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Kathrin Lau
Editor in Chief
kathrin.lau@dvvmedia.com

Just for fun?

It is remarkable – how much digital systems have become a matter of course in our everyday routines. Most of the time, we don’t really think about all the digital applications we are using any more, whether in a private or professional context.

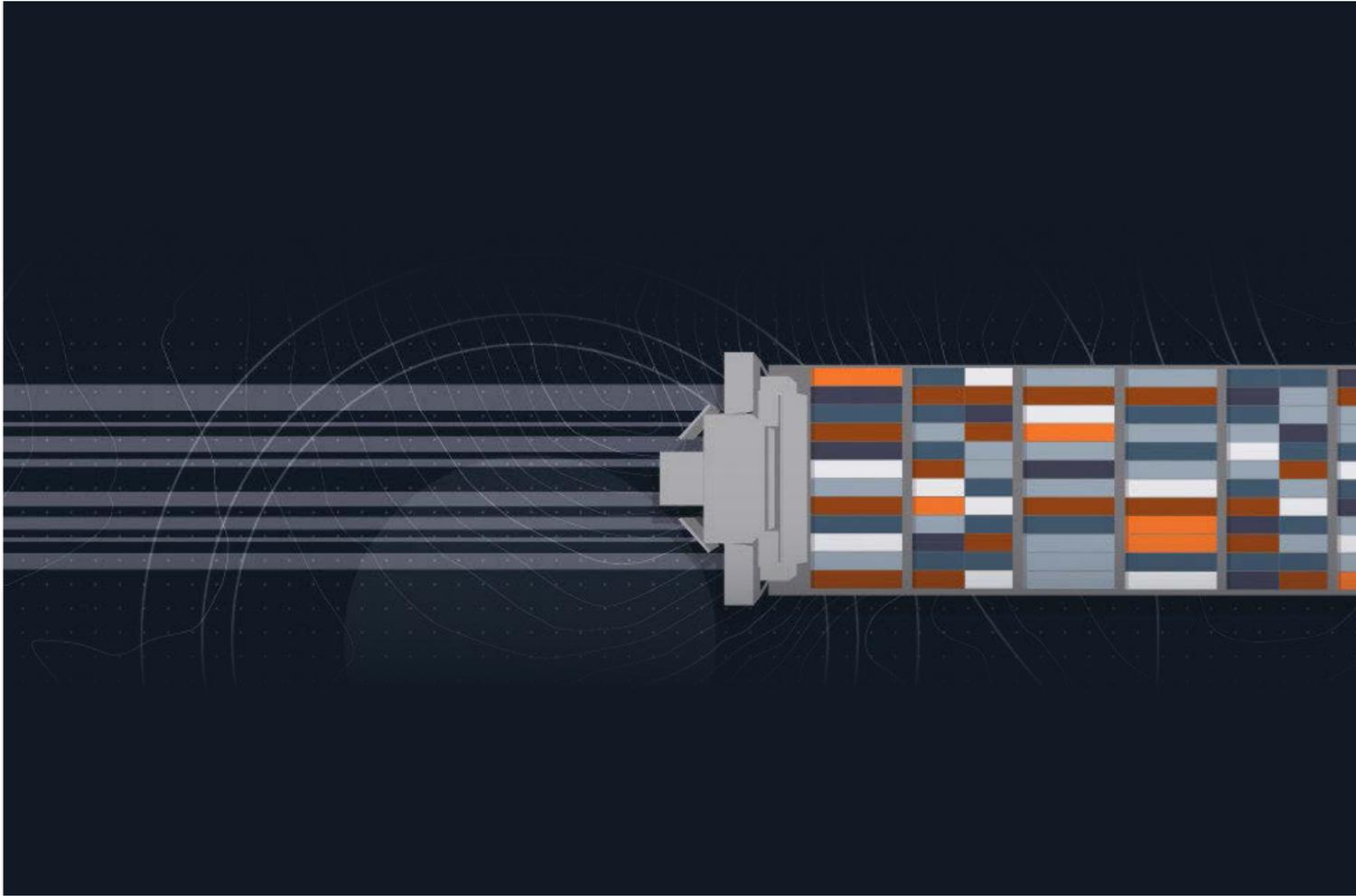
In contrast to this, however, AI and how much it can influence, improve or even threaten our daily lives, is probably one of the most discussed issues at present in this environment. Everyone has probably already tried ChatGPT, whether in a business matter or just for fun. And it is indeed astonishing (frightening?) how accurately this platform can deliver texts.

Be assured that this issue of our annual Special SmartShip Edition has been researched, composed and edited by real human beings, who again compiled a fascinating overview of current developments in nine subsegments of the digitised processes within the maritime industry. And this will stay that way!

However, I asked ChatGPT what it can do for the maritime industry and here is what it answered: *“ChatGPT has the potential to revolutionise the way we approach maritime digitalisation, by providing valuable insights and innovative solutions to the challenges faced by the industry. With its ability to understand natural language and vast knowledge base, ChatGPT can facilitate communication and collaboration between stakeholders in the maritime sector, accelerating the adoption of digital technologies and improving the efficiency and safety of maritime operations.”*

Sounds good! What potential AI will actually bring, however, is fortunately still for us to decide at the moment.





Digitalisation is essential to the future of shipping, the report finds

Is maritime progress at risk over fears of digitalisation?

REPORT A recent report published by Wärtsilä Corporation shows that 70% of industry professionals have a very clear understanding of why digitalisation is needed and what its benefits are. Over two thirds believe that the ability to digitalise existing infrastructure and retrofit vessels is challenging. While digitising existing processes undoubtedly has many advantages, does it also risk slowing down progress?

Despite 78% of industry professionals agreeing that change and technological innovation is a positive thing for the maritime industry, almost half (45%) admit to having a volatile attitude towards technology and over a third (36%) say they are actively resistant to change. This is according to the technology group Wärtsilä's 'Debunking the Mythical Beasts of Maritime Digital Transformation' report. The report also reveals that as many as 18% do not think that the industry is unified in its

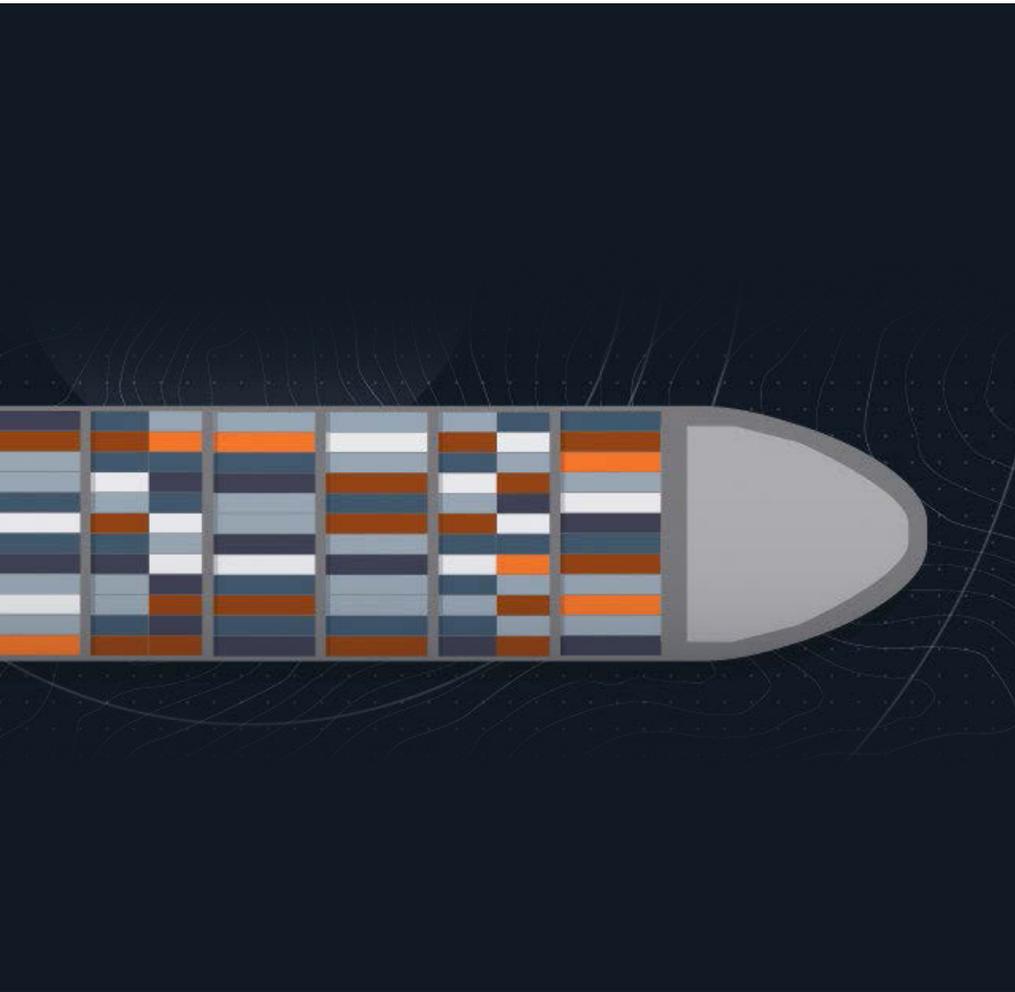
understanding of digitalisation and why it is needed.

Michael Christiansen, vice president Smart Vessel, Wärtsilä, commented: "This report makes clear that the industry agrees – digitalisation is essential to the future of shipping. But little tangible progress has been made so far because of wildly different and vague interpretations of what digitisation actually means.

"The report draws striking parallels between the fears and misunderstandings that

gave rise to vivid stories of famous mythological sea monsters that live on in folklore today and highlights the apprehension that many modern-day maritime professionals feel towards the largely uncharted ocean of digital transformation."

The research shines a light on these fears and misunderstandings, with over two thirds (68%) of industry professionals believing that the ability to digitalise existing infrastructure and retrofit vessels is challenging, and over half (56%) agreeing that



Source: Wärtsilä

the time and cost implications involved with digital transformation projects are too high. Moreover, 63% believe that there is a lack of skill and knowledge among seafarers to fulfil the requirements of new technologies.

On the positive side, the research also highlights a clear way forward. It reveals that 70% of industry professionals have a very clear understanding of why digitalisation is needed and its benefits, but 69% believe greater collaboration between industry players could be improved, with 88% agreeing that this will be essential to making digital transformation a reality. Significantly, 64% of respondents recognise that people are more crucial to digital transformation than technology, therefore without buy-in from more maritime industry professionals from the outset, successful digital transformation will not be possible.

Christiansen continued: "Like the sea, digital transformation is a great unifier. We are all in the same boat. Real progress will only happen when we collectively abandon the idea of digital transformation as

all or nothing. As each organisation within the maritime industry will be at a different stage of its own journey, we must appreciate it as an iterative and stepwise process.

There is still much work to be done to bridge the gaps – break the silos – between digital systems. To do this, we can and must share and learn from each other's experiences because digitisation won't be achieved by any one player alone. We need to work together to build an ecosystem where digital technologies on board a ship talk to those in offices on shore. This is how, as an industry, we can reframe the route to digitalisation and turn threats into opportunities."

Wärtsilä's 'Debunking Maritime Myths of Digital Transformation' report explores attitudes to digital transformation among maritime professionals across the Europe & Middle East, the US, and Asia-Pacific regions. It uncovers the surprising misconceptions thwarting progress and outlines how organisations can conquer key challenges to reach a better future for all.

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Extra CII functionality for voyage optimisation system



The system is optimised to ensure the best combination for engine RPM and propeller pitch resulting in minimised fuel consumption Source for both images: Qtagg

Different parameters can be selected in the fuel optimisation system

ECOPILOT | Sweden-based marine technology firm, Qtagg, now includes CII functionality in its tried and tested voyage optimisation system, EcoPilot. Ship masters will now be able to undertake a new voyage with a carbon intensity indicator (CII) rating known in advance. EcoPilot has been available for about ten years and is already used aboard RoRo, RoPax and cargo ships. Its just-in-time arrival setting typically yields fuel savings of around 7%, the company said. However, using 'interactive-on-time' arrival facilitates a further saving of up to 20%. Qtagg CEO, Tomas Lindqvist, explained

that shipowners and operators can now choose a CII value for a certain voyage rather than simply slowing down their ships with no certain outcome. Operators will be able to achieve their annual ship revenue targets whilst remaining fully in control of fleet performance. Lindqvist outlined that the EcoPilot is connected to the governors and pitch controller for automatic execution of the propulsion plan. This is recalculated continuously based on updated weather reports and progress of the voyage. Changes in schedule can be sent directly to the system from fleet operators ashore and once acknowledged

by bridge personnel on the ship, the propulsion plan can be revised. It is not possible to achieve the same result by seagoing personnel simply following advice on ship speed. "It is our integrated propulsion power control system that provides fuel savings," Lindqvist said, "and predictable arrival times and CII values – all at the same time. Also, this is not a tool for simulations – it is an actual working control system," he added. EcoPilot has different settings. Although the required CII value is the latest one, other parameters include arrival time, fixed ship speed, and lowest fuel consumption.

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Practical on-site simulator training and demonstrations

OFFSHORE ACCESS | Eagle-Access (EA), a Dutch developer of a new generation of offshore access systems, is introducing its Eagle-Access Academy for practical on-site simulator training purposes and demonstrations. Centrepiece of the Academy is the most advanced simulator equipment, technology, and instructional tools to provide future operators with a superior access training experience, the company said in a statement. Trainees can stand on the bridge of a supporting DP vessel virtually while lifting four people in a cabin to their work, without having to overcome a height difference using a gangway.

Using the program, crane operators can now be trained onshore with a simulator to show how to perform their EA work at sea in the best and safest possible way. The training takes only a few hours because the Eagle system is said to resemble an offshore crane. Therefore, the transition from qualified crane operator to EA operator does not require expensive or extensive time-consuming training courses.

The major advantage of the simulator, located at EA's headquarters in IJmuiden, is that realistic situations can be recreated risk-free, according to the company. "It is our mission to provide excellent services at all times and to optimise the standard in safety and efficiency in the offshore access industry worldwide," said Marco Klitsie, general manager of EA. Working offshore in all circumstances, day and night, good and rough sea state conditions, all motions of the vessel can be simulated and personnel effectively trained, he added. Both the simulator and the EA system share the exact same software. With these digital twins, operators can practice and test in a virtual world.

With the simulator, EA instructors can influence all the user's senses appropriately. This is carried out by projecting images around the future operator, evoking the feeling of what movements the ship (six degrees of freedom) and the EA system make in a simulated situation.

The simulator can also be used for demonstrations of the actual access system for interested parties. Klitsie commented: "We are happy to provide them with the opportunity to imagine themselves in an

offshore wind farm, transferring both people and cargo, working on realistic heights and in every condition."

The EA system is a single, fully balanced, and electrically driven offshore transfer system to lift technicians and goods weighing up to 1,000 kg at sea from a vessel with dynamic positioning to wind turbines or fixed oil and gas platforms.

The stair-free system without gangway has no diesel-driven engine but uses the onboard power supply. There are no hy-



Eagle-Access in IJmuiden, the Netherlands, has introduced the EA Academy for practical on-site simulator training purposes and demonstrations

Source: Eagle-Access

draulic elements involved, it is noise-free and can be placed in a convenient location on deck of a vessel.

It is instantly transfer-ready, because there is no gangway involved. Transferees simply board a closed cabin and are lifted to their offshore workplace.

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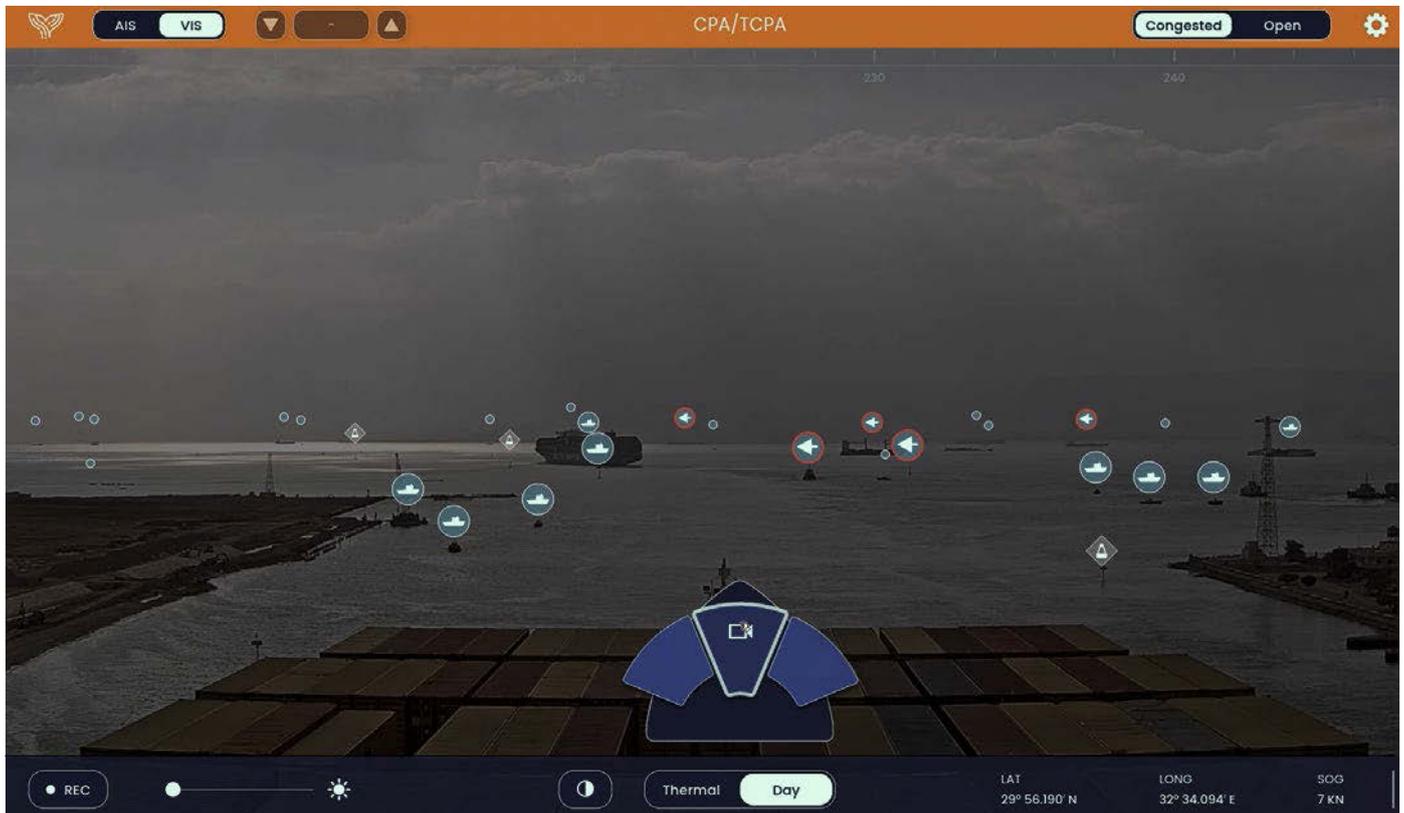
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Situational awareness for more safety and efficiency



Screenshot of the situational awareness platform

Source: Orca AI

VOYAGE SAFETY | Membership of the autonomous shipping alliance, One Sea, continues to expand. The latest new member is Tel Aviv-based Orca AI, a specialist in automated look-out technology for bridge operations and advanced situational awareness at sea. The company's artificial intelligence (AI) and computer vision-driven platform provides fleet managers and operators with greater visibility into fleet operations with real-time alerts and the identification of potential risks.

One Sea secretary-general, Sinikka Hartonen, commented: "Orca AI delivers cutting-edge technology to the maritime transport sector, and I am very pleased to welcome the company to the One Sea Association. Over the last twelve months, we have welcomed several new members and experienced an increase in the number of companies expressing an interest in joining One Sea as we continue to work with industry partners to address regulatory challenges and advance the develop-

ment of autonomous maritime transport systems."

Speaking for Orca AI, chief technology officer, Dor Raviv, said: "Powered by AI, our solutions provide the captain and crew with enhanced automated target detection and prioritisation capabilities in congested waters and low visibility conditions, helping to eliminate human error and maximise voyage safety and operational efficiencies.

"While AI is powering tangible progress in shipping operations, a collaborative approach is critical for the industry in order to secure the full benefits available from autonomous ship technology," he continued. "One Sea is helping to ensure the industry's voice is heard in developing global safety standards for autonomous ship operations, and we look forward to working with the Association and its members to advance our vision to improve safety and operational efficiencies using intelligent automated vessel technologies."

Automated situational awareness platform reduces close encounters

Recently, Orca AI announced that its platform has reduced the number of potential incidents and collisions significantly, while increasing operational efficiencies to deliver both fuel cost and CO₂ emissions savings.

An analysis was conducted on 110 commercial vessels, spanning tankers, containers, bulkers and RoRo vessels, which were equipped with the Orca AI platform throughout 2022.

Orca AI calculated that during this period, its customers saw a 26.9% reduction in the number of close encounter events, a 21.6% decline in sharp manoeuvres, and an 18% reduction in extreme drops of speed.

According to Orca AI, these improvements in operational efficiency led to a 66,300-tonne reduction in CO₂ emissions in total, helping customers to meet their sustainability goals as well as ensuring compliance in line with new CII regulations.



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Milestone for the testing of autonomous systems

WAVELAB The research catamaran *Wavelab*, which was christened in Kiel at the end of February, marks another milestone in the testing of autonomous shipping. The ship of the Research and Development Centre Kiel University of Applied Sciences (FuE-Zentrum FH Kiel GmbH) was built as part of the CAPTN (Clean Autonomous Public Transport Network) Förde Areal project and, as an experimental carrier, will provide important data for the autonomous systems of the future.



The research catamaran was christened on the grounds of the Gebr. Friedrich Schiffswerft in Kiel

Source: FuE-Zentrum FH Kiel GmbH

For Björn Lehmann-Matthaei, managing director of the Research and Development Centre Kiel University of Applied Sciences (FuE-Zentrum FH Kiel GmbH), the commissioning of the 21m-long and 8m-wide research vessel *Wavelab* is a major step forward in progress towards more autonomy. The ceremony took place at the shipyard Gebr. Friedrich Schiffswerft in Kiel. Kathrin Lau, editor-in-chief of Schiff&Hafen and Ship&Offshore, acted as godmother.

Lehmann-Matthaei said; “As an infrastructure project, CAPTN Förde Areal lays the foundation for practical research into autonomous shipping in the Kiel Fjord. For Kiel and Schleswig-Holstein with its strong maritime industry, it is of great importance to participate in new technological developments. The christening is an important milestone: soon the ship will be able to start its research operations.”

Research consortium combines science and business

FuE-Zentrum FH Kiel is the builder and operator of the *Wavelab* and heads a consortium of five project partners. Together, they have developed and implemented concepts for the floating test vehicle, a digital test field and the corresponding support systems over the past two years as part of the CAPTN Förde Areal research project.

The partners include the Christian-Albrechts-Universität zu Kiel (CAU), the Kiel-based company Anschütz GmbH, the Kiel-based ADDIX GmbH and the Wissenschaftszentrum (WiZe) Kiel GmbH. The project will also develop the necessary infrastructure for practical testing of autonomous shipping.

“The goal of the CAPTN initiative is to establish an autonomous and clean mobility chain on water and on land. For the sub-project of an autonomous ferry to succeed, large amounts of data are required, which serve as the basis for reliable and efficient navigation. We are pleased that with the *Wavelab* we now have an experimental vehicle with which the technologies can be tested in the field,” emphasised Prof Dr Eckhard Quandt, CAU Vice President for Research, Transfer, Scientific Infrastructure and Digitalisation.

Research into autonomous shipping is designed as a long-term project. Although some initiatives already exist today that deal with the topic of self-driving passenger ferries, the legal framework for this has not yet been created. “This research platform provides an important element for the realisation of a sustainable public transport system. Only if we create the conditions for this now will we succeed in achieving a timely mobility turnaround,” said Dr Wiebke Müller-Lupp, scientific director of WiZe.

For the shipbuilder too, the current project is another step towards shipping's digital future. "Our company offers the integration of all systems of a ship from a single source," explained shipyard boss Katrin Birr during the naming ceremony. "The connection of the shipyard and our electrical subsidiary Gebr. Friedrich Elektrotechnik in Wellsee ensures that we can offer both ship repair and the integration of all the ships' IT and sensor technology from a single source. We prepared for this at an early stage."

Prospects

In September 2020, FuE-Zentrum FH Kiel GmbH submitted an application for funding to the German Federal Ministry of Digital Affairs and Transport (BMDV) under the guidelines "Investments for the Development of Digital Test Fields on Federal Waterways" (DTW I). In spring 2021, the research project was awarded a grant of around EUR 6.1 million. CAPTN Förde Area will continue to be financed from this funding and the partners' own resources until July 2023.

During the project period, a so-called digital test field was established in addition to the construction of the *Wavelab*. This enables real-time communication between the ship and the control centre on land. The data, necessary for the development of software systems for (partially) autonomous shipping, are transmitted directly via WLAN.

In addition, autonomous operation is also being tested – for the moment under the supervision of a captain – on a cordoned-off area of water. The Federal Navy, Service for Maritime Technologies and Research WTD 71, is making the harbour of the naval arsenal in Kiel-Dietrichsdorf available for this purpose.

Just as important as the physical requirements for testing autonomous navigation are the technical ones. Therefore, the construction of an integrated bridge system on board as well as a digital twin of the ship in the control centre on land are part of the project.

Specifications

The *Wavelab* meets all official requirements for approval as an inland waterway vessel Zone 2 Sea. It has a circumferential sensor frame for optimal positioning of sensor technology for (partially) autonomous operation as well as an air-conditioned deckhouse. Expandable server cabinets are located in the 3m-high hulls, and a container storage area has been created on deck.

The electric propulsion system was supplied by Gilching-based Torqeedo. The package includes two 50-kW Deep Blue motors with steerable rudder propellers and six Deep Blue lithium-ion batteries with a total capacity of 240 kWh.

Four Power 24-3500 batteries supply the 24-V electrical system. These are recharged by a 22-kW fast charger, a DC/DC converter and a DC/AC converter.

The navigation system consists of an Integrated Navigation System (Conning, ECDIS, Radar), autopilot with course control, gyrocompass and extensive sensors supplied by Anschutz. This equipment provides a robust framework for the vessel's operation and, together with other sensors from the partners in the consortium, forms the basis for the planned research activities. In the course of Förde 5G, Anschutz is also setting up a control centre at the company, from which the research catamaran will be remotely controlled and monitored.

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SHI and Kongsberg Maritime to develop autonomous LNG carrier

AGREEMENT | South Korean shipbuilder Samsung Heavy Industries (SHI) and Norwegian marine technology firm Kongsberg Maritime have agreed to develop a design for an autonomous 174,000m³ LNG carrier jointly. The project aims to provide a basis for improved safety and efficiency in vessel operations through the use of autonomous, remote, and low emission technology, the partners said in a statement. SHI will be acting as a system integrator with overall design responsibility while Kongsberg is providing integrated solution designs and will serve as a strategic partner. Lisa Edvardsen Haugan, president of Kongsberg Maritime, said “We are pleased to announce our joint development project agreement to develop the next-generation LNG carrier with advanced digital technology, as we take a significant step towards the future of maritime transportation. Through the integration of autonomous, remote and eco-friendly technology, we aim to enhance safety and efficiency, setting new standards for the industry. This project represents our commitment to driving innovation in the maritime sector,



Signing ceremony at SHI's Geoje shipyard

Source: SHI

and we look forward to collaboration with our partners to deliver a sustainable and prosperous future.” “The autonomous LNG carrier we are developing in partnership will reduce operational risk and cost for our customers’

fleets, and as the shipbuilding and shipping industries become increasingly digitised, we are committed to continuing to develop cutting-edge digital technology for ship applications,” added Haeki Jang, Chief Technology Officer at SHI.

AiP for autonomous navigation system

HiNAS 2.0 | Korean Register (KR) and Liberian Registry (LISCR) have awarded an Approval in Principle (AiP) for the Hyundai Intelligent Navigation Assistant System (HiNAS 2.0).

The HiNAS 2.0, developed by Avikus, a subsidiary of Hyundai Heavy Industries (HHI), uses augmented reality (AR) to enable a ship to navigate optimal routes at ideal speed, and avoid collisions based on the integrated data by artificial intelligence (AI) collected from sensors attached to a vessel and its sailing equipment.

The system was created to ensure safe navigation, improve fuel efficiency and ease the operational burden on bridge teams, KR and LISCR said in a joint statement. The autonomous system is also expected to re-

duce maritime accidents and air pollutants. To overcome the limitations on existing rules for examining the new autonomous navigation systems, KR, HHI, Avikus, and LISCR signed a joint development agreement in August 2022 to collaborate on bringing HiNAS 2.0 to market. KR and LISCR have now each confirmed the system's safety and feasibility, having reviewed classification rules, domestic and international standards, and have subsequently issued an AiP.

Commenting on the approval, Lim Dohyeong, Avikus' CEO, said: “The outcome of this joint development research is quite meaningful because it is the first achievement through the collaboration of a shipyard, an autonomous navigation solu-

tion development company, a classification society and a ship registry. It proves that an autonomous navigation system can be installed on a ship and operated stably. We believe HiNAS 2.0 will drastically improve the safety and economic feasibility of ships, accelerating the commercialisation of autonomous navigation technology.”

Kim Yeontae, executive vice president of KR's Technical Division, added: “The commercialisation of autonomous ships is highly anticipated by maritime stakeholders. This AiP is significant since it has proven the reliability and safety of AI-based autonomous navigation systems. We will provide our full technical support to enhance the safe and cost-efficient operation of autonomous ships.”

Autonomous ROVs for commercial operation move step closer

UNTETHERED OPERATION | Robotic software specialist, Greensea Systems Inc, has recently completed successful untethered autonomy tests of a remotely operated vehicle (ROV) at sea. The test involved a VideoRay Defender ROV, equipped with the company's Opensea Edge software, successfully completing a mock explosive ordnance disposal (EOD) mission.

During the test, the ROV was able to search, classify, map, and inspect the undersea location while remaining untethered. Operators supervised the autonomous vehicle using Greensea's EOD Workspace user interface for defence applications.

The development is important for many reasons. It opens up a wide range of commercial applications in the ocean space as offshore activity and ocean resources become increasingly important.

Greensea's CEO, Ben Kinnaman, commented: "Eliminating the tether, surface ship, and on-site operator from ROV operations presents the opportunity for the industry to realise a new era of working in the ocean. In this concept, our reach into the ocean is infinite and presence persistent. This demonstration shows that it is possible, affordable, and enabling."

The Opensea Edge software places high processing power on the ROV itself where the software works directly with sensors to process the data on the asset itself. This eliminates the need for connections with a topside computer via a tether. Using an NVIDIA edge platform in parallel, the Opensea software handles sonar and video perception feeds while, at the same time, providing autonomy, navigation, communications, and task management for the robot.

Enabling data to stay on the ROV, with only a small volume of critical information sent to a human operator on the surface, reduces both the amount and frequency of data to be transmitted. This, in turn, facilitates a lower bandwidth and a higher latency communication method, including acoustic modems, for example, Greensea explained. Greensea used its Safe C2 (standoff command and control) technology during the experiment to provide sea floor to over-the-horizon communications. This

enabled an operator to supervise the ROV using a tablet. In addition to VideoRay as the vehicle partner, Greensea also used technologies from SeeByte Inc for automatic target recognition on Opensea Edge, and OceanComm Inc for the acoustic model system.

The company is continuing to develop the technology for both defence and commercial applications.



The VideoRay Defender with Opensea Edge

Source: Greensea

ClassNK is a major supporter of the Digital Era

While the maritime industry is reshaping its structure due to digitalization, ClassNK's role of ensuring the safety of ships and environmental protection as a third party organization remains the same. ClassNK is proactively applying digital technology to strengthen its services based on outcomes from a variety of research in areas including robots and analytic technology.

Further, ClassNK contributes to the digital transformation of the entire maritime industry by providing a platform for the collection and distribution of data. Together with industry players, ClassNK is promoting IoS-OP (www.shipdatacenter.com) consisting of clear rules for fair data use between data owners and users, along with a highly secured data center.



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Mixed reality for remote pilotage

RePO MAN Germany's research institute Fraunhofer CML and the Finnish Novia University of Applied Sciences are working together on a mixed reality concept for remote pilotage of vessels. Safety and efficiency considerations both need to be taken into consideration for successfully developing the project RePO MAN, write Fraunhofer's Jonathan Weisheit and Pascal Hohnrath.



Will VR glasses be a future tool for marine pilots?

Source for all images: Fraunhofer CML

Remote pilotage is a term yet to be determined, and there is no comprehensive definition for requirements or scope. The concepts are not defined internationally yet and can mean different things in different parts of the world. However, all definitions share the concept that a marine pilot no longer boards a vessel but issues instructions ashore or another remote location and provides guidance from a remote pilotage centre. The advantages of such a scenario include the improvement of safety and efficiency.

In the project Remote Pilotage – Operational, Innovative and Manageable Alternatives for Navigation routines, RePO MAN – a new product is being developed and tested by researchers of Fraunhofer CML and Novia University of Applied Sciences.

The aim of RePo MAN is the development of a user interface (UI) for personnel both ashore and at sea. Differentiated between Shore UI and Onboard UI, a mixed reality (MR) is under development in both virtual reality (VR) and augmented reality (AR). The Shore UI is composed of a live video feed originating from a 360-degree camera installed on a vessel combined with augmented functionalities, e.g., nautical charts, vessel information, traffic symbols, environmental information, and additional information on the expected route.

This should give the pilot, even though he is not on board, an immersive and interactive experience. The Onboard UI, using AR, has the officer of the watch (OOW) wearing special glasses that enable him or her to see the route ahead, instructions coming from the pilot, information on ship position and movement, and environmental information, which are visualised by the glasses in combination with what is visible to the OOW through his or her own eyes. Communication between the person ashore and on board is

enabled by voice radio and ideally supported by hand tracking of each participant to strengthen visual and audible exchange among them.

The challenge of locating a pilot ashore instead of on board a ship is complex on many levels. For RePo MAN the focus is on human-centred MR to create a support system that is user-friendly and intuitive without neglecting any information necessary for the interaction between the pilot and the OOW.

The researchers evaluate what basic information is essential and for which senses, or impressions, compensation is required. For example, how could a look in the eyes accompanied by a silent nod be replaced or mimicked in MR?

To understand more accurately the needs and demands of a pilot within the project, a questionnaire was sent to pilots in Finland, Germany and Norway. This was important not only to develop a good user experience and a product that is easy to use, but also to gain the trust of pilots, who in upcoming full-scale tests will apply the UI and test its limitations.

Can MR be used to create situational awareness between the pilot and the OOW or is it hindering the work? Which functionalities of MR are useful to create situational awareness in general? What basic information must not be missing when the pilot and the OOW are spatially separated? Missing answers to these questions are the main driver for RePo MAN and are creating a basis for testing future improvements.

Results from a previous research initiative are promising and paved the way for the current project. Within the scope of Sea4Value (S4V) Future Fairways, a programme that focuses on the digitalisation of port-to-port logistics chains, tests were

conducted at the Aboa Mare Autonomous Vessel Remote Operations Center (AMROC) which is connected to Novia's ship handling simulator.

A remote pilot workstation was added to the AMROC setup for the first real-life test in May 2022, when a remote pilotage was conducted. The 160m-long general cargo vessel *Viikki* was equipped with a front-view camera on the bridge to provide forward views for a remote pilot.

Onboard interface data was streamed to AMROC through two redundant 4G connections, and audio communication was established via a two-way audio connection. The available bandwidth was sufficient to transfer information on the ship's dynamics and data from navigational tools, and to have an audio connection, a radar view, and the bridge camera video stream.

In total four pilots were involved in this special pilotage, in addition to the vessel's bridge crew. The actual remote pilot was performing his tasks operating from AMROC. Another pilot on board was acting as the main counterpart of the remote pilot. For security reasons a pilot was on board the *Viikki* acting as a conventional pilot still in charge of the pilotage. A fourth pilot was acting as an observer also located at AMROC. A microphone installed on board for the voice-channel recorded conversations by the OOW and the conventional pilot, as well as VHF traffic. That way everything communicated on board was transmitted to AMROC and available to the remote pilot.

With the help of this setup and extensive testing, critical elements for situational awareness were identified. The most important criteria for safe pilotage include ship position, dynamic state of the ship, ship controls, external elements, and communication of persons involved. The key to a successful remote pilotage is a clear, intuitive UI and workstation that displays the most important information from each element mentioned before. Essential data should be arranged in a way that it supports the remote pilot and keeps him or her in focus. The UI should provide essential information for each element, thereby creating comprehensive situational awareness. For the UI developed within RePO MAN, this led to a distinct presentation of all critical elements, including a rating on the importance of each piece of information to limit the number of details that the pilot and OOW have to process in support of the decision-making process.

Another step forward on the implementation of remote-controlled vessels was the demonstration in the project RoboTug. Here, the feasibility of remotely controlling a tug was first examined and then demonstrated in several stages.

As part of the project, Fraunhofer CML developed a human-machine interface (HMI) which enabled the pilot located ashore to steer a full-scale tug remotely. The development of the HMI

paid particular attention to achieving high situational awareness during remotely controlled towing manoeuvres.

The interface used a MR setup to provide the remote pilot with a 360-degree live video stream augmented with additional sensory data from on board the tug. The HMI was developed in an incremental process, while results of previous tests within the project were incorporated and thereby improved in every iteration.

Earlier, in test runs, the HMI was used to steer a tug in a ship-handling-simulator (SHS) and also to steer a 6m-long unmanned surface vessel (USV) on a lake. The tests in the SHS showed that it is beneficial for the pilot to have the exact same information in MR as is available on board, but also to be able to use the same steering equipment, such as control units, for example.

For this reason, tug steering joysticks were installed at the remote station for subsequent test runs. Additionally, a LiDAR sensor was mounted on the USV and later on board the full-scale tug to compensate for the lack of stereo vision from the 360-degree camera.

With the data coming from the LiDAR, it was possible to display the distance to nearby physical objects. This information is especially important for controlling tugs, which often manoeuvre in close proximity to much larger vessels.

In the concluding test run, different tug manoeuvres were carried out on several days. All necessary sub-manoevres during a towing manoeuvre were performed successfully. Consequently, the test campaign showed that it is possible to control a tug remotely with a MR-based system.

During all tests, the user's performance and general acceptance of the system were repeatedly surveyed. Feedback was collected with standardised questionnaires and interviews concerning the design of the HMI. The detailed surveys led to valuable information about how the HMI and the control of a remote-control system need to be designed in order to create optimal working conditions and situational awareness for the pilot.

The results and findings from the S4V and RoboTug project yield important guidance for successful implementation of a UI for remote pilotage within RePo MAN. The remote-control of a vessel demonstrated in RoboTug goes beyond what is expected from a pilot, who is not in command of steering the vessel. However, the results show that all information can already be transmitted and the existing user experience in an MR allows to control a vessel.

The challenge for the RePo MAN project is now to establish a connection between those responsible for safe pilotage and enable them to work in a way in which they feel secure about both the technology and their interaction with it. This is essential to ensure that, in unexpected situations, nobody is endangered and the safe berthing of the vessel is not compromised.



VR glasses in operation: can they maximise situational awareness when working in mixed reality?



Ship manager adopts AI-powered ship-shore data flow

FLEETVISION™ | Zeaborn Ship Management GmbH & Cie KG has adopted ShipIn System's digital platform, FleetVision™, driven by artificial intelligence (AI), to improve safety standards, add value to existing safety and operational compliance, and support overall performance goals across its managed fleet.

FleetVision provides visual data both to ship and shore in near-real time, Zeaborn explained. It offers insight into issues including safety, security, cargo handling, maintenance, and bridge conduct across all fleet operations. The system operates by using AI-powered cameras and visual analytics to assist ship and shore personnel in identifying hazards, removing obstacles, and gathering information that could prevent issues from arising in the future.

"After an intensive operational pilot phase on board different vessel types, we're thrilled to partner with ShipIn, with the

ultimate target to implement FleetVision across our managed fleet," declared Zeaborn Ship Management's senior vice president, Projects & Performance, Stefan Schindler. "ShipIn has already added significant value to our organisation, and we strongly believe this solution will improve transparency, safety, and security, thus improving overall operations for our entire fleet.

"Furthermore, safety is a part of our DNA and value proposition," he continued. "The safety of our workforce and the continuous training of various critical safety situations on board, including new tools and software, is also a part of our ESG strategy as a responsible third-party ship manager. FleetVision gives us the opportunity to enhance the safety awareness of our most important asset, our colleagues on board, on a real case basis."

ShipIn Systems' CEO and Co-founder, Osher Perry, commented: "Seafarers' work-

load is continuously increasing, without the tools necessary to help them do their jobs efficiently and safely. ShipIn bridges that gap by providing a single platform for crew, managers and owners to collaborate on the same information in real-time. We're delighted that Zeaborn recognises the value of our platform, and we look forward to a fruitful, long-lasting collaboration.

AI-powered cameras and real-time visual analytics enable FleetVision to translate tens of thousands of hours of footage per vessel and month into real-time intelligence that shapes behaviour on board, he explained. This, in turn, raises safety standards, reduces risk, and enhances productivity. In addition to operational insights, the analytics dashboard centralises all data so that there is a consistent source of information for performing remote audits and benchmarking performance to help track return on investment.

Port deploys AI-powered systems to boost efficiency

AUTOMATED SCHEDULING | The Port of Cork Company, Ireland's second busiest port, has signed up Innovez One, a provider of port management services, to provide software that will improve efficiency and optimise services for ships arrive and departing from the port. Port calls and operations will now be digitised and optimised using Innovez One's software, marineM.

The software will automate and improve the scheduling of port, tug, and pilotage services, the Irish port said in a statement. Using algorithms powered by artificial intelligence and machine learning, marineM's planning module will manage schedules and allocate resources. It will assign pilots and tugs, for example, in the most efficient way, reallocating resources when key factors change. This might be the estimated time of arrival of a particular ship, for example, or a rescheduled departure.

The initiative is expected to raise the efficiency of the port's service boats, reducing overall distances, eliminating unnecessary journeys, and cutting both fuel bills and emissions. It will also help in berth scheduling and preventing unnecessary congestion. Agents will now be able to register their vessels, order supplies, arrange services, track logistics and the progress of each job from an online portal or a mobile phone. Automated billing will boost transparency and improve accuracy, helping to eliminate issues, delays and disputes, the port said.

Chief Commercial Officer, Conor Mowlds, said: "The Port of Cork plays a central role

for our local communities and businesses, keeping Ireland connected as part of global supply chains. We have high ambitions to deliver smarter, greener, and more efficient operations which will benefit our environment as well as the local and national economy. Having a strong digital backbone is essential to this. By partnering with Innovez One, we are proud to take the next step of our digitalisation journey, fully harnessing the latest advances in artificial intelligence to create a more efficient and sustainable future."

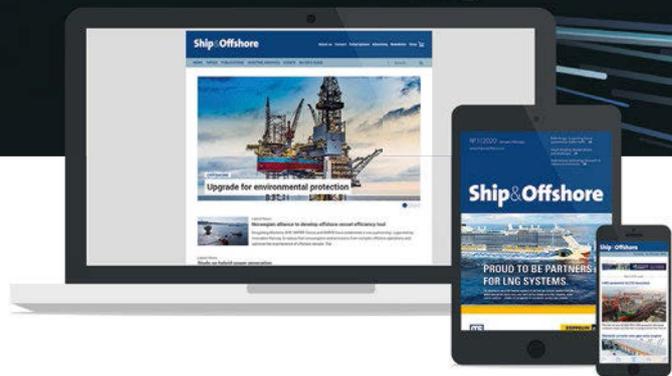
Speaking for Innovez One, Grant Ingram, CEO for UK and Europe, commented: "Digitalisation is an essential foundation that enables ports to tackle the most pressing challenges they face today, from persisting congestion to the need to reduce their emissions. Smart ports will also be the ones best placed to position themselves in the greener supply chains of tomorrow, and support decarbonisation in shipping and beyond. We are proud to work with the Port of Cork on this project, which will show how our state-of-the-art technology can deliver new heights in terms of efficiency and help deliver their ambitious vision for the future."



Port of Cork Company and Innovez One representatives pictured at the Tivoli Container Terminal, Port of Cork

DIGITAL IS SIMPLY FASTER

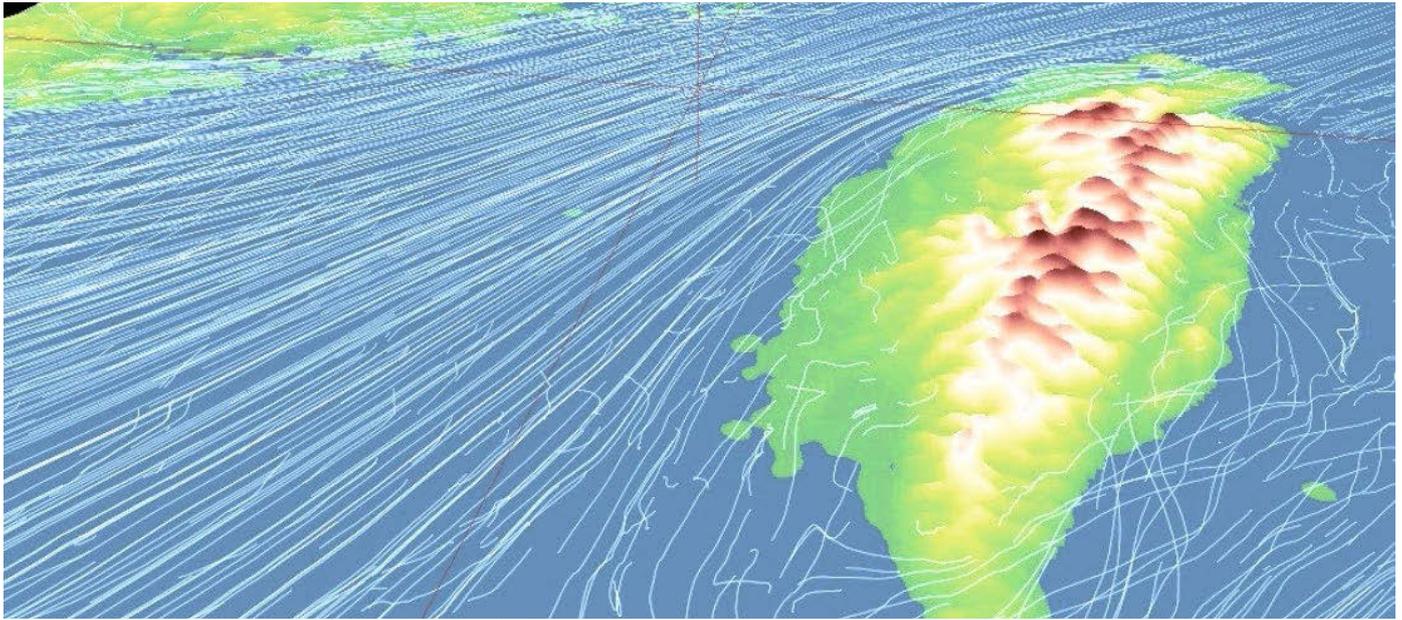
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Screenshot of the Emotion data

Source: Weathernews Inc

Real-time weather forecasting now a “must” for ship and offshore efficiency

ACCURATE DATA As regulations tighten and ships’ carbon efficiency climbs the agendas of regulators, charterers and ship operators, accurate weather forecasting is increasingly important. At a press briefing, Weathernews’ Jesse Vecchione explained why accurate forecasting is essential not only for shipowners, but also for offshore wind developers and operators. Applications based on artificial intelligence may help the process, but “the human in the loop” is still a vital component, he believes.

The recent focus on carbon efficiency, sharpened since the IMO’s steadily tightening carbon intensity indicator assessments became mandatory in January, has made voyage optimisation a top priority. Operating efficiency, or the lack of it, is something that is immediately apparent to shipping’s customers – charterers – who often pick up the cost of fuel bills.

Unlike retrofits or engine modifications, which take time and yard space, voyage optimisation is a feature of ship operation that can yield immediate benefits. Getting the route right is an essential component of the ship efficiency framework and can save days of ship time over a month, and thousands of dollars more in bunkers.

Bunker experts, meanwhile, predict that the new fuels of tomorrow – some of them

still years away – will cost several times more than those used today. If voyage optimisation makes sense now, it will become an imperative in the months and years ahead.

It is against this backdrop that the Japanese-headquartered weather data company, Weathernews Inc. (WN), is spearheading a new drive to highlight the importance of accurate weather predictions. Precise weather data are now essential, the company says, both for ocean shipping and for the rapidly developing offshore wind sector.

WN claims to have the world’s largest meteorological database, collecting data every day from its two satellites, 10,000 ships, 13,000 observation points, and 260,000 aircraft. It also collates 180,000 daily reports from other global weather sources.

More detailed forecasting

WN’s Jesse Vecchione, head of Business Development and Sales Leader, North America, revealed details of the company’s new drive to highlight the importance of accurate weather forecasting in the shipping and offshore sectors at a recent press briefing. The strategy comes as the company’s client base is growing, with more major charterers, shipping companies and offshore wind developers.

For this latter group, accurate weather forecasting is essential, he said, revealing details of the company’s Anemoi service and how it now incorporates a new proprietary model, Emotion, which forecasts wind and waves every hour for up to 72 hours. Anemoi can also provide forecasts every three hours up to 15 days out.

And whereas forecasting systems so far have a five-kilometre mesh resolution, the Emotion setup provides forecasts based on a mesh of just one kilometre.

Denmark's Ørsted, one of the world's leading offshore wind developers, has used Anemot at sites under construction off the coast of Taiwan. Having tried the system as a pilot in March 2022, the company has since used the software-as-a-service system for construction, maintenance, and other requirements at two large wind farms in Taiwan – *Greater Changhua 1 & 2A*.

The pace at which offshore wind is developing has quickened since Russia's invasion of Ukraine, as energy security climbs the agenda. Several European countries, but most notably Germany, have taken steps to boost activity in the sector.

Meanwhile, on the other side of the Atlantic, the Biden Administration has embarked on an ambitious strategy for both fixed-bottom and floating facilities. The wind power output targets that have been set are very ambitious, according to experts, some of whom believe they may not be achievable within the timeframe.

In due time, when the technology allows, large floating wind facilities will move further from shore where winds blow stronger and longer. Accurate weather forecasting will be an essential component in both efficient installation of wind farms and their operating yield, once commissioned.

The highly sophisticated wind turbine installation vessels (WTIVs) in use today already command high day rates, and maximising their uptime is a top priority for developers. However, the larger and even more complex subsea vessels, together

with several autonomous underwater vehicles that will be needed for deepwater floating installations, will cost even more.

Such facilities, once they are in operation, will also require accurate forecasting to make the most of wind energy, Vecchione explained. The weathervaning, by which wind turbines and their blades are aligned to harness maximum power from the wind, will be an important factor to monitor and predict. And for some farms far out to sea, accurate weather forecasting will also be required so that they can be shut down in advance of heavy storms or hurricanes.

Meteorological expertise

Meanwhile, choosing the optimum route for a vessel is increasingly important for ship and carbon efficiency, as well as other new optimisation tools such as just-in-time arrival. Establishing the best route, however, is not simply a matter of analysing historical data.

Vecchione explained that the process relies heavily on a range of physical weather factors, for which WN employs about 400 meteorological specialists. Safety is a growing concern in both offshore-related business and commercial shipping, particularly as the size of some ship types continues to increase.

In the large container ship market, for example, cargo owners and their insurers are amongst those expressing concern over the number of containers lost overboard. This can be caused by the sudden onset of bad weather, which may already have been evident to experts for hours or even days beforehand.

The situation may be made worse by the possible occurrence of parametric roll,

a synchronous rolling of a ship which can lead to high angles of heel and resulting cargo loss. Container ships and vehicle carriers are particularly susceptible.

The weather forecasting sector is becoming increasingly competitive, with ship and voyage efficiency, carbon footprints, and fuel costs key drivers. Vecchione noted the arrival of a number of relative newcomers in the field, most of whom have based their services on artificial intelligence and algorithms to predict likely weather patterns.

"This is fine up to a point," he admitted. But to provide a complete picture, he stressed that accurate forecasting still very definitely requires a "human in the loop". This is because marine weather forecasters know of certain ocean regions where the unexpected may not be predictable by the analysis of long-term weather patterns. And that is why the company still employs so many experts in meteorology.

Vecchione admitted to growing concern on this issue, pointing to the loss of the US-flagged RoRo, *El Faro*, built in 1975, which sank with the loss of its 33-man crew off the east coast of the United States in 2015. A subsequent US National Transport Safety Board investigation reached the same conclusion as a similar enquiry by the US Coast Guard Marine Board of Investigation – fatal route planning on the part of the ship's master.

Wittingly or not, the master had decided to sail his ship into Category 3 Hurricane *Joaquin*. After three separate missions, the ship's wreck was found in 15,000 feet of water. Vecchione admitted to concern that such an event could be repeated if "automated weather routing solutions" are not supported by experts.



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Real-time lightning data to improve helicopter safety



Real-time lightning detection and alerts integrated with an advanced weather monitoring system can provide critical data for optimising offshore helicopter operations

Source: Shutterstock

MONITORING | Finnish weather data specialist Vaisala has upgraded its helicopter safety system to include real-time lightning data. The Vaisala GLD360-enhanced Helideck Monitoring System has integrated data from the Vaisala Global Lightning Dataset GLD360, which the company claims is the only global sensor network that detects thunderstorms in real time anywhere in the world. These often include regions that are outside the range of weather radars.

The system provides valuable support for helicopter pilots, helideck operators, and shore-based logistics support managers. They often have to make “waiting on weather” decisions that can affect operational uptime, route planning, and the possible impact of weather disruption. The Vaisala system is designed to provide a weather outlook in real time that will support their decision-making and the scheduling of operations.

Vaisala recently listed some of the benefits for offshore operators:

- › Vaisala’s global lightning data network identifies all thunderstorms around the world and claims that its setup identifies five-to-ten times more lightning than any other global lightning network to a median accuracy of one kilometre;
- › The Vaisala Lightning Threat Zone provides nowcasts for storm and lightning trajectory in ten-minute increments

up to 60 minutes out, projecting when a specific location could be affected;

- › There are no associated capital or maintenance costs. The Helideck Monitoring System eliminates the need to purchase, install, or maintain single-point lightning detection sensors;

- › The company claims that its expertise in lightning data and its continuing investments in operating and maintaining its network, supports offshore operations with real-time lightning data with better than 99.99% availability;

- › The company’s lightning detection networks are used by many large power utilities and commercial organisations around the world. They are also used by the US Navy and the US Air Force;

- › The lightning data is compatible with 4G LTE, 5G and all common satellite internet communication systems in use at sea with minimal bandwidth requirements;

- › The fully certified Helideck Monitoring System and its software, certified by the Civil Aviation Authority, complies with all relevant regulations.

Mikko Nikkanen, head of Maritime at Vaisala, commented: “It’s all about safety and efficiency. Lightning can cause power outages, damage helicopters and infrastructure, and even put people in harm’s way. Monitoring lightning in real time to assess

its impact is essential for protecting lives and assets, and optimising the timing of offshore helicopter take-offs, landings, hoist operations, and fuelling. Our upgraded Helideck Monitoring System allows offshore customers to stay ahead of the weather and gain oceans of actionable insight to boost their operations with confidence.”

Finding the right weather window

Lightning is one of the most dangerous aspects of storms at offshore wind farms, Nikkanen continued. With today’s wind turbines soaring to 220m and higher, they also attract lightning which can cause significant turbine damage and impact the safety of helicopter operations to and from the site. Thunderstorms with heavy and turbulent winds, rain, hail, and bad visibility make flying even more challenging.

Helicopter service operators follow stringent rules and regulations, including CAP 437 standards for offshore helicopter landing areas by the UK Civil Aviation Authority. CAP 437 now highlights the monitoring of thunderstorm and lightning activity as part of present weather reporting that should be made available to the helicopter operator one hour before takeoff. Also, according to CAP 437, refueling during thunderstorms and significant lightning activity poses significant risks and should therefore be avoided.



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Companies agree to pool ship routeing expertise

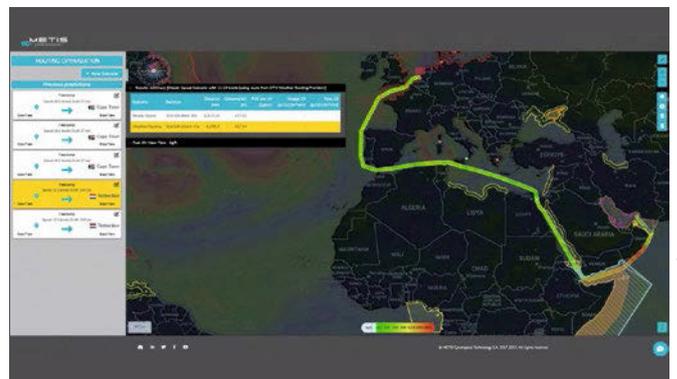
PERFORMANCE INCREASE | Athens-based Metis Cyberspace Technology and American data analytics company, DTN, have integrated their vessel routing services to combine the benefits of weather-based decisions and artificial intelligence (AI) analytics. The agreement, the partners claim, will deliver measurable gains to ship performance. Based on individual ship specifications and cargoes, Metis Augmented Routing Optimization and DTN Vessel Routing API optimise for speed, cost, fuel, and emissions. The system, which is supported by AI, takes into account not only the efficiency of the vessel but also its changing operating environment.

In a statement, the companies explained: “Integrating weather-optimised decisions with Augmented Routing Optimization delivers a comprehensive analysis of ship performance in real time, so that vessels can respond to the needs of expected time of arrival (ETA), contracted speeds, bunker consumption, or emissions reporting. Onshore, managers can calculate and recalculate routes to optimise schedules, propose route adjustments, and better evaluate voyage performance against charterparty expectations.”

Andreas Symeonidis, Marketing and Partner Relations manager, at Metis Cyberspace Technology, said: “Formalising the agreement with DTN is highly significant, because integrating weather-optimised routing functionality with Augmented Routing Optimization changes what is achievable for ship performance. Just as Metis analytics optimise performance for machinery, hull fouling and damages, maintenance and repairs, fuel oil and crew skills on each and

every vessel, Augmented Routing Optimization can now adapt to weather conditions.”

Metis CEO, Eleni Polychronopoulou, commented: “With every ship needing to report efficiency and emissions on an individual basis under the International Maritime Organization’s new EEXI and CII regimes, owners, managers and charterers have already entered a new era of accountability. Rather than simply avoiding ‘unwanted weather’ in a generalised way, this integration of weather-optimised routing from DTN means Augmented Routing Optimization helps ensure the safety of the ship, its crew, and its cargo while simultaneously basing routing decisions on optimised performance.”



Screenshot of the Metis Augmented Routing Optimization

Source: Metis Cyberspace

Comms and SaaS providers to enhance digital options



The agreement connects Marlink’s blended network with the voyage optimisation and vessel management services provided by ABS Wavesight
Source: Marlink

OPTIMISED CONNECTIVITY | Communications firm, Marlink, and ABS-affiliated software-as-a-service (SaaS) company, ABS Wavesight™, are to collaborate on optimised connectivity in the provision of services and data to clients’ ships. The agreement will result in connections between Marlink’s network, and voyage optimisation and vessel management services provide by ABS Wavesight, the partners said in a statement.

Tore Morten Olsen, Marlink’s President, Maritime, said: “Marlink is delighted to have put in place this agreement with ABS Wavesight, an innovative partner whose approach to the challenges faced by the maritime industry and the solutions required links so closely with our own. We look forward to helping our mutual clients enjoy improved access to ABS Wavesight services and investigate how to further optimise connectivity for the next generation of digital services.”

ABS Wavesight chief executive, Paul Sells, commented: “ABS Wavesight is an industry advocate for both digitalisation and decarbonisation, delivering unmatched value through its suite of products and integrated solutions and providing the insights needed for vessels to operate more efficiently. As we continue to partner with companies such as Marlink, we’re expanding our reach and strengthening our ability to help clients gain visibility into their existing operations to mitigate risk and deliver operational excellence.”

ABS Wavesight was launched late last year. It combines the software platforms Nautical Systems™ and My Digital Fleet™ that are now installed on more than 5,000 ships.

Marlink claims to operate the maritime sector’s most advanced information and communications technology networks. The company has connectivity across all available channels, including VSAT, L-band, 4G/5G as well as services provided by Starlink and OneWeb.

Cloud-based simulation supports online training

HYDRODYNAMIC MODELLING | Kongsberg Digital's K-Sim Navigation Cloud, developed in the SkyNav project funded by Innovation Norway, is to provide high-quality simulation training in navigation and ship handling to supplement classroom studies. With an advanced physics engine and precise hydrodynamic modelling, the simulated objects that could well be present in a seaway behave entirely realistically, Kongsberg claims. The system provides basic navigation training that complies with DNV's Class D requirements.

A sophisticated visual system powered by Unreal Engine accurately models simulated geographical areas and all possible weather conditions. Training institutes with online simulators can use K-Sim Navigation Cloud for blended learning or full-mission simulator training, the company explained. Meanwhile, training providers without hardware can also use the cloud-based system to provide students with simulation exercises.

Commenting on the latest development, Kongsberg Digital's executive vice president, Andreas Jagtøyen, said: "Digitalisation plays an increasingly major part in improving safety, efficiency, and contributing to more sustainable maritime operations. By combining our unique domain expertise in digital solutions with our broad experience in advanced simulation technology, we are proud to raise the bar for simulation training even further."

He said that the company's success in developing cloud-based simulation systems for engine and radar learning had stimulated



The K-Sim Navigation Cloud is based on the company's simulation technology
Source: Kongsberg Digital

demand for similar arrangements in navigation studies. "The advantages of online solutions are apparent," he said. "Students and instructors will get increased flexibility, and the students will get much more volume training."

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Cyber health tool unveiled



Source: Bureau Veritas

To help protect vessels from hackers, Bureau Veritas has developed key rules, guidelines and notations for cyber security and safety

CHART | Classification society Bureau Veritas (BV) has launched Cyber Health Analysis Report Tool (Chart), a safeguard to assist shipowners and operators in assuring the safety and security of their ships' digital systems, comprising both information technology and operational technology. The dynamic system is designed to identify specific vulnerabilities, the level of preparedness to counter potential cyber threats, and to review and update systems as necessary.

Chart provides a complete audit of a ship's equipment, its networks, security mechanisms and interconnections, ensuring that the systems are known to the owner and to ensure their compliance with cyber security standards. These include those from different regulatory bodies, such as flag states and members of the International Association of Classification Societies (IACS).

The setup will also assure compliance with new regulations. IACS Cyber Resilience Unified Requirements UR E26 will require strict mandatory cyber security protection from January 1st 2024.

BV's Paul Delouche, director of Strategy & Advanced Services, Marine & Offshore, explained: "The monitoring and remote management of connected and even hyper-connected systems, as well as cloud-based

web applications, have become instrumental to improve ships' performance and efficiency.

"While their benefits are undeniable, these systems also increase the surface for potential cyber-attacks," he warned. "Such incidents could compromise valuable cargo and entire fleet operations, as well as the safety of the ship and crew. Therefore, cyber security must be taken into consideration during the whole lifecycle of a vessel. "Our role at BV," Delouche continued, "is to support companies with our technical expertise on the cyber security ecosystem, and our knowledge of the highest industry standards, to help them progress in their digital resilience journey with the confidence that the right safeguards are in place to protect their systems and critical data. Our goal is to enable shipowners to protect their assets, define expectations for shipyards and equipment manufacturers, and support compliance with flag authority, IACS and IMO regulations."

OT-IT setup awarded AiP

Meanwhile, BV has awarded Mitsui O.S.K. Lines (MOL) Approval in Principle (AiP) for the basic design of its operational technology (OT) and information technology (IT) architecture and its cyber resilience.

The AiP demonstrates that the OT-IT setup, designed by MOL experts, meets the International Association of Classification Society's Unified Requirements (UR) E26 relating to ships' cyber security.

The regulations will apply to ships that are ordered on or after January 1st 2024. The UR states that equipment manufacturers, shipyards, shipowners, and other parties should implement appropriate cyber resilience measures during the whole lifecycle of the vessel – initially from design right through the building process to commissioning and operation.

BV's senior vice president, North Asia and China, Alex Gregg-Smith, commented: "We are pleased to deliver this Approval in Principle, and we would like to congratulate Mitsui O.S.K. Lines for being at the forefront of cyber security. As shipping enters the digital era, vessels are becoming more connected. Having a robust cyber security framework from the outset is essential, and constitutes the foundation for safe, secure and resilient shipping operations. Our role at BV is to accompany companies with our technical expertise and knowledge of the highest industry standards, to help them progress in their digital journey with the confidence that the right safeguards are in place to protect their systems and critical data."

Ship&Offshore Buyer's Guide

The Buyer's Guide serves as market review and source of supply listing. Clearly arranged according to references, you find the offers of international shipbuilding and supporting industry in the following 17 columns.

1	Shipyards		10	Ship's operation systems	
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2 Propulsion plants

2.02 GEARS

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2.03 COUPLINGS + BRAKES



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www.rw-kupplungen.de

Couplings, seawater resistant

2.04 SHAFT + SHAFT SYSTEMS

Piening Propeller

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 e-mail: pein@piening-propeller.de
 Internet: www.piening-propeller.de

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2.05 PROPELLERS

Piening Propeller

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3 Engine components

3.05 STARTERS

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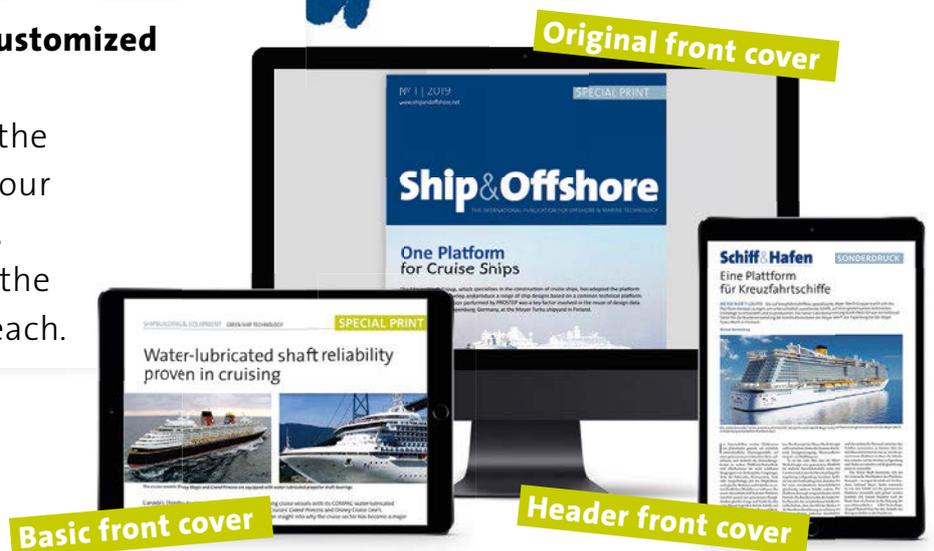
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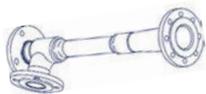
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	Size I H 30 / B 58 mm	Size II H 40 / B 58 mm
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2 Keywords	each € 90,-	each € 120,-
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A better view of the big performance picture

DATA COLLECTION Collecting, validating and acting on vessel performance data does not have to be hard, writes Thomas Hechmann, Growth director at Denmark-based Coach Solutions, a software provider for the shipping industry



Digital twins are created for each individual vessel in-house

Source: Coach Solutions

Gathering accurate, actionable vessel performance data continues to be a huge issue for shipowners. It is hard enough on owned assets, but on chartered tonnage, obtaining valid data is a difficult, time-consuming process that often relies on interpreting noon reports.

Collecting and verifying data relies on the ability to connect software to operational functions. Software can be a very useful item for shipping companies, but there is still a requirement to help people understand how to use it for commercial benefit.

There is a fine line between creating a product with many features and making it easy enough for people to use. If a shipping company plans to invest in software, it must choose a system that is simple to implement

and easy for users to adopt. A philosophy of keeping it simple means users are more likely to embrace it willingly, and owners will see the benefits more quickly.

The noon report continues to be the primary tool for vessel data collection, and despite recent attempts to improve the process, it is still too static a data set for a dynamic business like shipping. Therefore, Coach Solutions advocates collecting small amounts of the most valuable data, restricting users to providing only the information considered the most useful and ignoring the rest.

By having the Master and the Chief Engineer collate this data, there is a greater likelihood that it will be both correct and useful in accurately determining ves-

sel performance. With the right data in place, the owner can choose how to use the information.

Creating individual digital twins

Collecting and validating data is the first step in creating performance models. The company's in-house process relies on naval architects to construct a digital twin for each client vessel, plugging ship-specific fuel consumption and emissions performance into a platform that can create a report on how ships are performing against benchmark values.

By comparing the AIS position and hindcast weather data with other reported data, it is possible to build a resistance model of the ship's performance. This means putting the digital twin into exactly the same sailing conditions as the actual vessel, converting fuel into power, and measuring the discrepancy, including some resistance to represent hull fouling.

From there, it is a matter of extrapolating into actual speed performance. Being able to monitor the ship's performance during the voyage also demonstrates whether the voyage is executed to the terms agreed in the charterparty or whether a claim is valid.

Compliance

Vessel operators have always been subject to regulation, but the responsibilities that come with EEXI and the CII put them into new territory. This will matter more and more in the future, not just for compliance with IMO regulations, but also when the EU Emissions Trading System comes into force.

To help owners prepare, Coach has recently entered an agreement to enable them to submit vessel emissions data to DNV for verification using an open API. This partnership means that verification against MRV and IMO DCS reports is simplified.

With the data collected, owners can interrogate their emissions reporting against measures including the annual efficiency rating and the Energy Efficiency Operating Index, under the conditions they choose. Integration with ship management systems or business intelligence tools is now a necessity for carbon-compliant voyage planning.

Looking ahead

Understanding vessel performance also means looking beyond simplistic

numbers for energy or fuel savings and having a more holistic view. For a ship that tends to sail the same routes operating at 85% efficiency against the digital twin, it is possible that potential savings from physical optimisation might be minimal, while for another ship at 85% carrying larger cargoes on longer routes in more challenging conditions, a 3% or 5% improvement from hull cleaning could be a big saving.

Consistency of reporting is problematic: what are the start and end points,

what fuel remains on board, do consumption figures match? These are simple validations, but the operator cannot make a report unless he or she knows where and when to start.

Having the right data means being able to make better decisions on speed and consumption that improve profit and loss. Vessel operators need a complete view of the voyage, not just accessing the available information, but having the ability to compare it to something and make changes along the way.

Asset monitoring platform awarded type approval for cyber resilience

TRITON IOT | Bureau Veritas (BV) has issued type approval certification covering the cyber security features of the Triton IoT platform developed by Damen Shipyards Group. The asset monitoring system is now being installed as standard on Damen's new-buildings – about 150 ships a year.

The type approval is the result of close cooperation between Damen Digital Solutions (DDS) and Tata Consultancy Services (TCS). It means that Triton IoT not only meets BV's Rule Note NR 659 R02 on cyber resilience, but also complies with IACS UR E27 requirements which will apply to all contracts signed after January 1st, 2024.

The system collates and tracks a wide range of operational data from a vessel relating to engines, pumps, hydraulics, alarms, and other equipment, totalling more than 10,000 separate updates. These are then made available both to shipboard personnel and fleet managers ashore.

Cyber security was a top priority for Damen throughout the platform's development process. This included hardening the gateway and implementing procedures in software and firmware updates, as well as data security at rest and transit, and a robust risk management process, the company said. Damen and TCS are continuing to develop the platform and further data analysis will offer clients more scope in raising operating efficiency in the future.

Speaking as the type approval was issued, DDS director, Toine Cleophas, commented: "This type approval certification from Bureau Veritas is a significant milestone for us and a testament to the quality and reliability

of our Triton IoT Platform. I'm grateful to TCS for their partnership, which has been crucial in the development of this solution. We are proud to be a trusted partner for our customers and look forward to providing even more value to them in the future."

TCS' global head, IoT & Digital Engineering, Regu Ayyaswamy, said: "The Triton IoT Platform is the perfect example of how digital technology can transform an industry. It is an industry leading solution which enables unlocking exponential business for

Damen and also benefits its ecosystem and the wider society.

"TCS is proud to partner with Damen Digital Solution BV in this unique initiative that will ensure best-in-class security measures for the marine IoT ecosystem and will set an industry benchmark," he continued. "Bureau Veritas Type Approval for Cyber Resilience for the Triton IoT Platform echoes our commitment towards building a secured connected IoT ecosystem for sustained growth and transformation."



Willem van Leeuwen, product owner Damen Digital Solutions BV (left); and Marouane Dani, IoT Solutions Architect

Source: Damen



First ‘Offshore Drone Campus’ to be developed in Germany

ODCC | Germany’s Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM is to establish a centre for the testing and development of unmanned aircraft systems for offshore functions. The research organisation is to set up the Offshore Drone Campus Cuxhaven (ODCC) to develop offshore drones with scientific and industrial partners with the aim of building a regulatory framework for their operation.

A Fraunhofer IFAM statement revealed that researchers expect drones to be capable of undertaking operations including the inspection, maintenance and repair (IMR) of installations, as well as more general offshore surveying functions. Research will focus on new propulsion systems and material protection concepts for offshore drone designs.

Greater emphasis on offshore wind development in Germany and the expansion of wind turbine installations at sea will generate more demand for IMR services, Fraunhofer IFAM said. Unmanned aircraft systems (UAS), also known as drones, offer significant potential to perform these functions, while also relieving the burden on human beings in undertaking these tasks in often challenging conditions.

However, the research organisation noted that neither the technical prerequisites nor the organisational and regulatory processes are yet in place. Offshore drones must be suitable for safe and flexible handling, and ‘multi-layered development work is still required for regular industrial operation’, the research organisation said.

These include issues in areas including aircraft-specific factors such as increasing wind resistance and all-weather suitability, validation options for performance verification, regulatory flight approval processes, and the development of end effectors for sensor-based data acquisition and evaluation. A reliable source of power for drones is another issue. Research into this issue will compare battery systems, fuel hybrid propulsion with combustion engines, and hydrogen hybrid propulsion, with fuel cells. Drone construction materials will need to be carefully assessed and compared, while electronics and drone control systems will need a suitable level of fault-tolerant redundancy to ensure that units can be manoeuvred safely under demanding offshore conditions. These challenges include salty conditions, high humidity, and ultraviolet exposure.

Meanwhile, safety will of course remain paramount. Continuous, effective flight

monitoring and flight control at all times will be essential, Fraunhofer IFAM noted. Issues to be addressed in this context include collision avoidance systems, redundant communication and control units, navigation along a structure under variable environmental conditions, and landing on floating platforms.

The Cuxhaven site, where Fraunhofer’s research vessel *Joseph von Fraunhofer* is based, has a test flight area directly at the waterline. This will provide a suitable environment for realistic testing conditions. Meanwhile, test facilities located in a tower will provide options for testing near-object flights and structural interactions.

“With the immediate proximity of the test flight areas to the Elbe estuary and the associated possibility of direct flight corridors towards the German Bight and to Helgoland, there is a realistic application scenario,” the Fraunhofer statement said. The research institute already operates the Test Center for Maritime Technologies on Helgoland, together with the German Research Center for Artificial Intelligence GmbH.

As well as research areas on the mainland and in the harbour, this test site incorporates a 45m deep, 3km², testing area for surface and underwater applications a few miles from the North Sea island. Researchers and their industrial partners will therefore be able to test the drones and their components in harsh offshore conditions both over long-term trials and short-term tests.

Further research is also required into the joint use of airspace by manned and unmanned aerial assets. The Cuxhaven site will therefore be an important component in supra-regional activities within the ‘U-Space North-West & Drone Control Center Bremen’. This facility is currently under development to support the development of airspace and related infrastructure, Fraunhofer said. Research will focus on simplifying and automating the future operation and coordination of drones, taking into account airspace users today, and always with safety a top priority.



UAS deployment for the inspection of an offshore wind turbine. Supported by the Federal Ministry for Economic Affairs and Climate Action on the basis of a decision by the German Bundestag, Grant: 03EE3057A.

Source: Fraunhofer IFAM

Type approvals for standardised data infrastructure systems

D-INF RULES | DNV has awarded the world's first D-INF(S) type approvals to Samsung Heavy Industries (SHI) and Cosco for their data collection systems. The two companies have adopted the D-INF rules covering the design, construction, and maintenance of ships data infrastructure, thereby demonstrating their commitment to providing standardised data-sharing systems to their customers.

Such systems, DNV explained in a statement, set standards for improved connectivity, data sharing, analysis, real-time monitoring, safety, operational efficiency, and reduced maintenance. The classification society's rules ensure that a ship's data is reliable and secure, and capable of supporting the increasing demand for data-driven decisions in ship operations, including navigation, communications, and safety.

SHI's data collection system, SVESSEL® BIG, is a key component of the digitally enabled ships it builds, DNV said. The D-INF(S) approval of SVESSEL® demon-

strates that the data pipeline on board a ship meets the necessary standards for reliable, safe, and efficient information sharing.

Hyun Joe Kim, SHI vice president, said: "We are proud to have DNV verify our data collection infrastructure systems, SVESSEL® BIG. This is a testament to our commitment to providing safe, reliable, future-proof and innovative solutions to our customers. With such systems delivered as part of the vessel infrastructure, our vessels are truly digitally enabled."

Meanwhile, Cosco Shipping is to install the new Intelligent Integrated Platform System (IIPS) on a series of new container ships being built at the Cosco Shipping Heavy Industry shipyard in Yangzhou. The vessel-to-cloud IIPS data collection system has been developed by the Cosco subsidiary, Shanghai Ship and Shipping Research Institute (SSSRI).

General manager of SSSRI, Chen Gong, commented: "The verification of our data collection infrastructure systems by DNV

demonstrates our dedication to meeting the highest standards in the industry, and we are looking to continuously improve our smart fleet operation. Standardised data infrastructure ensures that we can implement this in a cost-efficient way for the fleet."

Knut Ørbeck-Nilssen, DNV Maritime CEO, stressed the importance of standardisation in the digital arena. "We congratulate Cosco and SHI on this achievement and look forward to continuing close cooperation with them to drive maritime digitalisation forward," he said. "To reap the benefits of the digital transformation, it is crucial that we as an industry establish a standardised approach and collaborate on data use to ultimately ensure safe, sustainable and efficient operations."

The D-INF(S) notation verifies that the data collection infrastructure can collect data from different systems and supports input and output according to a standardised ISO19847/19848 format.

Flat force sensors offer new possibilities for data acquisition

WIND TURBINES | Altosens GmbH, a Fraunhofer LBF spin-off from Osnabrück founded in April 2022, offers novel cloud-based sensors that measure forces where this was previously not easily possible. This allows service operations to be reduced and therefore systems that are difficult to access to be operated more economically, the company said in a statement. Such a monitoring system can, for example, increase the profitability of wind turbines, especially for offshore turbines, where on-site maintenance is costly due to difficult accessibility. A team of scientists at the Fraunhofer Institute for Structural Durability and System Reliability LBF had previously developed the capacitive Delta-C® technology. Through an internal Fraunhofer programme for technology transfer, the Darmstadt research team came into con-

tact with Uwe Steinkamp, the now CEO of Altosens GmbH. Together, they planned and pushed ahead with the founding of the start-up. Dr William Kaal, group leader for vibration optimisation at the Fraunhofer LBF and co-developer of the Delta-C® technology, said: "I am pleased that the founding of Altosens means that a technology developed by us at the Fraunhofer LBF is on its way to be available on an industrial scale and therefore can create benefit for various users. With Altosens as a partner, we can further develop the technology in an even more targeted manner and better support our customers."

With a force-measuring washer, Altosens plans to increase the profitability of (offshore) wind turbines by reducing unplanned service operations. A cloud-based monitoring system with the Altosens force



The force-measuring washer based on Delta-C® technology from Fraunhofer LBF can be used for monitoring wind turbines

sensors serves as the basis for this. The sensors contain an integrated evaluation unit, which can also provide information about the remaining service life of the structure, bolt pre-stressing forces and load trends, using the methods of fatigue strength.

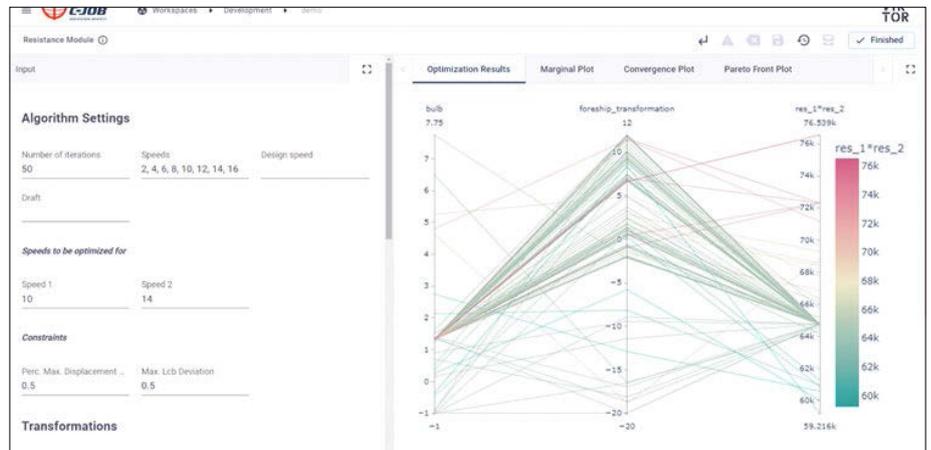


Optimising hull design in half the time

ENGINEERING | Netherlands-based C-Job Naval Architects, and engineering application specialist, Viktor, have developed a software programme which, the Dutch companies claim, optimises the design process for ships' hulls and is up to two times faster. The ACD Resistance Module refines the design of a ship's hull based on its resistance, the partners explained, with the likely result that both the first cost of assets and subsequent operating costs are both reduced. The cloud-based tool, developed with each partner's particular expertise, is easy to use and available for both companies' engineers.

The partners claim that the software enables the development of ship designs that ensure the best quality in the shortest possible time. Use of the tool, they say, reduces to almost zero the possibility of having to make alterations to the design later in the process, facilitating a smoother process and saving time.

The ACD Resistance Module builds on earlier development work by C-Job, which focused on accelerated concept design. This process uses simulation software in combination with algorithms developed in-house to generate optimised concept designs. These optimised algorithms have now been incorporated into the new system.



Screenshot of the new design programme

Source: C-Job

C-Job Naval Architects' R&D Engineer, Roy de Winter, explained: "Multiple algorithms were created and then added to C-Job's 'toolbox' of optimisation algorithms. These algorithms allow for complex design problems to be optimised in significantly less time ... In the early phases of design, engineers must make decisions that can have an irreversible influence on later design stages. Therefore, it is beneficial to make these decisions in a data-driven way.

"An optimisation process is difficult and labour-intensive work," he continued, "but

is essential for a reliable and efficient result. Together with the Viktor platform, we were able to create a tool, the ACD Resistance Module, that automates this process and reduces building and operational costs."

Viktor's CEO and co-founder, Wouter Riedijk, said: "We strive to never stop exploring new ideas and technologies and were excited to collaborate with C-Job on a solution that helps unlock engineering potential to an exponential degree. Through the Viktor interface, engineers can turn any idea into a cloud-based interactive, user-friendly, that is accessible to anyone."

New software to prevent parametric roll

STABILITY | Classification society Lloyd's Register (LR) has granted Approval in Principle (AiP) for a new Onboard Guidance System developed with Hyundai Heavy Industries (HHI) and Eastern Pacific Shipping. The safety system is designed to prevent excessive angles of heel and a synchronous phenomenon, parametric roll, which can gravely endanger container ships in heavy seas.

The AiP comes after a joint development project in which the rolling motion of a container ship in a seaway was modelled and tested. The system assesses a range of load conditions and sea states to generate operational guidance based on information in Hyundai Global Service's Integrated Smartship Solution.

The Hyundai Onboard Guidance System was tested in a pilot project aboard a 15,100-TEU Eastern Pacific Shipping container vessel in September 2022. As part of the approval process, LR suggested rules, requirements, and guidance for the system.

LR's Global Containership Segment director, Nick Gross, commented: "Approval in Principle for HHI's Onboard Guidance System is a meaningful milestone for preventing container roll at sea. Also known as Parametric Rolling Movement (PRM), container roll can cause a ship to dangerously roll at extreme angles, sometimes culminating in a vessel capsizing. This software is a crucial tool in preventing PRM and improving safety at sea.

Lloyd's Register is proud to continue our strong relationship with HHI with this approval."

Speaking on behalf of HHI, chief technology officer Seungho Jeon said: "We are pleased to be awarded Approval in Principle from Lloyd's Register. With the development of the technology, our clients are able to reduce unnecessary cost due to the loss of containers and HHI has come to secure differentiated competitiveness as a shipbuilder that ensures safe operation at sea. It also has a significant meaning in that we have established a foundation for further advancing the system by completing a pilot test on the Eastern Pacific Shipping vessels in operation."

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PUBLISHER

DVV Media Group GmbH
Postbox 10 16 09, D-20038 Hamburg
Heidenkampsweg 73-79, D-20097 Hamburg
+49 40 23714 - 100

MANAGING DIRECTOR

Martin Weber

PUBLISHING DIRECTOR

Manuel Bosch
manuel.bosch@dvvmedia.com

EDITORIAL STAFF

Editor-in-Chief
Kathrin Lau
+49 40 23714 237 | kathrin.lau@dvvmedia.com

ADVERTISING

Advertising Director
Markus Wenzel
+49 40 23714 117 | markus.wenzel@dvvmedia.com

Advertising Sales

Jan-Michael Jasper
+49 40 23714 248 | jan-michael.jasper@dvvmedia.com
Jörg Rösch
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ADVERTISING REPRESENTATIVES

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Singapore/Indonesia/Vietnam

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China

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ANNUAL SUBSCRIPTION RATES

Abonnement
Germany EUR 157.00 (plus 7% VAT) per year | outside Germany EUR 195.00 per year;
Single copy
EUR 32.00 (incl. VAT).
GMT members receive the magazine within their membership.

PRINTING HOUSE

Silber Druck OHG, Lohfelden

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ISSN: 2191-0057

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