SHIPREPAIR & MAINTENANCE

A publication of **THE ROYAL INSTITUTION OF NAVAL ARCHITECTS**
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4th QUARTER 2024

CLASS POINTS THE WAY TO EFFECTIVE RETROFITS

STAKEHOLDER COLLABORATION IS KEY

AUTONOMOUS SHIPS 2024

MARITIME AUTONOMY CONFERENCE

Rapid technological development in the field of Maritime Autonomy is creating opportunities for the marine industry as well as challenges for the regulatory framework. Recent years have seen various ship projects involving coastal and ocean-going routes with different degrees of autonomy being tested. These will have significant implications for naval architects, shipbuilders, shipping companies, and maritime systems providers. In December 2024, the International Maritime Organization (IMO) will host the 109th session of the Maritime Safety Committee (MSC) where the Maritime Autonomous Surface Ships (MASS) group will meet again. The Royal Institution of Naval Architects and the Danish Society of Engineers (IDA Maritime) are organising the 3rd Autonomous ship conference on 20-21 November 2024 ahead of the IMO meeting.

Conference Topics:

- IMO MASS Code Development
- Maritime remote-control technology
- Automated onboard systems
- Autonomous technology
- E-navigation
- Safety and Security
- Impact on maritime workforce
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SHIPREPAIR & MAINTENANCE

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THE ANSWER MAY BE BLOWING IN THE WIND

The next environmental retrofit boom could well be in the wind power segment and repair yards need to be ready to take full advantage of the accelerating trend

Wind-assisted propulsion retrofitting can bring with it many benefits, including less fuel consumption, lower costs and reduced CO_2 emissions. In addition, vessels can potentially increase their ship speed for the same engine power, while the technology does not require specialist crew competencies or additional crew numbers.

Due to such factors, the business case for retrofitting vessels with wind-assisted propulsion energy-saving devices is currently being explored and implemented by an increasing number of shipowners and operators. In a recent analysis of the current wind-assisted propulsion systems (WAPS) market, the classification society Lloyd's Register (LR) concluded that that "uptake is on the verge of a tipping point", with installations expected to surpass the 100-mark within the next two to three years. Moreover, it forecasts that orders will accelerate rapidly, notably in the bulk and tanker vessel segments, with analysis suggesting a higher end potential of nearly 14,000 candidate vessels over the next 26 years.

However, LR points out that some notable challenges remain in the application of WAPS technologies, including uncertainty around actual fuel savings, with no standardised criteria for validating savings claims, and potentially hidden costs around WAPS, including the full scope of engineering work and operational costs.

Furthermore, LR notes that for technology suppliers just to meet existing orders would require them delivering around 2.5 times the number of units they have installed in the past five years. Several suppliers are boosting production capacity, but understanding how suppliers plan to deliver and maintain reasonable lead times amid the ramp up to wider wind power use will be a crucial question for shipowners, it suggests.

To date, LR says, only around 16 yards have conducted WAPS retrofits, indicating that installation capacity needs to be far more widespread if demand for future installations is to be met. The report notes: "While there are no showstopping capabilities for shipyards, planning projects will require careful consideration. One option considered is for a two-stage retrofit process, with WAPS foundations and cabling prepared during a scheduled drydocking and the WAPS solution itself attached during a second docking or, in some cases, during an extended port call."

Despite some concerns, the pace of retrofit orders shows every sign of accelerating as LR predicts, with the technology being applied to an increasingly wide range of vessel types. The Dutch shipowner Anthony Veder has recently announced the installation of two VentoFoil sails on board the ethylene carrier *Coral Patula*, which were delivered by Econowind. As a result Anthony Veder becomes what is believed to be the first company worldwide to install sails on board a gas carrier. Later this year sister ship *Coral Pearl* will be equipped with two similar sails.

THE GAS CARRIER *CORAL PATULA* IS BELIEVED TO BE THE FIRST GAS CARRIER TO BE FITTED WITH A WIND ASSISTED PROPULSION SYSTEM

In other recent projects Jumbo Shipping has announced that it has fitted a WAPS system on its heavy lift vessel *Jumbo Jubilee*, again using VentoFoils from Econowind. The first installation of GT Wings' AirWing technology will take place on a Carisbrooke Shipping 124m general cargo vessel before the end of 2024, while MOL has received an AiP for its hard sail WAPS system, Wind Challenger, to be installed on a membrane-type LNG carrier, *Shofu Maru*. The project, jointly developed by MOL and Hanwha Ocean with input from LNG membrane tank designer GTT, marks a milestone as the world's first LNG carrier to receive such approval for a WAPS system.

MOL's Wind Challenger employs a control system that is fully automated with proprietary technology that uses sensors to detect the speed and direction of the wind, and automatically extends, reduces and rotates the sails. This highlights the importance of digital connectivity to fully harness the benefits of WAPS systems.

Also underlining the need for WAPS to be more closely integrated with digital solutions, particularly around weather forecasting, Anemoi Marine Technologies has signed an agreement with NAPA, the Finnish-based maritime software company, that will enable all vessels fitted with Anemoi's rotor sails to access critical weather and voyage optimisation data. This will enable shipowners and operators to choose routes that will enhance the performance of vessels equipped with rotor sails and optimise fuel savings and emission reductions.

Under the terms of the agreement, NAPA software will be included as an option in all future sales of Anemoi's rotor sails, including retrofits. Expect more similar partnership arrangements to be announced in the near future. ■

NEWS

ENVIRONMENTAL RETROFITS

WÄRTSILÄ TO UPGRADE FERRY SCRUBBER SYSTEMS

ONE OF THE CONTAINERSHIPS THAT WILL RECEIVE THE NEW CCS-READY SCRUBBERS

Technology group Wärtsilä will upgrade the exhaust treatment system on board four vessels in Norwegian operator Color Line's fleet. The company will add close-looped functionality to the ships' current open-loop scrubbers, enabling them to operate at higher levels of efficiency and in a more environmentally sustainable way. The upgrades will be carried out on two large conventional ro-pax and two high-speed ferries and will commence towards the end of 2024.

Upgrading to a hybrid scrubber system on board these ships will give Color Line control over any abatement from the scrubber wash water, ensuring its vessels remain compliant with tightening regulations. Wärtsilä's hybrid scrubber systems have the flexibility to operate in both open and closed loop modes, using seawater to remove SOx from the exhaust. As well as removing 98% of SOx emissions, the technology further reduces nitrogen oxide (NOx) and particulate matter emissions.

Wärtsilä has also been contracted to supply its latest carbon capture and storage-ready (CCS-Ready) scrubber systems for three container ships owned by German operator Leonhardt & Blumberg. Following a number of newbuild orders for CCS-Ready scrubbers, this will be one of the first retrofit projects for the technology.

The scrubbers are termed CCS-Ready because, as part of their installation, Wärtsilä will perform additional design and engineering work to ensure that future retrofits for a full CCS system on the vessels are accounted for.

The systems are being delivered on a fast-track basis, which began in September of this year. The retrofit engineering and installation of the equipment on board the vessels will be undertaken by Greentec Marine Engineering.

CLASSIFICATION

FIRST LR CLASS NOTATION FOR ONBOARD CARBON CAPTURE TECHNOLOGY

Lloyd's Register (LR) has assigned its first class notation for carbon capture on board a ship to the Eastern Pacific Shipping (EPS)-owned *Pacific Cobalt*. The 50,000dwt mid-range chemical carrier retrofit features a prefabricated onboard carbon capture and storage (OCCS) system supplied by Value Maritime, to significantly reduce exhaust emissions.

The Emission Abatement Carbon Capture & Storage (EACCS) (Amine, HFO) class notation assigned by LR provides assurance that any safety risks associated with the OCCS installation have been mitigated and the solution is effective and reliable. Rule requirements for the design, construction and installation survey of OCCS are included in the LR class notation EACSS.

Requirements associated with the new class notation address the safety risks that may be presented to the vessel, covering aspects such as materials, structure, containment, piping, refrigeration plant, electrical, control, safety systems, vessel integration and manufacturing.

Requirements associated with the READY descriptive note cover the preparation of a vessel for the future installation and integration of an EACCS, such as structures, layout, interfacing, materials, electrical and safety systems.

The Filtree OCCS system developed by Value Maritime can remove and capture up to 40% of CO_2 from exhaust gases, which is then stored on board in volumes up to the capacity of the onboard storage tanks.

VALUE MARITIME'S FILTREE SYSTEM INSTALLED ON *PACIFIC COBALT*

SHIPYARD TECHNOLOGY

DUNKERQUE YARD ACQUIRES PAINTING ROBOTS

DAMEN SHIPYARD DUNKERQUE WILL SOON BE USING FIVE NEW AMBPR ROBOTS

Following several years of collaboration and some recent successful final trials, Damen Shiprepair Dunkerque (DSDu) has signed a contract with SERCEL group subsidiary AMBPR for the supply of five GreenDock Robots. DSDu is the first shipyard in the world to acquire the technology, which offers an autonomous mobile solution for ultra-high-pressure and abrasive blast cleaning and painting of ships.

The robots, described as being "revolutionary", can be programmed to undertake complete hull restoration cycles, including washing, grit/hydro blasting, painting and final inspections. No human intervention is required aside from tool changes, which take no more than 20 minutes each. The new autonomous robots will initially be powered by hybrid energy but can be upgraded to 100% electric in the future for use in environments that require zero emissions.

Health and safety benefits are derived from the fact that the personnel responsible for the equipment no longer need to be in the immediate vicinity of hazardous, high-pressure blasting activities using water and grit. The blasting agents, overspray and the other residues from the painting are also contained to protect personnel in the area from inhaling them as well as preventing pollution of the atmosphere. An additional benefit of this is that other activities nearby can continue without interruption, Damen points out.

The process is also said to be highly sustainable. Not only does the precision of the robots result in less paint and water being used per square metre, around 90% of the water that is used by the robots is collected, cleaned and reused, thereby reducing the impact that the Dunkerque yard has on the environment and its workforce.

UK

MILESTONE FERRY VISIT FOR CAMMELL LAIRD

MANXMAN ALONGSIDE AT CAMMELL LAIRD IN BIRKENHEAD

The Isle of Man Steam Packet Company's *Manxman* arrived at APCL's Cammell Laird facility in October this year to undergo its first scheduled maintenance since entering service in August 2023. The vessel entered the wet basin to perform an inclining experiment before entering drydock for a package of repair works.

Manxman's scope of work included hull repairs, belting restoration, cleaning, painting and pipework modifications. The drydocking involved a comprehensive inspection and survey of all parts of the vessel and an inspection of the underwater areas and bow thrusters. Repairs were also made to its accommodation areas, flooring and deck. A permanent repair to damage *Manxman* sustained while docking at Heysham port during high winds was also completed.

The drydocking marks a significant milestone in the vessel's service history, being the first time *Manxman* has visited Cammell Laird for repairs since being commissioned into service just over a year ago. *Manxman* is required to be drydocked at least twice in every five-year survey cycle. In non-docking years, an annual dive inspection of the underwater hull and equipment is required.

ENGINE MAINTENANCE

NEW DIESEL ENGINE PERFORMANCE TOOLS

Condition monitoring solutions company CM Technologies (CMT) has developed two new tools to assess the condition of lubricating oils and cylinder liners. The company's WBS IR Analyser is an infrared-based solution designed to assess the base number (BN), soot and water content of cylinder and system oils, while the new CMT Scuffing sensor can detect sudden and severe wear of the engine's cylinder liners and piston rings well before other systems can see it.

"Modern engines are less tolerant to the rigours of maritime operation than yesteryears' workhorses and need to be correctly maintained and lubricated to prevent failure," says Matthias Winkler, CMT's managing director. "Engine technology has advanced markedly in recent years, but lube oil failure remains the most common cause of engine damage, accounting for 28% of all machinery insurance claims, with an average cost of US$1.2 million per claim. The condition monitoring technology we have developed can help optimise engine performance, prevent costly engine damage and downtime, and reduce insurance claims."

The WBS IR Analyser is described as a simple-to-use lube oil condition monitoring tool that does not need costly refill chemicals and reagents typical of existing lube oil test kits. Capable of measuring three important parameters (water, BN, soot) instantly and simultaneously, the small, handheld analyser incorporates the same infrared technology used for laboratory-grade oil screening to provide quick and reliable results onsite.

The CMT Scuffing sensor uses an electromagnetic acoustic transducer (EMAT) to monitor cylinder liner wear and temperature. These sensors incorporate a built-in amplifier and signal conditioning technology optimised to detect sound waves in a 300KHz to 700KHz range. The acoustic emissions are then evaluated using CMT's proprietary analytical software.

THE CMT SCUFFING SENSOR CAN DETECT SUDDEN AND SEVERE WEAR OF THE ENGINE'S CYLINDER LINERS AND PISTON RINGS

CONTAINER SHIPS

BERG PROPULSION ASSISTS WITH CONTAINER VESSEL RETROFIT PACKAGE

A joint initiative between Berg Propulsion, CMA CGM and shipowner Reederei Rambow is reported to be already leading to significant efficiency gains for an 868TEU container vessel, the 2007-built *Henneke Rambow*. The DNV class-approved upgrade focused on optimising the propulsion solution for fuel economy and also included optimisation of the ship's bulbous bow.

Existing propeller blades were replaced with profiles that had been hydrodynamically optimised for the vessel's operational profile. The ship's control systems have also been upgraded to include Berg's MPC800 propulsion unit with Dynamic Drive. In addition, Berg installed a custom-made Network Frequency Stabiliser (NFS), which allows the shaft generator to operate at variable speeds while continuously providing a stable frequency and voltage to the main switchboard.

According to Reederei Rambow, following this upgrade *Henneke Rambow* has been demonstrating a "remarkable" performance improvement.

COATINGS

HEMPEL INTRODUCES NEW SILICONE HULL COATING SYSTEM

Hempel's new Hempaguard Ultima coating is an evolution of the tried and tested Hempaguard X7, which has been applied to more than 4,000 vessels to date. A two-layer coating system, Hempaguard Ultima is described as being the company's "most significant innovation in a decade" and combines Hempaguard X7 with new biocide-free silicone topcoat Hempaguard XL, preventing growth of marine organisms while ensuring long-lasting hull protection.

By choosing Hempaguard Ultima, vessel owners and operators are promised up to 21% fuel savings, 160 fouling-free idle days and only 0.9% speed loss on average.

CANADA

SEASPAN YARD CARRIES OUT COAST GUARD LIFE EXTENSION PROJECT

THE LIFE EXTENSION PROJECT FOR THE *CCGS SIR WILFRID LAURIER* WAS THE LARGEST AND MOST COMPLEX AT THE VANCOUVER YARD TO DATE

Seaspan's Vancouver Drydock recently completed a major life extension project involving the Canadian Coast Guard's *CCGS Sir Wilfrid Laurier*, which departed the yard in August. According to Seaspan, this is one of the largest and most complex ship repair and overhaul projects ever undertaken at Vancouver Drydock.

The entire project consisted of over 100 separate upgrades including: the replacement of the ship's three 2,100kW generator sets; the replacement of the propulsion drive cycloconverters; the repair and refit of the rudder and shafting; installation of a new towing bollard complete with all new underdeck structures; and a new shipboard integrated communication system.

This complex project required high levels of technical expertise from the team at Vancouver Drydock, including running new cables and installing new software for upgraded systems. The team also removed the existing piping and cabling to allow installation of the new generator sets.

WEST AFRICA

TAKORADI FLOATING DOCK PLANNED

A specialist provider of offshore support services, Interocean Marine Services (Interocean), has announced it is supporting a groundbreaking floating dock ship project in Ghana. In partnership with Prime Meridian Docks Ghana, this initiative involves the building and operation of a floating dock ship repair facility at the port of Takoradi.

The project represents a total capital investment of US$137 million, and Interocean says it has already secured full financial backing for this. When finished, the new yard area will feature a 13,500tonnes capacity floating drydock, 18,000m^2 of reclaimed land, a 200m jetty, workshops and an array of marine equipment. These facilities will provide ship repair and maintenance services to vessels trading in the Gulf of Guinea and, according to Interocean, the project will be "a game changer for ship repair and maintenance services in West Africa."

UAE

DRYDOCKS WORLD DUBAI TO ACQUIRE LARGE FLOATING CRANE

Drydocks World Dubai has signed a contract with Shanghai Zhenhua Heavy Industries (ZPMC) of China to acquire a new generation 5,000tonne capacity floating crane, which will help meet the growing demand for large-scale offshore projects. The new crane is expected to enter service in the second quarter of 2026.

Once operational, the crane will boost Drydocks World's heavy lift capabilities, allowing it to meet the requirements of FPSO and other offshore conversion projects. The company's latest investment will thereby help build on the success of recent projects such as the conversion of *Tango* FLNG and *Excalibur* FSU vessels and the refurbishment and conversion of *Firenze* FPSO, carried out at the Dubai shipyard.

It is believed that when delivered this will be the largest crane of its type in the Middle East and Africa. According to CEO Rado Antolovic: "As offshore vessels continue to grow in size, the need for advanced lifting solutions with features like angled booms has become increasingly important. This new sheerleg crane, with its ability to handle heavier modules and expedite project timelines, enables us to manage more extensive and complex projects."

CLASSIFICATION

ABS APPROVES AMMONIA FUEL RETROFIT SOLUTION

An ammonia fuel supply system that can either be retrofitted to existing vessels or installed on newbuilds has earned approval in principle (AiP) from classification society ABS.

The ammonia fuel supply system from Nikkiso Clean Energy & Industrial Gases features high efficiency pumps and an integrated fuel management system. ABS completed design reviews based on class and statutory requirements.

"The ability to retrofit is significant for the maritime industry to meet sustainability objectives. This new fuel supply system promises a solution with decarbonisation benefits of alternative fuels like ammonia to be available for existing vessels near-term," says Michael Kei, ABS vice president, technology.

THE PRESENTATION CEREMONY OF THE AIP FOR THE NIKKISO AMMONIA FUEL SUPPLY SYSTEM

SHIPYARD TECHNOLOGY

HOLD CLEANING ROBOT LAUNCHED

THE ROBOTPLUSPLUS SYSTEM WAS LAUNCHED AT THIS YEAR'S SMM IN HAMBURG

RobotPlusPlus, a company that develops working-at-height robots, has recently launched its HighMate C20 cargo hold cleaning robot. The robot cleaner aims to bring reliability and efficiency to cargo hold cleaning operations, by allowing safe deployment in most sea conditions, reaching up to 95% of the hold's surface and protecting seafarers from the dangers of manual cleaning at heights.

The new HighMate C20's five 500bar high-pressure nozzles cover a 1m width pathway and can clean up to 500m^2 per hour. According to the company, the robot is "remarkably easy to operate" and most seafarers can learn basic functions of the HighMate C20 in 10 minutes or less.

COATINGS

ITALIAN SHIPOWNER CHOOSES JOTUN SOLUTIONS

Norwegian coatings supplier Jotun has been selected by the Italian shipowner Ignazio Messina for the forthcoming drydocking of two of its vessels, *Jolly Oro* and *Jolly Argento*.

Jotun has developed a customised coatings solution that reflects Messina's challenging trading pattern in warm waters, with moderate speeds. A tailored hull coatings system with Seaquantum, a silyl acrylate antifouling, and SeaQuest Endura, a biocidal antifouling, will protect Messina vessels while offering optimum hull performance and meeting the required sustainability targets sustainable target required, Jotun reports.

The Jotun coating systems selected by Ignazio Messina for *Jolly Oro* and *Jolly Argento* are expected to reduce emissions by about 20,000tonnes of CO_2 during the vessels' service period. Moreover, Jotun will support in-service hull fouling control with its Hullkeeper digital monitoring programme. This uses Jotun's in-house developed fouling risk algorithm and combines data from different sources to make fouling control and efficiency more predictable. Both ships will join the Hullkeeper programme after their drydockings, enabling Ignazio Messina to monitor the fouling pressure on the hulls and helping to maximise the coatings' performance results.

JOLLY ORO WILL RECEIVE JOTUN HULL COATINGS DURING ITS NEXT DRYDOCKING

CONVERSION

ALEWIJNSE LEADS IN METHANOL FUEL CONVERSION

Systems integrator Alewijnse is assuming a significant role in the electrical engineering and automation necessary for the conversion of the *Fugro Pioneer* to run on methanol, one of the world's first projects of this kind.

The first phase of the conversion has been completed at the Niestern Sander shipyard in Delfzijl. Preparatory work has been carried out for the replacement of two of the four original marine gas oil (MGO) engines with methanol equivalents. The remaining two engines will continue to run on diesel for the time being, allowing Fugro to also offer services in regions where green methanol is not yet available. The delivery and installation of the methanol engines is planned for the fourth quarter of this year.

"Converting a ship to methanol propulsion requires a significant change in its electrical systems," explains Alewijnse account manager Jim Stolk. “For that reason, Alewijnse has a substantial role in the *Fugro Pioneer* project. We are supplying and installing a new alarm monitoring and control system (AMCS) and making adjustments to the power management, fire protection, and CCTV surveillance systems. An essential part of the work also includes the electrical installation for the new methanol bunkering station, including the placement of fixtures and switches."

Both the liquid and vapour forms of methanol are highly flammable. For this reason, Alewijnse is using special PLCs to monitor safety and potential fire risks during the combustion process.

Fugro Pioneer is a specialist survey and research vessel built for collecting geo-data about the seabed in preparation for the construction of offshore wind farms. After the installation of the new methanol engines, the ship will be deployed on projects in European waters.

THE *FUGRO PIONEER* METHANOL CONVERSION PROJECT IS ONE OF THE FIRST OF ITS TYPE

SHIPYARDS

SHIPLIFT UPGRADES FOR DMC

THE RECENTLY UPGRADED SHIPLIFTS AT DMC ARE EXPECTED TO SIGNIFICANTLY BOOST SHIPREPAIR CAPACITY

Significant investments to enhance and expand shiprepair capacity at Dubai Maritime City in the UAE have recently been completed. Infrastructure works have included a retrofit of DMC's shiplifts, the introduction of new ship cradles and power supply improvements. As a result, DMC is now operating with upgraded 6000tonnes and 3000tonnes capacity ship lifts, more than doubling its capacity from 400 to 1,000 vessels per year, and enabling the facility to handle larger and more complex shiprepair projects.

Shiplift supplier Syncrolift has also signed a service agreement with DMC for the maintenance of DMC's two shiplifts and its dry berth transfer systems. Under the terms of the agreement, Syncrolift will implement innovative maintenance control systems designed to support the continuous servicing of shiplifts and transfer systems.

CONVERSION

METHANOL CONVERSION CONTRACT FOR VALMET

The Finnish company Valmet has been selected to deliver automation solutions for methanol fuel conversion projects aboard two CMA CGM container ships. The vessels will be upgraded at the CSSC Qingdao Beihai Shipbuilding yard in China.

While Valmet has been involved in other methanol fuel conversion projects, this is its first automation retrofit order in the Chinese marine market.

AI & PREDICTIVE MAINTENANCE

TRANSFORMING PREDICTIVE MAINTENANCE MANAGEMENT

A new platform from Elomatic promises to harness the power of AI to enhance vessel maintenance regimes

There are many who believe that, while the maritime industry has long recognised the power of data, shipping has been largely left behind in embracing digital transformation compared to other industries. Vessel maintenance, for example, still relies heavily on outdated systems, which can potentially impact already busy workloads, and can result in costly breakdowns at sea. According to Ilari Leinonen, product owner at Finnish tech company Elomatic: “In many ways the industry has grown complacent, accepting maintenance practices that would be considered inefficient in other sectors.”

To address these challenges, Elomatic has recently launched a new predictive maintenance platform called Aura Asset Performance Management (APM), which is specifically designed for shipowners and operators. Aura is set up to provide detailed access to customisable data streams from maritime assets, allowing ship owners to monitor and predict their vessel’s condition more effectively.

At present, vessel maintenance management relies on Computerised Maintenance Management Systems (CMMS). “These systems are mandatory for regulatory compliance, but they are often seen as unhelpful obligations,” says Leinonen. “Many operators use them as basic ‘tick box’ exercises, without fully exploiting their potential to optimise maintenance and improve operational efficiency.”

ILARI LEINONEN, PRODUCT OWNER, ELOMATIC

Traditional maintenance holds to a rigid schedule, requiring interventions at fixed intervals regardless of a vessel’s actual condition. This leads to inefficient processes, unnecessary maintenance tasks, and occasionally, missed opportunities to prevent costly breakdowns. Additionally, outdated inventories and scattered documents contribute to inefficient workflows, increasing the risk of delays or equipment failures at sea.

Aura seeks to improve the current state of vessel maintenance, by combining clean, accurate and accessible sensor data that provides a clear picture of exactly where maintenance is required, and when. This shift from reactive to proactive maintenance allows for real-time, condition-based interventions, ensuring that maintenance is conducted only when and where it is genuinely required, Elomatic suggests.

Harnessing the power of enhanced data insight has the potential to reshape maritime maintenance, the company believes. According to Leinonen: “By generating a clear and comprehensive picture of a vessel’s condition, systems such as Aura enable owners and operators to monitor performance and predict where maintenance is enquired and when. For instance, engine sensor data and hull status reports can now be instantly accessible, and maintenance programmes can be scheduled in real time to maximise operational efficiency. With Aura, routine cleaning and repairs can be timed precisely, preventing unnecessary interventions that consume time and can be costly.”

This level of precision is becoming even more crucial as the shipping industry moves towards decarbonisation, Elomatic believes. Regulatory pressures are mounting, and alternative fuel sources may still be years away from being scalable. In the meantime, the industry must focus on improving energy efficiency wherever possible. "Aura can play a significant role, allowing ships to optimise their fuel usage, reduce emissions, and identify marginal gains that can collaboratively lead to significant savings in both cost and emissions,” says Leinonen.

The inclusion of AI is set to play a central role in revolutionising the shipping industry’s approach in this context. By integrating trained AI models into APM systems, such as Aura, shipowners can gain direct access to live data, enabling them to adjust routing speeds, provide operational parameters to reduce emissions, and optimise fleet performance more effectively.

In partnership with Europe's largest private AI lab, Silo AI, now part of AMD, Aura is built to take advantage of advanced AI and machine learning capabilities to analyse operational data in real time. This integration allows shipowners to make data-driven decisions about fuel consumption, equipment lifecycle analysis, and even entire fleet operations.

Silo AI co-founder Peter Sarlin adds: "We have collaborated with Elomatic since the spring of 2022 and we have worked on complex R&D in maritime operations and ship maintenance. Together we have developed the Aura platform to include and enable AI capabilities. By augmenting the work of ship operators with AI-enhanced digital tools, operators can be equipped to work more efficiently, allowing them to focus on essential and more meaningful tasks."

In the near future, Aura's AI capabilities will also support automated maintenance planning and resource allocation, with the aim of reducing the burden for crews. As Aura continues to evolve, it will provide further enhanced condition monitoring and predictive maintenance features, to reduce the risk of unexpected breakdowns and ensure vessels operate at high levels of efficiency.

Leinonen says: "For decades shipping has relied upon limited, analogue asset performance management data. The goal of the Aura platform is not to introduce complex software integrations that compound already busy workloads, but to provide a tool that is easily accessible and aligns seamlessly with existing systems, with information constantly being updated with real-time tracking."

SILO AI CO-FOUNDER PETER SARLIN

He concludes: "By enabling predictive maintenance, optimising fleet operations, and reducing emissions, Aura empowers ship owners and operators to enhance efficiency, safety, and sustainability. As the industry continues to embrace increasingly more sophisticated systems, platforms such as Aura, will be critical in shaping a more resilient and environmentally responsible future for shipping." ■

ENGINE REPAIRS & MAINTENANCE

WÄRTSILÄ SUPPORTS HOLISTIC APPROACH TO ENGINE MAINTENANCE

Through a range of facilities, technologies and services, the engine OEM is encouraging customers to adopt proactive strategies

Over the past year Wärtsilä has upgraded the network of facilities it operates worldwide to support the servicing, maintenance and repair of its marine engine range. It has, for example, opened two more Land & Sea Academies, in which the company trains crews and service colleagues on how to operate and service its technologies. The new facilities are in Indonesia and in the town of Vaasa in Finland, within Wärtsilä's new Sustainable Technology Hub.

Wärtsilä now has nine such academies, with the others located in the US, Brazil, India, South Korea, the Netherlands, Italy, China, and Finland. In 2023, the centres delivered 990 courses for more than 30,000 students.

According to Henrik Wilhelms, director, agreement sales, Wärtsilä Marine: "As maritime decarbonisation brings new technologies and fuels to the market, and as digitalisation leads to more advanced and interconnected systems, we can anticipate that demand for training will only increase. Many operators look to OEMs for support in running engines or vessels efficiently and reliably across their lifecycle, especially when using new technologies."

Another element of maintenance is delivered through Wärtsilä's Expertise Centres. This is a global network of remote support locations that can assist operators with technical or operational questions at any time. "Combined with our very strong physical presence in the field – we have service engineers in more than 70 countries – these centres ensure that we have the resources to meet service and maintenance demands quickly," says Wilhelms.

Another relatively recent enhancement is the Wärtsilä Expert Insight service, which uses real-time data to detect potential issues with vessels that could require a service or maintenance response. It monitors the performance and behaviour of engine or hybrid power systems and uses this information for predictive maintenance.

"Because it uses advanced AI and rule-based diagnostics, Expert Insight will recognise problem symptoms very early on," says Wilhelms. "Data patterns that indicate a problem are flagged to an expert, who will recommend maintenance that will prevent the problem. In this way, Expert Insight works hand-in-hand with Expertise Centres. With Expert Insight, the engineers at the Expertise Centre have access to the complete data picture when they answer an operator's query."

HENRIK WILHELMS, DIRECTOR, AGREEMENT SALES, WÄRTSILÄ MARINE

Alongside support for regular day-to-day maintenance, Wärtsilä is being called on to support some significant engine conversions and retrofits, as operators seek to transition to more environmentally friendly and fuel-efficient technologies. One particularly notable project is being undertaken with Chevron Shipping, to convert one engine on each of six LNG carriers, from dual fuel to spark gas (SG) operation. This is a first in the industry as spark-ignited engines have not been used in deep sea shipping previously. The upside is that SG engines offer much more complete combustion of LNG without the need for pilot fuel, and therefore significantly reduce methane slip. The challenge has been to develop an SG technology that is robust enough for the maritime environment.

Wärtsilä's 50DF to SG conversion project is designed to modify the engines in service to operate as SG, using spark ignition as opposed to diesel pilot fuel to initiate combustion. This enables a more optimised combustion process, thereby reducing the methane slip and improving efficiency.

Wärtsilä is also working with Norwegian shipowner Eidesvik on a project to convert the offshore platform supply vessel *Viking Energy* to operate on ammonia fuel. Scheduled for completion in early 2026, this conversion will result in what is claimed to be the world's first ammonia-fuelled in-service ship. The project includes Wartsila's newly released ammonia solution and the Wärtsilä 25 Ammonia engine.

In May this year, Wärtsilä announced that it will supply the electrical systems needed to convert two Scandlines ferries to a plug-in hybrid solution. The project will involve replacing an engine and existing systems with a new shore-charged electrical system, including a large energy storage system.

WÄRTSILÄ HAS OPENED A NEW LAND & SEA ACADEMY AT ITS SUSTAINABLE TECHNOLOGY HUB IN VAASA, FINLAND

Wärtsilä will engineer and deliver the hybrid converters, the energy storage system, and the energy management system, as well as the switchgears, transformers, the onboard port charger, and replacement components in the existing switchboard equipment. In addition, Wärtsilä will supervise the installations, carry out the commissioning, and provide preventive maintenance support services. All of this equipment is scheduled for delivery in summer 2025.

In terms of retrofits, Wärtsilä sees one of the most promising areas as being two-stroke engines. Last year it launched Fit4Power, a radical derating retrofit solution which reduces the bore size of two-stroke engines by 25%, enabling the engine to run at optimal loads and with "outstanding" fuel and combustion efficiency.

"For owners, this will improve the efficiency of their existing fleets, ensuring compliance with CII regulations, and future-proofing assets against planned environmental regulatory measures. Potential savings of a vessel retrofitted with Fit4Power are estimated to be 2,000tonnes of fuel, depending on the vessel's operating profile, and 6,400tonnes of CO_2 emissions," claims Wilhelms.

There are currently more than 30 vessels lined up for retrofitting with Fit4Power. Ten of these have already been converted and have now been in operation for up to 20 months.

The maintenance and repair of marine engine assets present several significant challenges in today's maritime landscape, Wilhelms says, particularly in light of the industry's decarbonisation goals.

"One of the primary issues is unscheduled downtime, while another key challenge lies in identifying potential issues before they develop into major problems. Equipment often gives early warning signs of impending issues, but these can be easily missed by crew members during day-to-day operations. Without the right tools and expertise to spot these subtle indicators, minor issues can escalate into significant problems, leading to more extensive repairs and longer periods of downtime," says Wilhelms.

He continues: "To address these challenges, predictive maintenance is crucial. By leveraging real-time data from onboard sensors and applying advanced analytics, potential issues can be identified early. This allows for prompt action before problems escalate. For instance, our Expert Insight service uses real-time vessel data to detect potential issues with vessels that could require a service or maintenance response."

Having skilled engineers available round the clock to address problems quickly when they do occur is crucial, as is efficient spare parts management, ensuring the availability of necessary components when repairs are needed. "Ultimately, the key to overcoming these challenges is adopting a holistic approach to asset lifecycle management," concludes Wilhelms. "This involves not just reacting to problems as they arise, but proactively optimising engines through data-driven maintenance, avoiding unnecessary part replacements, and focusing on overall vessel performance." ■

WÄRTSILÄ WILL CONVERT ONE ENGINE ON SIX OF CHEVRON'S LNG CARRIERS

GOLTENS INVESTS TO SUPPORT ELECTRONICALLY CONTROLLED ENGINES

New testing facilities are adding to its specialist maintenance and servicing capabilities

Global marine engine maintenance and repair services provider Goltens is pioneering investments in advanced electronically controlled engine services (ECES), recently introducing the first of three planned multi-way valve testing units at its ECES Service Centre workshop in Singapore. The investment enables the facility to strengthen the services offered for a wide range of MAN B&W and other gas and electronically controlled engines.

Multi-way fuel injection valve actuation (FIVA) valves play a critical role in operating newer two-stroke engines, many of which are now approaching key operating hours-based service intervals. The newly commissioned Singapore Multi-Way Valve Tester is the first of three that Goltens will install within its global network, with the other two testing units pending delivery for Goltens China and Goltens Dubai.

Designed to assess FIVA, electronic fuel injection (ELFI) and electronic valve actuation (ELVA) systems, the new machine boasts a wide range of capabilities. These include an ability to calibrate zero settings in accordance with manufacturer specifications; to verify the precision of main spool positions; and analyse the responsiveness of sensor feedback. Moreover, the new unit can scrutinise proportional valve functionality and inspect internal leakage volumes, ensuring valves meet the same standards of performance and safety as newly available products on the market.

The use of the advanced technology within the machine will support Goltens' existing overhaul services for FIVA, ELFA and ELFI valves. The engines that can now be serviced by Goltens Singapore with the new testing equipment include MAN ME-C and MAN ME-B engines, for which it has a full capability; while it offers a partial service capability for MAN ME-LGIM, MAN ME-GA and MAN ME-GI engines.

THE FIRST OF THREE NEW MULTI-WAY VALVE TESTING UNITS HAS BEEN COMMISSIONED AT GOLTENS ECES SERVICE CENTRE IN SINGAPORE

Goltens has worked closely with Hyundai Marine Solutions Tech (HMST), a subsidiary of HD Hyundai Marine Solutions, on this project to ensure that the machine meets rigorous testing standards for the relevant MAN B&W engine valves.

Last year Goltens Singapore widened its existing cooperative services agreement with Hyundai Global Service to include services related to Hyundai Heavy Industries electric and electronically controlled four-stroke, gas and two-stroke ME engines. Under the terms of the agreement Goltens is now acting as the 'preferred service provider' in Singapore and the surrounding regions for Hyundai engines. Over the past year Goltens has also signed cooperation agreements with other notable engine OEMs, including Bergen Engines and STX Heavy Industries.

Goltens currently works on around 5,500 vessels annually, operating out of 26 locations in 14 countries. According to chief executive Sandeep Seth: "We have the ability to coordinate closely amongst our sister stations to mobilise the most effective teams to meet customer requirements. While many companies profess to have 'global reach', few can coordinate services locally with their customers in one region and engage effectively with resources resident in others."

In recent months Goltens teams around the world have carried out several notable projects, including the replacement of a stern tube bearing on a containership while in dock in China. The shipyard removed the forward and aft stern tube bearings and discovered they were damaged. The customer then requested Goltens China to carry out an inspection and laser alignment check of the shaft centre line and submit a proposal for repair.

Goltens was subsequently engaged to perform in-situ line boring of the aft and forward stern tube housings in the drydock. Once completed, Goltens inspected and calibrated the new stern tube bearings, including laser alignment checks of inner bore slopes. The company's technicians machined the new stern tube bearings' outside diameters and provided technical guidance for press fitting of the bearings. Goltens performed a final laser alignment check of the shaft system centre line after press-fitting the forward and aft stern tube bearings.

Other recent projects have included crankshaft replacement and reconditioning for a dredger in Bahrain, and a crankshaft replacement for a platform supply vessel in Spain. Additionally, Goltens Singapore was engaged to undertake the replacement of a Bergen B32-40LBP

crankshaft on one of two main engines on a 16-year-old offshore tug supply vessel.

One of its primary marine engine service centres, Goltens Dubai has seen a significant increase in docking and afloat repairs, with over 25 projects already completed in the year to date, above the level recorded in the whole of 2023. Notable projects have included work to an asphalt bitumen tanker, which required an overhaul of its Daihatsu main engine and Weichei auxiliary engines; an anchor handling tug supply (AHTS) vessel which needed an overhaul of its GE main engines; and a chemical/ products tanker which was docked for a package of work that included the overhaul of the MAN main engines and auxiliary engines.

Goltens is also developing a wide range of environmental services through its Goltens Green Technology division, with its Dubai hub playing a key role. Having carried out more than 1,000 ballast water treatment system retrofits to date, the company is now expanding its range to include many other types of environmental retrofits, including some related to marine engine performance.

As an example, one of the world's largest container ship owners recently contacted Goltens Dubai to conduct a feasibility study and design for the replacement of two of its 21-year-old SKL 8VDS 29/24 AL-2 auxiliary engines, which were to be replaced with STX 7L21/31 units. A 3D scan and survey were performed around the diesel generators rendering precise details of the existing foundations and piping connection to the engines, which included fuel-oil supply and return line, low temperature freshwater piping, high-temperature piping, exhaust piping, lube oil drain, and starting air and air breather line. Goltens scanned one of the replacement diesel generator sets in its Dubai workshop, preparing a 3D model that was then superimposed on the engine room scan to carry out the feasibility check. Taking into consideration the overall dimensions and any possible clashes or modifications required, the new foundation was successfully designed in order to replace the existing diesel generators with newly refurbished units.

EARLIER THIS YEAR GOLTENS WORLDWIDE PERFORMED CRANKSHAFT REPLACEMENT AND RECONDITIONING FOR A TRAILING SUCTION HOPPER DREDGER IN BAHRAIN

GOLTENS CEO SANDEEP SETH

Seth concludes: "We stand out because, as a specialised engineering service company rather than an engine OEM or product vendor, our success depends on meeting the ongoing, critical operational needs of our customers, rather than just selling the next piece of equipment. Whether it is routine and reliable maintenance support, upgrades of obsolete equipment, restoration from catastrophic failure, or expert engineering and retrofit support to meet ever-changing environmental regulations, our focus is always on responsiveness and precision delivery." ■

TRUST-OCEAN ADDS ANOTHER DIMENSION TO CHRIS-MARINE'S SERVICE PORTFOLIO

A new performance management system is designed to help shipowners decision making processes

For more than five decades, Chris-Marine has designed, manufactured and sold engine maintenance equipment for two- and four-stroke diesel engines. Increasingly over the years the company has diversified its activities and its latest initiative is the new Trust-Ocean performance management system, which was officially launched at this year's SMM exhibition in Hamburg.

Leif Abildgaard, chief commercial officer, says: "It is a system that has been designed as an extension of our deep knowledge in hardware and signal processing. As a result, Trust-Ocean can provide ship operators with real time performance data and recommendations for performance improvement."

Whereas some other suppliers are marketing their performance monitoring systems as purely software as a service (SaaS), Chris-Marine says it prefers to rely on data generated by trusted hardware. "SaaS is only as good as the signals it receives," Abildgaard points out.

THE AGREEMENT TO PARTNER TRUST-OCEAN AND DNV'S VERACITY WAS SIGNED AT POSIDONIA THIS YEAR. FROM LEFT: LEIF NYDAL ABILDGAARD, CHIEF COMMERCIAL OFFICER, CHRIS-MARINE; AYMEN ABDAOUI, PROJECT LEADER, CHRIS-MARINE; BARRY AUTHERS, HEAD OF PARTNERSHIPS, VERACITY; AND LINE J.C.H. DAHL, VERACITY

To deliver the full advantages of Trust-Ocean, Chris-Marine has teamed up with DNV and its Veracity maritime emissions cloud solution. The aim of this partnership is to reduce the risk of low-quality data and improve data transparency, supporting customers' decision-making processes, and helping them achieve compliance and operational efficiency goals.

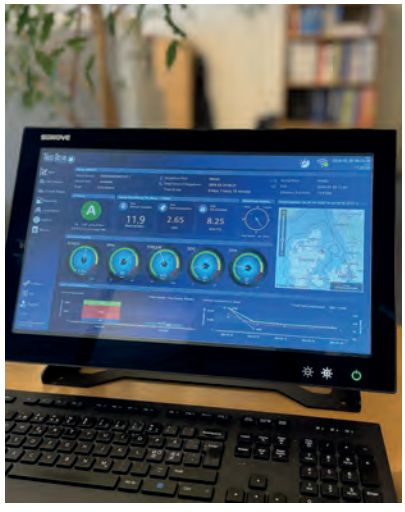
Chris-Marine believes that Trust-Ocean represents a significant advance in maritime performance and monitoring technology. By automatically collecting data from onboard sensors, the system minimises manual processes and enhances data accuracy, saving time and effort for the crew. Trust-Ocean features dynamic dashboards for real-time monitoring of vessel operational efficiency, actively engaging the crew onboard to take immediate and informed actions. Through a centralised platform, ship data is transmitted to the shore, stored in the cloud, and analysed via a secure web-based application.

Abildgaard adds: "Chris-Marine is known for being a service and support minded company where customers can get support around the clock. Trust-Ocean is no different and we are offering 24/7 support for both hardware and software."

Alongside its digital initiatives like Trust-Ocean, Chris-Marine continues its work to support the booming market for dual fuel engine technology. The company has developed fuel injector testers for many years and it is fully engaging with the major engine designers to support the common goal of a future with sustainable fuels. Currently Chris-Marine has developed methanol, ethanol, biofuels and, most recently, ammonia injection designs in conjunction with leading engine manufacturers and designers.

The company is putting energy into future fuel development not only through its work on injector testers but also grinding machinery. Abildgaard says: "Engines with clean fuels tend to react differently in the combustion chamber, resulting in different needs for overhauling sealing surfaces. Luckily for the engine makers, the tools needed for these changed engine wear conditions are being continuously developed by Chris-Marine."

A CHRIS-MARINE FUEL INJECTOR TEST UNIT FOR MAN B&W TWO-STROKE MARINE ENGINES RUNNING ON LPG



TRUST-OCEAN OFFERS REAL-TIME PERFORMANCE DATA COVERING THE MAIN ENGINE AND OTHER ONBOARD SYSTEMS

Chris-Marine is widely considered to be one of the leading experts in engine tooling and condition motoring, so it often accompanies engine manufacturers and service companies to complex or advanced service jobs on-site. This can include cylinder condition monitoring, including liner diameter measurement, which is a simple way for the operator to obtain data on the liner condition. Abildgaard adds: "Understanding the data is a much more complex assignment and our LEMAG ship performance tool experts can quantity the data into a useful report with recommendations on honing patterns, lube oil composition and general wear analysis. This is one of many services where Chris-Marine supports not only its customers, but their customers as well, by being the go-to experts." ■

MAN PRIMESERV HAMBURG INVESTS TO MEET FUTURE CHALLENGES

MAN PrimeServ's largest service centre is adopting new repair and conversion concepts to address challenges arising from key market trends

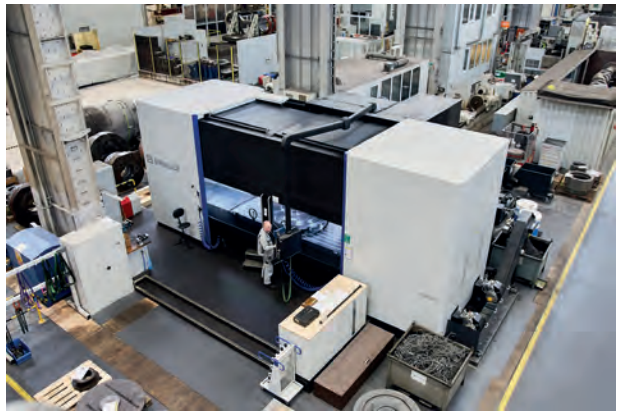
MAN Energy Solutions' largest service centre, in Hamburg, Germany, has announced some significant initiatives to enable it to adapt to changing times in the maritime service sector. The company cites the emergence of alternative fuels, larger ships and shorter harbour stays as general trends within the industry, that have implications for engine maintenance and servicing, both in workshops and for engineers working in situ aboard ships.

Stefan Eefting, senior vice president and head of MAN PrimeServ Germany, says: "Our Hamburg site has developed its own concept to address these new market trends. Accordingly, it is expanding its workshop and developing its specialisation in repair technologies. The future is about new welding technologies, in situ machining of components and extending the service life of components, with an associated reduction in CO_2 emissions compared to manufacturing a new part."

Located in the heart of the port, and specialising in the repair and maintenance of both two- and four-stroke marine engines, as well as turbomachinery, MAN PrimeServ Hamburg has 300 employees and approximately 30,000m^2 of factory space.

Olaf Gunia, head of MAN PrimeServ Hamburg, adds: "Our investment in new machines for processing components includes a machining centre that reduces the machining time for certain units, such as piston-crowns, cylinder covers, flywheels and counterweights for crankshafts, by a factor of four. These shorter processing times are intended to take account of shorter port stay times and will reduce costs, which of course will be passed onto customers."

Another new field for the Hamburg service centre will be the conversion of diesel engines to dual-fuel technology, which will be undertaken by service engineers in Hamburg with the help of MAN PrimeServ's international network, as needed. The company points out that such projects require complex planning, not only in terms of technicians and tools, but also the dispatching abroad of any components required by the host vessel.



MAN PRIMESERV HAS INVESTED IN ADDITIONAL MACHINERY FOR ITS HAMBURG SERVICE CENTRE

Gunia says: "We are preparing for more conversions, procuring the necessary tools, and training employees to handle the new fuels. Recruiting qualified personnel is a current challenge, but we are steadily adding to our roster with experienced engineers and skilled trades people, such as machine fitters, welders and machining technicians."

In a big win for the company, PrimeServ Hamburg has recently signed an agreement with Hanyuan Technical Service Center, a subsidiary of COSCO Shipping Group, to provide support services for spare parts, materials, inspections and repairs for all COSCO Shipping vessels arriving in Europe, North Africa and the Near Middle East. The new service cooperation agreement is set to last for an initial period of two years and was signed at the 2024 SMM maritime trade fair in Hamburg.

Gunia says: "As one of the largest shipping companies globally, COSCO Shipping Group is already one of our global key accounts and we cooperate closely in, among other aspects, the supply of spare parts. With this latest service cooperation agreement, we aim to enhance our mutual business in technical services, particularly in Europe, and looking forward, we also see the possibility to extend cooperation to other Chinese customers." ■

AT THE SMM SIGNING CEREMONY: CHENGDONG ZHONG, DEPUTY GENERAL MANAGER OF YUANTONG MARINE SERVICE; WEIDONG WANG, HEAD OF REGIONAL SALES, MAN PRIMESERV HAMBURG; OLAF GUNIA, VICE PRESIDENT AND SITE MANAGER OF MAN HAMBURG; JUN XIONG, GENERAL MANAGER OF HANYUAN TECHNICAL SERVICE CENTER; JIANGLIN LIU, GENERAL MANAGER OF YUANTONG MARINE SERVICE; AND TREVOR WONG, SALES DEPARTMENT MANAGER, YUANTONG MARINE SERVICE

WINGD EXTENDS DIGITAL DIAGNOSTICS SOLUTION

The success of the upgraded WinGD integrated Digital Expert (WiDE) platform since its launch last year has led to an extension of its application in the field

In February 2023 WinGD launched a pilot project for a new engine diagnostics solution designed to greatly simplify engine maintenance for crew and fleet managers. This enhancement to its engine monitoring and remote support platform, WiDE, was initially trialled on a vessel managed by Bernhard Schulte Shipmanagement (BSM) and, as part of the initial pilot, WinGD defined faults, improved diagnostics and formulated a scheme for condition-based maintenance recommendations which train the artificial intelligence that analyses the engine data. The accuracy of the diagnostics is currently being validated by feedback from crews about maintenance activities, as well as by subsequent monitoring and analysis.

Over the past year WinGD has extended that concept across two more pilot cases and says it is seeing very encouraging results. The company is now working with a number of class societies, including Lloyd's Register, American Bureau of Shipping, Bureau Veritas and China Classification Society (CCS), to illustrate the benefits achieved and the ability of the predictive maintenance solution to reduce the need for physical class inspections. The ultimate aim, WinGD says, is to commercialise the enhanced concept as an optional addition to the existing WiDE subscription offer.

WinGD's head of retrofit solutions, René Baart, says: "Condition-based maintenance is increasingly important, but we think it is helpful to go beyond that. So WiDE doesn't just look for faults that indicate wear on components, but analyses performance for any deviation that may indicate that wear could happen. We have successful cases where components at risk of wear were changed early. That's a really useful benefit for ship operators as it means that the replacement can be scheduled optimally based on the vessel's operating schedule, minimising vessel downtime, and without interfering with other components or systems."

WiDE has also been shown to have benefits beyond engine maintenance. One example relates to the impact of hull and propeller fouling on vessel efficiency. WiDE uses a digital twin of the individual engine at shop test as a baseline, comparing real-time performance to that model while taking into account operating conditions. Using this approach WiDE can tell when the hull and propeller are fouled, isolating its impact and highlighting how cleaning will affect efficiency. Operators can then take that knowledge and work out when would be the best time and place to conduct cleaning, restoring the vessel to better performance without either spending too much on excessive cleaning or leaving it too long between cleans.

Engine retrofitting as a means of achieving cost savings and environmental regulatory compliance in the longer term is a key trend within the shipping industry and as a reflection of that, WinGD's list of retrofit projects is growing. Its first series of methanol retrofits are

REPRESENTATIVES OF WINGD AND MES-DU AT THE END OF THE VCR TEST CAMPAIGN IN JAPAN

RENÉ BAART, HEAD OF RETROFIT SOLUTIONS, WINGD

approaching on a series of COSCO container ships. Although these are newbuild vessels being built in China, only the final vessel in the series will have a new methanol-fuelled X92-DF-M engine. The first three will have diesel-fuelled X92-B engines installed, and these will then be retrofitted to X92-DF-M engines at the newbuild yard once the final engine is built and commissioned. According to Baart: "This is a really smart way to develop retrofit packages and experience, working with partners, including the shipbuilder and engine builder, that understand the engine deeply."

WinGD also recently announced its first retrofit project for a new solution, involving variable compression ratio (VCR) technology, that dynamically optimises combustion on dual-fuel engines for the current fuel and engine load. A major container shipping line will install VCR on a WinGD RT flex50DF dual-fuel engine on one of its vessels, providing a long-term, full-scale test of the concept's reliability and operability.

Baart says: "The technology, which will eventually be available for all WinGD's LNG dual-fuel engines, has performed well on the testbed with our development partners, MES-DU, in Japan. The retrofit pilot will give us experience of installation on existing vessels and a chance to measure fuel and emissions saving performance against our expectations."

He adds: "We are also in the process of ensuring that all our new engines are designed to make future retrofits as simple as possible. They already share a common robust design that can withstand the higher pressures and temperatures needed for alternative fuels. The latest changes add to that by ensuring that the engine bedplate and A-frame are prepared for the extra servo oil supply units that will be needed to activate multiple fuel pumps on each cylinder head, when the cylinder covers are changed for the new fuel."

While many shipowners are already choosing methanol or ammonia-fuelled engines, many are sticking with diesel or LNG until the fuel availability and cost picture becomes clearer. Baart says: "Engines that are optimally ready for retrofitting give operators the extra time they need to assess lower-carbon fuel choices, safe in the knowledge that the installed engine will not be a barrier to their decision. This is already being reflected in our discussions with owners."

The retrofit trend is also evident in a slightly different form in the ammonia sector. Many LPG carriers also carry ammonia, and as ammonia becomes more widely transported as a mainstream energy source, some of those vessels are likely to become dedicated to that trade. Consequently, it would be logical for them to run on ammonia as fuel, but at present green ammonia remains scarce and expensive.

However, given those expected market dynamics, WinGD believes it would make sense to offer an engine that can initially use LPG and then be converted for ammonia fuel when the trade takes off. Baart says: "This is exactly what we are developing. The X-DF-P will be our first engine capable of burning ammonia as fuel. It will be 'reverse engineered' from our X-DF-A ammonia-fuelled engine, ensuring that retrofitting from LPG to ammonia, or from ammonia to LPG if needed, is straightforward when the time comes. This is a long-term development aimed at 2027, which is when owners are likely to begin considering these kinds of fuel decisions." ■

THE ENHANCED VERSION OF WIDE AIMS TO FURTHER SIMPLIFY ENGINE MAINTENANCE FOR BOTH CREW AND FLEET MANAGERS

CLASSIFICATION SOCIETIES

DNV FOCUSES ON ENHANCING ENERGY EFFICIENCY IN GLOBAL FLEET

The society is actively working on a number of notable retrofits aimed at improving fuel efficiency, which it considers to be the best short-term option for decarbonisation

In recent years, there has been a marked increase in in-service upgrade projects aimed at enhancing vessel energy efficiency, including the fitting of, for example, shaft generators, bulbous bows, wind assisted propulsion systems (WAPS) and air lubrication systems (ALS). Additionally, there has been a rise in alternative fuel retrofits, including those allowing the use of LNG and methanol.

The classification society DNV has been involved in several such projects over the past year. It is, for instance, engaged with Samskip, which is retrofitting one of its vessels with hydrogen technology. The goal is to reduce emissions by integrating hydrogen fuel cells into the vessel's power system. Similarly, Eidesvik's offshore vessel *Viking Energy* has received preliminary approval from the Norwegian Maritime Authority for its ammonia fuel system design. This retrofit, part of the ShipFC H2020 initiative, will enable the vessel to operate on ammonia for up to 3,000 hours annually.

Additionally, X-Press Feeders has begun converting its methanol-ready ships to fully operational methanol-powered vessels upon delivery. The first vessel, *Eco Umande*, will be undergoing conversion immediately after delivery.

Furthermore, in the wind-propulsion sector, Bound4blue's eSAIL technology has received a Type Approval Design Certificate (TADC) from DNV. This certification ensures compliance with the WAPS technical standard, streamlining the adoption process for shipowners.

Norwegian offshore support vessel (OSV) owners are increasingly adopting battery-hybrid propulsion systems to enhance energy efficiency and reduce emissions. Companies like Simon Møkster Shipping and Rem Offshore are retrofitting their fleets with containerised energy storage systems, significantly reducing their greenhouse gas emissions.

As a partner in all these projects, DNV not only handles classification and approvals but also provides comprehensive technical advisory services and acts as a mediator between owners, suppliers and other parties to help build the kinds of networks that will bring together know-how from many players, including from outside the shipping industry.

The regulatory landscape is also evolving, with new EU regulations requiring vessels to report GHG emissions and

DNV HAS BEEN WORKING WITH EIDESVIK ON A GROUNDBREAKING RETROFIT THAT WILL ALLOW THE OFFSHORE SUPPLY VESSEL *VIKING ENERGY* TO OPERATE WITH AMMONIA AS FUEL

participate in the EU Emission Trading System (EU ETS). Norway is a global leader in maritime battery applications, accounting for approximately one-third of global installations, with the majority of these ships being hybrids or plug-in hybrids. This technological shift is considered by DNV to be crucial for meeting decarbonisation targets and ensuring sustainable maritime operations.

Having local expert advice and support, especially ship segment specific expertise, is vital for projects to be successfully realised, DNV believes. This year the classification society established a new expert team focused on bulkers and tankers in Shanghai to meet demands arising from the major renewal of the fleet in these sectors which is now underway, including substantial retrofits as well as newbuildings. This new team is made up of 11 professionals, including ship type experts and senior approval engineers.

Reaching shipping's 2030 decarbonisation goal of 20% emission reductions, set by the International Maritime Organization (IMO), will not happen without significant energy savings, according to DNV's latest Maritime Forecast to 2050. The report stresses that, until carbon neutral fuels become viable, prioritising the development and use of technologies that reduce energy consumption is crucial for lowering shipping's emissions.

Knut Ørbeck-Nilssen, DNV Maritime CEO, says: "While we are currently witnessing a slowdown of decarbonisation in shipping, we are entering an era of unprecedented technological exploration that will drive progress forward. With carbon neutral fuels in short supply, smart decision-making and strategic investments today are crucial to

BOUND4BLUE'S ESAIL RECENTLY RECEIVED A FULL TYPE APPROVAL DESIGN CERTIFICATE (TADC) FROM DNV

lay the foundations for future emissions reductions. Prioritising energy efficiency, leveraging technological solutions, and embracing digitalisation are key steps towards reducing the extra cost burden and achieving our decarbonisation goals."

According to the report, reducing energy losses is the most straightforward way for the global fleet to cut emissions. Operational and technical energy efficiency measures can reduce fuel consumption by between 4% and 16% by 2030. Furthermore, the report highlights onboard carbon capture (OCC) as potentially the most effective way to decarbonise, as it enables the continued use of conventional fuels and technologies. However, CO_2 handling infrastructure needs significant development before this technology can gain momentum, DNV suggests. ■




STRATEGIC PARTNERSHIPS ENABLE BV TO GUIDE INDUSTRY THROUGH TECHNICAL CHALLENGES

Bureau Veritas (BV) is committed to working with stakeholders to help owners meet evolving technical challenges, especially in the drive to decarbonise fleet operations

As the maritime industry navigates the twin challenges of decarbonisation and digitalisation, classification societies are playing a pivotal role in driving sustainable, efficient operations. BV is focused on being at the forefront of this shift, guiding shipowners, operators and shipyards through the complexities of vessel maintenance, retrofitting and regulatory compliance.

According to Julien Boulland, sustainable strategy lead, and head of future shipping, at Bureau Veritas Marine & Offshore (BV): "Retrofitting existing vessels has become essential in the drive toward decarbonisation. BV is working closely with stakeholders to optimise the energy efficiency of the existing fleet through advanced retrofitting solutions and energy-saving devices. Our expertise in alternative fuels, such as LNG, ammonia, hydrogen, and methanol, combined with a deep understanding of de-risking complex retrofit projects, helps ensure safe, compliant and technically robust transitions."

BV's strategy for supporting maintenance and retrofit activity within the maritime sector is based largely around developing strategic partnerships and innovative solutions. By collaborating with key stakeholders across the industry, BV aims to drive efforts to reduce emissions and enhance operational efficiency.

One recent example of this is the application of the SMART notation to the fleet of Laskaridis Shipping, enabling real-time monitoring and optimisation of operations, leading to both improved business outcomes and reduced environmental impact. BV's collaboration with Laskaridis has also led to a pioneering project involving the installation of a methanol-fuelled fuel cell on a bulk carrier. This initiative explores the feasibility of fuel cells and the safe handling of methanol as an alternative fuel source. Through rigorous testing and analysis, BV says it is committed to "advancing sustainable propulsion systems, laying the groundwork for future innovations in the maritime sector".

In addition, BV has partnered with leading shipping companies such as MSC Cargo and Naftomar to advance their decarbonisation efforts. Projects with MSC Cargo include retrofitting vessels for lower speed efficiency and exploring alternative fuels like LNG and ammonia. Meanwhile, Naftomar's construction of dual fuel gas carriers, designed with future ammonia retrofits in mind, highlights BV's commitment to supporting the transition to cleaner energy in maritime transport.

BV has also been working with green technology providers, including Hanwha Ocean, which has been awarded a statement of compliance and approval in principle for its new rotor sail system, designed for use on board LNG carriers. A joint development project (JDP), conducted by Hanwha Ocean in collaboration with BV and the Liberian Registry, aimed to independently assess regulatory equivalency and exemptions for the installation of wind propulsion systems, specifically the rotor sails, on LNG carriers.

BV HAS BEEN CONDUCTING SEVERAL NOTABLE RETROFIT AND UPGRADE PROJECTS WITH LEADING SHIPOWNERS, SUCH AS LASKARIDES, MSC CARGO AND NAFTOMAR

As part of a rigorous evaluation by the JDP, the system was benchmarked against BV NR206 – Wind Propulsion Systems and NR467 – Rules for the Classification of Steel Ships, both of which provide essential criteria for certifying innovative maritime technologies. BV says its approval not only validates the technical viability and safety of Hanwha Ocean's rotor sail system, but also marks a crucial step toward the broader adoption of wind-assisted propulsion.

BV is supporting maritime stakeholders embrace digital technologies. Its recently launched MOVE platform, for example, enables digital collaboration with clients to simplfy operations and enable quick and informed decisions on asset compliance and performance.

One of the key features within MOVE is a new Fleet in Service application, which provides a visual and intuitive real-time fleet compliance overview and can also be used to take action specific to the asset's needs, such as requesting surveys. In time, BV says the existing VeriSTAR Info service will be phased out and replaced by MOVE's Fleet in Service app. MOVE is currently available to shipowners and Flag Authorities, and it is expected that it will be progressively expanded to include shipyards, designers and equipment manufacturers as well. ■

RINA SUPPORTS SOLUTIONS TO KEEP MARITIME ASSETS IN SERVICE

The Italian classification society RINA has been involved in a number of interesting projects in recent months which highlight its capabilities in supporting distinct solutions to extend the life of maritime assets and meet environmental targets

RINA HAS BEEN WORKING WITH OFFSHORE OPERATOR GLOMAR ON A NUMBER OF NOTABLE PROJECTS

Working with Glomar Offshore, RINA has supported a project involving the supply vessel *Minkar* at a yard in Poland, in which the owner kept the existing ship hull to carry out what it describes as a "second hand new building." RINA performed the necessary technical verification of the hull and carried out the thickness measurements. RINA is also currently performing plan approval and surveillance during the re-construction of this vessel.

In France, in a project for Compagnie des Bateaux Mouches, a 60m inland passenger vessel, *Le Mulet Coreau*, was completely renewed. The main propulsion has been replaced with diesel electric systems and general maintenance has been carried out according to European Standard Technical Requirements for Inland Navigation (ESTRIN) rules. RINA performed plan approval and relevant hull and machinery renewal surveys in conformity to ES-TRIN 2021, including witnessing thickness measurements, bottom surveys, fire and safety renewal surveys, and the commissioning onboard of all equipment and installations.

Other passenger vessel projects have included work to the 70m *Le Spuair* and *Le Diamant Bleu*, both of which have been fitted with batteries and for which RINA performed plan approval and renewal surveys in conformity with ES-TRIN 2021, and *L'Hirondelle*, a 60m inland passenger vessel that has also been extensively upgraded, including fitting diesel electric propulsion. In this case RINA performed plan approval and relevant hull and machinery renewal surveys, again in conformity to ES-TRIN 2021.

An unusual conversion which has received RINA support was undertaken at Damen Maaskant Shipyard in the Netherlands. A fishing vessel has been converted to a yacht called *Scintilla Maris*. It was about to be scrapped but the owner decided to do a major conversion and retrofitting, with RINA appraising the drawings, diagrams and manuals and supervising the refitting work. The old fishing vessel has now been 'reborn', fitted with batteries, as a green yacht available for charter.

One of RINA's strategic aims is to help owners avoid scrapping vessels and extend their useful life. After extensive thickness measurements, a ship's hull can be preserved and used as a structural block in a newbuild. The main engine can be replaced, and the vessel upgraded with batteries and bow thrusters, resulting in a modern, environmentally friendly ship, RINA states, adding: "This service is excellent for sustainability, is cost-effective, and does not require full design approval, as existing approved drawings can be reused. In the future, it could also be extended to other components of a ship."

Furthermore, through its RINA Marine Consulting team, the society has also launched two specific services that go in the same direction. One is a Life Extension Program (LEP) to support the trend to look to extend the lifetime of well-performing vessels to limit costs, reduce the risks of building a new vessel in uncertain times, and lower the environmental impact associated with scrapping.

RINA Marine Consulting has further developed a programme to quantitatively and technically assess a ship's expected lifetime, helping owners decide when to replace their assets. Through this service, RINA defines the fatigue structural lifetime of a vessel, the risk of extending the lifetime of machinery items and compares the carbon footprint of maintaining the vessel as opposed to building a new one.

Supporting this direction of travel, RINA has introduced a service called Life Optimal Ship Operation (LOSO), and associated IT tools. This provides insights into the accumulated fatigue life post-ship delivery, taking into account its geographic areas of operation. ■

RINA SUPPORTED THE CONVERSION OF A FISHING VESSEL INTO A YACHT, *SCINTILLA MARIS*, AT DAMEN MAASKANT SHIPYARD

ENVIRONMENTAL UPGRADES

REPLACEMENT MARKET RAMPS UP AS RETROFITS GO INTO DECLINE

As owners find some existing BWMS systems do not meet original expectations, many are opting to replace them in order to ensure continued compliance and secure added efficiency gains

Over the past five years or so, one of the biggest areas of environmental retrofit activity within shipping has been the installation of ballast water management systems (BWMS) to meet IMO regulations. The IMO Ballast Water Management Convention entered into force in September 2017, with a phased implementation which specified that all ships covered by the convention had to be in compliance by September 2024.

In line with the implementation schedule, retrofit demand reached its peak in 2022. Since then, demand for BWMS retrofits has gradually decreased, until the deadline was reached.

However, it is evident that a new area of activity, BWMS replacement, is becoming increasingly important for technology suppliers. As an example, Alfa Laval has just received an order to replace 18 BWMS on board vessels belonging to a major European shipowner. According to Tobias Doescher, head of global sales, business development and marketing, Alfa Laval PureBallast: “This significant order shows the high demand for the replacement of malfunctioning systems and a growing market for Alfa Laval’s BWMS replacement offering.”

The gradual enforcement of the convention as well as challenges with some installed systems are driving shipping companies to ensure their ballast water management systems are fully operational to avoid high costs, downtime and potential business losses. As the majority of the world fleet is now equipped, many suppliers have reduced their commitment to customers or left the market entirely, leading to a lack of support and upgrade options as regulations evolve. “This is especially challenging when the systems purchased are not functioning properly,” states Doescher.

TOBIAS DOESCHER, HEAD OF GLOBAL SALES, BUSINESS DEVELOPMENT AND MARKETING, ALFA LAVAL PUREBALLAST

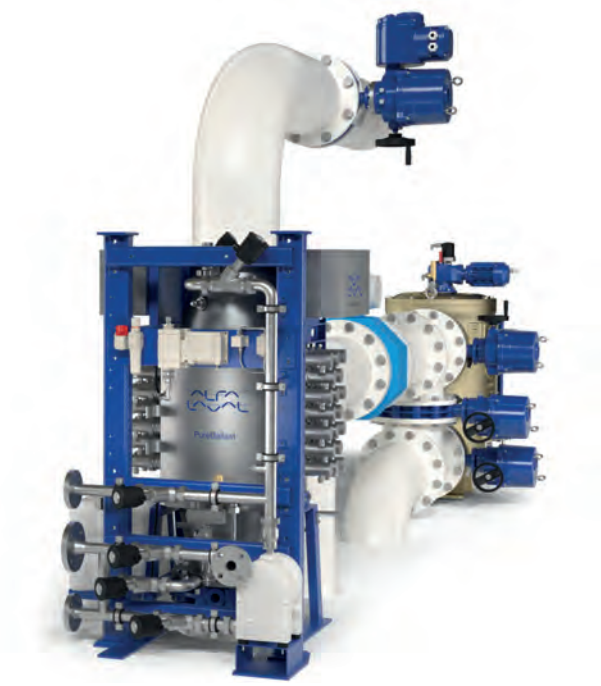
Over the past two years, Alfa Laval has replaced more than 250 systems from 30 different manufacturers, and the orderbook for replacement continues to grow. “With the consolidation of the BWMS market, we see a growing need for replacing installed systems,” says Doescher. “We have been contacted by an increasing number of shipowners and ship management companies worldwide who are experiencing issues that their current supplier cannot resolve. We are happy to step in and support customers with cost-efficient and sustainable solutions.”

Alfa Laval has experience replacing systems using both electrochlorination (EC) and UV technology. The replacement process involves a thorough onboard assessment of the existing system by a qualified expert. This evaluation determines any replacements that are necessary and identifies components that can be reused.

Doescher adds: “The retrofit market is coming to an end in 2024, so we see a downturn in this market, as expected. However, we can see that a new market, the replacement market, is forming, where shipowners replace malfunctioning, costly, poorly operating or poorly serviced BWMS with a reputable system for which they know there is a reliable supplier that will not leave the market and will continue to support it. We can see this market picking up momentum and expect it to grow in the near future.”

He continues: “During the past year we have installed and commissioned PureBallast 3 on several hundred vessels, either as retrofits, when the vessels were not yet equipped, or replacement when there was a need to switch to a more reliable system or supplier. We have also performed multiple system upgrades on older systems. The key to all those projects is to conduct a professional onboard assessment survey to determine what is needed, based on our many years of experience.”

While some suppliers are exiting the market, Alfa Laval says it remains committed to through-life support and to continue to develop products to meet shipowner requirements. The company has in recent months launched Alfa Laval PureBallast 3 Ultra as an



THE FIRST DELIVERIES OF THE LATEST GENERATION BWMS, PUREBALLAST 3 ULTRA, ARE EXPECTED TO COMMENCE IN 2025

evolution of its proven PureBallast 3 technology. The system brings a number of new advantages to its UV treatment solution, including enhanced performance in challenging waters, further power savings and simpler installation. Deliveries of PureBallast 3 Ultra will begin in the third quarter of 2025.

For shipowners who operate in ports with challenging water qualities, PureBallast 3 Ultra offers enhanced performance thanks to a new filter design that reduces the risk of filter clogging. Several of the filter improvements, such as a faster gear motor that improves back flushing efficiency, are also available as an upgrade for existing PureBallast 3 systems.

By supporting higher flow rates, PureBallast 3 Ultra is designed to use less energy than competing UV systems in relation to the ballast water volume. It can also be more efficient than previous PureBallast 3 systems, thanks to an expanded range of UV reactor sizes that closely match the ballast pump capacity. For certain flows, power needs are reduced by almost 20%, Alfa Laval claims.

The wider UV reactor range means more flexibility for shipyards, who also benefit from other features. The Cleaning-In-Place (CIP) unit and pressure monitoring device are integrated into the UV reactor module, and the upgraded filter design is smaller. With a small footprint and fewer connections, PureBallast 3 Ultra can be configured for ballast water flows of 42m^3/h to 3,000m^3/h. ■

HEAVY LIFT SHIP RECEIVES WIND POWER RETROFIT

Econowind and Jumbo Maritime have collaborated on a recent installation

JUMBO JUBILEE HAS BEEN FITTED WITH TWO ECONOWIND VENTOFOILS

The shipping industry is increasingly embracing wind-assisted ship propulsion technology, and most recently heavy lift shipping and offshore transport company Jumbo Maritime has joined the movement. Wind power technology supplier Econowind has installed two leased VentoFoil units on the heavy lift vessel *Jumbo Jubilee* in a retrofit project that marks what the company says is the first time a geared vessel has been equipped with wind-assisted systems.

These are also the latest in a series of technologies installed on the vessel in a bid to boost fuel efficiency and cut carbon emissions. This recent move, with the installation of the two Econowind VentoFoils, will help the company assess the impact of wind-assisted propulsion on the vessel's efficiency.

Jumbo technical manager Andres Cassanova explains: "While not fully optimised for our vessel type, these sails will help us to gather valuable insights on real-world fuel savings and explore further optimisations that will allow Jumbo to reduce its environmental footprint even more."

The relatively small footprint of the sails is said to make them an ideal solution for installation on a heavy lift vessel, where deck space is required for project cargoes. Additionally, the sails are flexibly mounted on a customised frame, engineered in-house by Jumbo structural engineer Estelle Bongers. As a result the sails can be moved, or even transferred to another vessel, should additional space be required for cargo.

The installation of the VentoFoils follows the application of an anti-fouling coating on the ship's propeller to maintain efficiency, as well as the introduction of an AI-powered anti-fouling hull coating monitoring system. This latter system captures a wide range of data including vessel speed and geographical position, as well as sea water temperature and other environmental conditions and parameters. This allows the system to make predictions and provide notifications when there is a risk of accelerated fouling and means that Jumbo can perform an inspection and undertake maintenance in advance of a decrease in fuel efficiency. It also ensures the coating system can be maintained using less aggressive methods, preserving it for longer durations between dockings.

A further measure taken by Jumbo is the installation of an eco-control system to the vessel. "This can be viewed as a type of intelligent cruise control," explains Cassanova. "It allows us to set a fuel consumption or maximum speed limit. With this, the eco-control system takes over and, based on rpm and propeller pitch, is continually adjusting to ensure optimally efficient performance, minimal fuel consumption and emissions."

With these various technologies installed on *Jumbo Jubilee*, Jumbo expects to achieve significant fuel savings. A crucial factor in this, says technical superintendent Patrick Feddes, is collaboration. "If you want to reduce your environmental footprint, it's not only down to one part of the company. It's a team effort between those onboard the ships and those on shore. The technologies play an important supporting role in creating energy savings, but a significant factor is awareness and cooperation throughout the various departments of the organisation," he suggests.

Jumbo's partner in this particular project, Econowind, has been producing wind propulsion for seagoing vessels since 2016. Its 16m aluminium VentoFoil, which is ideally suited for the short-sea market, is produced at its Zeewolde factory in the Netherlands, but the company is now also collaborating with Bijlsma shipyard in Warten, where it is building 30m-high steel VentoFoils, which are designed for large ocean-going vessels. ■

THE VENTOFOILS ARE MOUNTED ON A SPECIALLY DESIGNED FRAME THAT FACILITATES MOVEMENT ON THE DECK TO ACCOMMODATE PROJECT CARGO SHIPMENTS

SINGAPORE & SOUTH EAST ASIA

SEATRIUM SEES SIGNIFICANT INCREASE IN REPAIR VOLUMES

Long-term shipowner agreements help secure a healthy future for the Singapore yard group's repair and upgrade business sector

Singapore-based Seatrium is enjoying a strong recovery in business fortunes, following its creation last year as a result of the merger of the Sembawang and Keppel shipyard businesses. Overall, the company achieved revenues of around S$4 billion (US$3.1 billion) in the first half of 2024, generating a net profit of S$115 million this period, compared with a net loss of S$264 million in the equivalent months of 2023.

A strong increase in repair and upgrade activity has played a key part in the upturn, with the group securing a string of major repair and upgrade contracts, including the world's first full-scale carbon capture and storage (CCS) retrofit for Solvang AS.

Over the first six months of 2024 Seatrium completed 133 vessel repair and upgrade projects, generating revenues of S$517 million, compared with $S504 million over the first half of 2023. Highlights of the first half of this year included repairs to 28 LNG carriers, consolidating its market leading position in this segment; two FSRU special dockings; four cruise ship upgrades; two FPSOs; and two offshore rigs.

Seatrium has also been successful in securing Favoured Customer Contracts (FCCs) with leading shipowners, with six agreements of this type signed to date in 2024. This has included an FCC with Hyundai LNG Shipping, its first long-term strategic partnership agreement with a leading Korean liquefied natural gas (LNG) company, for the repair and upgrade of its LNG carriers. The contract includes the refit of a series of LNG carriers over the next two years. The first LNG retrofit under the FCC agreement took place at Seatrium's Admiralty Yard this May and involved the LNG carrier *Hyundai Utopia*.

Additionally, Seatrium has secured an FCC with the Greek Angelicoussis Group. This two-year contract, with a one-year renewal option, includes the refit of 10 to 15 vessels a year, including LNG carriers, tankers and bulk carriers. Andreas Spertos, executive vice president and technical director of Angelicoussis group company, Maran Gas, says: "Seatrium was selected to be our partner as they have demonstrated a strong track record, and delivered over 70 successful retrofits, including 20 of our LNG carriers and a series of scrubber installations for our tanker fleet, since 2012. We are confident that this partnership will be the blueprint for a successful long-term fleet retrofitting programme, thereby enhancing our operational efficiency and instilling the highest standards of quality, safety, and environmental sustainability in the maintenance of our fleet."

THE TANKER *POLAR ENTERPRISE* IN DOCK AT SEATRIUM

AN FCC HAS BEEN SIGNED WITH TEEKAY SHIPPING (AUSTRALIA) WITH THE FIRST VESSEL DOCKING IN JULY THIS YEAR

Another significant FCC has been signed with Teekay Shipping (Australia). This is its first long-term partnership agreement with a leading ship management company for the repair and upgrade of a fleet of vessels under the Australia Defence Maritime Support Services Program (DMSSP). The contract includes the refit of a series of vessels over the next two years and the first vessel under the FCC entered the Admiralty Yard in Singapore in July. Six more dockings for Teekay are planned over the next 12 months.

The importance of such agreements was stressed by Seatrium chief executive Chris Ong in announcing the impressive first half year results. He commented: "FCCs facilitate forward capacity planning, joint value creation and support a steady flow of repair and upgrades orders that contribute towards a recurring revenue base. Every docking space in our shipyard is valuable, and forward planning allows us to plan ahead for future projects."

All the signs are that the second half of 2024 will also be positive for the Seatrium repair and upgrade business. Recently the company has announced that it has secured a further series of repair and upgrades contracts with an aggregate value of S$180 million. These include major repairs to offshore vessels, naval vessels, ferries, LNG carriers, tankers as well as damage repair work, for a wide range of customers, including Velesto Energy Berhad, Zonda Drilling, Seadrill and Sapura Energy Berhad.

The group has also won a contract for the docking and repair of *Kaitaki*, a ro-ro ferry operated by Interislander of New Zealand. In the tanker segment, Seatrium has been awarded periodic maintenance and upgrade work to two tankers for ConocoPhillips/Polar Tankers, and one main engine, dual-fuel ready MAN Lifecycle Upgrade of a tanker from Alaska Tanker Company, as well as a series of seven LNG vessel retrofits from long-term repeat customers.

Seatrium has also recently confirmed that major retrofits and upgrades are underway to *Sea Challenger*, an offshore installation vessel. The first steel was recently cut for this project at Seatrium's Pioneer Yard, which will see the company performing engineering works, and the fabrication and installation of a new crane and upgraded leg jacking systems, over the next few months for Japan Offshore Marine (JOM), a joint venture between Penta-Ocean Construction and DEME. ■

INVESTMENT IN SMART YARD BOOSTS ST ENGINEERING'S REPAIR AND CONVERSION CAPABILITIES

The company's newly opened Gul Yard is one of the most technologically advanced in the region

For ST Engineering, one of Singapore's leading shipyard operators, the ship repair and conversion segment has performed well to date in 2024 compared to the same period last year, driven by increased activity in both areas. The marine segment witnessed a 9% increase in first-half-year revenues, compared with the first six months of 2023, rising to Sing$373 million from Sing$314 million, with repair and conversion related projects playing an influential part in that improved performance. According to Tan Leong Peng, president, Marine, at ST Engineering: "This growth has been bolstered by our investment in a third floating dock. Consequently, we expect our ship repair and conversion segment to operate at full capacity for the whole of the 2024 financial year."

The company reports increased demand in various niche market segments, particularly with regard to offshore vessels, dredgers and wind farm installation and support vessels, driven by increased offshore oil and gas activities and a buoyant offshore wind energy sector. Peng says: "With our proven expertise in sophisticated, high value repair and conversion work for a wide range of vessels, we are well-positioned to capitalise on these emerging opportunities."

So far this year, ST Engineering has completed several major re-activation and conversion projects, with three being particularly significant. These include the re-activation of a trailing suction hopper dredger that was laid up for more than three years; drydocking and repair works on another trailing suction hopper dredger where the yard was engaged to perform extensive steel repairs for the hopper holds, bottom doors and dredging equipment, including underwater coating and propulsion works; and the conversion of a ro-ro ship into a training vessel. The latter project involved the construction of a 500ton accommodation block complete with a new machinery space and auxiliary systems to support

ST ENGINEERING'S RECENTLY OPENED GUL SHIPYARD FEATURES A RANGE OF SMART TECHNOLOGIES DESIGN TO ENHANCE PRODUCTIVITY, IMPROVE SAFETY AND REDUCE ENVIRONMENTAL IMPACT

over 100 personnel. ST Engineering was responsible for the full conversion, including the design, detailed engineering and build of the accommodation block, and supplied all the necessary materials and equipment, completing the project within six months to meet a stringent contractual timeline.

Currently, ST Engineering is working on a notable hybridisation project for an offshore customer. This involves outfitting the vessel with the necessary infrastructure to enable future battery installation, supporting the eventual conversion of the propulsion system to hybrid operations.

In a major development for the company, ST Engineering recently opened its new 14hectare shipyard at 55 Gul Road in Singapore, a facility that was acquired in February last year for Sing$95 million, to support the further growth of its marine business and maintain competitiveness in the shiprepair segment. This facility features advanced 5G digital infrastructure and an integrated yard management system, enhancing workflow efficiency for larger projects.

This new facility will replace ST Engineering's Tuas Yard, whose lease expires at the end of 2024. Twice the size of the Tuas facility, the Gul Yard is designed to handle larger, more complex projects and enable ST Engineering to explore new market segments, including refits and upgrades for local and international customers.

The Gul Yard is a "smart yard", equipped to enable the application of AI-powered technologies in the near term and beyond, with a majority of these innovations developed in-house. This includes a proprietary integrated yard management system, which will oversee all aspects of the yard's operations, streamlining workflow management, from planning and resource allocation to tracking project milestones and predicting potential bottlenecks. It also features predictive maintenance to prevent unplanned downtime by detecting early signs of equipment failure, and condition-based monitoring for real-time tracking of equipment and ships. According to Peng: "Since the acquisition of the yard, we had plans to invest about Sing$60 million to develop new infrastructure and acquire new capabilities. There are also plans to have similar digital advancements at our Benoi Yard."

The application of new technology extends from yard operations to ensuring workplace safety to going green. ST Engineering's safety and video analytics solutions, including AGIL Vision and security robots, provide real-time hazard detection and automated safety alerts, while drones are used to inspect hazardous and hard-to-reach areas, further enhancing safety. Additionally, IoT enabled devices, including smart watches and helmets, will provide real-time updates of work progress and monitor workers' wellbeing. Furthermore, the Gul Yard will deploy electric-powered automated guided vehicles (AGVs) and buggies to reduce reliance on fossil fuels, as well as implement efficient scrap sorting and recycling processes to minimise waste. Gul Yard is also poised to significantly reduce carbon emissions by 2034 through the adoption of renewable energy sources such as ammonia, hydrogen, biofuel and solar power.

The Gul yard has a water frontage 730m long and has three floating docks: one measuring 185m x 33.20m that has a 17,000tonnes lift capacity and can dock vessels up to 40,000dwt; one measuring 240m x 43.96m, that has a lifting capacity of 28,000tonnes that can dock vessels up to 70,000dwt; and a third measuring 170m x 27m, with a lifting capacity of 12,000tonnes that can handle ships up to 12,000dwt. These docks are supported by construction halls and open fabrication areas, and a variety of workshops.

While ST Engineering is upbeat about prospects generally, with the opening of the new facility and positive market trends, there are some challenges that lie ahead. As Peng observes: "One of the main issues we face is manpower. With the lowering of limits on the number of foreign workers a company can employ, we have a smaller workforce. In response, we have formed task forces to review and develop efficient work processes that save man-hours while maintaining the level of output, and without compromising safety and quality."

Automating repair and conversion processes is also challenging compared to shipbuilding, he points out. However, Peng adds: "We are addressing this by investing in technologies like hydro blasting, automated guided vehicles and drones for inspections to enhance productivity and we are well-positioned to assist our customers in implementing innovative solutions." ■

SUPERYACHT REFITS & REPAIRS

MB92 FURTHER STRENGTHENS ITS REGIONAL PRESENCE

The group has acquired a new yard to add to its superyacht refit network, while investing further in innovative environmental and sustainability solutions

MB92 HAS ADDED A NEW YARD AT GOLFE-JUAN IN THE SOUTH OF FRANCE, TO ITS YACHT REFIT NETWORK

European superyacht repair and refit specialist MB92 Group continues to expand the scale and scope of its operations within the Mediterranean region. The company has recently taken over operations at the Golfe-Juan shipyard in the South of France, and the new facility, spanning an area of 9,000m^2 and capable of servicing yachts up to 45m, marks a significant strategic step for the Group in expanding its presence in key yachting hubs around the world.

MB92 La Ciotat is now working closely with the concession holder, D-Marin, which has entrusted the company with operating the site, as well as the existing shipyard team, who will remain, to ensure a smooth transition and prepare the facility for its future role within MB92's growing operations. This will involve upgrading health, safety, and environmental (HSE) protocols, alongside significant investments in modernising the shipyard to align its operations with the Group's ESG commitments, particularly regarding water treatment, waste management and energy efficiency. The company says the improvements aim to transform the facility into an environmentally friendly and innovative operation that meets both the needs of the yachting industry and the expectations of the local community.

Rob Papworth, managing director of MB92, says: "At Golfe-Juan, our goal is to deliver the same high level of quality and attention to detail that MB92 is known for throughout the Group, benefiting from our extensive experience in servicing yachts in the under 50m segment. Through collaboration with local subcontractors and MB92 Group's extensive network of partners, we will ensure that each refit adds real value, positioning Golfe-Juan as a key destination for superyacht refit services in the Mediterranean, while furthering our commitment to sustainable practices."

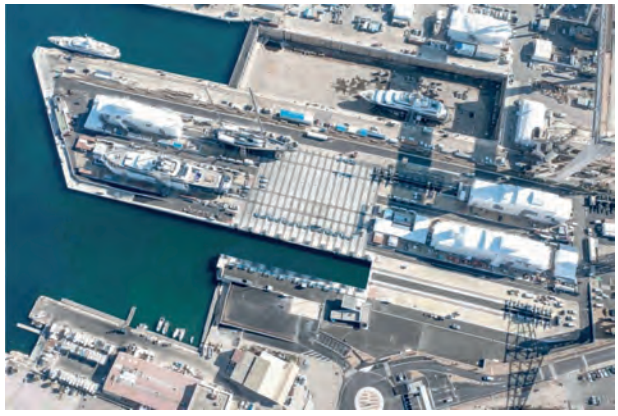
In another significant development MB92 Group has signed a Heads of Terms agreement to acquire GYG Limited, a superyacht painting, service and supply company which primarily trades under the Pinmar, Pinmar Yacht Supply and Technocraft brands. The agreement, expected to be finalised by the end of this year, represents an extension of a longstanding relationship between the two companies. MB92 and GYG have worked together many times on refit projects for over 30 years and a statement promsies they "will continue to respect and develop each company's existing partnerships".

This acquisition by MB92 Group, which now has facilities in Barcelona, La Ciotat, Golfe-Juan and the Red Sea, supports both companies' strategic vision to "enhance market responsiveness and elevate client services". GYG will continue to operate its businesses across Europe and the US, while the combination is expected to allow GYG to achieve its full growth potential.

A key area of strategic focus for the MB92 Group and its various shipyards is environmental sustainability. Its recently published *Annual Sustainability Report for 2023* highlights the significant measures the company has taken, particularly in terms of waste management, energy transition and water management, over the past year. Notable projects carried out include the introduction of systems for reducing wastage during painting operations and the installation of underwater inspection robots. An electrically powered tender was introduced into operations at its Barcelona yard, in conjunction with local firm Nauta Services, and much greater use of renewable energy sources was made, with the addition of photovoltaic panels, increasing energy output by 129kWp in 2023. Further significant projects involving alternative fuels are in progress at Group yards for completion in 2024.

According to Jean-Marc Bolinger, CEO, MB92: "Investments in innovative solutions such as smart monitoring technology and heating for paint projects have enabled us to optimise performance and minimise waste."

At the La Ciotat shipyard, equipment such as cranes and forklifts have been converted to run on HVO renewable fuel



OVER THE PAST YEAR MB92 HAS FOCUSED HEAVILY ON REDUCING THE ENVIRONMENTAL IMPACT OF ITS OPERATIONS, INCLUDING ITS DOCKS AND SHIPLIFTS

and ongoing projects continue to modify equipment such as heaters for HVO use. Bolinger adds: "The case of heaters is a particularly satisfying one as the company is one of just a few authorised to use HVO for this purpose in France."

Water treatment is also pivotal to the company's environmental strategy. Bolinger says: "We have introduced robust systems and policies to maximise water efficiency, recycle resources and reduce reliance on freshwater supplies. Across the group we managed a 26% reduction in freshwater usage in 2023 compared with 2022. This has been achieved through a number of initiatives including new water treatment systems at La Ciotat capable of converting rainwater to use for industrial purposes. Other measures are at the planning stage and will be rolled out over the coming months."

The company is working in partnership with Rolls-Royce to support the integration of next generation propulsion and energy management systems to reduce the environmental impact of yachts. Furthermore, in 2023 MB92 Group launched "Refit for the Future!", a new sustainability refit service tailored for superyacht owners looking to reduce the environmental impact of their yachts. This service is said to have been quite successful over the first year and is an important focus for the group going forward. Bolinger says: "This service is designed to lower the impact of the existing fleet through enhanced performance, comfort and value. It aims to support owners apply various solutions seamlessly ahead of expected regulation."

He continues: "Across our industry there is a shared recognition of the urgent need for action amidst the uncomfortable reality of our environmental challenge. Now it is important to translate that awareness into tangible progress. The potential within our industry and the broader maritime sector is vast and we must seize this momentum to drive meaningful change during the crucial period ahead. At MB92 we view this fundamental challenge as an opportunity rather than a threat." ■

YACHT REFIT DEMAND STAYS STRONG AT AMICO & CO

High levels of investment have helped the Italian shipyard keep pace with owner requirements

The 2023/2024 refit season saw Genoa-based Amico & Co work on a total of 154 refit projects, including seven full paint jobs on vessels between 55m and 80m in overall length. Several interior cabin conversions were also completed within very tight refit timeframes, assisted by onboard visits while the vessels were on location and an extensive amount of pre-fabrication work.

Notable current projects include a major 20-month refit involving lengthening, superstructure modifications, interior refitting and a full paint job on a yacht in excess of 80m in length. This work is underway inside the 102m covered drydock within the shipyard.

Manuel Di Tillio, operational, technical and sales director, says: "The refit industry continues to be buoyant owing to the sheer volume of the fleet to be maintained, a glut of special survey deadlines and the refits desired by owners new to yachting in the last few years."

Amico & Co is however seeing rapidly changing dynamics in terms of refit preparation timeframes, in particular for globally operating vessels over 60m length. Manuel Di Tillio says: "The exponentially increasing complexity of yachts of this size often now leads to planning refits over a year in advance in order to both secure the desired facility, whether it be one of our permanent covered painting sheds, a drydock or a hard standing slot, as well as ensuring availability of the resources – including OEM technicians – necessary for a successful refit. It is important that owner teams are aware that where possible refits must be planned well in advance, even more so now than ever before."

Amico & Co has recently come to the end of a five-year cycle of investments, totalling €33 million. This has included a 4,000tonnes capacity ship lift, capable of manoeuvring vessels up to 95m in length, additional hard standing berthing slots and also a 26-berth crew-friendly mooring facility, called Waterfront Marina.

INVESTMENTS IN RECENT TIMES HAVE INCLUDED A NEW SHIPLIFT WHICH HAS EXPANDED BOTH CAPACITY AND OPERATIONAL FLEXIBILITY

According to Amico & Co, the new ship lift allows for both regular pre-planned and emergency maintenance and refits to the growing fleet of yachts over 60m, with six dedicated, independent slots on hard standing, one of which is equipped with a keel pit and another with a modular painting shed with a special opening roof.

Waterfront Marina is considered an ideal facility for vessels prior to, after and outside of refits, located conveniently near the yachting hub of Portofino. Within this facility, vessels can organise their own clean, marina-compatible works in a cost-efficient manner.

Over the summer of 2024, Amico & Co's external 80m dock was upgraded and reconfigured allowing for the creation of additional large yacht berths in the technical area of the marina. The next development planned by the company is the construction of an additional modular covered paint shed over a 95m berth slot.

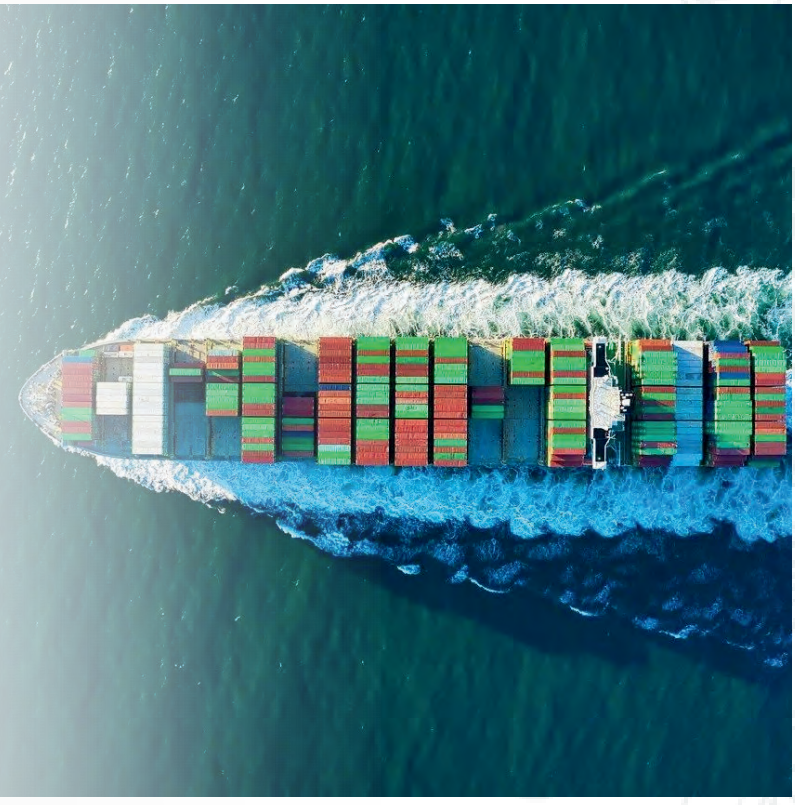
In parallel, important investments are ongoing in terms of human resources to further expand and develop internal in-house departments and to create and train the project management and support teams of future. A technology transformation is also anticipated over the next 18 months with a new version of its proprietary management system being developed. Furthermore, investments are also being made to accommodate ever-increasing demands relating to yacht tenders. This will cater not only for their storage, but also for their refit, as these become ever larger. ■

DEMAND FOR SPACE AT AMICO & CO'S FACILITIES HAVE REACHED A LEVEL WHERE CUSTOMERS NEED TO PREPARE WELL IN ADVANCE FOR REFIT PROJECTS

CII 2025

TECHNICAL CONFERENCE: MANAGING CII AND ASSOCIATED CHALLENGES 2025

In January 2024, the Royal Institution of Naval Architects (RINA) hosted the first Technical Conference on Managing CII and Associated Challenges at the IMO Headquarters in London. The conference resulted in bringing together 90+ industry stakeholders who exchanged feedback and insight on CII's first year. The 2024 conference, supported by SPNL and the Nautical Institute, allowed the delegates an opportunity to hear from two keynote speakers – Mr. Tianbing Huang, Deputy Director, Sub- Division of Protective Measures, Marine Environment Division, IMO and Julien Boulland, Global market leader for sustainable shipping within Bureau Veritas Marine & Offshore, head-office commercial team, among many other presentations including from companies such as Ardmore Shipping; d'amico società di navigazione spa; MSC Cruise Management (UK) Ltd; DNV; Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping; International Chamber of Shipping; Royal Caribbean Group; and many more. The IMO must conduct a review of the CII before 1 January 2026, and following initial feedback, changes are expected to CII, though it is not yet clear on what the final outcome will be. The Royal Institution of Naval Architects is proposing a follow up conference in January 2025, and is inviting companies to share how they manage performance as a system, and to explain how continuous improvement in energy efficiency may be achieved.



Carbon Intensity Indicator (CII) – What is it?

The Carbon Intensity Indicator (CII) is a mandatory rating measure for ships, developed by the International Maritime Organization (IMO), that came into effect on 1st January 2023. As part of its commitment to addressing climate change, the IMO has been working on the development of a Carbon Intensity Indicator (CII) for international shipping. The CII is intended to measure the carbon efficiency of ships and assess their relative carbon emissions performance. The concept of the CII was introduced in the IMO's Initial Strategy on Reduction of GHG Emissions from Ships, adopted in 2018. The strategy sets out a vision to reduce total annual greenhouse gas emissions from international shipping. The CII is intended to be a key tool to assess and monitor the carbon intensity of ships, providing a standardized and transparent measure for evaluating their energy efficiency and emissions performance. It is expected to be a dynamic indicator that can be updated periodically to reflect technological advancements and best practices. However many sectors of the maritime industry have expressed concerns regarding the unintended consequences of implementation of CII.

21ST - 22ND JANUARY 2025

LONDON, UK

Conference Topics:

- **Experience with managing and complying with CII**
- **Challenges with implementation of corrective actions**
- **Experience with effectiveness of corrective actions**
- **Lessons learnt**
- **Intersection with commercial and contractual issues**
- **Best practice energy efficiency management approaches**

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