard pipe was welded by Hydrex-certified welders and the welding was verified by an independent inspector. With the test completed, the cofferdam was removed, and a final visual inspection was carried out by the team. A classification society representative, present throughout the process, officially approved the repair.

Several months later, a second overboard pipe on the same vessel was replaced using an identical process, reinforcing the reliability of this approach.

Rotterdam repair

Shortly afterwards, a similar repair was undertaken on a 250m-long tanker in Rotterdam. In this case, an additional section of the pipe had to be replaced as well.

After many successful pipe repairs, Hydrex now has these repairs down to a fine art. The jobs are completed rapidly and with very consistent results.

Importance of overboard pipe repairs

Any damage to a ship's overboard pipes can jeopardise the vessel's structural soundness, posing serious safety risks. Recognising this, classification societies maintain strict oversight and demand prompt, thorough repairs to address any issues. Hydrex has developed the techniques and expertise to carry out many of these repairs with the ship still afloat. By eliminating the need for drydocking, shipowners can save time and reduce operational disruptions without compromising on safety or the ship's integrity.

These repairs in France and the Netherlands are a testament to Hydrex's commitment to delivering reliable, cost-effective services that prioritise both vessel integrity and uninterrupted vessel operations.

Left: Hydrex recently executed vital overboard pipe repairs on two tankers in Marseille and Rotterdam

Middle: Reinstalling brackets of overboard pipe after replacement

Right: Grinding the edges of the new overboard after a protective Ecospeed coating was applied

REMONTOWA SHIPREPAIR YARD

MEMBER OF REMONTOWA HOLDING S.A.

SHIP REPAIRS
SHIP CONVERSIONS
OFFSHORE PROJECTS

Steady increase in SHIP REPAIR

Steve Gordon, Global Head of Clarksons Research, **summarises the latest changes in ship repair data points from Clarksons World Fleet Register.**

Globally, China remains the largest destination for ship repair work, accounting for around 39% of total activity in Q1-25, consistent with its share of work in full year 2024 (see Charts 1.1-2), while Turkey was the world's second-largest destination (7%) followed by Japan and Indonesia (both 6%).

Focusing in on Northern Europe, repair yards based in the UK/Continent (UKC) collectively accounted for 14% of total global repair work in Q1 (steady on full year 2024), with the most active countries in the region being the Netherlands (17% of UKC activity), Norway (14%) and Poland (11%) (see Charts 2.1-2.2). While the UKC forms only a moderate share of the global ship repair industry, its repair yards play an outsized role in the MPP (39% of work since start-24), cruise (38%), ferry (24%) and offshore repair and retrofit sectors (19%).

China continues to remain the largest destination for ship repair work

Chart 1.1: Total Refurbishment & Repair Events In Q1-25 By Repair Yard Country

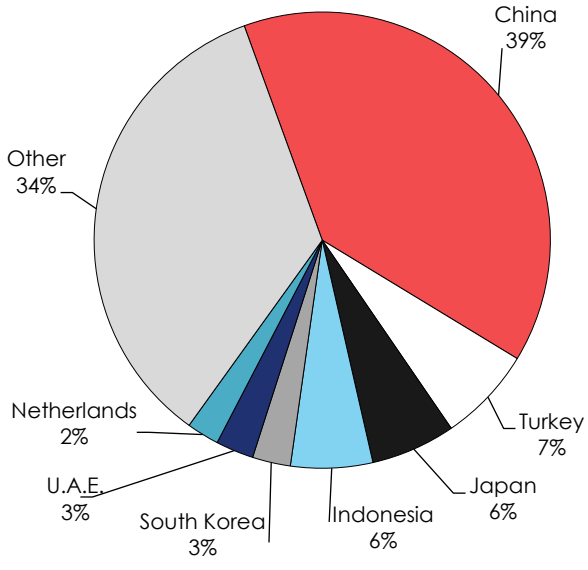


Chart 1.2: Total Refurbishment & Repair Events In 2024 By Repair Yard Country

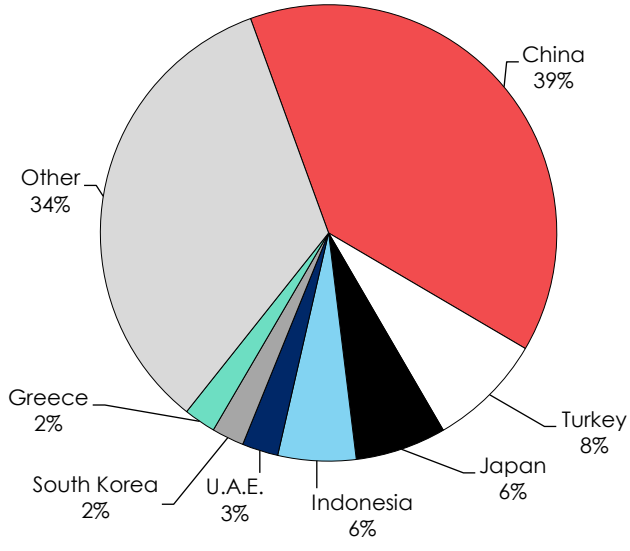


Chart 2.1: Refurbishment & Repair Events In Q1-25 In UK/Continent

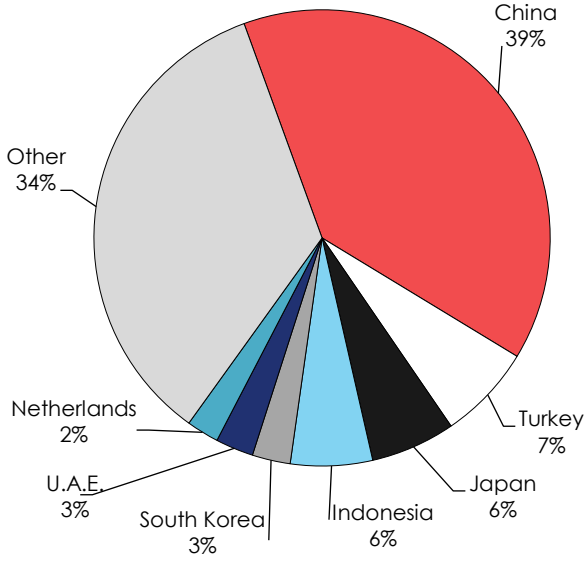
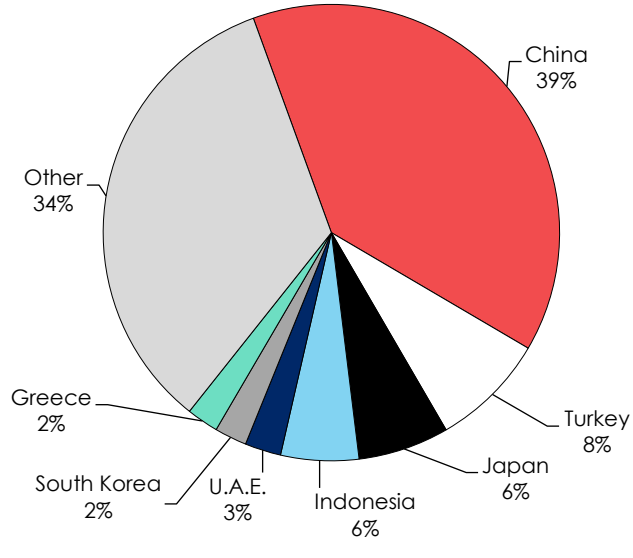
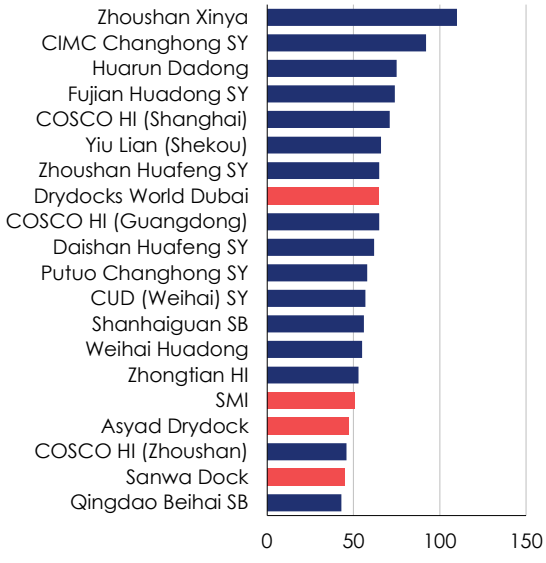


Chart 2.2: Refurbishment & Repair Events In 2024 In UK/Continent



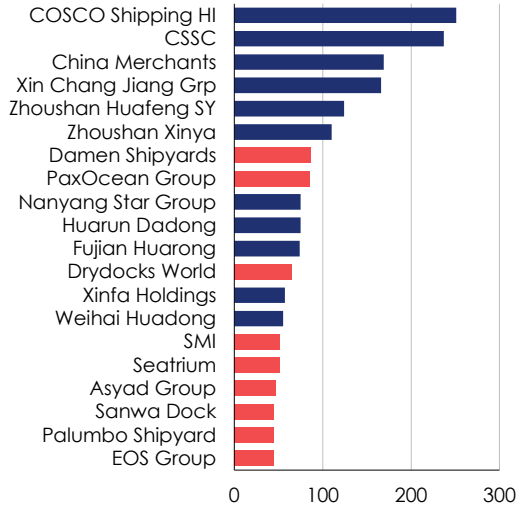
Note: Includes special surveys, scrubber/BWMS retrofits, repairs, cruise refurbishments and other activity. Data as of April 2025. Data subject to late reporting.

Chart 3.1 Repair Events By Repair Yard Q1-25



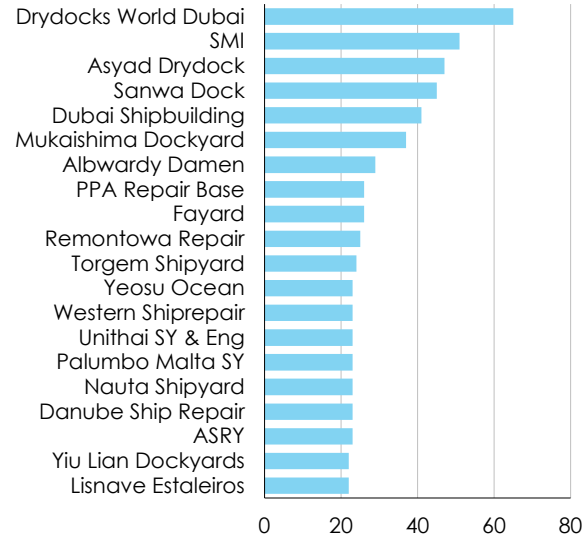
Total unique repair events in Q1-25. Yards in red located outside of China. Data as of April 2025.

Chart 3.2 Repair Events By Repair Yard Group Q1-25



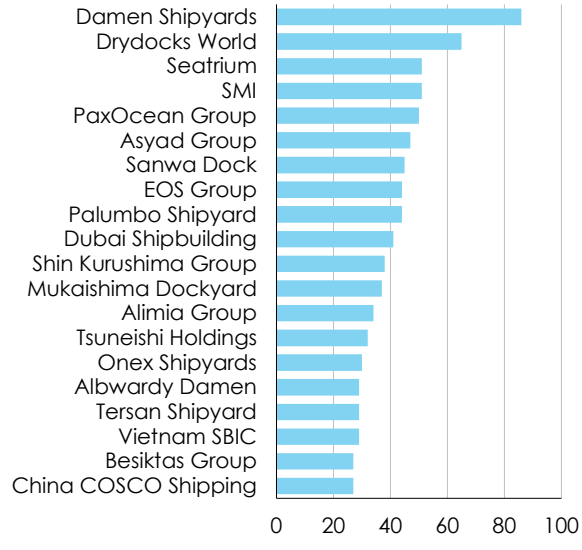
Total unique repair events in Q1-25. Yard Groups in red based outside of China (total may include Chinese subsidiary yards). Data as of April 2025.

Chart 3.3 Repair Events By Repair Yard Q1-25 (Non-Chinese Yards)



Total unique repair events in Q1-25. Data as of April 2025.

Chart 3.4 Repair Events By Repair Yard Group Q1-25 (Non-Chinese Yards)



Total unique repair events in Q1-25. Data as of April 2025.

Charts 3.1-3.6 show a breakdown of ship repair activity at the most active yards and yard groups in Q1-25, globally, outside China and in the UKC.

Overall, the flow of ship repair work has steadily increased over recent years amid an expanding fleet and retrofit programmes, with >22,000 ships entering a repair yard in full year 2024, up 4% y-o-y (see Chart 4). The SOx scrubber retrofit programme was slower last year at around 330 retrofits (-36% y-o-y) as a tight HSFO-VLSFO fuel price differential (avg. differential at Rotterdam: ~ $85/tonne in 2024 v ~ $217/tonne in 2022, lower still in Q1-25), and strong cross-sector market conditions (2024 ClarkSea avg: +50% v 5yr avg.) have discouraged vessel owners from taking ships out of service to undergo retrofit work.

Meanwhile, the pace of Ballast Water Management System (BWMS) retrofits, which peaked at >5,900 ships a year in 2022, has eased back significantly as the programme nears completion and with all international sailing vessels now covered by the IMO's BWM Convention. About 1,700 BWMS retrofits were reported in 2024 (-52% y-o-y).

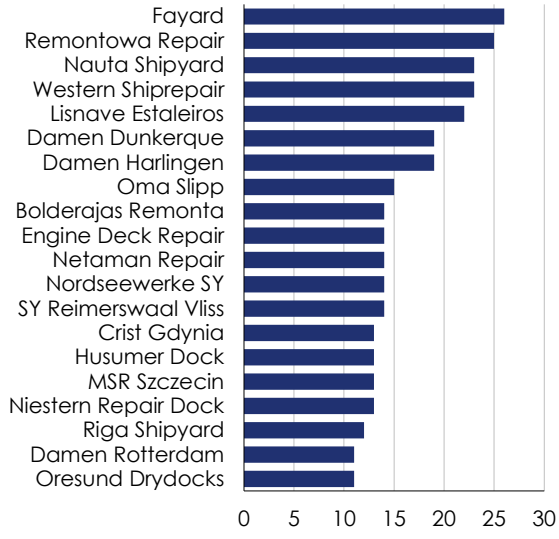
Energy-saving devices

However, while these work streams have receded in significance, there has been growing interest in the retrofitting of energy-saving technologies (ESTs), with >500 ships undergoing an EST retrofit in 2024 (+17% y-o-y) following a strong rate of growth over recent years (avg. annual growth of 40% since 2020). Meanwhile, with shipping's 'Fuelling Transition' a focus, the fuel conversion programme is at an early stage, with 13 vessels having undergone a fuel conversion since the start of 2024 (six methanol conversions, three hydrogen, two LPG, one LNG and one ammonia conversion).

Chart 5 shows trends in repair yard work by type. Table 1 shows a variety of different ESTs and their adoption.

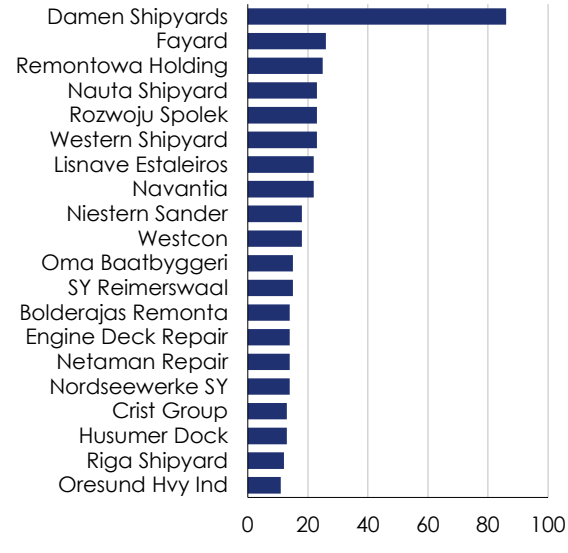
Focusing in on the cruise and ferry sectors, since the start of 2024, around

Chart 3.5 Repair Events By UK/Continent Repair Yards Q1-25



Total unique repair events in Q1-25. Data as of April 2025.

Chart 3.6 Repair Events By UK/Continent Repair Yard Groups Q1-25



Total unique repair events in Q1-25. Data as of April 2025.

280 cruiseships and >2,500 ferries have entered a repair yard to undergo work, representing a modest increase on recent years. The volume of work at yards has been supported by a resurgence in cruiseship refurbishments on the back of a recovery in the cruise sector following the Covid-19-induced downturn; while the rate of special surveys in the passenger ferry and cruise sectors has remained relatively consistent, the volumes of tonnage undergoing refurbishment have been increasing, with about 110 ships of ~ 8.0m gt receiving such work last year (+22% y-o-y, +88% on 2020 low) (see Chart 6). Moreover, unlike in the major cargo sectors where China holds a significant market share, repair yards in the UKC account for a larger share of work in the cruise sector, with the shares held by facilities in Spain (10%), France (9%) and the Netherlands (8%) particularly notable. Meanwhile, in the ferry sector, repair yards in East and Southeast Asia remain significant – Indonesia accounts for 20% of vessels undergoing work, China 9% – though

Chart 4 Vessels Arriving At A Repair Yard

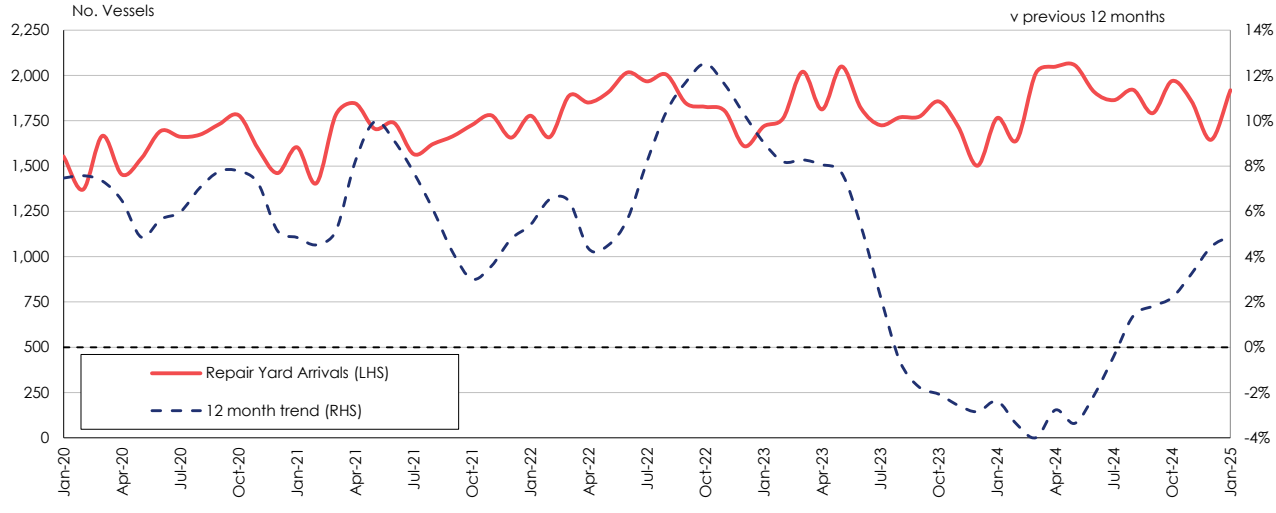


Chart 5 Repair Yard Activity By Event Type

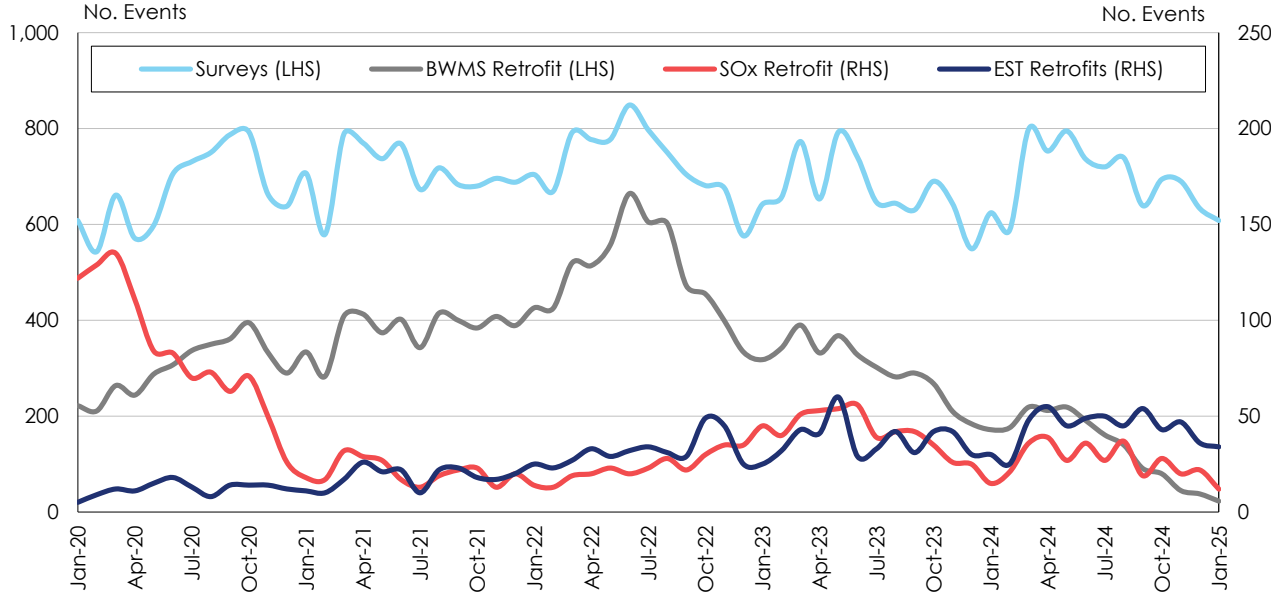
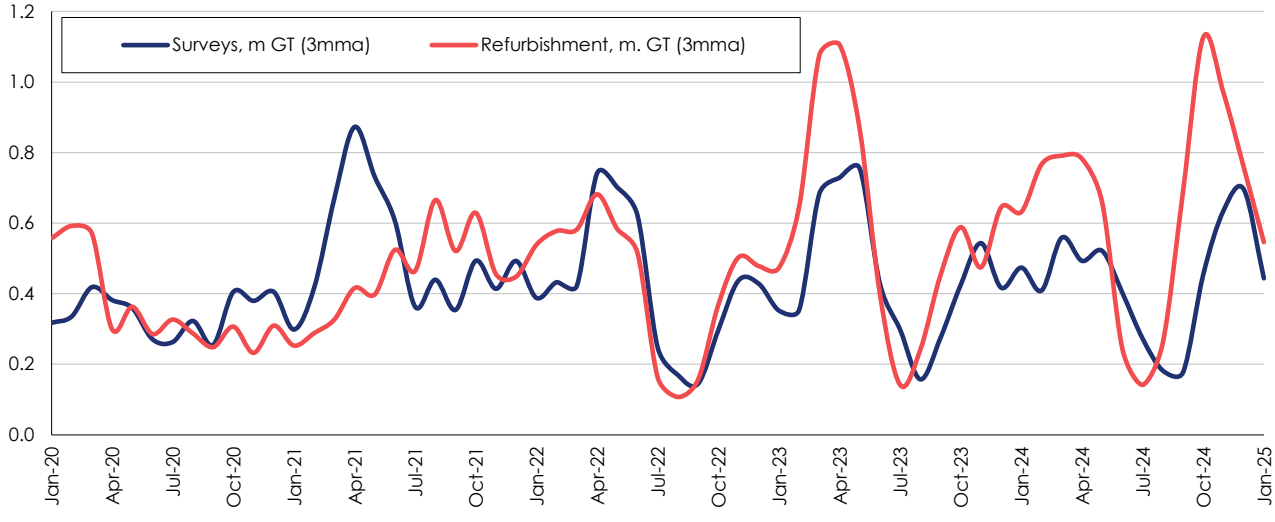


Table 1

Equipment Group	Technologies	Example Projects	Vessels Equipped (Fleet & Orderbook)
Engine Room	Waste Heat Recovery Generator	Climeon, Alfa Laval, ABB, Hanwha, Calnetix Hydrocurrent	>193
	Variable Compression Ratio	WinGD	>62
	Fuel Emulsifier	FOWE, IPCO, Kawasaki	>187
Propeller	Propeller Duct	Becker Mewis Duct, Kawasaki, other in-house shipyard designs	>3,405
	Pre-Swirl Stator	Becker BTF, DSME Pre-Swirl, CMES-Tech, SDARI, Wartsila EnergoFlow	>3,476
	Rudder Bulb	Becker, Kongsberg Promas, SDARI, Imabari Hybrid-Fin, Wartsila Energopac, other in-house shipyard designs	>5,282
	Propeller Boss Cap Fin	MMG escap, CMES-Tech, MOL Techno-Trade, SDARI	>2,939
	Wake Equalizing Duct	Schneekluth WED, CMES-WID	>799
Wind	Flettner Rotors	Norsepower, Anemoi	>53
	Suction Wing	Econowind, Bound4blue, Oceanbird	>52
	Rigid Sail	BAR Technologies, DSIC, AYRO, Oshima Shipbuilding	>38
	Wind Kite	Airseas Seawing	>4
Hull	Air Lubrication System	Silverstream, DSM ALS, Samsung SAVER Air, Alfa Laval, Mitsubishi MALS, Armada	>621
	Bow Enhancement (including Windshield)	Ulstein X-Bow, Damen Sea Axe, Kawasaki SEA-Arrow, other in-house shipyard designs	>3,741
	Elogrid	Elomatic	>10
	Hull Fin	Oshima Advanced Flipper fin, Namura NCF™ , Sanoyas Tandem Fin™, Japan Marine United A.L.V Fin	>1,488

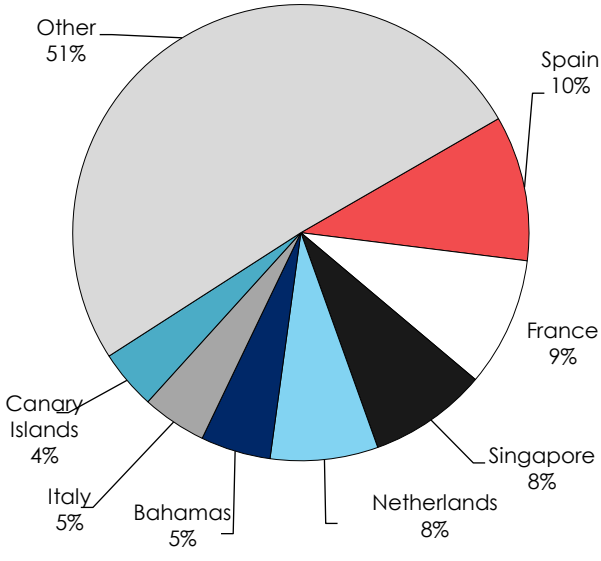
Chart 6 Select Ferry & Cruise Repair Events By Type



yards in Europe retain a significant position (Italy: 9%; Greece: 9%, Norway: 7%) (see Charts 7.1 and 7.2).

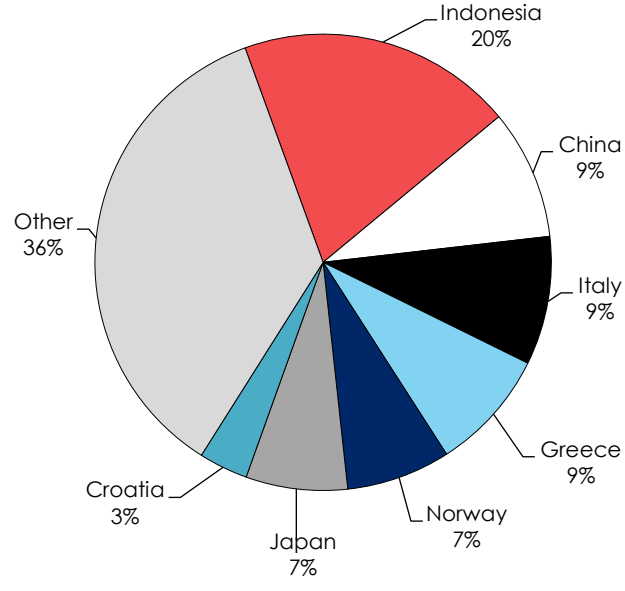
Charts 8.1-8.2 show the most active yards in cruise and ferry ship repair globally since the start of 2024.

Chart 7.1: Total Cruise Refurbishment & Repair Events Since Start-24 By Repair Yard Country



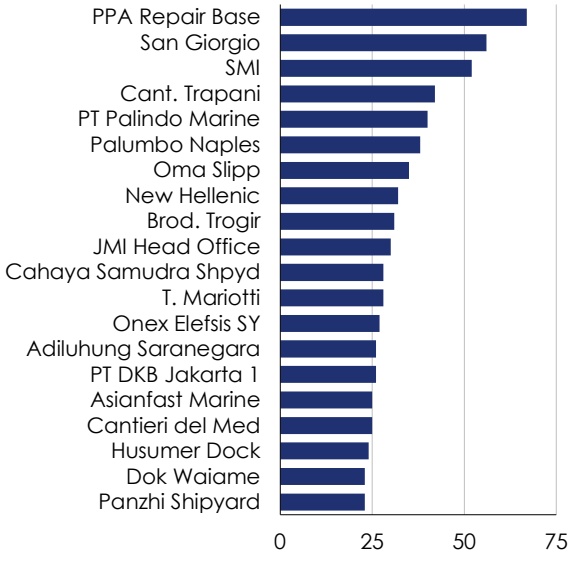
Note: Includes special surveys, scrubber/BWMS retrofits, repairs, cruise refurbishments and other activity. Data as of April 2025. Data subject to late reporting.

Chart 7.2: Total Ferry Refurbishment & Repair Events Since Start-24 By Repair Yard Country



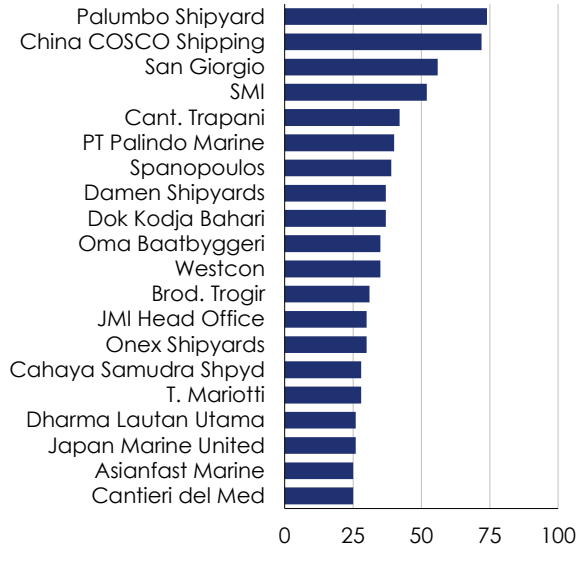
Note: Includes special surveys, scrubber/BWMS retrofits, repairs, cruise refurbishments and other activity. Data as of April 2025.

Chart 8.1 Cruise & Ferry Repair Events By Repair Yards Since Start-24



Total unique repair events in Q1-25. Data as of April 2025.

Chart 8.2 Cruise & Ferry Repair Events By Repair Yard Groups Since Start-25



Total unique repair events in Q1-25. Data as of April 2025.

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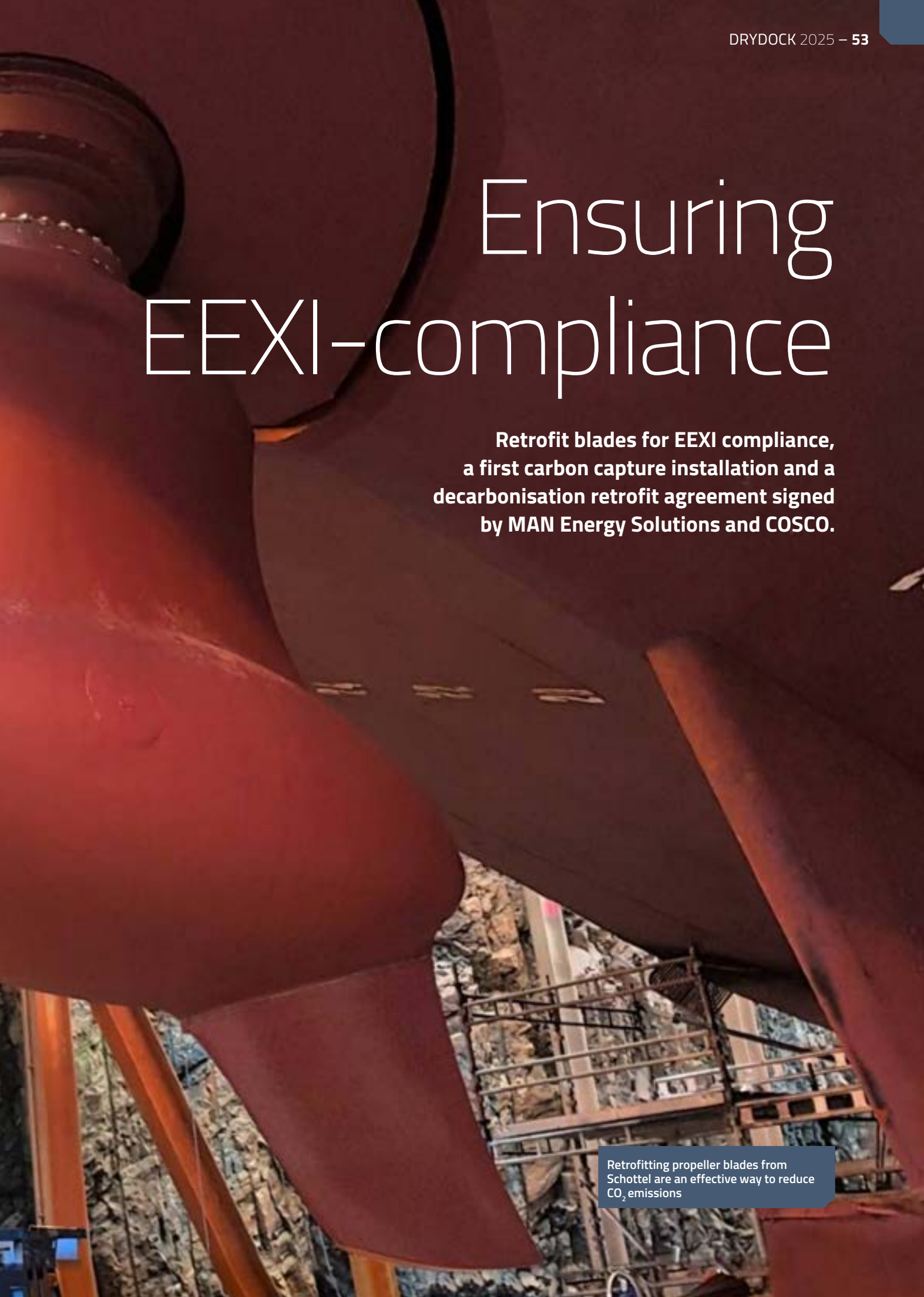

Retrofitting propeller blades from Schottel are an effective way to reduce CO_2 emissions

In order to reduce and ultimately eliminate greenhouse gas (GHG) emissions from ships, the IMO has launched a series of regulatory measures, bundled in the 2023 IMO GHG Strategy. The strategy aims to reduce the carbon intensity of international shipping by at least 40% by 2030 and to zero by 2050. To achieve these targets, ship operators have to meet certain efficiency standards set by the Energy Efficiency Existing Ship Index (EEXI) from 2023. If the ships are not in compliance with the specified requirements, efficiency-enhancing measures must be taken to ensure unrestricted operation in the long term. In this context, retrofit propeller blades from Schottel are an effective way to reduce CO_2 emissions, thus ensuring compliance with EEXI regulations.

With the EEXI, new benchmarks for the energy efficiency of ships came into force in January 2023 as an integral part of the IMO (International Maritime Organization)'s long-term climate objectives. In order to comply with the EEXI regulations, an increasing number of vessels are operating at lower speeds (slow steaming) to reduce fuel consumption. Schottel offers its customers the option of adapting the propulsion system to the vessels' changed operating profiles, thus achieving maximum efficiency. For this purpose, the German propulsion expert is equipping existing vessels with new, hydrodynamically-optimised propeller blades for the Schottel ControllablePropeller (SCP). The propeller blades are custom-designed by Schottel, using extensive propulsion system and vessel analyses as well as calculation methods, such as computational fluid dynamics (CFD).

Increase in propulsion efficiency

In addition to the savings resulting from an optimised operating profile, the new propeller blades, which are precisely tailored to the revised operating conditions, are expected to increase propulsion efficiency by up to five per cent. Taken together, this will significantly reduce fuel consumption, thereby lowering CO_2 emissions and the ships' operating costs. Besides increasing propulsion efficiency, redesigned propeller blades will also

The new propeller blades are precisely tailored to the revised operating conditions

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LIFTING EQUIPMENT

Caption: Value Maritime has successfully installed its unique EGCS and Carbon Capture unit aboard *Nexus Victoria*

ensure a reduction in cavitation and pressure fluctuations, as well as a decrease in noise emissions.

Robust, reliable and powerful

Schottel controllable pitch propeller systems are characterised by their outstanding performance in terms of propulsion efficiency and bollard pull. The SCP is designed to be both robust and user-friendly, guaranteeing minimum maintenance and thus a long service life. Particularly suitable for vessels fulfilling a wide-ranging operation profile, the SCP always provides optimal propulsion power for changing speeds or loads. With a robust construction based on 60 years of engineering excellence, the SCP is a design that has been tried and tested in thousands of practical applications.

CARBON CAPTURE FIRST

Value Maritime (VM), a pioneer in emissions-reducing maritime technology, has successfully installed its unique Exhaust Gas Cleaning System (EGCS) and Carbon Capture unit aboard *Nexus Victoria*, a 75,000dwt LR1 product tanker owned by Mitsui OSK Lines (MOL). The completion of this installation marks a significant development in CO_2 emissions reduction in the shipping industry and demonstrates MOL's commitment to sustainability.

VM's 15MW next-generation EGCS Filtree system can filter sulfur and (ultra) fine particulate matter and can capture 10% of the vessel's CO_2 emissions with potential scalability to 30% if needed. *Nexus Victoria* is now the largest vessel to incorporate VM's SOx scrubber with advanced carbon capture technology and the first ever LR1 tanker to sail with this system. The installation was completed in Singapore under the supervision of VM's specialised technical team.

"Our first commissioning in Singapore is a milestone for Value Maritime," said Alican Kilinc, Operations Director at Value Maritime. "We appreciate MOL's trust in our technology and are excited to support their decarbonisation efforts. Collaborating with one of the world's leading shipowners drives us to push innovation forward and provide the industry with the most effective emission-reducing solutions."

Shipping it green

MOL has established the MOL Group Environmental Vision 2.2 as a roadmap to achieve net zero greenhouse gas (GHG) emissions by 2050 and promote the sustainable development of people, society and the Earth. MOL positions the environmental strategy as one of the main strategies in its management plan, BLUE ACTION 2035.

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Guo Zhiqiang and Michael Petersen signing the framework agreement

"This system represents a crucial step in decarbonising vessels that cannot yet transition to next-generation fuels," said Hiroyoshi Kubo, Executive Officer – Tanker Unit at MOL. "Together with Value Maritime, we are committed to advancing carbon capture solutions and building a CO_2 value chain that contributes to a sustainable, carbon-neutral industry."

The Filtree System

VM's Filtree system is designed to filter sulfur, CO_2 and (ultra)fine particulate matter from the vessel's exhaust stream. The system's plug-and-play design includes onboard CO_2 capture and storage capabilities, enabling captured CO_2 to be offloaded onshore for reuse in greenhouse cultivation, methanol production and even the food industry.

Looking ahead, Value Maritime aims to expand its partnerships across Asia and enhance its carbon logistics infrastructure through Value Carbon, its dedicated carbon capture and storage sister company. "End-to-end carbon capture solutions are essential to achieving industry-wide decarbonisation," said Christiaan Nijst, Co-founder and Director of Value Group. "By integrating maritime carbon capture with onshore utilisation, we're closing the loop on emissions and creating a more sustainable shipping ecosystem."

DECARBONISATION AGREEMENT

At a recent ceremony in China, MAN Energy Solutions signed a framework agreement with COSCO Shipping Heavy Industry Co, Ltd. (CHI) regarding a future cooperation on decarbonisation retrofit projects.

Michael Petersen, Senior Vice President and Head of PrimeServ Denmark, signed the agreement on behalf of MAN Energy Solutions, with Guo Zhiqiang, Deputy General Manager, CHI Commercial Headquarters, doing so for CHI.

"I am pleased to announce that CHI and MAN Energy Solutions, having served shared clients in their respective domains, are now forging a closer collaboration in vessel decarbonisation," said Guo Zhiqiang.

"Starting today, our integrated one-stop solutions will inject fresh impetus into the green transition of the global maritime industry."

"This frame agreement facilitates MAN Energy Solutions' partnership with CHI, one of the largest repair yard groups in the world," said Petersen. "The agreement means that we can join forces on many future projects to ensure the decarbonisation of the existing commercial fleet worldwide. Today, there are some 4,500 vessels globally with the potential to benefit from changing their current bunker fuel to more environmentally-friendly options. We look forward to working with CHI to deliver new decarbonisation solutions to the maritime industry."

Retrofit of existing ships

The new framework agreement provides for the retrofitting of existing ships to operation on new alternative fuels such as methane, methanol and ammonia – all fuels that can be produced in a sustainable way through power-to-X processes. MAN Energy Solutions will provide advanced engine retrofit technology and digital energy efficiency solutions, while CHI will leverage its rich EPC (Engineering, Procurement and Construction) experience in large-scale ship modification projects.

With five ship repair yards, CHI has the capacity to repair and modify approximately 1,500 ships annually. This collaboration will integrate MAN PrimeServ's cutting-edge, dual-fuel engine technology with CHI's repair and modification capabilities to decarbonise the merchant fleet globally.

MAN Energy Solutions views the new agreement as a natural development stemming from the companies' strong relationship. In this respect, MAN Energy Solutions and CHI are already working together on two major projects for two world-leading containership owners.

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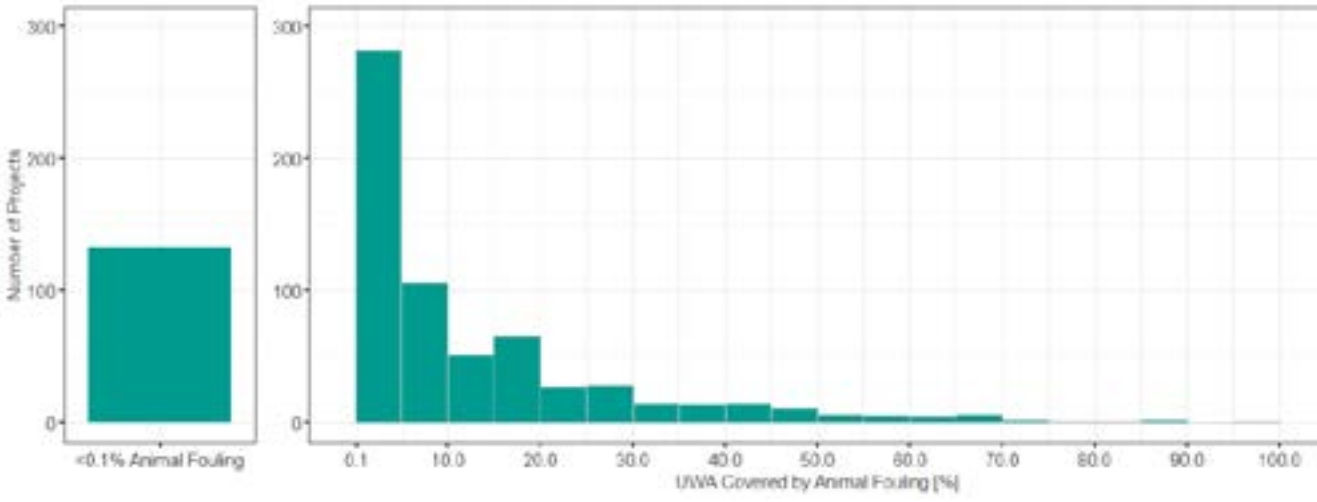
Underwater coatings & cleaning in focus

A new barnacle biofouling study from I-Tech, fuel savings with Ecospeed, a first drydocking for PPG's electrostatic coating, a no-negative-impact coating from Nippon Paint Marine and the latest HullSkater agreement from Jotun.



Barnacle fouling surface coverage

A new study has found that nearly one-fifth of a sample group of 685 vessels inspected in drydock had more than 20% of their underwater hull surface covered by barnacles, and as much as one-third had more than 10% coverage. High levels of barnacle biofouling on underwater hulls across the global shipping fleet can significantly drag down decarbonisation efforts and increase fuel costs.

The reality of the barnacle biofouling burden on the global shipping fleet has been determined with findings from extensive analysis of hull condition across a large group of ships, of varying type and age, confirming that the presence of barnacle biofouling is extremely common.

A new research study entitled 'How much could barnacles limit shipping's decarbonisation?' published by I-Tech, developers of the barnacle-repelling antifouling technology Selektope, details how over a third of vessels in a 685-sample group sailed into drydock with barnacles covering more than 10% of their hull surface.

More alarmingly, more than a fifth of vessels inspected in the sample group were found to have over 20% of their underwater hull surface covered with barnacle biofouling, whereas only 140 vessels inspected had the optimal condition of less than 0.1% barnacle biofouling.

The extensive data analysis that sits at the core of the new research study was conducted by an independent marine coatings consultancy group based on data collected from 685 vessel hull condition inspections. These were undertaken between 2015-2025 on a majority of vessel types with a range of trading activity levels.

While this sample group is relatively small in comparison to the 55,000 merchant ships trading internationally, the high prevalence of barnacle biofouling found gives indicative insight that should be of great concern to the industry, considering the immense negative impact barnacle biofouling has on increasing vessel emissions.

Barnacle biofouling was found on all vessel types; however, it was present on tankers more than other ship types. For example, almost 90% of tankers were found to have barnacle biofouling present on their underwater hull with varying intensity, compared to around 70% of pure car carriers and containerships inspected.

It was also clear that lower-activity vessels are at greater risk and barnacle biofouling is more prevalent on the flat bottom area compared to vertical sides or boot-top hull areas.

Various root causes

Variations in barnacle biofouling between vessel types can be attributable to a certain degree to different root causes: different paint systems, speed, activity and route. However, the presence of more than 10% barnacle biofouling coverage can result in significant added resistance,

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with 36% more shaft power required to maintain the same speed through water. This has a significant negative impact on a vessel's fuel use and subsequent emissions to air. Extrapolating from published data taken from a 2011 study by Michael P. Schultz, this level of hard biofouling could be responsible for at least 110 million tonnes of excess carbon emissions per year, and an additional $15 billion spend for the global commercial fleet. The true figure is likely to be higher, as this is a conservative calculation based on today's low-sulfur fuel oil prices and only assumes a 10% coverage of hard biofouling.

Therefore, the significant extent of hard fouling found across the sample group in the research study demonstrates the magnitude of unnecessary demand being placed on engines because of barnacle biofouling, increasing fuel consumption and emissions, and exacerbating speed losses due to increased hydrodynamic drag.

Worrying findings

"The findings that more than one fifth of vessels in this study had more than 20% barnacle biofouling is concerning," says Dr Markus Hoffmann, Technical Director at I-Tech. "This reinforces the fact that antifouling coating systems with good static performance, boosted by the presence of biocides that target hard fouling, even under extended static conditions, are an absolute necessity if barnacle fouling is to be reduced to much lower levels on a global fleet scale."

"Data analysis on a sample group of vessels using coatings containing Selektope, conducted by the independent coatings consultants, showed that in the majority no barnacle biofouling was present. This confirms that good barnacle fouling protection is always worth the investment, not least because these organisms can really drag a vessel's Carbon Intensity indicator (CII) down and thrust greenhouse gas emissions up," he concludes.

From the conclusions drawn in the research study, I-Tech's advice for shipowners and/or operators includes using careful consideration of hard biofouling protection components during antifouling coating selection. Ensuring adequate hard biofouling protection – for all vessels, but particularly those at risk of longer idling periods while in service, is essential for the adequate protection of the global shipping fleet from barnacle biofouling.

FUEL SAVINGS WITH ECOSPEED

Fuel is one of the largest ongoing expenses for any shipowner or operator, accounting for up to 50% of a vessel's operating costs. A cruiseship, for example, typically spends $80,000-$200,000 a day on fuel. The world fleet spends from $120 billion to over $200 billion a year on bunker fuel. Anything that can significantly reduce that fuel bill is of great interest to the industry.

Why so much fuel?

An analysis in the Second IMO GHG Study explains: "43% of the fuel energy is converted into shaft power while the remaining energy is lost in the exhaust or as heat losses. Due to further losses in the propeller and transmission, only 28% of the energy from the fuel that is fed to the main engine generates propulsion thrust in this example… The majority of these remaining 28% are spent overcoming hull friction…"

Hull friction

Hull friction is the enemy of fuel efficiency. A very high percentage of the energy generated by a ship's engines is expended in overcoming the resistance to the ship's hull as it moves through the water. This is hull friction.

Assuming that the ship's hull has been efficiently designed and built, there are two main factors that contribute to the fuel efficiency or inefficiency:

1. The roughness or smoothness of the hull itself, which, assuming the ship has been well built, comes down to the paint, its application and its maintenance over time
2. The degree of biofouling accumulated on the hull.

Making sure the hull coating is smooth and remains so, and keeping it clean of biofouling – even a small degree of accumulated slime – can save as much as 20% of the ship's fuel consumption or more. In the case of heavy fouling, the fuel penalty can be 80% or higher. This is a fact that has been known since the days of sailing ships, where fouled ship hulls could cost a navy a whole battle due to loss of speed and manoeuvrability.

If the world fleet consisted of well-coated, smooth hulls that were kept clean of slime, let alone weed and hard fouling, this would save $20 billion to $40 billion a year or more, with a proportionate reduction in carbon emissions.

Hull coating systems

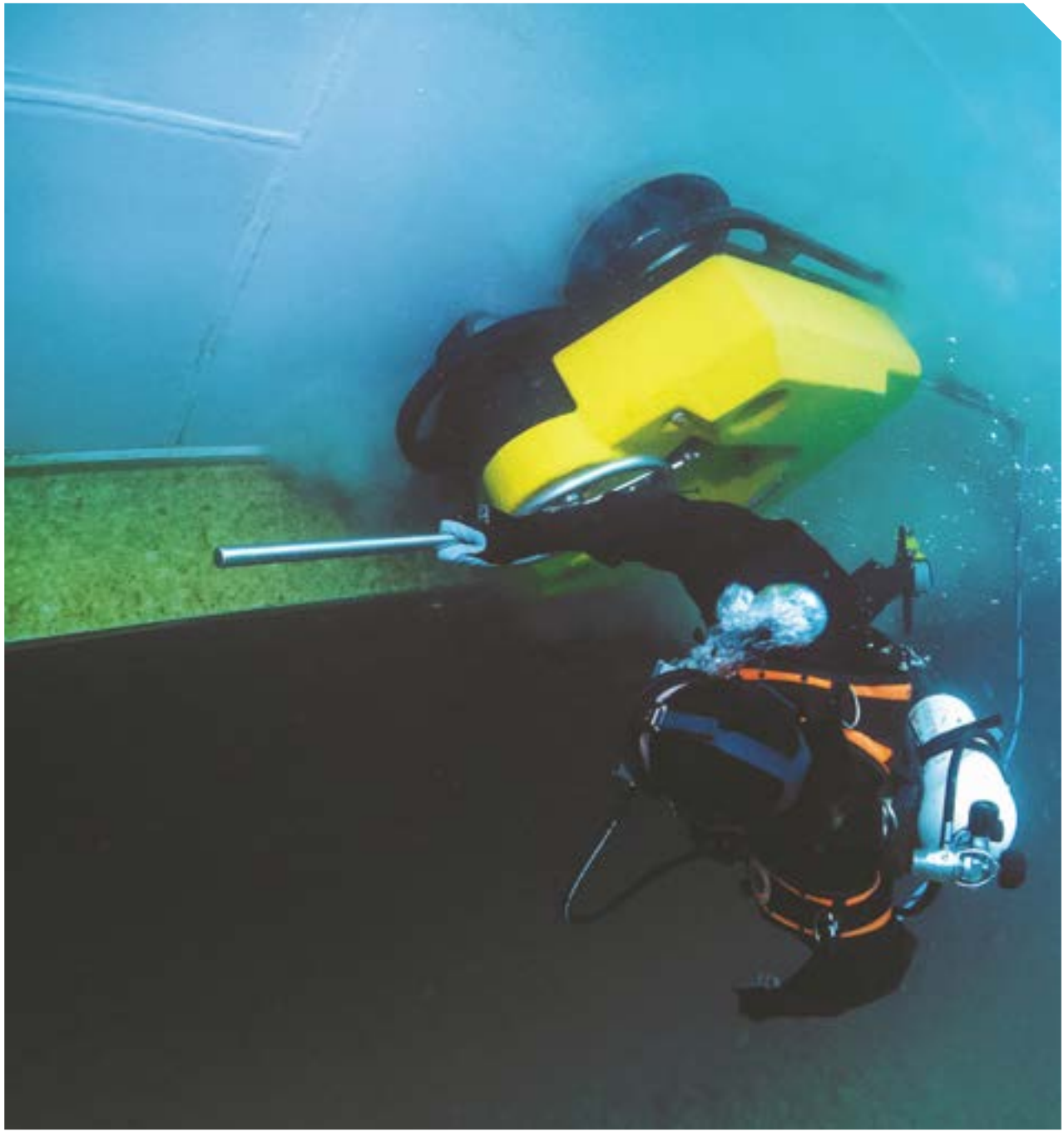
There are three main types of underwater hull coatings in use today: antifouling coatings (AF), which leach poisonous substances into the water continuously to kill vegetable and animal fouling before it can attach; foul release coatings (FR), which have a slick surface that biofouling cannot easily attach to and are designed to release any fouling that does accumulate when the ship moves, particularly at speed; and hard, inert surface treated composites (STC) which provide a hard, smooth surface that does not degrade over time and can be cleaned in the water to remove accumulated fouling without harm to the coating or the environment.

They are listed above in order of prevalence in today's fleet. The biocidal antifouling coatings are by far the most common.

Here, we look at the third type of coating, specifically Ecospeed.

Description of Ecospeed

Ecospeed is a hull coating system designed to fully protect the hull for the life of the ship without need to repaint, while achieving maximum fuel efficiency



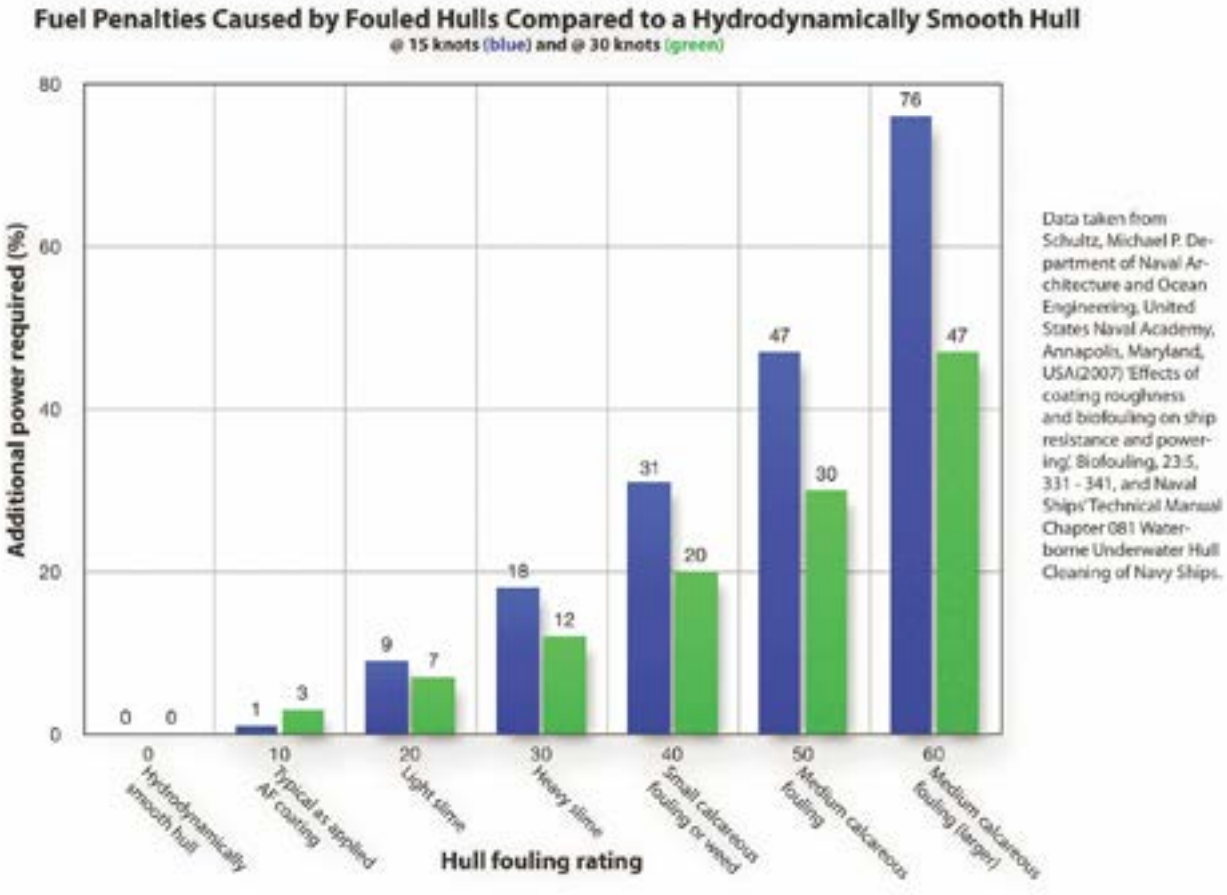
Ecospeed can be cleaned as often as needed in the water

throughout the ship's life. Because it is entirely non-toxic, it avoids any contamination or pollution of the marine environment.

Ecospeed is a system consisting of a hard, inert glass platelet-reinforced vinyl ester resin combined with in-water cleaning as needed to keep it free of biofouling.

These are the main characteristics that distinguish it from conventional antifouling and foul release coating systems:

- Designed to last the life of the ship without any need to repaint. Minor touch-ups to repair mechanical damage are very easy to carry out, and leave the repaired coating as smooth as the original
- Does not emit any contaminants, such as copper, zinc or other heavy metals, biocides such as pesticides or herbicides, PFAS or microplastics, into the water. It has been tested and proven to have no harmful effect on the marine environment



Data taken from Schultz, Michael P. Department of Naval Architecture and Ocean Engineering, United States Naval Academy, Annapolis, Maryland, USA (2007) 'Effects of coating roughness and biofouling on ship resistance and powering'. Biofouling, 23:5, 331 - 341, and Naval Ships' Technical Manual Chapter 081 Waterborne Underwater Hull Cleaning of Navy Ships.

- Can be cleaned as often as needed in the water without any damage to the coating or loss of thickness and without any harm to the environment. Any degree of fouling can be safely removed. The coating is restored to its original smoothness
- Cleaning the coating underwater using the correct tools also has a buffing effect which will make the hull smoother over time. Trying to clean a conventional antifouling or foul release coating damages the coating, particularly if macrofouling has to be removed. Barnacles and other fouling organisms can penetrate the softer AF and FR coatings, whereas with Ecospeed they cannot.

Ecospeed in action

A notable fuel savings success with Ecospeed is the case of a major cruise line which applied the coating to four ships in its fleet. First, two existing vessels were recoated during routine drydocking. The ships sailed mostly in the Caribbean where fouling is fairly rapid. They were cleaned every 6-10 weeks on average in order to maintain maximum fuel efficiency. The president of the company stated publicly that these Ecospeed-coated ships were saving 10% fuel costs compared with their previous AF coating.

Based on this success, the cruise line applied Ecospeed to two newbuilds with even greater success. Because Ecospeed is so durable and designed to last, when the ships drydocked there was no need to repaint – at most some minor touch-ups of mechanical damage.

The cost of cleaning the ships 8-10 times per year was dwarfed by the fuel savings plus the additional savings of drydock fees, off-hire time, materials and labour required in maintaining the AF coating they had previously used.

There have been many other examples of fuel savings through correct application of the Ecospeed system.

PPG has announced the first drydocking for COSCO Shipping Energy Transportation Ltd using electrostatic application of PPG Sigmaglide fouling release coating

Cautions

It must be noted that Ecospeed is not just another hull paint – it is a ship hull protection and performance system consisting of a special coating plus routine cleaning. When deciding to switch to Ecospeed or apply Ecospeed at newbuild, it is vital to take the cleaning requirement into consideration. As the coating does not leach any poison, it will accumulate biofouling. This will occur at different rates depending on the ship's sailing pattern and operating environment. Ships operating in the tropics will require cleaning much more often than those sailing in ice. The fouling will not damage the coating in any way and can always be cleaned off. Each individual ship's situation is discussed, and Subsea Industries assist with working out how the cleaning requirements will be met.

Work is in progress on an industrial cleaning system that will not require divers and can clean a large containership's vertical sides in an hour or two. Until now, the coating has been cleaned successfully with divers using powerful hydraulic in-water cleaning equipment or in drydock using high pressure washing.

Conclusion

Used correctly and cleaned often enough to keep the biofouling down to a light slime or microfouling, Ecospeed is capable of delivering the highest fuel efficiency of any ship hull coating system. To this is added the advantages of it lasting the life of the vessel without the need for recoating, and the absence of any adverse effects on the marine environment.

FIRST DRYDOCKING FOR ELECTROSTATIC COATING

PPG has announced the first drydocking for COSCO Shipping Energy Transportation Ltd using electrostatic application of PPG Sigmaglide fouling release coating. The project was carried out on the *Yuan Chun Hu*, a 333m crude oil tanker owned by COSCO Shipping at the Liuhengdao shipyard in Zhoushan, China. PPG Sigmaglide 2390 coating was applied to the underwater hull and PPG Nexeon 810 antifouling coating to the boot top.

With the largest tanker fleet in Asia, COSCO Shipping is seeking innovative low-friction hull coatings to meet its greenhouse gas (GHG) emissions

reduction targets under the IMO's energy efficiency (EEXI and EEDI) and carbon intensity (CII) requirements.

"Shipowners and shipyards are being encouraged to look for innovative solutions in order to comply with stricter environmental regulations and meet their sustainability goals," said Xia Lei, PPG business director, Marine Asia Pacific, Protective and Marine Coatings. "Our premium hull coatings suitable for electrostatic application can help to reach these targets."

Improved emissions

PPG Sigmaglide 2390 coating is biocide-free and helps vessels reduce power consumption by up to 20% and GHG emissions by up to 35% compared to traditional antifouling coatings. These performance benefits stem from PPG's HydroReset technology, which creates an almost friction-free, non-stick surface that marine organisms cannot recognise or adhere to. PPG Nexeon 810 coating is an ultra-low-friction antifouling that can enable a total GHG emissions reduction of up to 25%.

Both hull coatings are compatible with electrostatic coating application, introduced by PPG to the shipping industry just over a year ago. Electrically-charged paint particles are precisely guided toward the grounded surface of the vessel, resulting in exceptionally even distribution and the formation of a uniform, ultra-smooth, long-lasting film layer. This technique offers sustainability benefits including increased transfer efficiency compared to traditional airless spraying, thus significantly reduces coating overspray and waste. Combined with the low volatile organic compound (VOC) emissions of PPG Sigmaglide coating, the technique provides an improved working environment for the applicators.

"COSCO strives to conduct its business sustainably by constantly measuring its environmental impact," said Lei. "One of its primary goals is to reduce carbon emissions across its entire fleet, so choosing the right hull coatings is critically important. Adopting our premium fouling control coatings that support emissions reduction combined with the sustainable electrostatic spraying technique has significantly reduced overspray, waste and VOC emissions. It also provides a cleaner shipyard and improved working environment for dock workers. This solution combines practicality with effectiveness, helping COSCO achieve its environmental goals."

NO-NEGATIVE-IMPACT COATING

Nippon Paint Marine has announced that results from a recent independent study show that its Aquaterras hull coating had no negative impact on the marine life tested – including zero mortality among marine invertebrates – following simulated in-water hull cleaning.

The trial, conducted by the independent laboratory PML Applications Ltd and concluding in August 2024, exposed marine organisms in estuarine sand and mud to flakes of the Aquaterras biocide-free self-polishing coating.

Biocide-free

Aquaterras is a low friction, biocide-free, self-polishing coating that provides a long-lasting smooth hull surface for up to 90 months, and up to 14.7% fuel savings compared to market average. In-water cleaning has become a greater feature of ongoing hull maintenance, as awareness of the fuel saving benefits

An independent study shows that Nippon Paint's Aquaterras hull coating had no negative impact on the marine life tested following simulated in-water hull cleaning

of reduced friction between hull and water has increased. While the IMO's best management practice requires in-water cleaning operators to be aware of local regulation regarding the discharge of biofouling and waste substances into the marine environment, particle abrasion is an unavoidable outcome of the process, and may cause risks to marine life.

"PML Applications provides cutting-edge facilities and expertise to test the efficacy and potential ecological impacts of marine coatings," says Dr Tom Vance, COO of PML Applications, the commercial arm of Plymouth Marine Laboratory (PML). "In this study, we were commissioned to independently assess the impact of five different types of marine coating particles, including Aquaterras, on selected marine life, and also to characterise the physical effects of in-water cleaning on the integrity of the various coatings.

"Our tests showed no adverse effects on either ragworms or bivalve cockles after 28 days of exposure to Aquaterras coating particles. The bivalves continued to gain weight and grow, with no significant difference in growth rates compared to the control group. Similarly, ragworms gained weight throughout the 28-day trial with no significant differences from controls.

"Using specialist testing protocols, we also simulated in-water hull cleaning on Aquaterras-coated panels using standard soft brush, medium brush and water jet methods. Zinc and copper levels remained at background levels across all cleaning methods, confirming no release of these metals from the coating. Our next challenge would be to understand any longer-term impacts of paint debris generated during in-water hull cleaning."

JOTUN AND THORESEN TIE-UP

Jotun has entered into a commercial agreement with Singapore/Thailand-based shipowner Thoresen Shipping Singapore Pte Ltd for the adoption of Jotun Hull Skating Solutions (HSS).

Under the new partnership, Thoresen Shipping has selected bulk carrier *Thor Brave* for the implementation of HSS. Designed to maintain a clean hull throughout the vessel's entire sailing interval, HSS will enhance operational efficiency through preserving fuel, cut carbon emissions and protect biodiversity.

HullSkater hull cleaning

A key component of Jotun's HSS is the HullSkater, the first robotic technology that has been purpose-designed in collaboration with Kongsberg for proactive hull cleaning. Combined with ultra-premium SeaQuantum Skate antifouling that works in perfect symbiosis with the HullSkater, HSS enables *Thor Brave* to prevent early-stage fouling, to contribute positively towards the sustainability agenda.

Commenting on the partnership, Thoresen Shipping's Managing Director Andy Hillier said: "We at Thoresen Shipping are excited by our partnership with Jotun to help redefine the next generation of hull and vessel performance. We are pleased to have signed this agreement and taken a step towards decarbonisation with Jotun's HSS to support our vision of delivering

a high-quality service with a passion for being the best in class for cost control and in caring for our environment. We also hope this encourages further industry partnerships and efforts to reduce global carbon emissions."

Sustainability imperative

As the maritime industry pursues its ambitious net-zero emissions target by, or around, 2050, optimising vessel efficiency has become a critical priority. Keeping the hull clean is regarded as one of the 'lowest hanging fruits' of decarbonisation. A solution like HSS driving proactive biofouling management is not just an operational best practice but a sustainability imperative, offering an effective and immediate pathway towards positive contribution to carbon intensity indicator (CII) and other operational efficiency indicators.

"We look at HSS, with the HullSkater as the core element, as a ground-breaking approach to biofouling management," explains Kristine Anvik Leach, Managing Director of Jotun Thailand. "We are absolutely delighted that Thoresen Shipping understands the potential of HSS when it comes to their business practices as well as the impact it has on the environment as a whole.

"As a company, we strive to go beyond improving operational efficiency by also focusing on concrete environmental goals and fostering deeper relations with our community. This agreement supports our clean shipping commitment, and we are hopeful of its ripple effect to progressively reaffirm how small changes can set the example for what a sustainable shipping industry should look like in the future."

The partnership between Jotun and Thoresen Shipping will assist the integrated shipowner and operator of bulk carriers in accelerating its carbon-zero vision as it takes a leading role in promoting sustainable growth in the maritime industry through its environmental efforts.

Jotun has signed a commercial agreement with Thoresen Shipping Singapore for the adoption of Jotun Hull Skating Solutions

Vessel engine damage: **Prevention or cure**

***Steve Bee, VPS Group Marketing & Strategic Projects Director*, explains how fuel system check monitoring will reduce risks, save time and money.**


VAPOUR
079
AIR-DRY PRESSURE

Statistically, data indicates that a vessel will suffer between one and two incidences of main engine damage over the course of its operational lifetime. The average damage costs have been estimated at around $650,000 per incident, with even more damaging incidents costing up to $1.2 million per claim. Therefore, it is important to identify the main causes of this damage and understand how it can be prevented.

Prevention of damage is, of course, preferable to cure. Fuel quality and handling issues remain leading contributors to critical main engine failures. VPS frequently observes that such issues could have been prevented through the implementation of a robust and well-structured fuel management programme onboard vessels.

A common misconception is that a fuel meeting the international marine fuel quality standard, ISO 8217, means it is 'fit for purpose'. But this is definitely not the case as even fuels that are 'on specification' at the point of delivery to the vessel can cause major engine damage if not properly managed post-delivery. ISO 8217 specifies the requirements for petroleum fuels for use in marine diesel engines and boilers, prior to appropriate treatment before use, which means that fuels should then be treated onboard between delivery and being burnt.

Catalysts used in petroleum refining are made of aluminium silicates, which over time break down. The resulting coarse, dense fragments composed of aluminium and silicon eventually reside in the residual portion of the refining stream. Known as 'cat fines', these particles are highly abrasive and can cause severe damage to vessel engine parts.

> "A COMMON MISCONCEPTION IS THAT A FUEL MEETING THE INTERNATIONAL MARINE FUEL QUALITY STANDARD, ISO 8217, MEANS IT IS 'FIT FOR PURPOSE'."

Recommendations

Major marine engine manufacturers recommend that a fuel should contain less than 10-15 mg/kg aluminium plus silicon (Al+Si) at the engine inlet. However, assuming a delivered fuel meets the stringent ISO 8217:2024 limits of 40-60 mg/kg Al+Si, dependent upon the fuel grade, the fuel treatment plant would have to operate at an efficiency level capable of removing 75%-83% of these highly abrasive particles in order to meet the engine manufacturers' requirements.

Furthermore, the International Council on Combustion Engines (CIMAC)'s recommendation regarding fuel quality states: "Fuel analysis is the only way to monitor the quality of fuel as delivered at the time and place of custody transfer, before and after the fuel cleaning onboard and at the engine inlet. Regular monitoring of the fuel cleaning plant will provide information, which will help to make decisions about the maintenance cycles of the equipment as well as potential engine problems resulting from malfunctioning or inadequate operation."

Yet one of the most important but often overlooked processes is that of regular fuel system checks (FSCs) in order to assess the level of aluminium and silicon catalytic fines within fuel. The presence of 'cat fines' within fuel can be extremely damaging, causing rapid engine-part wear. Monitoring cat fine levels before they can enter vessel engines can prevent such damage. Therefore, sending samples for analysis which are taken before and after purification processes on a quarterly basis is the most effective way to monitor cat fine levels.

FSCs will also help comply with the engine manufacturers' general recommendation of a maximum of 10-15 mg/kg level of cat fines in the fuel entering the engines, and assess purifier efficiency.

There are numerous reasons why regular fuel system checks are critical:

- Help identify potential risks and operational issues before major damage occurs
- Confirm that the system's flow rate, temperatures, discharge cycles are properly adjusted to handle the specific fuel that is being treated
- Verify that the fuel treatment system is properly maintained
- Reduce operating cost and increase lifecycles of critical components

Unit No.	Piston rings condition	Cylinder liner condition	Correction action
1	2, 3 – damaged	Good condition	To renew piston rings 2, 3
2	2, 3 – damaged	Good condition	To renew piston rings 2, 3
3	2, 3, 4 – damaged	Good condition	To renew piston rings 2, 3, 4
4	1, 2 – damaged	Cracked	To renew cylinder liner & piston rings 1, 2
5	2, 3 – damaged	Good condition	To renew piston rings 2, 3
6	1, 2 – damaged	Good condition	To renew piston rings 2, 3

Sample point	Al+Si (ppm)
Transfer Pump	36
Before Separator	46
After Separator	31
Fine Filter Inlet	31
Before Main Engine	32

- Identify presence of unusual components that can enter fuel post-delivery.

Periodic sampling from the fuel treatment system will also identify problems such as water ingress from ballast systems, leaking heating coils and cargo contamination. The last thing anyone wants to see is a purifier working as a pump!

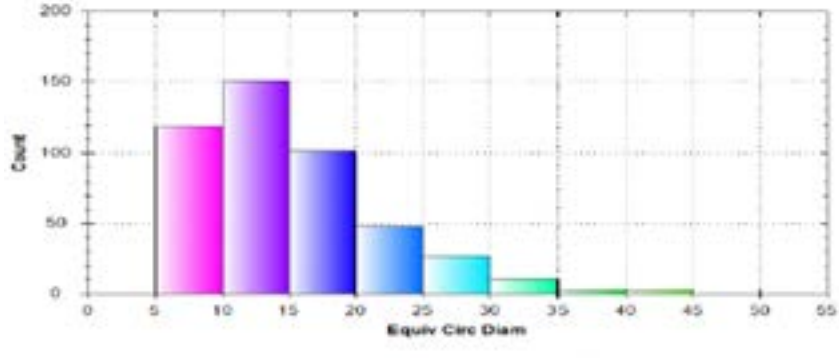
A prime example

An LPG tanker bunkered HSFO in Fujairah where its fuel met ISO 8217 specifications. However, after using the bunkered fuel, the Chief Engineer reported the main engine expansion tank low level alarm, with the main engine exhaust gas temperature high on cylinder unit 2 & 4. The vessel started a gradual slowdown of the main engine. The Chief Engineer reported that the vessel was unable to run the engine due to suspected leaks on the main engine cylinders. The vessel drifted for about 10 hours before dropping anchor off the coast of India. Upon dismantling the engine, the above findings were made:

The VPS Technical Advisor recommended that the vessel submit fuel system samples, and upon checking, the results from the system (shown left) indicated that the purifier was in fact only working like a pump.

The screening size of Al+Si on the before engine sample further confirmed why the vessel was having problems, as the physical size of Al+Si particles ranged from 5-45µm.

The ideal particle size range of cat fines that can be effectively removed by a marine vessel's purifier system typically falls between 5 and 15µm. Purifiers are designed to target these smaller particles, as they are the most common size found in heavy fuel oil and can cause significant wear and damage to engine components.



catalyst fines in before engine sample ranged from 5µm to 45µm.

> “CURRENTLY 52% OF ALL SAMPLES RECEIVED BY VPS FOR TESTING ARE VLSFOS, WITH A FURTHER 32% BEING HSFOS. AS THE TWO LEADING FUEL GRADES USED IN GLOBAL SHIPPING, THEY ARE THE TWO WHICH WILL AND OFTEN DO CONTAIN VARYING LEVELS OF CAT FINES.”

Figure 2: VPS FSC Vessel Monitoring Chart

If the particle size of catalytic fines is greater than 15µm, it can pose significant risks to marine engines. Larger particles are more abrasive and can cause severe wear and damage to critical engine components such as cylinder liners, piston rings and fuel injectors.

Potential issues:

- Increased wear: Larger cat fines can embed themselves in softer metal surfaces, leading to accelerated wear and tear
- Engine efficiency: The presence of larger cat fines can reduce engine efficiency and increase fuel consumption
- Maintenance costs: More frequent and costly maintenance may be required to address the damage caused by these particles.

Mitigation strategies:

- Enhanced filtration: Using advanced filtration systems to capture larger particles before they enter the engine
- Regular monitoring: Continuously monitoring fuel quality and performing regular maintenance to detect and address cat fines early
- Fuel treatment: Employing fuel treatment systems to reduce the concentration of cat fines in the fuel.

This VPS fact-finding was highly appreciated by the vessel Chief Engineer and the shipowner, following their realisation of what was the cause of the problem. They subsequently put in place routine sampling of fuel system check (FSC) samples to prevent the same incident recurring.

As part of the VPS FSC service, each vessel has a monitoring chart checking the cat fine level upon receipt of the fuel, then the before-purifier level and the after-purifier level. Should any submitted FQT (manifold) sample show >40mg/kg cat fines, the vessel will be advised to send an additional sample for fuel system check. The before-purifier sample should always have a lower cat fine level than the manifold sample. Then the after-purifier should always be below 15mg/kg cat fines, if the purifier is working efficiently.

Currently 52% of all samples received by VPS for testing are VLSFOs, with a further 32% being HSFOs. As the two leading fuel grades used in global shipping, they are the two which will and often do contain varying levels of cat fines.

For VLSFOs across Q1 2025, 17% of all samples tested had cat fine levels between 41-60 mg/kg, which was slightly lower than Q4 2024 and full year 2024, at 18%. These levels are high enough to cause concern and would trigger the request for additional FSC samples to be sent for analysis.

Across 2024 and Q1-25, less than 2% of samples tested exceed the ISO 8217 specification limit of 60 mg/kg.

So, around 19% of VLSFOs delivered in Q1 2025 had cat fine levels >40mg/kg. Should the recipient vessels not have effective, efficient purification of their fuel, they run the risk that one in five fuel deliveries could cause engine damage.

For HSFOs across Q1 2025, 12.5% of all samples tested had cat fine levels


Our passion is not new!
We work with the same passion since the day we started, despite the high demand on quality, and always with the same commitment.
Chantier naval Dakar
GROUPE LISNAVE INTERNACIONAL
Dakarnave

> IN SUMMARY, CAT FINES FOUND IN THE RESIDUAL COMPONENT OF VLSFO & HSFO FUELS ARE HIGHLY CORROSIVE MATERIALS, WHICH CAN CAUSE CONSIDERABLE & COSTLY DAMAGE TO VESSELS.

Figure 3: VPS tested VLSFO Cat-fine Levels

Figure 4: VPS tested HSFO Cat-fine Levels

between 41-60 mg/kg, which was lower than Q4 2024 and full year 2024, at 19% and 20% respectively. These levels are also high enough to cause concern and would trigger the request for additional FSC samples to be sent for analysis.

Again, like VLSFOs, HSFOs across 2024 and Q1-25 showed fewer than 2% of samples tested exceed the ISO 8217 specification limit of 60 mg/kg.

So, around 13% of HSFOs delivered in Q1 2025 had cat fine levels >40mg/kg. Should the recipient vessels not have effective, efficient purification of their fuel, they run the risk that one in seven fuel deliveries could cause engine damage.

Conclusions

In summary, cat fines found in the residual component of VLSFO and HSFO fuels are highly corrosive materials, which can cause considerable and costly damage to vessels. Regular monitoring of onboard purifier performance efficiency, as part of a routine preventive maintenance programme, should be a key tool in mitigating such risks.

It is therefore recommended that a vessel submits 'before and after purifier' samples, for each onboard purifier, four times per year. This way the efficiency of the purifiers can be checked and advice provided to ensure optimum efficiency is being achieved and the engine is being protected to the highest level possible. ■

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RECHARGE

Worldwide REPAIR ROUNDUP

An FPSO life extension for Drydocks World, bound4blue completes the installation of the world's largest suction sails and ClassNK issues an AiP for the design concept of a retrofitted Kamsarmax bulk carrier.

Drydocks World has been awarded the contract for the refurbishment and life extension of the FPSO *Baobab Ivoirien*

Above: President at MODEC Gary Kennedy and CEO at Drydocks World Rado Antolovic signing the contract

Opposite page: bound4blue has completed the installation eSAILs on the *Atlantic Orchard*

Drydocks World has been awarded the contract for the refurbishment and life extension of the FPSO *Baobab Ivoirien*, further strengthening its position as a global leader in complex offshore asset upgrades.

Set to commence as this issue goes to press, the eight-month expedited project on the Floating Production Storage and Offloading (FPSO) vessel will involve extensive structural enhancements, including 1,000 tonnes of steel renewal, 250,000 square meters of tank coating and 11,500m of new piping.

The scope of the contract, awarded by MODEC Management Services, also covers enhancements to crew living quarters and integration of advanced technologies to boost efficiency and reliability. Upon completion, the vessel's lifespan will be extended by 15 years, ensuring sustained energy production for West Africa.

Drydocks World has a proven track record in vessel refurbishments, life extensions and conversions, having successfully completed over 50 similar projects, including more than 30 FPSO upgrades. This latest contract underscores its unmatched expertise in offshore engineering and life extension solutions while reaffirming its commitment to delivering tailored solutions that meet the unique operational needs of its clients.

The *Baobab Ivoirien* plays a crucial role in West Africa's offshore production, with a processing capacity of 70,000 barrels of oil per day (bpd) and 75 million cubic feet of natural gas. It can also inject 100,000 bpd of water and store up to two million barrels of crude oil.

The contract-signing ceremony, held at Drydocks World, was attended by Rado Antolovic, CEO of Drydocks World, and Gary Kennedy, President of MODEC Management Services Pte. Ltd.

"Signing this agreement with MODEC highlights our expertise in complex FPSO refurbishment and life extension projects," says Capt Antolovic. "Our proven track record in executing large-scale offshore engineering works positions us as the ideal partner to enhance the vessel's longevity, efficiency, and operational safety. We are proud to support MODEC in ensuring the long-term efficiency and reliability of its FPSO."

"This contract award is the result of a rigorous selection process to find the best partner for this critical project," said Gary Kennedy, President, MODEC Management Services. "Drydocks World's extensive experience in FPSO upgrades and their commitment to quality and safety made them the ideal choice. The vessel's deepwater operations demand precise refurbishment and life-extension measures to overcome complex engineering and operational challenges, while ensuring efficiency and long-term safety.

"We look forward to working closely with Drydocks World to deliver a revitalised vessel that will continue to play a key role in Côte d'Ivoire's offshore production."

Originally converted in 2003 from an Ultra Large Crude Carrier (ULCC), *Baobab Ivoirien* was designed with expandable topsides to maximise offshore production capacity. FPSOs like this are essential in deepwater operations, enabling crude oil and gas processing at sea before transferring resources to tankers or pipelines.

JUICING UP ATLANTIC ORCHARD

bound4blue has completed the installation of the world's largest suction sails, with four 26m-high eSAILs fitted to the juice carrier *Atlantic Orchard*. Chartered by Louis Dreyfus Company (LDC) and owned by Wisby Tankers AB, Sweden, the specialised vessel had the sails fitted in a single stop already planned for its 10-year survey at Astander Shipyard in Spain, ensuring optimal efficiency.

The four eSAILs were installed in under a day per unit, as planned. When sailing, the 2014-built vessel, which was originally a dry bulk vessel before

undergoing a conversion in 2020, will now enjoy simplified FuelEU Maritime compliance, taking advantage of the Wind Reward Factor, with further CII, EU ETS and additional regulatory benefits.

Depending on trading routes, the vessel will now benefit from fuel consumption and emission savings, projected to reach around 10%, also unlocking commercial advantages.

Flexible, proven, profitable

This latest installation marks the third so far this year for bound4blue, underscoring the company's ability to deliver, scale its technology and oversee its deployment. It is the latest in a series of recent installations that has seen the DNV Type Approved suction sails fitted to vessels ranging from MR tankers to general cargo and Ro-Ro vessels. As José Miguel Bermúdez, CEO and Co-founder, bound4blue, explains, the project showcases the simplicity and versatility of adopting advanced Wind Propulsion Systems (WPS) for an industry in transition.

"eSAILs open an easy, proven and economically beneficial pathway to greener operations for a wide variety of shipping segments, including unique vessel types such as juice carriers," says Bermúdez. "This specialist project is a prime example of how our technology meets customer needs. In this case, the units were lifted into positions originally occupied by four deck cranes, with all electrical and structural work, sail preparation, and full unit programming carried out in one co-ordinated yard visit."

ClassNK has issued an AiP for the design concept of a retrofitted Kamsarmax bulk carrier, converting it from conventional fuel to methanol dual-fuel

He continues: "We are thrilled to partner with ambitious and like-minded companies such as LDC and Wisby Tankers to accelerate shipping's wind revolution, installing our mature, mechanically simple technology to deliver substantial fuel and emissions savings."

Expert assessments

WPS were identified for *Atlantic Orchard* following an exhaustive review of emissions-reducing and efficiency-boosting technology by LDC's shipping decarbonisation team. Lloyd's Register was then called in to provide an expert third-party assessment of competing solutions, before bound4blue's fully-autonomous system was selected in late 2023.

"Reflecting LDC's journey to help shape a low-carbon maritime industry, and thanks to bound4blue's unique technology as well as Wisby Tankers' collaboration, we are excited about this significant first step of a voyage that represents a new milestone in our Group's long history in shipping," says Sébastien Landerretche, LDC's Global Head of Freight. "We look forward to sharing our initial experiences and insights in the weeks to come, as we complete our first crossing to Brazil, before returning to Europe."

Accelerating adoption

bound4blue eSAILs have a typical payback period of less than five years and are suitable for either newbuilds or retrofitting across a diverse array of vessel segments. This includes, but is not limited to, tankers, bulkers, Ro-Ros, cruise, ferries, gas carriers and general cargo vessels. Recent orders have been received from shipping companies such as Maersk Tankers, Marflet Marine, Eastern Pacific Shipping and Klaveness Combination Carriers, amongst others.

DUAL-FUEL RETROFIT

ClassNK has issued an Approval in Principle for the design concept of a retrofitted Kamsarmax bulk carrier, converting it from conventional fuel to methanol dual-fuel, jointly developed by Tsuneishi Shipbuilding and Fonden Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping. This certification demonstrates the regulatory feasibility of the ship, serving as a meaningful step in advancing the transition of the existing fleet to alternative fuels, as bulk carriers of this size are widely operated today.

The design concept was developed as part of a project exploring the conversion of Tsuneishi's Kamsarmax bulk carrier standard design to a methanol dual-fuel configuration. Aiming to establish a model that could pave the way for a broader green transition within the medium-sized bulk carrier sector, the project is working through retrofit challenges, such as determining the location of the new methanol fuel tanks.

Design review

ClassNK carried out a design review of the design concept based on *Part A Guidelines for Ships Using Methyl/Ethyl Alcohol as Fuels (Edition 3.0.0)* of the *Guidelines for Ships Using Alternative Fuels*, and examined the risk assessment through HAZID. ClassNK issued AiP upon confirming the feasibility of the key design, including the arrangement of methanol fuel tanks and fuel supply systems, in terms of regulatory compliance. ■

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NEWS

BULK CARRIER RETROFIT

Damen Shipyards Group, together with partners including Atal Solutions, has completed its retrofit of four bulk carriers for BAM Shipping. The project has involved the integration of a series of efficiency-boosting technologies and is expected to lower the vessels' fuel consumption and emissions significantly.

The retrofit is the first time that all of the various solutions have been used in a single retrofit project. In aiming to reduce fuel consumption, the project has maintained five main focal points: resistance in the water, optimising power usage, enhancing propulsion, cutting emissions and lubrication systems.

Initially, the plan was to install solutions including the Damen Air Cavity System marine lubrication system, the Damen Triton IoT solution, low-friction antifouling paint, variable frequency drives, shore power connectivity, LED lamps, a wake equalising pre- and post-swirl duct, CO_2 capture systems and DEX QM lubrication technology.

Collectively, the project partners anticipated that these measures would reduce fuel consumption by 20-25%, with a reduction in emissions of around 90%. However, during the project, the scope was broadened yet further with the inclusion of four more efficiency-boosting solutions.

These were the inclusion of fuel additives, oil lubricant additives, a Hempel propeller coating and use of nano EFX. This spray solution is applied to the engine's air intake, ionising humidity and ensuring optimal fuel combustion, minimising consumption, emissions and carbon deposits.


BAM ARION

From left to right: Benjamin Smith, Shaun White, Jonny Berglund, Tuur Killaars, and Mitchell Hamber

Jesper Boman, Head of BU WWF Service, Alfa Laval Marine Division welcomes Darren Rowlands, Founder & CEO of NRG Marine, to Alfa Laval

In the coming weeks, the vessels will be verified by classification society RINA, at which point the total volume of fuel savings will be confirmed. However, two of the vessels have already been in operation following the initial retrofit measures and show signs of meeting their anticipated efficiency goals. The fuel savings will additionally reduce the vessels' OPEX considerably.

The project prepares the four bulk carriers for operations in compliance with recent regulations including the Carbon Intensity Indicator (CII) and Energy Efficiency Existing Ship Index (EEXI). The work undertaken will also extend the lifetime of the vessels by an expected 12 years.

While Damen performed the retrofit of the vessels, Atal Solutions arranged the $123.7 million funding for the project.

FORESHIP UK SURPASSES 100 PROJECT MILESTONE

Foreship UK has completed its 100th project, marking a significant milestone in the expansion of the naval architecture and marine engineering firm's UK presence since launching in 2022.

The accomplishment highlights the robust demand in the UK for Foreship's specialist knowledge in newbuilding, conversions and sustainability. Foreship UK has collaborated with some of the largest shipowners and operators in the UK, across the cruise, ferry and wider maritime industries, successfully establishing long-term agreements. The scope of these projects has been extensive, encompassing a variety of services that include energy efficiency technologies, alternative fuel solutions, ship theory and stability assessments, naval architecture and initiatives related to electrical and machinery systems.

"Reaching our 100th project milestone highlights the impact Foreship UK has made in a relatively short time," said Shaun White, Managing Director, Foreship UK. "We are proud to support our customers in addressing today's regulatory and technical challenges and would like to express our immense gratitude for the trust they have placed in us. Our local presence enables us to foster close relationships that ensure we can continue to deliver value to the UK maritime community."

Foreship UK's growing project portfolio demonstrates how a local team can support a sustainable maritime industry with independent technical expertise and a deep understanding of both regulatory requirements and practical implementation.

"The UK's maritime, ship design and engineering heritage, along with its leadership in research and deep talent pool, have enabled Foreship UK to become a valuable contributor to the wider Foreship Group," said Lauri Haavisto, CEO, Foreship Group Ltd. "This success reinforces our commitment to providing independent technical expertise to shipowners in the UK and globally."

Foreship actively contributes to the UK's role as a centre of excellence for maritime education, engaging with industry bodies and programmes such as the Society of Maritime Industries, Maritime UK, Innovate UK, IMarEST conference programmes and the Maritime Futures Forum, while forging links with UK maritime universities and research institutes. These initiatives form part of a broader strategy to support the development of future naval architects, marine engineers and maritime professionals.

From its Southampton base, Foreship is strategically positioned to assist UK shipowners and operators in navigating regulatory and technical advancements. The company aims to grow its UK workforce throughout 2025, targeting both recent graduates and seasoned professionals. Additionally, Foreship plans to broaden its influence in the merchant marine sector, building on its achievements in the cruise and ferry industries.

ACQUISITION COMPLETED

Alfa Laval has completed the acquisition of UK-based NRG Marine, a leading provider of ultrasonic antifouling technology for marine, oil and gas and industrial applications. This strategic move strengthens Alfa Laval's capabilities toward enhancing energy efficiency and operational performance while reducing costs and extending asset lifespan.

Rising energy costs, CII improvement and evolving regulations are accelerating the shift toward future-proof, eco-friendly innovations that optimise operations, support decarbonisation and reduce environmental impact. Ultrasonic antifouling technology is one such immediate opportunity for industries to improve their operations sustainably.

This move strengthens Alfa Laval's position as a provider of next-generation solutions for multiple sectors. With the addition of ultrasonic antifouling technology, Alfa Laval will enable its customers to benefit from solutions that prevent organic matter build-up on the surface of critical assets in a sustainable way, thereby increasing equipment efficiency.

"This acquisition is a strategic step towards offering solutions that enhance operational efficiency and minimise

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Sameer Kalra, President, Marine Division, Alfa Laval

environmental footprint, supporting industry's net-zero objectives," says Sameer Kalra, President, Marine Division, Alfa Laval. "By integrating ultrasonic antifouling technology into our portfolio, we aim to expand its reach and impact, empowering customers across marine, oil and gas and industrial sectors with greater energy optimisation and performance improvements."

NRG Marine, recognised for its Sonihull and Agitate brands, prevents organic deposit build-up by using imploding microscopic bubbles to create surface agitation, passively cleaning surfaces and preventing biofouling of critical components.

Installing the system improves the equipment's performance and lifespan, reduces system downtime and lowers maintenance and cleaning costs. The system's low cost compared to the value gained from reduced fouling and improved maintenance cycles offers attractive returns on investment for all sectors.

In addition to the operational benefits, antifouling systems play an important role in reducing fuel consumption and improving vessel CII in the maritime industry. They also mitigate the risk of spreading invasive species, further supporting sustainability efforts and other environmental metrics.

The system provides reliable, low-maintenance biofouling prevention, critical for enhancing uptime and minimising operational risks in industrial operations. It ensures the uninterrupted cleanliness of internal pipes and valves, keeping operations running smoothly without downtime.

AIP FOR SRC

SRC's Methanol Superstorage Technology, the innovative solution that makes it possible to integrate net-zero-emission methanol fuel seamlessly into the limited storage space available onboard a ship, has secured Approval in Principle (AiP) from leading classification society RINA.

The comprehensive AiP confirms that the highly space-efficient methanol and ethanol fuel storage solution complies with RINA's Guide for AiP of Novel Technologies.

Conventionally-produced methanol is fairly easy to store and handle. Renewably sourced, methanol offers shipping a clear pathway towards the International Maritime Organization target to achieve net zero by around 2050, with interim IMO guidelines (in MSC.1/Circ.1621) covering the safety of ships using methanol/ethanol. Around 240 methanol-capable ships are in service or on order.

In practice, however, ship tanks storing low-flashpoint fuels include a cofferdam of at least 600mm to separate the internal and external walls. Less energy-dense than HFO, a methanol tank needs to hold 2.4 times the amount to generate the same energy, with consequences for ship range and design.

SRC Methanol Superstorage replaces the internal wall-cofferdam-external wall solution with a solid elastomer core 'sandwiched' between two steel plates. Providing a triple barrier against leakage, the 25mm-thick Sandwich Plate System (SPS) Technology walls deliver 85% more volume. Already in maritime and offshore use for over two decades, SPS Technology can satisfy A60 fire rating equivalence and is approved by all major members of the International Association of Classification Societies.

Based on its most recent Rules for Classification of Ships, the RINA Methanol Superstorage AiP takes account of IMO's interim safety guidelines and amendments to the International Code of Safety for Ships Using Gases or Other Low-Flashpoint Fuels. It confirms the solution "has proper capability to achieve equivalent level of safety to prescriptive requirements and improve the utilisation rate of space as required for methanol and ethanol fuel storage onboard different ship types".

"RINA always encourages maritime industry innovators," commented Simone Manca, Vice President of RINA North Asia. "Approval in Principle for SRC Methanol Superstorage Technology recognises that the solution offers significant potential as an enabler for adopting methanol as a marine fuel."

RINA's comprehensive Methanol Superstorage AiP explicitly acknowledges its methanol resistance, and acceptance of the principles of design details overall including perimeter bar connections. Securing AiP establishes that no issue has been identified that would block a given solution from meeting IMO requirements, or class society rules at the final detail design stage.

"This is another sizeable step forward for industry acceptance of Methanol Superstorage and offers owners clarity as they evaluate an alternative fuel that will stand the test of time in meeting shipping's decarbonisation targets," said Alex Vainokivi, Innovation Manager, SRC Group. "Methanol Superstorage can be retrofitted without significant disruption to a vessel's general arrangement. RINA's comprehensive AiP confirms that it is applicable across a full range of ship types."

Simone Manca, Vice President of RINA North Asia (left) awards AiP for the Methanol Superstorage solution to Hannes Lilp, CEO and Founder, SRC Group

NEW ROLE FOR HEMEXPO

HEMEXPO, a leading marine equipment manufacturers' and exporters' association for the international shipping industry, has joined the EU HORIZON Innovation Action project entitled 'Sustainable Emission Abatement Strategies & Technologies for Advanced Revolution Ships' (SEASTARS).

The groundbreaking initiative aims to achieve a minimum 30% reduction in well-to-wake greenhouse gas (GHG) emissions by 2030 (compared with 2008 levels) and a 20% increase in energy efficiency compared with 2022, creating a global maritime decarbonisation landscape and supporting the European Commission's proposed Fit-for-55 targets.

With EU and global regulators expanding the scope of mandatory measures to drive maritime decarbonisation, SEASTARS will provide shipowners with market-ready solutions for retrofitting and newbuilds across the inland, short-sea and high-seas sectors.

By leveraging Model-Based Systems Engineering, SEASTARS enables shipowners to implement flexible, modular and scalable decarbonisation strategies with low investment risks while ensuring compliance with evolving regulations.

The project integrates cutting-edge efficiency and emissions-reduction technologies, including:

- Hydrodynamic enhancements: Propeller-hull optimisation, air lubrication systems.
- Machinery innovations: Fuel cells, electric motors, integrated solar panels, wind-assisted propulsion, electrochemical storage.
- Alternative fuels & energy systems: Biofuels, hydrogen, methanol, LNG, ammonia, fuel reforming, CCS (carbon capture & storage).

As part of its role within the consortium, HEMEXPO will lead design-thinking workshops to align technological advancements with the real-world needs of shipowners, shipbuilders, maritime technology providers and operators. These workshops will focus on practical, scalable decarbonisation solutions that support a smooth transition to greener shipping.

Christos Papakis, Executive Director of HEMEXPO

"The project is a major step forward in making decarbonisation solutions available to the sector," says Christos Papakis, Executive Director of HEMEXPO.

"It reinforces HEMEXPO's commitment to innovation by working closely with maritime stakeholders to develop technologies that reduce emissions, improve efficiency and drive a more sustainable future for global shipping."

INDEPENDENT LIFEBOAT VALIDATION

Survitec, a global leader in survival technology, has received independent validation for its Seahaven system, the world's largest inflatable lifeboat, which signifies an innovative advancement in passenger safety, vessel design and operational efficiency.

The study, conducted by Foreship, quantifies the substantial benefits of integrating Seahaven into cruiseship designs, with a focus on space utilisation and cost efficiency. The study also highlights that vessels can experience weight advantages with Seahaven, making the system favourable for both new designs and retrofitting existing ships.

Survitec's white paper, *Seahaven Application Study*, outlines the study's findings and examines four primary configurations for integrating the Seahaven system. The findings emphasise Seahaven's ability to significantly enhance cruiseship layout and functionality, optimising valuable deck space by eliminating bulky davit-launched lifeboats.

Seahaven occupies a reduced vertical and longitudinal space relative to traditional lifeboat designs, thereby enhancing bridge visibility and minimising vessel overhang. This characteristic is particularly beneficial for vessels manoeuvring through the Panama Canal. The system's lower weight compared to conventional lifeboat configurations affords greater flexibility in ship design, which may lead to reduced construction costs for newbuilds and improved stability for retrofitted vessels.

With this design flexibility, operators can strategically repurpose prime space for additional passenger cabins, expanded public areas or upgraded leisure and entertainment facilities, ultimately enhancing revenue potential and the guest experience. The white paper outlines opportunities for mid-sized cruiseships, such as converting interior cabins into sought-after balcony cabins. Alternatively, larger vessels can utilise the space savings to introduce additional leisure and entertainment facilities.

The Seahaven system is the world's largest inflatable lifeboat

DATA COLLABORATION ESSENTIAL

AkzoNobel has published a new white paper on big data and fleet optimisation.

The research highlights how relying on vessel performance data alone can present a misleading view for shipowners, and increased data collaboration is essential for more informed decision-making.

The paper includes a 60-month case study of AkzoNobel's coating Intersleek 1100SR being used on three LNG vessels, which helped meet CII ratings.

It comes as the Global Maritime Forum reported that inaccurate data and insufficient transparency perpetuates a lack of trust between shipowners and those that supply data.

DEEPENING COOPERATION

ABS and Akselos, a global leader in structural performance management software, have announced a deepening of cooperation with the joint completion of technical assessment for structural digital-twin technology. This marks a significant advancement in the application of digital-twin technology for Floating Production Storage and Offloading (FPSO) units, enabling more accurate and reliable assessments of structural integrity.

The announcement comes at a critical time for the offshore energy industry. FPSOs are some of the most complex and capital-intensive assets in operation, often required to perform far beyond their original design life. With increasing pressure to improve safety, extend asset life and reduce costs, operators need better tools to understand and manage structural health in real time.

This data-driven approach can significantly improve operational cash flow by reducing inspection and maintenance costs by up to 33%, minimising both planned and unplanned downtime, and enhancing safety by limiting human exposure in hazardous operational areas. This ultimately unlocks hundreds of millions of dollars in value through extended FPSO life and production losses avoided.

FPSO vessels are substantial capital assets operating in harsh offshore environments and handling highly volatile substances. Proactive protection of their structural integrity is crucial for maximising production and ensuring a strong return on investment. However, traditional assessment methods, often time-consuming and reliant on simplified models, lack the predictive capabilities needed to optimise o perational efficiency and avoid costly downtime and underperformance.

Akselos's SPM software provides a high-fidelity, near-real-time digital twin of the entire FPSO. By combining inspection records, metocean conditions and cargo operations into one dynamic model, operators gain a live, continuous view of structural performance. This allows for real-time monitoring, identification of stress concentrations and on-demand fatigue analysis to support data-driven maintenance and risk-based inspections.

When supported by ABS's Condition Manager and Eagle Twin inspection data management and condition-tracking software tools, the combined suite is capable of monitoring real-time load and condition information within a digital-twin framework that enables full lifecycle support of an offshore asset.

The technical work builds on a long-standing collaboration between Akselos and ABS, including joint digital-twin deployments in Brazil's Cessão Onerosa oilfield. Akselos's SPM software also integrates with ABS's Eagle Unified suite, providing operators with a unified platform for asset performance management and class compliance.

COMMERCIAL CCS AVAILABLE

Wärtsilä has announced that its breakthrough carbon capture solution (CCS) is now commercially available to the global maritime industry, delivering a step-change in shipping's decarbonisation journey. According to Wärtsilä's tests, the new CCS is proven to reduce vessel CO_2 emissions by up to 70%, providing shipowners with an immediate solution to meet increasingly stringent environmental regulations. The ability to capture CO_2 from ship exhaust systems will have a major impact on the industry's efforts to reduce GHG emissions, taking into account the International Maritime Organization's 2050 reduction target.

"CCS is a game-changer for the maritime industry, and we are already seeing huge interest in the market for this solution," says Håkan Agnevall, President and CEO of Wärtsilä. "Ahead of shipping's net-zero targets, this new technology complements the industry's ongoing efforts to dramatically reduce emissions from vessels and prevent stranded assets."

The launch follows the successful installation of the world's first comprehensive, full-scale solution onboard Solvang ASA's ethylene carrier *Clipper Eris*, where the technology captures emissions from all exhaust gas sources. Earlier this year, Wärtsilä installed its CCS technology onboard the 21,000 m^3 vessel for full-scale testing and optimisation. The solution, which has been in operation since the *Clipper Eris* set sail from Singapore in February 2025, will support Solvang

Claus Reimers, Chief Product and Technology Officer at Akselos

Wärtsilä offers different scalable CCS sizes and configurations to suit various vessel types and operator needs

ASA's commitment to reducing carbon emissions and promoting sustainable maritime operations.

Wärtsilä offers different scalable CCS sizes and configurations to suit various vessel types and operator needs, both on newbuildings and retrofits. Wärtsilä's CCS can be applied to the exhaust from any carbon-based fuel – such as HFO, methanol, LNG and MGO – and is designed to work alongside other emission-reduction technologies, including SOx scrubbers, NOx reduction systems and particulate matter filters. As part of Wärtsilä's broader portfolio, CCS can be integrated with other decarbonisation technologies and services.

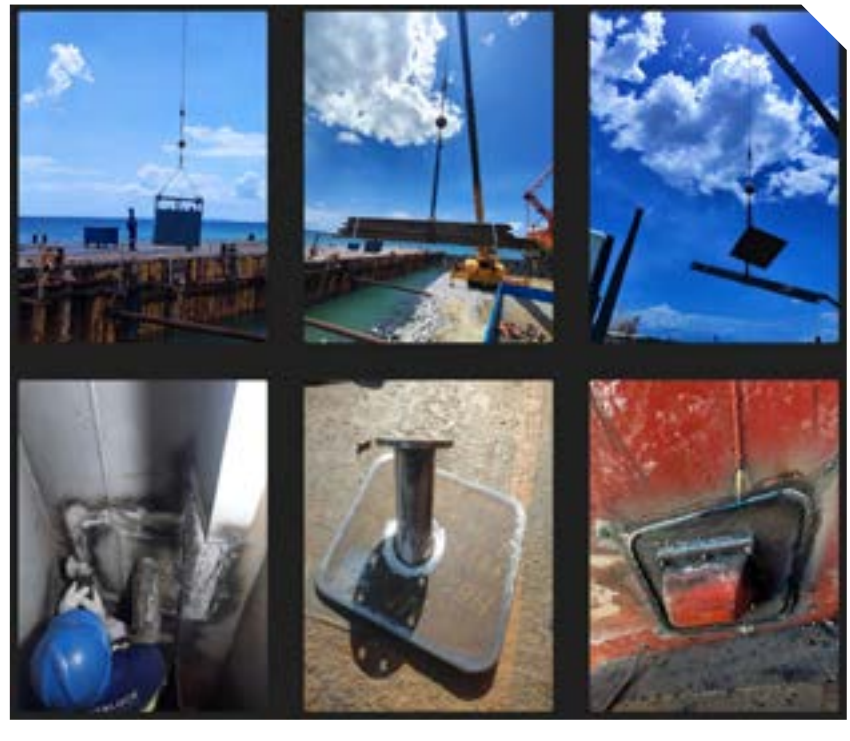
NEW HIGH-LEVEL SUMMIT

The Ministry of Maritime Affairs and Insular Policy of the Hellenic Republic, the International Chamber of Shipping (ICS) and the Union of Greek Shipowners (UGS) are co-hosting a high-level summit in Athens, Greece in June this year. At a time of significant volatility in the sector, the summit will bring together policymakers and industry leaders to address the critical issues affecting global trade and the maritime value chain. The summit also provides a timely platform for industry leaders to discuss how to convert the GHG reduction agreement at the International Maritime Organization into reality and catalyse the supply of new fuels.

The summit, entitled 'Shaping the Future of Shipping: Navigating global megatrends, mitigating risk and the role of shipping in delivering economic security and prosperity', will be held at the Athens Conservatoire on 11 June 2025.

EMERGENCY REPAIR PERFORMED

Metalock Brasil recently performed an emergency structural repair on a foreign-flagged oil tanker operated by a major Indian shipowner specialising in the transportation of oil and chemical products. The intervention took place in the sheltered waters of the Bay of All Saints in Salvador, Bahia.



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Tejal Davda, Finance Director at Anemoi Marine Technologies

The vessel, operating in several ports across northeast Brazil, reported water ingress in the pump room due to structural wear in the discharge line located below the waterline. After the initial inspection, Metalock Brasil defined the most effective repair strategy and quickly coordinated the shipment of equipment and materials to Salvador.

With the vessel trimmed to a safe limit, allowing the affected area to be raised above the waterline, Metalock Brasil's technical team began by cutting the damaged section, followed by welding, finishing and non-destructive testing. The entire procedure was conducted under the supervision and approval of the responsible class society.

Three months after the repair, during a visit to the shipowner's headquarters in Mumbai, the fleet superintendent personally expressed his satisfaction with the quality of the service and the efficiency demonstrated by Metalock Brasil.

NEW FD AT ANEMOI

Anemoi Marine Technologies, a leading provider of innovative Rotor Sail technology solutions, has announced the appointment of Tejal Davda as Finance Director. She brings a wealth of experience in maritime finance and leadership, further strengthening Anemoi's executive team, which is now 33% female.

Davda holds a first-class degree in Economics and Business Finance and is a chartered accountant, having trained and qualified with a Top 10 accountancy and audit practice. She specialised in audit and advisory services for the shipping sector, rising to Audit Director. She subsequently joined a UK-based shipowner and operator, where she led the financial reporting, financial planning and analysis and commercial finance divisions during a period of rapid growth. Her expertise also includes raising finance, S&P analysis and tax planning and strategy.

In her new role, she will be responsible for establishing a financial strategy to support Anemoi's growth plans and collaborating with the leadership team to ensure that financial insights guide strategic decisions. "I am excited to join a company that values collaboration, innovation, excellence and is committed to sustainability," Davda says. "I look forward to contributing towards Anemoi's plan for decarbonisation and play a part in shaping a greener, more sustainable future for the maritime sector."

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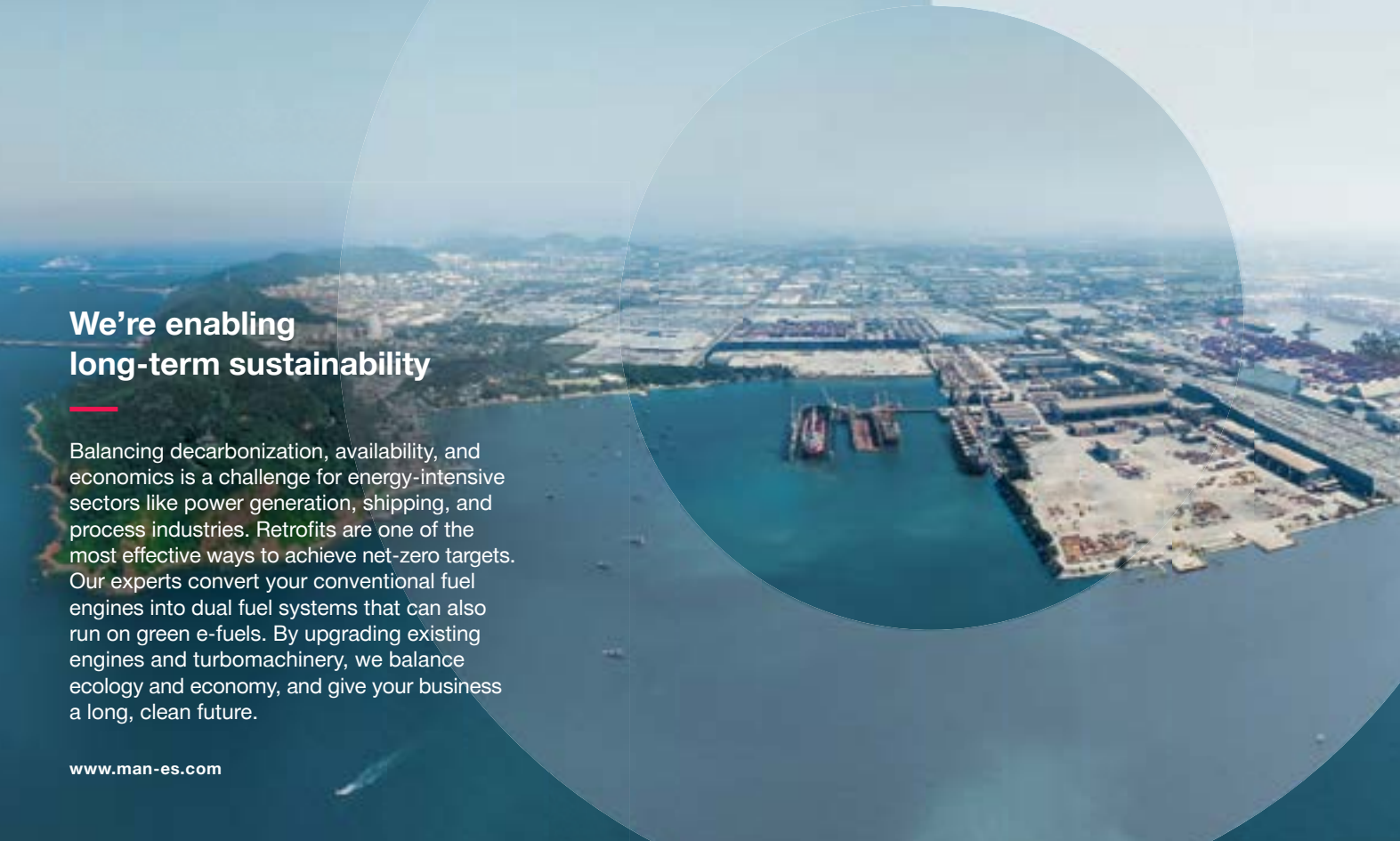

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