Edition 2021

Ship&Offshore

Special **SmartShip**

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

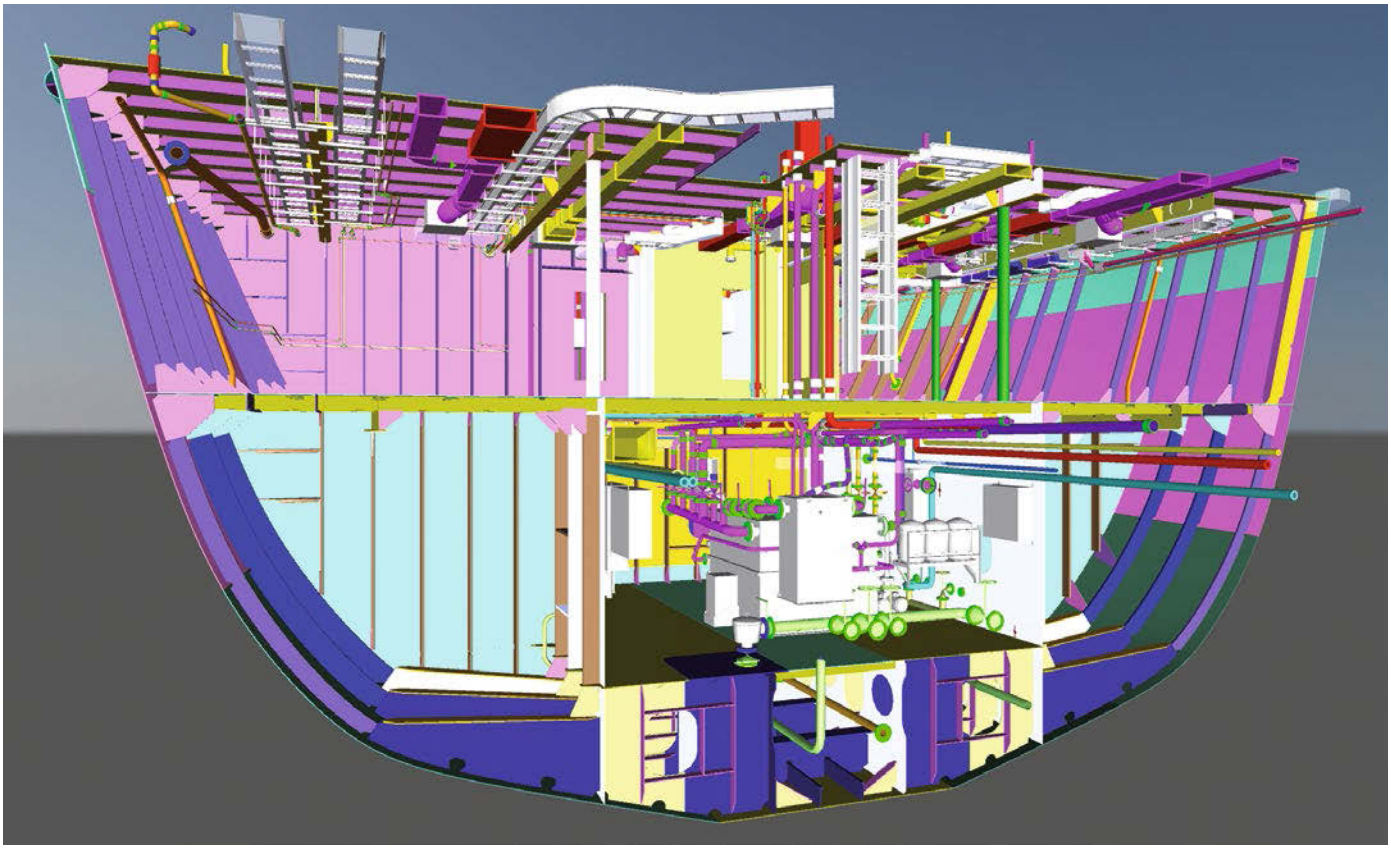
Digital diversity

When one tries to identify the few positive outcomes from the pandemic, one is certainly the pace with which digitalisation has been pushed forward in recent months. Not only but particularly in the maritime business, the digital transformation is accelerating and has become more visible than before. The number of different approaches and applications in this field is impressive. They range from automated steering systems to digital port calls, intelligent safety arrangements and forward-looking monitoring set-ups. Enough innovative and sophisticated developments to fill yet another issue of our SmartShip Special Edition.

The great diversity is also reflected by the nine categories we have chosen this year. Most of the topics we are covering, however, combine several key areas of autonomy, digitalisation and smart operation.

What might be different compared with previous issues is that crew matters – the human factor – have once again come into sharper focus. Without properly trained and healthy people on board, the best technology will not yield optimal results. Among other things, this is highlighted in the article "The main drivers for digitalisation", starting on page 26.

What was also striking when putting this publication together is the enormous ambition of classification societies all around the world. They are currently putting huge effort into helping owners, yards and suppliers alike understand and use the most appropriate digital technologies for their needs. The 2021 SmartShip Edition bears witness to this in several places.



Simulation tools can be used for design purposes, test and qualification, and class verification

Source: ABS

Applications of digitalised modelling and simulation

ABS A trend towards digital techniques for class approval enables a fully digital approach to the industry's biggest challenges like decarbonisation, writes Patrick Ryan, vice president Technology at the classification society ABS

In a digital environment, simulation tools can be used for design purposes, for test and qualification and also for class verification.

There are three primary use cases for modelling and simulation from a class perspective: it will help the industry with studies around decarbonisation, validation of performance of complex software-driven systems including autonomous functions, and virtual testing or commissioning of systems that are highly software dependent. More cases are currently under development, such as techno-economic modelling. ABS recently released its Class Guide for Hybrid Electric Power Systems, including provisions for simulation-based testing as an alternative, for the first time.

Simulation sits at the centre of a wheel containing familiar engineering topics such as control system analysis, kinematics, power distribution systems and interface design. There are tools available on the market today that connect each of these disciplines to one another as well as to more familiar 3D tools like finite element analysis (FEA) and computational fluid dynamics (CFD). For this reason, they are often called 'multi-physics' modeling or multi-physics sim.

These tools can be connected in the real world through data, linked to physical systems in a test environment, or used entirely digitally. The ABS Rules can also be included inside the same model to help designers, class engineers and surveyors evaluate the performance of these multi-physics and inter-connected systems against class requirements.

Multi-physics modelling and simulation can deliver three benefits:

- It connects a number of separate engineering domains;
- It complements physical testing;
- It adds rigour and confidence to the class process.

Decarbonisation

There are several energy initiatives and technologies that could potentially contribute to the decarbonisation of shipping. For example, improvements to the energy efficiency of ship designs will be required by the next phase of the IMO's Energy Efficiency Design Index (EEDI). Closing

the emissions gap between 2030 and 2050 will require a combination of physical and operational measures.

With all the available options – and especially with different technologies at different levels of technical maturity – there are challenges for designers offering advice, and for owners preparing to make planning decisions.

The first is diversified selections: the portfolio of different energy-saving technology options is large and works on different principles to reduce fuel consumption or emission levels. Alternative fuels have direct impact on the type of emission, which can be the most effective in carbon emissions reduction.

Other technologies like hull design optimisation and the use of energy-saving devices improve the hydrodynamic efficiency of the vessel. Technologies like solar and wind bring additional energy sources to the vessel for propulsion.

To consider the available technologies, it is important to have an evaluation method that can be scaled to consider the combined effect of different tools, design features, or operational approaches. There is heavy risk in making these decisions early in the process that will affect the owner for many years.

ABS has been working to develop a multi-disciplinary approach that connects the performance of the vessel in different aspects and provides a systematic evaluation of the vessel's performance. The decarbonisation Simulation Model can be used to analyse the fuel savings and carbon footprint of a vessel considering trade-offs between different design features and operational measures.

Using this tool, the impact of many combinations of technologies can be evaluated to help owners validate some of the claims made by designers – whether the designer is using modelling and simulation or not. Timing of the upcoming regulations can be included to see a vessel's predicted performance against these requirements over time, helping the designers to understand their constraints as well.

Software driven systems

In the second example, modelling and simulation can be used to verify software-driven systems up to and including autonomous functions. As vessels' operations become more automated, reliance on software steadily increases. Validation of these critical software-driven decisions provides confidence that the system can operate effectively without human intervention. However, emulating every scenario in the real world to validate the responses of software is becoming increasingly impractical.

There are scenarios that may pose a risk to equipment, personnel and the environment. These could involve uncontrolled conditions such as weather and sea state, or others that are simply too costly to recreate or too obscure to contemplate.

Simulation and virtual testing allow for designers to consider scenarios that would otherwise be impossible to recreate in the real world, and conduct testing of these software-driven components faster than they could in real time. As these technologies mature, the industry will see more and more evaluation of these components and systems in the digital domain.

Testing and commissioning

Testing of system automation is an essential practice today. But it is an expensive process and economically risky as it often cannot happen until late in the building cycle when a system is installed and connected. This makes the concept of virtual testing to supplement physical testing a very attractive option.

In simulation-assisted automation testing, the application is connected to a dynamic plant system model which can be used to verify the functionality of the automation system before connecting it to the actual process. This has several benefits when compared with traditional testing methods; in particular the whole automation application can be tested with real system-like responses before installation.

These tests can also include scenarios which would be impossible to carry out at the site because of high risk or cost. Tests made beforehand can significantly reduce the time required for the site acceptance test or testing on board.

Closing the loop

Modelling and simulation also have a role to play in one of the most used terms of the digital revolution: the digital twin. In an industry that increasingly employs streaming data and machine-learning to improve understanding of real-time vessel condition and performance, this approach could help close the loop on the digital twin.

This means that modelling and simulation can be used to train machine-learning algorithms in ways that are otherwise far too expensive to test for accuracy. Modelling and simulation can likewise accept streaming data to validate the accuracy and performance of the process itself, closing the verification loop and giving confidence that the data from the digital twin is accurate and actionable.

Given the increasing amounts of time and resources being expended on understanding the condition and performance of remote assets, the prospect that a true digital twin could be realised using modelling and simulation is an exciting indication of this technology's potential.

NEW GUIDANCE AND SERVICES

Guide for Autonomous and Remote-Control Functions

ABS recently released guidance on autonomous and remote-control technologies which sets out a goal-based framework for the implementation of these technologies on vessels and offshore units. The framework of the Guide for Autonomous and Remote-Control Functions also covers interactions with relevant stakeholders such as port authorities and other vessels. It uses a risk-based approach to determine the requirements for the assessment and implementation of autonomous and remote-control functions.

Guide for Additive Manufacturing

The classification society has also published guidance on the application of additive manufacturing (AM) in the marine and offshore industries. It focuses on two main categories of metal AM processes: Powder Bed Fusion and Directed Energy Deposition. The Guide defines the ABS approval and certification process for AM facilities and AM parts by providing standards for AM design, feedstock material, building processes, inspection and testing. It also includes a strong focus on the quality of the materials and of the manufacturing process, both of which are key elements of the AM process.

Cyber security

ABSG Consulting Inc. (part of ABS Group) has launched a new integrated cybersecurity service designed to help organisations monitor, manage and reduce the growing threat of operational technology (OT) cyber attacks. The service is designed to deliver effective support for a wide range of industry sectors, including power plants, wind farms, oil rigs, energy platforms, ships, pipelines and industrial manufacturing.

Transition to fully digitalised classification

KOREAN REGISTER | The global pandemic has accelerated the pace of change in classification, with digitalisation offering new opportunities and the means to adapt to a changing environment, writes Hyung-chul Lee, chairman and CEO of the classification society Korean Register (KR).

Operational efficiency

As the fourth industrial revolution becomes more and more embedded in the maritime industry, KR is looking for new ways to enhance and simplify the operational efficiency of the survey work process. By applying new technologies like remote inspection techniques using drones and crawlers or virtual reality, safety both for shipping companies and surveyors can be improved.

KR's surveyors have been using remote inspection technology/drones for surveys since 2017, and in November 2020, the classification society completed its first hull survey using both a drone and crawler, a type of drone capable of climbing up and down walls. No scaffolding was required for the intermediate survey of a bulk carrier, demonstrating that drone surveys are safer, faster, more practical and beneficial for all parties.

Condition-based maintenance (CBM) technology is also one of KR's priorities. The classification society is working with shipowners and data analysis companies to install sensors on essential and auxiliary equipment on newbuildings and existing vessels to collect data. This will then be used to promote practical maintenance and enhance the energy efficiency of vessels in our classed fleet.

Paperless design approval

Traditionally, the design approval of a ship by a classification society has been a paper-based process, involving the exchange of numerous large-format drawings between the shipyard and the classification society. KR has developed and launched a paperless 3D model-based design approval system which provides a more accurate and intuitive review of ship structure.

The classification society has also developed virtual reality (VR) technology-based application systems. It now offers a ship inspection training simulator and a ship crew safety training simulator which both use digital 3D models of the relevant ships.

Cyber security

As the shipping industry becomes more and more digitalised, cyber attacks on shipping companies and ships have increased. Effective response and comprehensive cyber security preparedness is now essential for any maritime organisation. KR has vast experience in this field because as information and communication technology is widely applied to more and more of the maritime business world, so the risk of cyber attack for ships, shipping companies and ports grows.

With this in mind, the classification society recently launched a range of maritime cyber security e-learning courses in conjunction with Orange Security, a specialist consulting company, to support clients who may be having difficulty organising group training because of the global pandemic.

KR established its cyber security certification process in 2018, in accordance with international security standards ISO 27001, IEC 62443, NIST framework and in line with International Maritime Organization (IMO) and BIMCO cyber security guidelines. And in 2019, KR completed a comprehensive cyber security audit of Songa Shipmanagement, based in Glasgow, UK. It has certified the company as fully compliant in all areas – 87 inspection items in 18 categories such as human management, risk management, asset management, response and recovery.

Smart IT

In 2020, KR released an upgraded suite of online services for customers which include the KR e-Fleet v2 for fleet management, KR e-MESIS v2 for managing the inspection and approval of material and equipment and KR EDAS v2 for electronic drawings approval. Customers can arrange a remote survey using the society's KR e-Fleet which is an online service available through websites and mobile apps, allowing customers to manage their fleets and apply for the inspection and approval of both equipment and materials.

The KR e-Fleet v2 application's fleet management system also provides a vessel management mobile service, which gives the user the status of ship inspection applications from their phone, plus key information relating to the inspection, audit and location of a ship, all in real-time. The KR e-Fleet v2 website also has a function to facilitate ship management by linking the ship's location and inspection (audit) details.

The classification society is also supporting shipowners and operators with its new web based EEXI/CII calculation program which helps shipping companies to comply with the IMO's Energy Efficiency Exciting Ships Index (EEXI) and Carbon Intensity Indicator (CII) decarbonisation regulations which will come into effect in 2023. The programme uses KR's software development experience to offer a simple way to calculate each vessel's compliance using basic key information.

KR-CON is a portable database program listing the most recent IMO convention documents, which can be carried on board instead of hard copy documents and allowed under MSC-MEPC.2/Cir.2. It was first developed in 2000 and has been updated continuously up to the latest version 19 (launched in April 2021). Again, it is accessible online or via an app or USB. Widely used by South Korean shipyards, the KR Seatrust Series is considered one of the most powerful tools for strength assessment. The results are calculated faster than any other competing software with solid accuracy. The very latest edition supports the comprehensive structural analysis of container ships, RoRo vessels, LNG carriers, LPG tankers, and FPSOs and has been updated to include the new Common Structural Rules (CSR).

In November 2020, the classification society completed its first hull survey using a drone and crawler Source: Korean Register

Putting you in control

Operating a tug is a challenge. You need to make decisions quickly and under pressure. To help make things easier, we have developed the Damen Human Machine Interface (HMI) for our Next Generation Tugs.

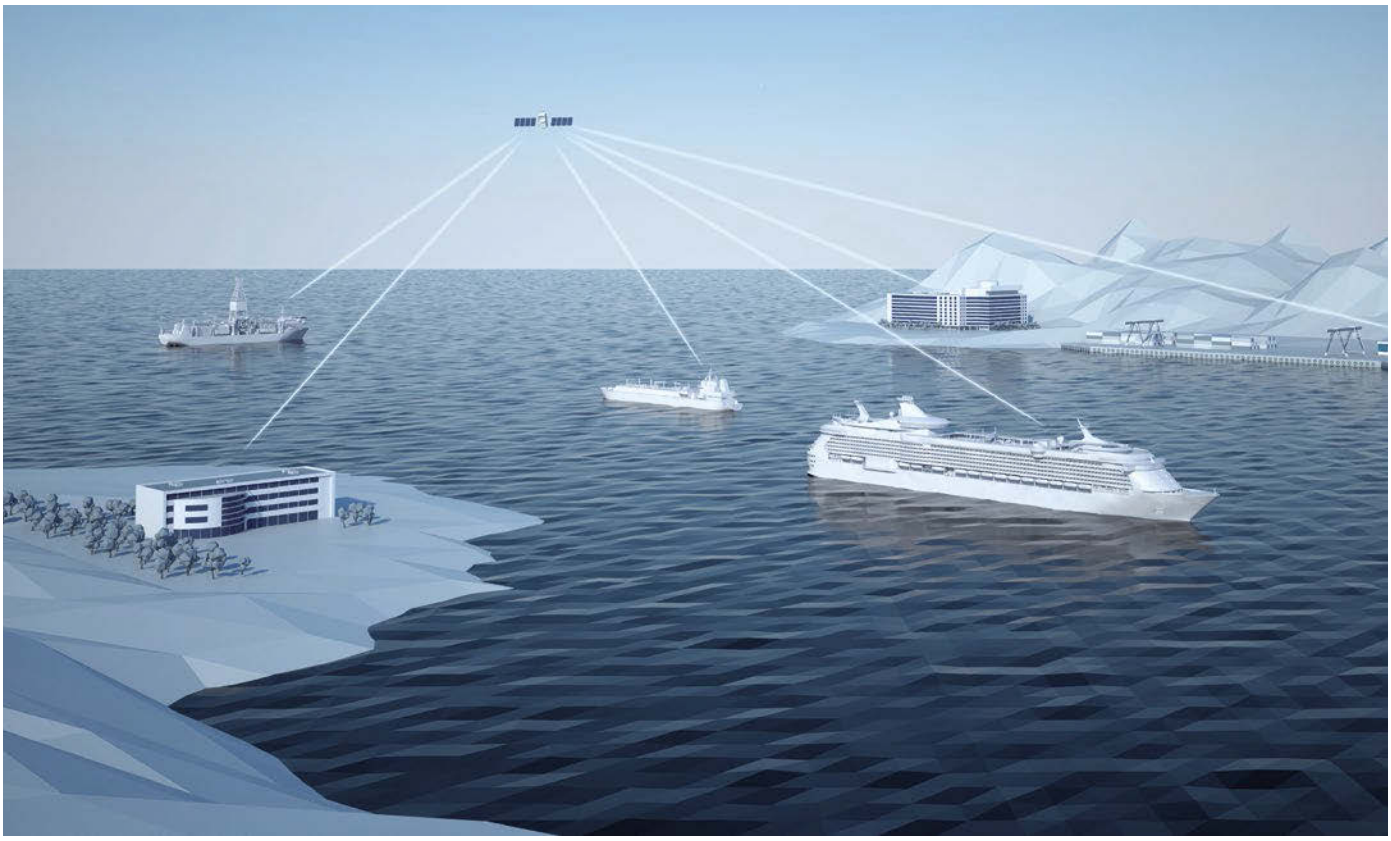
This integrated and innovative solution is intuitive and class-approved. It gives you the information you need - when you need it, where you need it.

Our HMI draws on digitalised connectivity to make you safer, presenting you with the relevant information on the task at hand - so that you can focus on what counts and get the job done.

Pictured here:
RSD 2513

Find out more on **Damen.com**

DAMEN
OCEANS OF POSSIBILITIES



The One Sea initiative aims to lead the way towards an operating autonomous maritime ecosystem by 2025 Source: ABB

Route to autonomous ship safety

ECOSYSTEM Autonomous ship technology can improve maritime safety according to One Sea, the industry grouping targeting 2025 as its target for the first autonomous maritime ecosystem. Some of One Sea's leading technology company members explain why, and how. One Sea is a 20-member consortium which includes international technology heavyweights such as ABB, Cargotec, Inmarsat, Kongsberg, Monohakobi Technology Institute (MTI) and Wärtsilä.

Safety is of paramount importance to the maritime industry, yet 75% of marine insurance claims point to human error as a main cause [1]. Autonomous vessels are regarded by some as integral to the future of shipping but tension persists when it comes to the degree to which operations should be automated, and the pros and cons of different human-machine interfaces.

The One Sea Ecosystem aims to lead the way towards an operating autonomous maritime ecosystem by 2025, and improving maritime safety is a key objective. For this reason alone, One Sea Senior Ecosystem lead Paivi Haikkola explained, autonomous ship technology should not be seen as simply a precursor to unmanned vessels.

"It's important that as an industry, we understand how autonomous technology can be applied to improve operations and enhance safety – a key objective for One Sea and its members," said Haikkola. "While the end goal is to develop fully automated vessels, there are many stages to this process, and we can start exploiting the benefits of autonomous technology to improve maritime safety today."

Eero Lehtovaara, One Sea chairman, master mariner and head of Regulatory and Public Affairs at ABB Marine and Ports, suggested that autonomous technology can support crews by providing greater awareness of the vessel's overall situation and condition. Autonomous technologies improve situational awareness, both in terms of visible obstacles as well as hidden risks such as potential technical failures, and so provide critical data for ship operations, Lehtovaara said.

"People are good at perception, risk assessment and decision making, but what we are not good at is focusing on several things at the same time. For example, when a person on the bridge focuses on a single obstacle that is perceived as a risk, this can easily overshadow everything else that is going on at that time.

"The perception of objects and fusion of navigational data can be improved significantly by technology so that a machine performs wide-angle continuous monitoring and sensor fusion. This would provide the human operator with a good overview of the actual situation and enable them to focus on the important items, instead of trying to focus on

everything at the same time," Lehtovaara added.

The benefits of using technology to improve situational awareness becomes clear when discussing collision avoidance.

"Driven by improvements in sensor technologies, AI and computer power, the algorithms to identify possible upcoming collision scenarios improve both in accuracy and reliability as well as distance," Lehtovaara said.

"Collision avoidance during manoeuvring in close range will significantly improve as the perception in close range is heavily dependent on deck crew's manual observations and communication over radio," he continued. "That is prone to human error and miscommunication. Autonomous technologies will enable continuous data-driven situational awareness in close and long range for all of the bridge crew members and therefore facilitates communication, common situational awareness and decision-making."

While discussions have been initiated at the International Maritime Organization, and the Maritime Safety Committee completed its regulatory scoping exercise on Maritime Autonomous Surface Ships in May to assess next steps, no regulatory framework exists covering the use of autonomous technologies at sea. If technological advances can enhance maritime safety, lack of regulatory rigour would – at best – mean such advances are patchy.

"We have the technology; however, we don't yet have the regulations. We urgently need a regulatory framework at both an international and national level, and it is our hope that One Sea will be there to represent autonomous technologies as the regulations are developed," declared Lehtovaara.

The important role autonomous technology can play in navigation and the need for new regulations also draws comment from Anton Westerlund, vice president Remote Operation Solutions, site manager at Kongsberg.

"The safety aspect is one of the most important drivers for different levels of autonomous shipping. Removing humans from hazardous working environments on board vessels, reducing the likelihood of human error by introducing smarter systems that are highly automated and autonomous to various degrees, improves both internal and external situational awareness," he said.

"Collision avoidance is a vital part of the autonomous navigation system. Collision avoidance functionality can be used as an advisory system together with current onboard systems as soon as regulations allow for it. When it comes to collision avoidance and the related COLREGs [2], there is room for a lot of improvement on how the rules are interpreted and followed. Standardised collision avoidance advisory systems can benefit the current seagoing vessels."

Awake.ai CEO and co-founder, Karno Tenovuo, agrees that new rules need to be implemented for autonomous vessels regarding COLREGs; he believes many collisions could be avoided by using autonomous technology because intended manoeuvres can be calculated in advance.

"Autonomous technology will make ships safer and has the potential to have the biggest impact on crew safety by removing or reducing the number of crew on board, because in most cases, when accidents happen it is the crew that gets hurt," he said

Less contentious is the fact that autonomous technology is not susceptible to fatigue or lapses in concentration as it operates around the clock at 100% capacity. Maritime cargo and load handling specialist MacGregor has been taking ›

a systematic approach to developing autonomous technologies that will further contribute to raising safety and efficiency standards.

Janne Suominen, manager, Offering Development at MacGregor, explains that no isolated development will secure a safer, more efficient environment. The key lies in many smaller advances that will be integrated together. The process will depend on stakeholder collaboration.

"The success of partial or fully autonomous operations will rely on greater connectivity between systems. The important part will be to standardise connection protocols so that a system, comprising a number of components, can work effectively.

"Ship safety connects closely to port operations, as there are multiple physical and digital touch points when a vessel arrives at/departs from the port and while loading/discharging operations are being carried out. Autonomous technologies can be used during port calls to increase safety by having systems that allow working in safe conditions such as the control room of the terminal."

However, Suominen stresses that crews still have a vital role to play in an automated environment.

"Automation will deliver increases in safety by removing human errors, but it will not automatically be like that," he explained. "Without a crew on board or at the port to solve a problem, an autonomous vessel would need either to be extremely robust or to offer greater levels of redundancy than traditional vessels. Today, the crew plays a vital role in effective redundancy capabilities, a factor that should not be underestimated when considering a more automated future.

"Responsive, expert service teams will need to be available to provide support, together with advanced remote monitoring systems, so that the integrity of the autonomous vessel is continuously supervised."

The call for the industry to start utilising autonomous technologies to improve safety and efficiency has been explored in detail by Wärtsilä in a recent white paper. Here too, the company suggests that the journey towards fully autonomous vessels could prove to be of more importance to the industry, as autonomous technologies can provide solutions to current challenges.

"The pursuit of autonomous operations is already leading to smarter systems that can enhance the safety, cost-efficiency and environmental performance of today's vessels; in practice this means reducing collisions or incidents – especially in busy ports – assisting with docking, saving fuels through optimised speed profiles, reducing associated emissions and optimising crew numbers," the paper says.

Accelerated digitalisation has been one of many unexpected outcomes from the Covid-19 pandemic and, in a maritime context, the trend has additional implications for autonomous ships, according to Juhani Hupli, One Sea Vice-Chairman and Vice-President, Transformation Programs and Strategy at Wärtsilä.

"Covid-19 created new demands for a more coordinated response to ensuring safe crew changes and the mental and physical wellbeing of sailors aboard," he explained.

"The pandemic increased the need for solutions that minimise the number of people who need to be aboard — for example, remote guidance systems for vessels as well as remote support and monitoring systems that allow for troubleshooting and issue resolution without the need to send maintenance personnel aboard."

In this context, external pressures as well as the industry's own operational challenges are driving the adoption of autonomous technologies as a route towards safer ship operations, through the continuous monitoring and decision-making support it enables, and through the ship efficiency that enhances crew competence.

References

[1] 2021, Wärtsilä, The Future of Smart Autonomy is Here, retrieved from https://www.wartsila.com/insights/whitepaper/the-future-of-smart-autonomy-is-here
[2] Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs)

Marine robotics training centre to be set up in UK

MEZ | Autonomous ship operations will take a significant step forward in the UK with the establishment of a maritime operations and training centre for robotic vehicles in Southampton. The National Centre for Operational Excellence in Marine Robotics is the result of collaboration between the UK's Royal Navy (RN), the National Oceanography Centre (NOC), and SeaBot XR, an autonomy specialist focusing on transport and energy.

The parties are all members of the Solent Maritime Enterprise Zone (MEZ) and all have specialisms in Maritime Autonomous Surface Ship (MASS) operations as well as sub-surface operational training. They recently signed a memorandum of understanding setting out plans for the new training entity and a set of standards that are to be implemented at the NOC.

The initiative fulfils a growing requirement in the autonomy sector – training facilities required for MASS operations do not currently exist in the UK or Europe, the partners said in a statement. Now, third-party companies can test their own developments in autonomy, as well as making use of the training for personnel in both civil and military contexts. Users of the facilities will have access to a remote operations centre as well as various surface and sub-surface vessels with a range of features and capable of operating in different weather and tidal conditions.

The RN's deputy director, Future Training, Commodore Andrew Cree, commented: "This initiative is testament to the Solent MEZ's enterprise approach. The new centre of excellence … marks a pivotal change in maritime as the RN constantly seeks way to optimise technology to support RN operations and to prepare our people with the skills required to operate new technologies, surface and sub-surface autonomous vessels being a priority."

Seabot XR founder and CEO, Gordon Meadow, said: "Current training available for seafarers of crewed vessels has served the industry well for decades, but many of the training methods and much of the curriculum cannot be applied to autonomous and remote vessel operations. Digitalisation is the next frontier in shipping and so requires a fresh approach to workforce training. It is vital that training is developed alongside the technology so that it serves humans to their advantage."

Management software for robotic vessels

AUVS | Ocean Infinity, a marine robotics and deep-sea data acquisition company, is implementing ShipManager fleet management software for 17 new robotic ships and additional autonomous underwater vehicles (AUVs). The software has been developed by classification society DNV.

Ocean Infinity will use ShipManager's modules for planned maintenance, procurement and business intelligence for its advanced fleet of uncrewed, low-emission vessels for capturing ocean data.

"As part of our efforts to secure the reliability of our fleet of robotic ships and AUVs, we were looking for a trusted partner that could deliver an integrated fleet management solution," said Andy Holt, fleet director, Ocean Infinity. "We know DNV has validation in the market and ShipManager is very intuitive and user-friendly. We were also excited to see the latest developments in user experience based on modern cloud solutions. Especially ShipManager Analyzer, with its advanced reporting capabilities, really delivers what we were looking for," he added.

The robotic ships in Ocean Infinity's Armada fleet use low-emission fleet technology and are equipped with state-of-the-art sensors and pioneering navigational systems that allow information to be gathered from the shallowest and deepest waters, whether for exploration, mapping or searching for wreckage. The marine robots use hybrid technology, cutting CO_2 emissions. An Armada robotic vessel emits up to 90% less CO_2 than a conventional survey vessel, Ocean Infinity said in statement.

The Armada fleet comprises 15 low-emission robotic ships for gathering ocean data

"We are proud to be part of this exciting journey with Ocean Infinity," said Torsten Kappel, head of Ship Product Line, Digital Solutions at DNV. "The utilisation of advanced technologies, as well as the focus on decarbonization, fits perfectly with our own values at DNV."

The ShipManager systems are part of DNV's maritime software portfolio for ship management and operations, installed on board approximately 7,000 vessels worldwide. ShipManager provides modules for technical management, procurement, hull integrity management, dry docking, QHSE, crewing and business intelligence.

USV receives first Unmanned Marine Systems certification

UMS | Classification society Lloyd's Register has awarded its first ever Unmanned Marine Systems (UMS) certificate to Sea-Kit International for its unmanned surface vessel (USV). Sea-Kit has worked closely with Lloyd's Register since early 2020 in a concerted effort to achieve the highest standards for the USV sector, culminating with its latest 12m X-class USV for geo-data specialist, Fugro, being awarded the new UMS certification.

Paul James, Lloyd's Register's Naval Centre of Expertise manager, said: "Lloyd's Register has been working on the safety assurance of Unmanned Marine Systems since the launch of our UMS Code in 2017. Early on, we recognised the industry's need for a cost effective and robust method to demonstrate that unmanned novel and complex systems are safe. The Lloyd's Register naval team welcomed the opportunity to work with Sea-Kit to delve into the design, operation and construction of its latest Unmanned Surface Vessel. We are pleased to provide certification and safety assurance of Sea-Kit's unmanned system."

Ben Simpson, Sea-Kit CEO, said: "We thrive on challenging ourselves to continuously raise the bar and this is yet another example of hard work by the whole team paying off. Everyone here at Sea-Kit was integral to this achievement. We are absolutely delighted to be the first to receive UMS certification from Lloyd's Register and hope that this will be the first of many as we continue to push boundaries and set the highest standards in the development of safe, multi-mission USV platforms."

Unmanned systems technologies continue to gain a stronghold in the offshore sector. Fugro's Sea-Kit USVs are already working on commercial projects around the world, with multiple additional builds planned that include a larger vessel later this year.

Ivar de Josselin de Jong, Global Director Remote Inspection at Fugro, said: "This is a ground-breaking milestone as it provides the framework needed to certify the safe design and build of our Blue Essence USV fleet. It will enable us, our clients and the flag states to achieve the ambitious net-zero targets that we have set. A world-first for the industry, it's great to be able to contribute to the transformation of the maritime business in this way."

Sea-Kit has identified numerous applications for its USV technology in other marine sectors and recently ran a series of live capability demonstrations for maritime defence and security stakeholders from its base in Essex, UK.

The first gas carrier operator has selected a new METIS cargo handling and energy efficiency option for its ships

Source: METIS

Bringing the power of AI to gas carrier operations

INTELLIGENT ANALYSIS A recent commercial breakthrough adds specialised gas carrier operations to the range of vessels benefiting from artificial intelligence (AI)-based data acquisition, real-time performance monitoring and intelligent analytics, writes Serafeim Katsikas, CTO, METIS Cyberspace Technology

Cloud-based and using artificial intelligence (AI) and machine learning, the METIS analytics platform has seen good uptake recently, with over 250 vessels of different types now using the integrated performance monitoring and evaluation system.

Early this year, a significant breakthrough was achieved when an Asian ship manager became the first gas carrier operator to select a new METIS cargo handling and energy efficiency option for its ships, having upgraded to the Inmarsat Fleet Data IoT platform. Functionality specifically developed for LNG and LPG vessels has resulted in METIS monitoring and evaluation systems now enhancing operations for four gas carriers.

As a cloud-based platform, the system is specific to the gas ship data acquisition and analytics needs of the ship's owner/manager, but agnostic as far as the original maker of the equipment monitored and evaluated on board is concerned. Data acquired from shipboard sensors is uploaded for application program interface (API) exchange with the METIS analytics hub.

The data is stored securely alongside information from other sources, such as weather providers and traffic monitoring services including AIS, as well as corporate and maintenance planning systems. All of this data is immediately available to the 'micro-service' functionality interacting with end users.

Round-the-clock data provides a high-resolution picture of ship performance, while the ability to pool, access and manipulate data for different purposes is one of the 'game-changing' ways that maritime digitalisation enhances ship efficiency, safety and environmental performance.

Ship-specific data needs

This is a qualitative approach that contrasts markedly from the one-size-fits-all model seen in the maritime space until now, where everyone has been presented with the same unfiltered data, leaving it up to the individual user to manipulate or interpret it.

Requirements vary by ship type, and even among supposed sister ships. The METIS system has therefore been developed as highly configurable to detect and act on significant events based on thresholds specific to individual vessels. Its diag-

nostic capabilities help engineers pin down the likely cause of any anomaly, while predictive capabilities enable the planning of corrective actions.

LNG and LPG trades demand thorough monitoring of the sensitivities to temperature, pressure and conditions of special cargoes in storage, in transit and during handling, but also precise and timely information relevant to each vessel. METIS has developed specialised functionality to monitor and evaluate parameters through the entire voyage, including during loading and discharge.

Cargo condition

Where cargoes in transit are concerned, the METIS package for gas carriers monitors the condition of cargo tanks in real time, with live dashboards showing latest readings covering critical cargo parameters (temperature, pressure and tank level), and a record of measurements over the previous 24 hours. Functionality also enables the shipowner/manager to evaluate the condition of cargo tanks over longer periods to develop performance insights across a range of conditions.

Loading and discharging is also monitored in real time to ensure adherence to the strict operational guidelines that apply wherever LPG cargoes are handled. The monitoring also ensures that the condition of cargoes remains within the required range of values.

In a move also specific to gas carrier power consumption, the METIS platform continuously monitors and evaluates the performance of diesel generators in their critical role of maintaining conditions in the cargo tank. As well as ensuring the availability and reliability of machinery, generator performance is evaluated for optimised fuel oil consumption and performance, reflecting the higher power required for handling cargoes on these types of ships compared with conventional tanker and bulk carrier counterparts.

Weather- sensitive routing

Where other vessel types are concerned, the machine learning supporting the METIS platform has achieved significant successes in route planning. Speed profile, fuel consumption, hull fouling and other parameters that include the weather conditions that the vessel is likely to encounter can be used to generate 'what-if' scenarios and propose a route that strikes the best possible balance between safety, voyage time and fuel efficiency. One customer reported a 21.5% reduction in fuel consumption as a result, while another took the benefit as a one-and-a-half day cut in transit time plus a more moderate fuel saving.

LNG and LPG cargoes are especially sensitive to changes in conditions at sea, adding value to any system which promises to enhance voyage planning. The recent collaborative project involving four gas ships also included the use of data analytics as a tool to optimise route selection.

METIS does not offer real-time weather services in its own right, but offers virtual scenarios based on predictions from three forecast providers. This, in combination with actual vessel performance and hull condition data, allow the LPG carrier operator to evaluate routing alternatives.

Different stakeholders

Safety, efficiency and environmental performance can only benefit from the availability of timely information, while accumulated data and evaluation becomes increasingly useful as a decision-making tool for a range of stakeholders. Another newly developed digital tool within the METIS portfolio has special relevance to the gas carrier sector – especially for ships working in the spot market. The company recently launched a software module to tackle the challenges shipping companies face in monitoring vessel performance effectively to meet Charter Party Agreement (CPA) reporting needs.

The system uses weather data, vessel manoeuvring status and all other remarks included in the CPA and offers automated notifications in case the speed consumption curve exceeds predefined limits. METIS has made it possible for LNG and LPG carrier operators to monitor and track their vessel's CPA performance at a glance online using a set of visually helpful dashboards. Once all CPA terms are imported into the system, the user can monitor all vessels concerned and identify potential deviations to specified consumption and speed terms.

Other modules of interest include shipping's first tool to predict the trade-off between emissions reduction and debt servicing for ships financed under the Poseidon Principles. This module, launched in early 2021, calculates whether and when ships need investment to keep pace with the IMO average efficiency ratio (AER) underpinning the Principles.

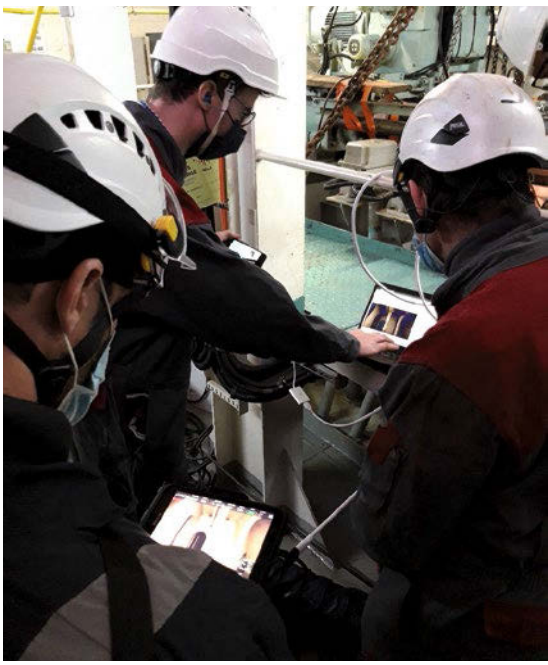
Drone and AI combination prove capable of corrosion detection

HULL SURVEY | Classification society, Bureau Veritas (BV), has successfully demonstrated proof of concept that a combination of aerial drone and artificial intelligence can be deployed to detect corrosion in steelwork during the hull inspection of a bulk carrier. The test was successfully undertaken in partnership with remote inspection technology firm, MaDfly Marine Drone Services Ltd, in Dunkirk, France.

The remote inspection supported the findings of the surveyor during his visual inspection of the vessel in several ways, BV explained in a statement. One, the arrangement enabled results to be provided in real time. Two, the application could still run offline with no internet connection. And three, the setup could be deployed in the field with normal computing capacity.

Corrosion is one of the largest and least predictable components of through-life ship maintenance costs. Shipowners and operators recognise this, together with the implications for vessel reliability, uptime and repair costs. Classification societies monitor the condition of the hull during regular surveys but BV's proof of concept is likely to facilitate a new approach to hull inspections and maintenance, providing more predictability and optimised survey schemes for particular ships.

"Digitalisation is changing our daily lives," declared BV's Laurent Leblanc, senior vice president Technical & Operations, Marine & Offshore. "The use of AI in the shipping industry can make a real difference, helping the industry to be more effective with improved inspection standards and maintenance techniques. The ambition for Bureau Veritas is to develop an end-to-end solution that will support shipowners and ship managers in anticipating repairs and better maintaining the hull condition of the ship. It will also support BV's team of surveyors by building their collective experience and knowledge around corrosion detection underpinned by AI solutions."



AI was used for corrosion detection during a hull inspection Source: Bureau Veritas

AiP for artificial intelligence-based fire monitoring system

SAFETY MANAGEMENT | South Korea's Hyundai Heavy Industries Group (HHI) has been awarded Approval in Principle (AiP) for a computer vision-based artificial intelligence (AI) system enabling the early identification of fires aboard ships. The shipbuilding group's HiCAMS, which gained AiP from the Korean Registry (KR) earlier this year, has also been approved by the Liberian Registry.

The classification society and flag state approval of the AI-based fire-monitoring system is likely to provide the basis for development of other safety-related technologies applicable to the internal and external operation of commercial vessels. These are likely to include systems to aid safe navigation through improved situational awareness, reduce the risk of personal accidents, identify oil leaks or water ingress, and more advanced monitoring of cargo-related issues. The systems are also likely to have direct applicability in the development of autonomous ships.

The HiCAMS internal fire monitoring system has been unveiled in the wake of a series of fires on board container ships and other vessels resulting in extensive damage and, in some cases, loss of life. Marine insurers are increasingly concerned about the incidence of such events, many of which are thought to be attributable to mis-declared or undeclared cargoes. Early fire detection, particularly in ships' internal spaces, is essential in tackling such incidents.

In a statement, HHI explained that its new AI-based early fire monitoring system combines image recognition and processing technology with big data on ships' interior fires, and advanced AI algorithms. This setup enables significantly faster and more accurate fire detection by enabling immediate recognition, the company said, thereby saving critical time. Existing fire-monitoring sensors can take up to two minutes to detect flames or smoke.

A spokesman for the shipbuilding group commented on the development. "It is meaningful in that it is the first shipbuilding organisation to incorporate artificial intelligence into the field of ship safety management. Starting with the development of this AI-based fire monitoring system, we will preempt the future autonomous ship era by expanding it to the entire ship safety field."

Meanwhile, the shipbuilding group has developed a series of digital systems which have a bearing on safety management more generally. These include HiNAS, a navigation assistance system which has possible applications in autonomous ship development, and HiDTS – a virtual commission system based on digital twin technology. The company is also developing other AI-based systems for the internal safety management of smart ships in the future.

In a ceremony, the AiP was handed over

Source: Liberian Registry

Integration is central to application architecture

OPENPDM SHIP Darmstadt-based PROSTEP AG has developed the OpenPDM Ship platform that provides integration as a standard product. The product lifecycle management (PLM) experts emphasise that integration is not an interface between systems but an integral part of a company's IT architecture.

The digital twin allows for a completely new level of product lifecycle

Source: PROSTEP

The paradigm shift from drawing-based to model-based product creation processes has resulted in drawings, bill of materials (BOM) lists and reports becoming derived information. They are created only as needed from model-type artefacts – such as 3D computer-aided design (CAD), simulation, product structures – as the primary information subject to revision, configuration and change management.

Model-based product development turns out to be the major precondition to establish product information models for manufacturing and operational purposes, known as digital twins. These digital representations of a shipyard´s products allow for a completely new level of product lifecycle support, including manufacturing methods, field data collection and related all-new business concepts.

To make this process possible, internal and cross-company business processes need to be shaped accordingly, PROSTEP noted. Integration is becoming the crucial part here. However, so far, integration is often realised by in-house developments of a shipyard's IT departments, the company added. These integration interfaces reflect today's workflows but are typically point-to-point connections lacking flexibility and adaptability due to their hard-wired architecture. Maintenance is expensive and time-consuming.

Software updates to the connected systems must be addressed and the integration needs to be adapted by the shipyard`s IT experts each time. In addition, increased complexity due to model-based product development, specialised applications, and the need to include new types of platforms, such as digital twins of products and manufacturing into the integration architecture, challenge in-house systems to their limits. A sufficient and economical operation can no longer be guaranteed.

Semantic integration enables digital enterprise platform

To address the increased integration requirements, systems need to be connected at a different – and higher – semantic

level. Approaches inherently capable of dealing with the data semantics of product development, or the product lifecycle in general, provide the capabilities for seamless integration of the various enterprise systems and to cope with the new complexity. This puts integration at the centre of a company's enterprise application architecture and on par with existing enterprise systems such as CAD, product data management (PDM), and enterprise resource planning (ERP). Here too, systems based on standard products are more cost-effective and lower risk than in-house developments. Standard integration products ensure changes of processes and updates to connected software systems that can be handled without the need for an internal software development project. Standard integration products are updated by their supplier just like other commercial software applications and provide maturity, robustness, and reliability. This allows IT to focus on the operation rather than development of software, thereby significantly increasing efficiency as an additional benefit.

Integration as a product

PROSTEP's OpenPDM Ship platform provides integration as a standard product. It addresses vertical integration of shipbuilding CAD applications and common PDM systems like ARAS, Enovia and Teamcenter or ERP systems including IFS and SAP to enable configuration and change management or feed material sourcing and production planning. It also supports the horizontal integration between authoring tools, i.e., the transfer of model data to and from the shipbuilding-specific, intent-driven CAD systems such as Aveva Marine, Cadmatic, or Napa.

To connect the various systems to OpenPDM, connectors are available as maintained standard product components. Each connector provides read-and-write access to the connected system using interfaces provided by the system vendors. On their backside, all connectors share a common interface to provide PLM data into the OpenPDM platform in a normalised format while maintaining the proprietary data semantic.

PROSTEP stressed that it is continuously working on optimising the platform to meet the requirements of ship development processes. Just like data model and workflow are the places in a PLM system to implement company specific requirements as part of a PLM implementation project, data mapping and workflow are the places to do the same during an implementation of OpenPDM.

To enable IT experts to adapt and expand the platform on their own, on the job trainings are provided during the implementation project. In this way, shipyards can maintain existing integration arrangements on their own if they wish to, while benefiting from up-to-date platform components as their PLM environment evolves.

Conclusion

OpenPDM Ship is a digital enterprise platform ensuring seamless integration of a growing number of tools, systems, and platforms. Other than data warehouse solutions, it provides a transactional hub without the need for a persistency layer. Focus is on the semantical mapping and automated data flows, providing the central place of flexibility and scalability in a shipyard's business architecture.

Strategic partnership to cut environmental footprint

DIGITAL TWIN | Kongsberg Digital, BW LNG and Alpha Ori Technologies are to collaborate on raising efficiency and reducing the environmental footprint of LNG carriers and floating storage and regasification units (FSRUs). The companies have signed a strategic partnership and will develop digital twins, digital processing models and use a common data management platform. The partners are aiming to accelerate development of the technologies required for future-ready LNG carriers and FSRUs.

A pilot project has already been established to develop and test a digital twin developed to promote operational excellence, reduce emissions and costs, and increase safety. The twin will be generated for the FSRU, *BW Magna*, using Vessel Insight data infrastructure, the Kognifai digital platform and maritime simulators, and expert applications from Alpha Ori, the partners explained.

Harald Martin Myhre, head of IT and Digitalization at BW LNG, said: "We're confident that these digitalisation initiatives will help close the information gap between ship and shore and empower us to be more data-driven in our decision making. By supplementing our extensive operational experience with well-managed data and algorithms, we can create more value for all our stakeholders – increasing the safety of operations, reducing emissions to the environment, and reducing operating costs for our customers."

Alpha Ori Technologies co-CEO, Rajesh Unni, commented: "Our customers have seen outstanding results through digitalisation in improving fleet operational efficiencies, fuel savings and decarbonisation. We strongly believe in partnerships and in building synergies, thereby creating enhanced value to the asset owners."

Hege Skryseth, Kongsberg Digital president and a Kongsberg executive vice president, expressed pleasure at the new strategic partnership. "The goal … is to lead the way in the industry through reducing emissions and proving operational excellence through digitalisation," she said. "Kongsberg Digital is also looking forward to developing the world's first comprehensive maritime digital twin, leveraging our digital twin expertise, data infrastructure, Vessel Insight, our digital platform Kognifai, and our maritime simulators."

ClassNK releases guidelines on 3D printing

APPROVAL REQUIREMENTS | Classification society ClassNK has issued Guidelines for Additive Manufacturing (3D Printing) that set out approval requirements for the 3D printing of metallic equipment in shipping.

Additive manufacturing technology is now used in various sectors including cars, aerospace, medicine, and metallic components. However, its applications in the maritime field are limited so far, ClassNK noted.

The process, by which components are manufactured in layers of different materials – including metal, carbon fibre, plastic, resin, powder and graphene – is made possible based on 3D model data, enabling the creation of complex and high-precision products.

The ClassNK guidelines specify approval requirements for the feedstock used in the 3D printing of metalic marine equipment, the manufacturing process itself, and subsequent tests and inspections. The guidelines also provide details of terminology and information about the characteristics of materials such as metallic powder used in the manufacturing process.

Scaling up 3D printing of crane hooks

TESTING | Huisman has successfully tested four new 3D-printed 350mt crane hooks under the supervision of classification society Lloyd's Register

The hooks are approximately 170 by 130cm in size, almost nine times larger than the first Huisman 3D-printed crane hook. They have a weight of 1,700 kg each and a loading capacity of 350 tonnes. Each hook consists of approximately 90 km of welding wire.

Huisman has been employing the 3D printing technique 'Wire & Arc Additive Manufacturing' (WAAM) to produce mid- to large-sized components with high-grade tensile steel, the Dutch company noted. An important benefit of using this technique for crane hooks is the significant reduction in delivery time at a cost that competes with forgings and castings, and a more consistent quality level.

Huisman says it has plans to expand the robotic workplace of its production facility in Sviadnov, Czech Republic, which currently has three welding robots. By upgrading its capacity, the company will be able to produce crane hooks with a weight up to 5,000 kg.

Daniel Bílek, project coordinator said: "Crane hooks are commonly part of the delivery of heavy lifting cranes for the offshore industry, one of our key products. The price of a forged hook increases exponentially with size, especially if it is a non-standard size. If a hook is produced by casting, the problem of inconsistent internal quality could result in longer delivery times. All this led to the idea of making the hooks ourselves, using the so-called WAAM method. After five years of research, development and testing of 3D-printed products, we have gained the necessary expertise to use this innovative method for the production of high-quality crane hooks."

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

1.06 Repairs + conversions

BREDO DRY DOCKS GmbH
Dockstraße 19 • D-27572 Bremerhaven
Phone +49 (471)7997-10 • Fax +49 (471)7997-18
info@bredo.de • **www.bredo.de**

Repairs and Conversions

2 Propulsion plants

2.01 Engines

MARIDIS
Maridis GmbH, Friedrich-Barnewitz-Straße 4c
18119 Rostock, Germany
Phone: +49 381 77 89 38 80
spareparts@maridis.de • www.maridis.de

MarParts: Spare Parts & Components for Main & Auxiliary Engines

2.02 Gears

REINTJES GmbH
Eugen-Reintjes-Str. 7
D-31785 Hameln
Tel. +49 (0)5151 104-0
Fax +49 (0)5151 104-300
info@reintjes-gears.de • www.reintjes-gears.com

Propulsion systems with power ratings from 250 up to 30,000 kW

2.03 Couplings + brakes

R+W Antriebselemente GmbH
Hattsteinstraße 4
63939 Wörth am Main / Germany
Fon: +49 (0)9372-9864-0
Fax: +49 (0)9372-9864-20
email: info@rw-kupplungen.de
www.rw-kupplungen.de

Couplings, seawater resistent

2.04 Shaft + shaft systems

Piening Propeller
Am Altendeich 83 • D-25348 Glückstadt
Tel. +49(0)4124 91 68-0 • Fax +49(0)4124) 37 16
e-mail: pein@piening-propeller.de
Internet: www.piening-propeller.de

Fixed and Controlable Pitch Propellers, Shaft Gears, Gearboxes

2.05 Propellers

Piening Propeller
Am Altendeich 83 • D-25348 Glückstadt
Tel. +49(0)4124 91 68-0 • Fax +49(0)4124) 37 16
e-mail: pein@piening-propeller.de
Internet: www.piening-propeller.de

Fixed and Controlable Pitch Propellers, Shaft Gears, Gearboxes

2.06 Rudders + rudder systems

DAMEN MARINE COMPONENTS
MARINE SYSTEMS VAN DER VELDEN

Wendenstraße 130 • D-20537 Hamburg
Tel.: +49-40 711 80 20 • Fax: +49-40 711 80 221
e-mail: oceangoing@vdvms.com
www.damenmc.com

Rudders and Steering Gear • Nozzles • Winches • Energy Saving Devices

2.08 Fuels + lubricants

BINDEMANN GROUP
MFT MARINE FUEL TECHNOLOGY

With Blending-on-Board you can blend a fit-for-purpose Cylinder oil while benefiting from cost reductions, fuel savings And a more responsible oil consumption.

For more information, visit us at	Bindemann Group
www.bindemann-group.com	Gärtnerstrasse 81G D-25469 Halstenbek
www.marinefluid.dk	Tel. +49 40-41 91 88 46 Sales.agencies@bindemann-group.com

2.09 Exhaust systems

hugengineering.
A FAURECIA COMPANY

Hug Engineering AG
Im Geren 14 • CH 8352 Elsau
Phone +41 52 368 20 20
info.ch@hug-engineering.com • www.hug-engineering.com

Exhaust Gas Purification Systems Diesel Particulate Filters / SCR Catalysts

2.13 Service + spare parts

BINDEMANN GROUP
Gärtnerstrasse 81G • D-25469 Halstenbek
Tel. +49 40 - 57 08 12 3
Fax +49 40 - 57 14 81 51
e-mail: spare.parts@bindemann-group.com
www.bindemann-group.com

spare parts for turbochargers, filters, separators, pumps, boilers and E-motors

3 Engine components

3.03 Pistons + cylinder liners

BINDEMANN GROUP
Gärtnerstrasse 81G • D-25469 Halstenbek
Tel. +49 40 - 57 03 03 3
Fax +49 40 - 57 03 03 2
Piston.rings@bindemann-group.com
www.bindemann-group.com
DAROS

Vertretung von: DAROS Piston Rings for 2-stroke Diesel Engines

3.05 Starters

DÜSTERLOH Fluidtechnik GmbH
Abteilung Pneumatik Starter
Im Vogelsang 105
D-45527 Hattingen
Tel. +49 2324 709 - 0 • Fax +49 2324 709 -110
E-mail: info@duesterloh.de • www.duesterloh.de

Air Starters for Diesel and Gas Engines up to 9.000 kW

3.07 Filters

BOLLFILTER Protection Systems
Boll & Kirch Filterbau GmbH
Siemensstraße 10-14 • 50170 D-Kerpen
Tel.: +49 2273 562-0 • Fax: +49 2273 562-223
E-Mail: info@bollfilter.de • www.bollfilter.de

Applied filtration technology for marine engines and maritime water management

FIL-TEC Rixen GmbH
Osterrade 26
D-21031 Hamburg
Tel. +49 (0)40 656 856-0
Fax +49 (0)40 656 57 31
info@fil-tec-rixen.com • www.fil-tec-rixen.com

Filter spare parts and accessories, bilge water elements, maintenance, repair and service.

HYDAC INTERNATIONAL GMBH
Industriestraße • D-66280 Sulzbach/Saar
Telefon +49 (0) 6897 509-01
Fax +49 (0) 6897 509-454
E-Mail: info@hydac.com • www.hydac.com

Fluid management for heavy diesel engines

3.10 Injection systems

WOODWARD L'orange

Porschestrasse 8 • D-70435 Stuttgart
Tel. +49 711 / 8 26 09 - 0
Fax +49 711 / 8 26 09 - 61
sales@lorange.com • www.lorange.com

High pressure fuel injection systems up to 2.500 bar for diesel engines from 1.000 to 40.000 kW

4 Corrosion protection

4.01 Paintings

International Farbenwerke GmbH
Bereich Schiffsfarben
Sachsenkamp 5 • D-20097 Hamburg
Tel. (040) 720 03 122 • Fax (040) 720 03 110
e-mail: iphamburg-marine-orderdesk@akzonobel.com
Internet: www.international-marine.com

Marine Coatings

5 Ships' equipment

5.03 Refrigeration • HVAC

FREUDENBERG INNOVATING TOGETHER

Freudenberg
Filtration Technologies SE & Co. KG
Tel.+49 (0)6201/80-6264 | Fax +49 (0)6201/88-6299
Weinheim / Germany
viledon@freudenberg-filter.com
www.freudenberg-filter.com

Filters for intake air filtration of gas turbines, turbo chargers and HVAC systems

5.06 Furniture + interior fittings

PFLEIDERER

Pfleiderer Deutschland GmbH
Tel.: +49 (0) 91 81/ 28 480
E-Mail: info@pfleiderer.com
Internet: www.pfleiderer.com

Wood-based materials for decorative ship interior fitting

5.09 Waste disposal systems

MARTIN

MARTIN Systems GmbH
Friedrichstr. 95
10117 Berlin | Germany
Phone: +49 30 2005 970 0
www.martin-systems.com

Advanced Wastewater Treatment Technologies for Vessels & Offshore Installations

5.11 Ballast water management

BOLLFILTER Protection Systems

Boll & Kirch Filterbau GmbH
Siemensstraße 10-14 • 50170 D-Kerpen
Tel.: +49 2273 562-0 • Fax: +49 2273 562-223
E-Mail: info@bollfilter.de • www.bollfilter.de

Applied filtration technology for marine engines and maritime water management

HYDAC

HYDAC INTERNATIONAL GMBH
Industriestraße • D-66280 Sulzbach/Saar
Telefon +49 (0) 6897 509-01
Fax +49 (0) 6897 509-454
E-Mail: info@hydac.com • www.hydac.com

Ballast Water Management

5.16 Refuelling Systems

Alfons Haar Maschinenbau GmbH & Co. KG
Fangdieckstraße 67
D-22547 Hamburg
Tel. +49 (40) 83391-0
Fax +49 (40) 844910
Sales@alfons-haar.de
www.alfons-haar.de

Alfons Haar

On board helicopter and boat refuelling systems for aviation fuel, petrol and diesel

6 Hydraulic + pneumatic

6.01 Pumps

Behrens Pumpen

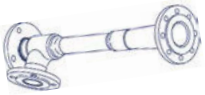
von-Thünen-Str. 7
D-28307 Bremen
Tel. +49 421 486 81-0 • Fax +49 421 486 81-11
e-mail: info@behrenspumpen.de
Internet: www.behrenspumpen.de

Ship Centrifugal Pumps

KRACHT

KRACHT GmbH
Gewerbestr. 20 • D-58791 Werdohl
Tel. +49(0)2392.935 0 • Fax +49(0)2392.935 209
info@kracht.eu • www.kracht.eu

Lubricating oil gear pumps and fuel gear pumps



sales@koerting.de
+49 511 2129-446
KOERTING.DE

Körting
THE EJECTOR COMPANY

Bilge and ballast ejectors/eductors

6.02 Compressors

Sauer Compressors

J.P. Sauer & Sohn Maschinenbau GmbH
Brauner Berg 15, 24159 Kiel/Germany
PHONE +49 431 3940-0
FAX +49 431 3940-24
E-MAIL info@sauercompressors.de
www.sauercompressors.com

Air- and water-cooled compressors, air receivers, compressed air dryers and accessories

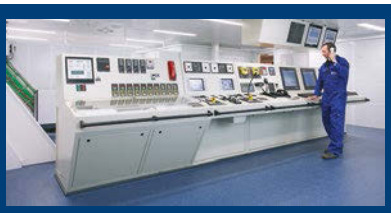
6.05 Piping systems

STRAUB Werke AG
pipe couplings
Straubstrasse 13
CH - 7323 Wangs

straub the original

Tel. +41 81 725 41 00
straub@straub.ch
www.straub.ch

STRAUB pipe couplings and pipe system solutions



8 Measurement + control devices

8.01 Engine control systems

AVAT Automation GmbH
Derendinger Straße 40
D-72072 Tübingen
Tel: +49 7071 97 35-0
Fax: +49 7071 97 35-55
e-mail: info@avat.de
www.avat.de

Gas & Dual-Fuel Engine Control Systems, Cylinder Pressure & Knock Monitoring, NOx Estimator

Aventics GmbH
Ulmer Straße 4 • D-30880 Laatzen
Tel. (0511) 21 36-0 • Fax (0511) 21 36 269
e-mail: marineservice.aventics@emerson.com
Internet: www.emerson.com/marine

Ship control systems, alarm & monitoring systems, tank ballast & level measurement systems

8.02 Pressure monitoring

MARIDIS
Maridis GmbH, Friedrich-Barnewitz-Straße 4c
18119 Rostock, Germany
Phone: +49 381 77 89 38 80
maridis@maridis.de • www.maridis.de

MarPrime: Performance/Pressure/ Power Measurement & Reporting

VEGA Grieshaber KG
Am Hohenstein 113
D-77761 Schiltach
Tel. +49(0)7836 50-0 • Fax +49(0)7836 50-201
e-mail: info.de@vega.com • www.vega.com

Pressure and differential pressure transmitters

8.04 Level measurement systems

Barksdale
CONTROL PRODUCTS

Barksdale GmbH
Dorn-Assenheimer Strasse 27 • D-61203 Reichelsheim
Tel: +49 (0) 6035 - 949 - 0 • Fax: +49 (0) 6035 - 949 - 111
e-mail: info@barksdale.de • **www.barksdale.de**

Sensors & Switches to control Pressure, Temperature, Level, Flow

Official member of the Honeywell Enraf Tanksystem Service Network for your annual UTI shore services

Gärtnerstrasse 81G
D-25469 Halstenbek
Tel. +49 40 - 571 48 252
Fax +49 40 - 571 482 71
technical.services@bindemann-group.com
www.bindemann-group.com

Inspection, Verification, Repair, Calibration, Certification of your UTI's strictly according to makers specifications and your instructions.

VEGA Grieshaber KG
Am Hohenstein 113
D-77761 Schiltach
Tel. +49(0)7836 50-0 • Fax +49(0)7836 50-201
e-mail: info.de@vega.com • www.vega.com

Level sensors for all solids & liquids

8.05 Flow measurement

KRACHT
KRACHT GmbH
Gewerbestr. 20 • D-58791 Werdohl
Tel. +49(0)2392.935 0 • Fax +49(0)2392.935 209
info@kracht.eu • www.kracht.eu

high-precision gear and screw type flow meters, fuel consumption measurement, valve position indicators

8.09 Test kits

Martechnic GmbH
Adlerhorst 4
D-22459 Hamburg
Tel. +49 (0)40 85 31 28-0
Fax +49 (0)40 85 31 28-16
E-mail: info@martechnic.com
Internet: www.martechnic.com

Test kits, autom. monitoring systems, sampling devices, ultrasonic cleaning

8.11 Tank level gauging systems

Honeywell
MARINE SOLUTIONS

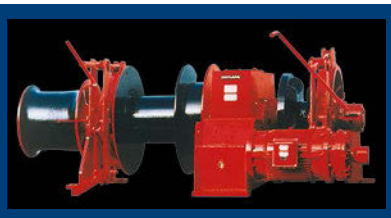
Tank Gauging and Safety Systems for Cargo, Ballast and Service Tanks
Portable UTI meter, Samplers, Digital Thermometers, Deck Valves and associated Accessories

German agent: C. Bindemann Group of Companies GmbH & Co. KG, Tel. +49 40 - 41 91 88 46
Fixed solutions : contact.marine@honeywell.com
Portable Solutions: tanksystem@honeywell.com

8.13 Measurement + control devices

Aquametro Oil & Marine
Phone +41 61 725 44 00 / Phone +49 381 382 530 00
info@aquametro-oil-marine.com
www.aquametro-oil-marine.com

High-precision flow measurement technology to measure the consumption of fuel and heavy oil



11 Deck equipment

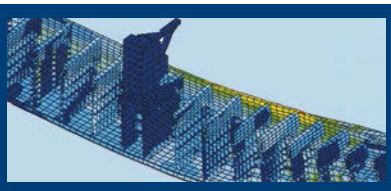
11.01 Cranes

d-i davit international-hische Gmbh
Sandstr. 20
D-27232 Sulingen
Tel. +49 (0) 4271 93 44 0
e-mail: info@di-hische.de
Internet: www.di-hische.de

Cranes, davits and free-fall systems

Global Davit GmbH
Graf-Zeppelin-Ring 2
D-27211 Bassum
Tel. +49 (0)4241 93 35 0
Fax +49 (0)4241 93 35 25
e-mail: info@global-davit.de
Internet: www.global-davit.de

Survival- and Deck Equipment



12 Construction +consulting

12.01 Consulting engineers

SDC
SHIP DESIGN & CONSULT
Naval architects
Marine engineers

info@shipdesign.de · www.shipdesign.de · Hamburg

Design – Construction – Consultancy
Stability calculation – Project management

S.M.I.L.E. Engineering GmbH
www.smile-consult.de
info@smile-consult.de

+49 (0) 431 210 80 0
Winkel 2 - 24226 Heikendorf

Finite Element Simulation – CFD – Structural Strength – Explicit Dynamics
Basic and detailed design – Outfitting – CAD/CAM – Technical documentation

terra.blue - Dr. Walter L. Kuehnlein
Hamburg: +49+40+2546 9970
Houston +1-713-930 2650
wk@terra.blue • www.terra.blue

Advice, concepts and concept/design reviews for offshore systems in ice and/or open waters

14 Alarm + safety equipment

14.01 Lifeboats + davits

d-i davit international-hische Gmbh
Sandstr. 20
D-27232 Sulingen
Tel. +49 (0) 4271 93 44 0
e-mail: info@di-hische.de
Internet: www.di-hische.de

Cranes, davits and free-fall systems

Global Davit GmbH
Graf-Zeppelin-Ring 2
D-27211 Bassum
Tel. +49 (0)4241 93 35 0
Fax +49 (0)4241 93 35 25
e-mail: info@global-davit.de
Internet: www.global-davit.de

Survival- and Deck Equipment

16 Offshore + ocean technology

16.07 Arctic + polar technology

terra.blue - Dr. Walter L. Kuehnlein
Hamburg: +49+40+2546 9970
Houston +1-713-930 2650
wk@terra.blue • www.terra.blue

Advice, concepts and concept/design reviews for offshore systems in ice and/or open waters

17 Maritime services

17.06 Professional Commercial Diver

Hydrex NV
Haven 29
2030 Antwerp / Belgium
Tel. +32 3 213 53 00
Fax +32 3 213 53 21
e-mail: hydrex@hydrex.be
www.hydrex.be

Hydrex provides fast on site repair solutions to underwater problems encountered by ships.

17.10 Consulting

Deutscher Wetterdienst
Bernhard-Nocht-Str. 76
D-20359 Hamburg
Tel: +49 (0) 69 8062 - 6181
E-Mail: seeschifffahrt@dwd.de
Internet: www.dwd.de/seeschifffahrt

– Maritime weather briefing – Weather forecasts on board

18 Buyer's Guide Information

Buyer's Guide

The **Buyer's Guide** provides a market overview and an index of supply sources. Every entry in the **Buyer's Guide** includes your company logo (4 colour), address and communications data plus a concise description of products or services offered.

➲ **For further information please contact:**
Lisanne Groß
Phone: +49/40/23714 - 248
e-mail: lisanne.gross@dvvmedia.com

Publishing

	Schiff&Hafen	Ship&Offshore	Select
Target regions	Central Europe	Worldwide	China, GreenTech, SmartShip
Issues	January / February – March – May – July / August – September – November –	January / February – March / April – May / June – July / August – September / October – November / December –	– – – – – – July / GreenTech August / SmartShip – – – December / China

Price per keyword per issue

	Size I H 30 / B 58 mm	Size II H 40 / B 58 mm
1 Keyword	€ 95,–	€ 125,–
2 Keywords	each € 90,–	each € 120,–
3 Keywords	each € 85,–	each € 115,–
4 Keywords	each € 80,–	each € 110,–
5 Keywords	each € 75,–	each € 105,–
from 6 Keywords	each € 70,–	each € 100,–

Minimum time span for your booking is one year in one target region. Each target region can be booked individually. For bookings in several regions, we offer the following rebate off the total price:

Two target regions/year: 10%
Three target regions/year: 20%

Buyer's Guide Premium online entry + **Buyer's Guide print entry**

Buyer's Guide Online

The premium online entry, including an active link, logo and email, is free of charge for all customers of the Buyer's Guide print issue.

New class for cloud-based simulation

DNV | The classification society DNV has revised its ST-0033 Maritime Simulator Systems standard with the introduction of a new class D for all function areas covering cloud-based simulation. The new standard sets an industry first, and DNV is ready to begin certification of simulators that are compliant.

The use of remote methods to provide training programmes for seafarers has increased during the Covid-19 pandemic as a result of restricted or impossible physical attendance at training and examination centres, DNV noted.

New function areas and new technologies for real operations, as well as statutory requirements, must be covered in all learning programmes. Under the validity conditions of DNV SeaSkill™ Learning Programme Certificates, all real, virtual and cloud-based simulators used as tools in such training and examinations are also required to be DNV certified.

Addressing the need to continue to educate new seafarers and, critically, to enable serving seafarers to renew their existing certificates in accordance with international requirements, a cross-industry project with simulator suppliers and end-users was created to develop a new simulator class D for all function areas covering cloud-based distance learning simulators with virtual reality (VR) requirements.

Until now, physical-realism requirements have described hardware and interfaces, as well as the operating environment, only at a high level in line with the Standards of Training, Certification and Watchkeeping (STCW) Convention.

Although remote simulation is not new technology in itself, the core focus of the revision was on the replacement of hardware with a software-enabled artificial environment presented in such a way that the user suspends belief and accepts it as a real environment (VR) while still maintaining the required behavioural realism, DNV said.

"As one of the first to develop remote, cloud-based simulation solutions, meeting the demand for new training methods, Kongsberg Digital is delighted that DNV has developed this new class D certification. It recognises the value contributed by cloud-based technology in recent months and how it can continue to be an integral part of maritime training in the future," commented Andreas Jagtøyen, EVP Digital Ocean, Kongsberg Digital.

"By formulating class D, DNV is helping to ensure that seafarers can go through their required training in spite of the restrictions of Covid 19," said Captain Aksel David Nordholm, Simulator Certification Specialist in DNV SeaSkill™. "We are now ready to commence required certification of maritime simulators that comply with the new class," he added. "Training is an extremely important safety barrier for shipping, and for DNV to certify training schemes and the latest methods of distance learning is yet another great example of our commitment to safety at sea," said Knut Ørbeck-Nilssen, CEO of DNV Maritime.

Dubai shipyard embarks on digital transition

IFS CLOUD | Drydocks World (DDW), one of the world's largest ship repair companies and a leading offshore construction specialist, has adopted the IFS Cloud platform in its move to implement digital systems across its operations. IFS, a global enterprise applications company with headquarters in Linköping in southern Sweden, will support the shipyard group in improving the performance of core systems including operational efficiency and customer service.

Digitalisation of the company's systems would facilitate more streamlined processes, enhance integration between systems, and enable greater use of real-time data to drive optimised decision-making across the organisation, DDW explained in a statement. It will also enable the company to enhance core technologies such as radio frequency identification (RFID) devices and adopt new ways to raise efficiency such as augmented reality and robotics.

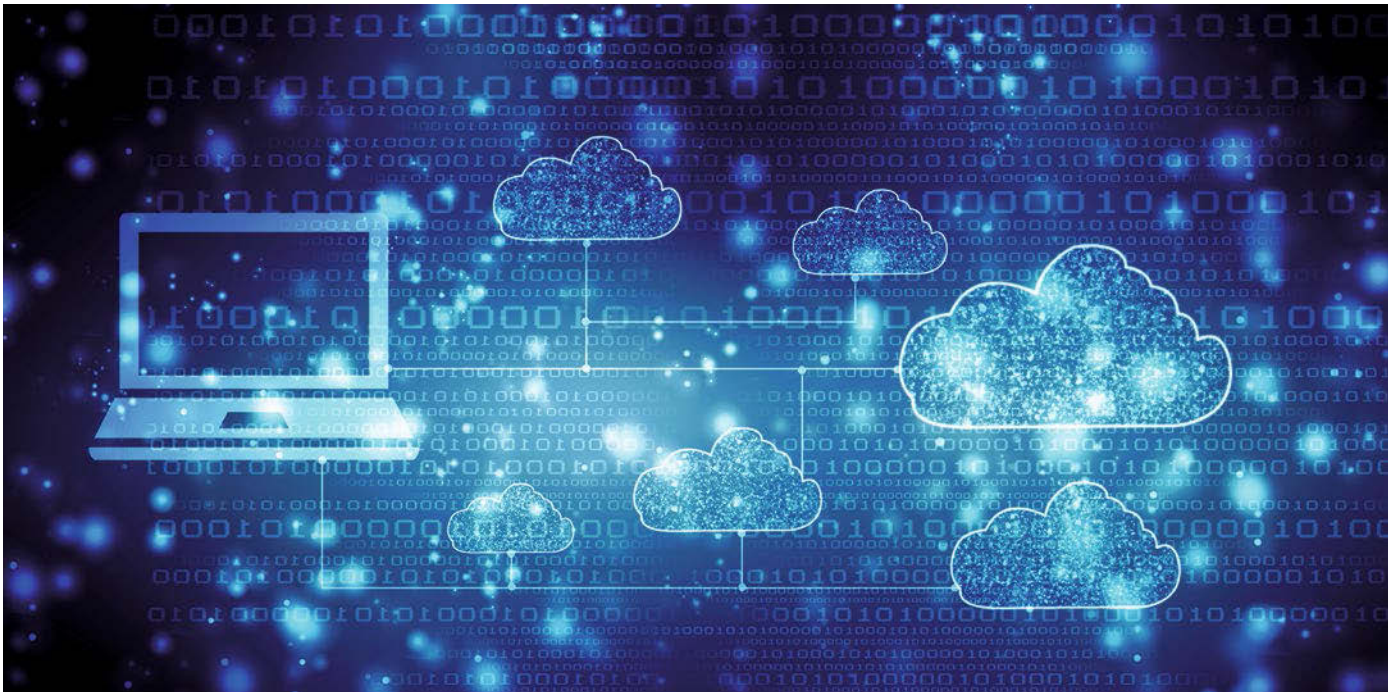
The setup provided by IFS will modernise and automate the shipyard's production and operation capabilities, consolidating core systems and processes into one single product built on a common platform. DDW anticipates that the asset manufacturing modules of the IFS system will increase transparency and automation at its facilities, both in the new construction and repair sectors.

DDW's Capt Rado Antolovic, CEO, commented: "This digital transformation programme is important to ensure we deliver world-class service. With this new system, our people will be better equipped to do their jobs by working with real-time data, integrative platforms and improved knowledge-sharing that will enable them to focus on the areas of their expertise. We chose IFS for its industry experience and expertise, as well as its best-in-class product capabilities."

Aerial view of the DDW shipyard in Dubai Source: Drydocks World

The main drivers for digitalisation

MENTAL WELLBEING Despite the downturn, the Covid-19 pandemic has brought one positive aspect. For many industries, including shipping, it has been a time to embrace digital technology in a completely new way. Alexander Buchmann, managing director at Hamburg-based Hanseaticsoft, looks at the main drivers for digitalisation in the maritime business. Mental wellbeing of the crew is one of the most important aspects here.



Cloud-based options offer a range of benefits for shipping companies

Source: Shutterstock

One of the big drivers for technology adoption across the whole of society has been the move to remote working due to lockdowns and restrictions, which forced many businesses to close offices and move their workforce to home. Shipping companies also sent shore-based teams to work from home where possible, but with varying success.

Those with the right online tools and access to the cloud could already access data and information from any location and continue working, whilst for others it highlighted huge technology gaps. Typically, many were still heavily reliant on paper-based systems and outdated technology.

This prompted a change and led some to invest in technology and move their business into the cloud for the first time. This helped them create a connected workforce and enabled easy exchange of data between crews at sea and teams working remotely.

The real-time sharing of information and data, and having data accessible in one central place, has meant that employees are no longer working in silos and can communicate and collaborate easily with colleagues. This is transforming how businesses operate no matter where they are located.

Business critical information such as important maritime instructions, crew schedules, payroll data and other key communications can be shared by the team onshore with crews at sea. And it can be actioned immediately, ensuring that the company is responsive and dynamic and can react to any situation.

Maritime software is empowering masters on board to take control of crew management and carry out their administration faster and more easily. They can simplify crew management, complete all their work documentation and visas, and schedule their working and rest hours in line with regulations, all in real-time and at the touch of a button.

For example, planning and allocating crew accommodation digitally means always having a digital overview of all cabins and bunks on board, making it easy to keep track and prevent any double occupancy or errors. Masters can also manage tasks such as cleaning and maintenance, and take work shifts into consideration.

Using maritime software also supports the safety of vessels and crews. For example, sending out a fire drill procedure can be completed in just one click to all the vessels that need it. This speeds up communications and saves fleet managers from having to send instructions manually or check if all vessels have received them.

There are tools to enable managers to prepare for different emergencies at sea too, so they can provide crew members with detailed instructions on how to respond effectively in a real emergency. In cases where the crew needs to abandon ship, the management of lifeboats and the assigning of crew members can be undertaken centrally, automatically checking that no lifeboat is overbooked and highlighting any conflicts on a dashboard.

Software is also helping companies automate the entire purchasing process and give real-time visibility over budgets and operating expenditure. Managers can keep on top of stock-taking and procurement

and approve purchases on the go. They no longer need to pick up the phone to request prices or place orders; and they can access the latest offers and deals automatically, enabling them to make more informed and faster purchasing decisions.

Going digital is improving how shipping companies manage maintenance of their fleets too. It enables them to have full visibility of their fleet status and maintenance jobs, so they can manage them and cost them more efficiently. Crew can see immediately which jobs are most critical so they can carry them out quickly and productively.

The need for accurate data

Companies are increasingly reliant on data and technologies that support data management and analysis to improve business decision-making, performance and success. The cloud facilitates the sharing of data from all different sources across the business, including updates from ships which can be transmitted simply and quickly. As soon as the data is entered and synchronised, it can be transferred to the office and accessed immediately by all relevant personnel.

This enables companies to streamline and accelerate processes, including red-flagging areas that need urgent attention to improve efficiency – thus saving both time and money. Without this kind of insight, companies can often be left in the dark as to what is going on operationally and unable to rectify poor systems and processes in a timely manner.

Tools such as Microsoft's Power BI are further helping drive a data culture across the shipping industry and improving business decision-making. This tool is enabling shipping companies to draw data from many different sources, so that it can be analysed in a central place. It provides interactive visualisation tools and business intelligence capabilities and allows users to create their own reports and dashboards.

Companies can process any operational data, giving them access to robust and informative reporting options. Being able to visualise data in a clear and structured way can enable managers to make decisions much more quickly than if they received information from several different sources and then had to collate it themselves.

Data becomes more than just numbers and can be used to give the business clarity, uncover areas that need improvement and highlight growth opportunities. Investing in digital technologies to harvest and analyse this data efficiently will help companies emerge from the pandemic in a much stronger position and ensure they are agile, dynamic and ready to react to any situation.

Looking after mental wellbeing

Cloud-based technology is also offering shipping companies a simple way to look after the health and wellbeing of seagoing personnel. Data from Mental Health Support Solutions (MHSS) [1] showed a growth in mental health problems among seafarers over a three-month period. The report showed heightened anxiety from seafarers on board along with burnout and depression being reported. The mental health service provider also said it saw an increase in master's requests for counselling support.

The latest Seafarers Happiness Index [2] also showed big discrepancies in seafarer welfare, with happiness levels fluctuating significantly. The report also revealed that if Covid-19 issues have brought any single seafaring issue into focus, it has been that of connectivity.

Towards the end of 2020, some shipping companies were doing more to ensure their crews could get online, and this ramped up in the first quarter of 2021. The impact has been very positive, with those who can now stay connected, more easily and cheaply, reporting the impact and improvement on their lives at sea [3].

Being able to send emails or make video calls is something that more companies are recognising as a great way to tackle mental health issues. This can be a real lifeline for seafarers at sea for months. As connectivity improves for ships at sea, offering internet access is a simple strategy for tackling growing concerns around mental wellbeing.

Conclusion

Embracing digital technology is now very much on the shipping agenda and can be a way for companies to 'future-proof' their businesses. Greater connectivity at sea, as well as access to 5G will help shipping companies on their digital journey so that they can take full advantage of cloud-based options. This will enable them to recover more quickly and weather the stormy economic conditions that may lie ahead as the world moves beyond the pandemic.

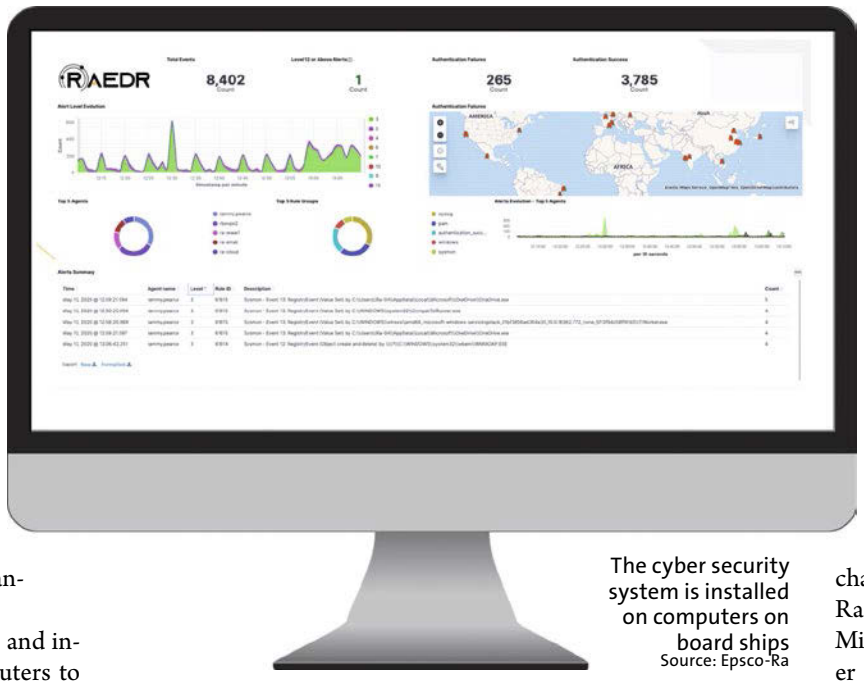
References

[1] https://www.seatrade-maritime.com/ship-operations/rise-seafarer-mental-health-issues-reported

[2] https://www.happyatsea.org/news/article/download-q1-2021-seafarers-happiness-index-report/

Cyprus firm unveils managed cyber security service

CLOUD SUPPORT | Cyprus-based Epsco-Ra Security Systems has launched a managed cyber security service for merchant ships, offshore assets, and passenger vessels. Its Ra Endpoint Detection & Response (RaEDR) is configured for low bandwidth connectivity, providing support through security event monitoring, vulnerability assessment, and security configuration management.



The cyber security system is installed on computers on board ships
Source: Epsco-Ra

RaEDR is downloaded and installed on ships' computers to provide a constant overview of shipboard IT environments, the company explained, providing real-time information on digital dashboards and diagnosing cyber issues. Shipping and offshore companies are provided with 24/7 security monitoring and protection against emerging threats, hackers, and vindictive viruses as soon as the system is remotely deployed. It focuses on identifying vulnerabilities on end points throughout a network.

Computer networks are regularly scanned for vulnerabilities at a frequency specified by customers – once a day, every six hours, or hourly, for example. The system then alerts IT managers to changes in vulnerability status, or threats such as network intrusion. Epsco-Ra security specialists assist in monitoring and analysing data and providing advice to shipping companies. A priority system determines whether or not alerts are sufficiently serious to require immediate attention.

Graphic displays on dashboards provide key metrics on current security, vulnerability and threat-level status. They also reveal significant background detail and security information that enable managers to investigate potential cyber issues or vulnerability changes in more detail.

RaEDR integrates with Microsoft Windows Defender as well as other antivirus software. The setup also works with other operating systems including Unix, Linux and Apple's iOS. The cyber security service, which is available on a free 30-day trial, is fully scalable for any fleet size and charges are levied on a monthly subscription basis.

Marine software firm launches security upgrades

DATA MANAGEMENT | Data communications software provider, GTMaritime, has launched two new products, GTReplicate v1.2 and GTSentinel 8, to provide more cyber security resilience, improved data management, and greater file synchronisation capability.

The latest GTReplicate v1.2, delivered over FastNet, configures, monitors and securely executes fleet-wide file transfer tasks from a central location, the company explained. Fastnet improves security and optimises data streams between ship and shore by removing the need for crew intervention and reducing the number of vessel connections needed.

GTSentinel 8 provides a range of advanced protection features including machine learning, memory scanning, exploit blocking, botnet protection, malicious DNA detections, and a unified extensible firmware interface scanner. Meanwhile, the 'Live' feature provides updates as soon as they are available. Users with low bandwidth/volume data plans can still opt for daily or weekly updates.

GTMaritime's Mike McNally, Global Commercial director, commented: "As digitalisation continues to advance across the maritime sector, it is essential that cybersecurity software meets changing market needs. GTReplicate v1.2 and GTSentinel 8 are the latest fruits of our continuous product development strategy and offer greater resilience than ever before to the evolving threats our customers face.

"The protection provided by GTSentinel 8 is ideally suited to vessels which are VSAT enabled, for example," he continued. "Live updates are based on millions of ESET users worldwide to provide near to real-time protection against emerging threats. With over 8,000 vessels now benefiting from GTMaritime products, we continue to invest in our maritime solutions, so that customers receive the highest level of cyber resilience and efficiency."

Mitigating cyber risks offshore

DRILLING RIGS | Cyber defence expert Naval Dome and the offshore division of an unnamed energy major have completed a joint project to identify and mitigate cyber risks common to offshore deepwater drilling rigs.

Findings from the two-year project, culminating in the installation and pilot testing of Naval Dome's Endpoint cyber defence system aboard drilling rigs in the Gulf of Mexico, indicate that the minimum industry guidelines, regulations and security techniques are out of step with current platform technology, connectivity requirements and cyber-attack methodology.

In a joint research paper presented at the Offshore Technology Conference in Houston, the authors stated: "Activities over two years have demonstrated shortfalls and real challenges that need to be addressed if we are to create a more cyber-secure deepwater drilling rig environment."

In presenting the Cyberdefence of Offshore Deepwater Drilling Rigs paper to conference delegates, Adam Rizika, head of Strategy, Naval Dome, said: "Where systems installed on offshore platforms had traditionally been isolated and unconnected, limiting cyber hack success, the increase in remote monitoring and autonomous control, IOT and digitalisation has made rigs much more susceptible to attack."

Going on to reveal how the test rigs' operation technology (OT) networks were penetrated using a software installation file for dynamic positioning (DP) and workstation charts, Rizika explained that Naval Dome simulated an OEM service technician unwittingly using a USB stick with malicious software containing three zero-day exploits.

"The modified file was packaged in a way that looked and acted like the original one and passed anti-virus scanning without being identified as a cyber attack or picked up by the installed cyber network traffic monitoring system," he said.

Although the attack was carried out internally, Rizika noted remote execution was feasible using the rig's externally facing network connections.

"Penetration testing confirmed how a targeted cyber attack on a deepwater drilling rig could result in a serious process safety incident, with associated financial and reputational impact," he said.

In the paper, the authors state that pilot tests confirm traditional, "perimeter type" IT transplanted OT cyber security solutions, such as anti-virus, network monitoring and firewalls, are not enough to protect critical safety and processing equipment from attack, leaving rigs vulnerable.

Rizika said: "Although industry guidelines and regulations offer minimum standard requirements, we found the advancement in rig technology, connectivity and cyber-attack methodology has outpaced the regulations, driving the need for a more comprehensive approach."

Commenting on the project's findings, Naval Dome CEO Itai Sela, said: "The project and successful pilot testing of a multi-layer cyber defence solution aboard these rigs has demonstrated that both new and legacy OEM systems can be better protected from internal and external cyber attack vectors, without the need for expensive equipment upgrades, or higher overheads that lead to an increase in total cost of ownership."

Flexible access to complex computer systems

KVM The continuing digitalisation of ships and ports comes with a very large volume of data that has to be managed, monitored and evaluated. The aim is to manage resources efficiently, make the best possible use of capacity, and connect logistics players with each other to ensure the smooth flow of goods. Germany's Guntermann & Drunck has developed a KVM (keyboard, video, mouse) system to provide flexible access to the complex computer landscape.

KVM offers flexible and secure access to complex computer systems Source: G&D

The management of the vast amount of data requires a new generation of dynamic, IT-based ships and control centres on the water and on land. A wide variety of systems has to be intelligently connected, and seamless integration of multiple technologies and systems has to be securely made available.

KVM systems provide an optimal and secure basis for visualisation, control and monitoring of complex processes in maritime control room environments. They allow servers to be offloaded from the control centre, the ship's bridge or the productive work environment. The computers are housed in access-protected and air-conditioned server rooms. And computer signals are extended from the server room back to the workstations in the control centre via Category cable, fibre-optic cable or IP structures and made available via workstation modules.

Full access control – remotely and in real time

KVM also helps to harmonise the computing landscape and provide users with homogeneous access to a wide range of systems. This means that KVM matrix systems enable any user to connect to any computer and therefore react to changing situations and conditions. The systems provide flexible access to the complete underlying computer landscape – in real time and with full access control, KVM manufacturer Guntermann & Drunck (G&D) said.

Focus on security

KVM provides a secure basis for working in the maritime control centre. Cyber security and network separation are central here. KVM systems do not require software installation. Although the computers can be operated from the same workstation, they do not have to be interconnected at the data level. Classic dedicated KVM systems use standard interconnection technology based on copper or fibre optics, creating a proprietary "network".

This offers a major security-related advantage because the networks are kept separate. The KVM systems can be set up and operated completely separately from the general network, which minimises risks in everyday IT operations. In addition, KVM systems can be used to set up far-reaching redundancy concepts and therefore ensure system-wide fail-security.

With classic KVM systems, physical access in the server room is usually necessary to be able to manipulate the system, for example to integrate additional devices. This is gradually changing with the arrival of more and more IP technology in port control rooms and on ships. Now it is not physical access in the server room that poses the greater risk here, but rather access from the outside via the internet or even

internally via the typically easier access to the network.

Using appropriate software or operating systems, it is perfectly possible to scan the entire internal network for so-called security vulnerabilities. Most often, the weakest link in the chain is targeted and attacked. Such attacks could be, for example, so-called "man-in-the-middle" attacks, where the complete network traffic is passed on to a "third party". That is why network separation and network segmentation are important tools to protect the actual control room applications from cyber attack.

The security of mission-critical applications, such as on ships and in ports, is correspondingly higher, and the security mechanisms are therefore significantly more important. The typical security mechanisms used here are VPNs, VLANs or secure encryption. They are of extraordinary importance to limit access. "Sniffing" of input data, especially keyboard data (logins, passwords, etc.), is even more critical than data being read.

Secure encryption is absolutely essential at this point (AES 128 or AES 256 as a secure standard) as well as regular exchange of the security key so that it cannot be read over time. It is imperative to exchange the key at the shortest possible intervals. To secure KVM systems consistently, G&D has developed features such as unique identification number (UID) locking, which determines which device pool belongs to the system so no other KVM end devices can be added or modified.

KVM end devices from G&D do not store any information. This means that it is not possible to read a physically stolen device to obtain cached credentials. In addition, so-called "keyloggers" have no function on the keyboard and mouse interfaces of G&D devices. Optional USB 2.0 data connections can be disabled via intelligent user management at hardware level.

G&D uses two different ports for its KVM-over-IP systems for the transmission of all highly critical data in the IP network via a VPN tunnel. The first port that is established from all KVM end devices to the KVM matrix ControlCenter-IP (CC-IP) is the so-called "control port". A self-developed authentication plug-in is used to negotiate the communication of the end devices with the CC-IP.

This port is also used for the exchange of the respective security keys, which are generated by the CC-IP for each individual end device. The second port is called the "communication port". With G&D's KVM-over-IP, keyboard and mouse data are transmitted via a separate port from a CPU (computer connection module) to CON (workstation connection module) via the CC-IP.

Of course, this process also takes place in reverse for C/M inputs on the user side. This technology ensures that the keyboard and mouse data are specially separated from the actual AV data to counteract so-called "man-in-the-middle" attacks. If the destination IP address or VPN tunnel is compromised, the KVM end devices, as well as the matrix system, go into security mode and stop transmitting data. The VPN tunnel is based on "IKEv2 Strongswan" with an AES-128 bit encryption.

The video data is transferred from the computer module to the workstation module via user datagram protocol (UDP) and MultiCast. This video stream, which is converted to G&D's own proprietary protocol before being sent, is also encrypted using AES-128 bit technology.

Sensitive information such as login credentials and passwords are stored permanently encrypted in the database of the CC-IP matrix system.

This database is implemented in G&D's operating system, is trusted platform module (TPM) protected, and is also based on a hardware raid. Possible modifications of the firmware can be detected at an early stage, which leads to an interruption of the boot process. Attempts at manipulation, such as smuggling in a keyboard sniffer, are prevented.

Remote vessel monitoring and administration

Keeping the security of IP-based systems in focus while still providing remote vessel monitoring and administration capabilities is more important than ever for many operators. The pandemic has shown how important "remote working" and remote access to in-house systems are.

G&D's solution for this is called RemoteAccess-GATE. This stand-alone device acts as a link between the KVM system and the network world, providing remote access to the IT infrastructure connected to the KVM system via LAN, WAN and the internet. The use of RemoteAccess-GATE in maritime applications is particularly interesting, as it also enables remote administration and remote IT support on ships from the mainland.

The RemoteAccess-GATE also meets the highest security requirements, G&D said. Security features include AES encryption, LDAP, Active Directory and RADIUS directory server integration, user and group permissions, IP access control, login restrictions, KVM session encryption, SSL certificates, configurable security banner, monitoring log, SNMP/Syslog event logging and notifications, and secure passwords.

AI the focus of new study

FRAUNHOFER CML The study "Terminal Operating Systems 2021" by the Fraunhofer Center for Maritime Logistics and Services CML comprises information on providers and systems available on the market. It presents their offerings in a clear and comparable way, write Patrick Zimmerman and Julius Küchle, research associates of the group "Ports and Transport Markets" at Fraunhofer CML.

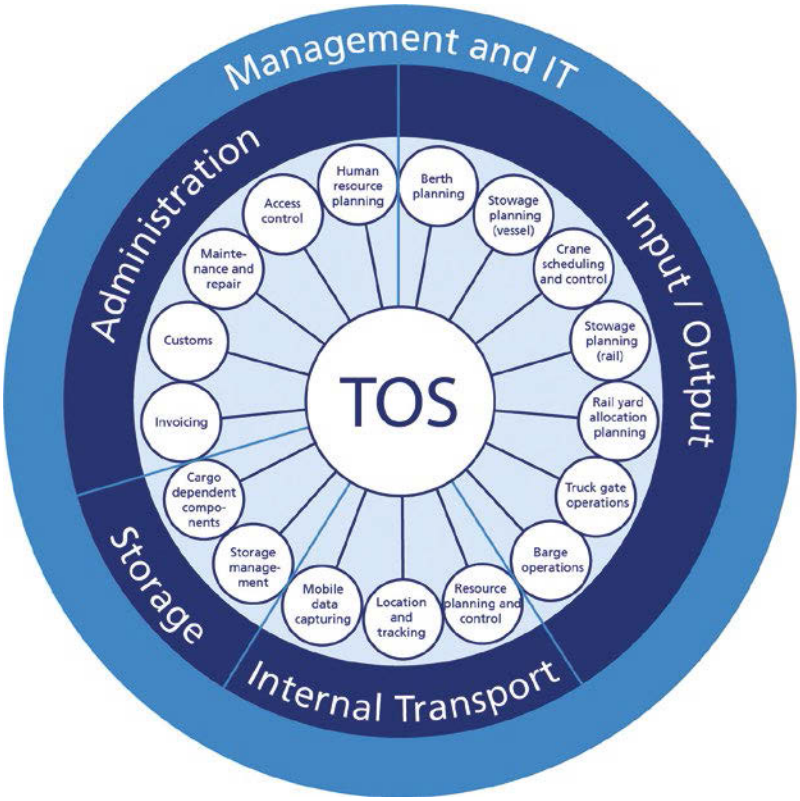


Figure 1: Core and functional areas of TOS

Source for both images: Fraunhofer CML

The fourth edition of the market overview Terminal Operating Systems (TOS) puts its focus on the implications of artificial intelligence applications for the way terminals function and are managed today and in the near future. "In doing so, the study aims to provide a basis for selection and decision-making processes," is how the CML formulates its claim and presents detailed information on more than 20 core and functional areas (Figure 1). The target group includes cargo terminal operators, including the RoPax segment, and corresponding TOS providers, while pure passenger and cruise terminals are not considered here.

Terminals in competition

Today, terminal operators worldwide are in fierce competition. To operate successfully, they have to improve continuously. New technologies, constantly changing and rising customer demands, and increasing regulatory requirements, add to the pressure. The global Covid-19 pandemic has further exacerbated the situation and led to sometimes chaotic conditions and delays at ports.

Detailed market overview

As the requirements on terminal operators grow, so do the demands on TOS providers. Their IT systems are expected to make significant contributions to more efficient operations. A complicating factor for TOS providers is that the world's ports are extraordinarily diverse and heterogeneous. While the basic IT architecture remains comparable (Figure 2), many details of individual components have to be tailored to each specific terminal.

In addition to increasing productivity and efficiency through the use of AI, terminal operators are hoping for additional cost savings from modern TOS through the automation of processes. The selection and implementation of TOS is therefore not a trivial task for either side. The declared aim of the Fraunhofer study is to support and facilitate this process on both sides – for terminal operators and TOS providers. For the Market Overview 2021, 38 relevant TOS providers were identified worldwide. The study presents their different products, modules and system approaches clearly and according to task areas. This makes it easier for terminal operators to get in-depth insights into the market and to find the right provider for the respective task.

Data is the key

Expectations for new, AI-based systems are high throughout the entire logistics chain. The second focus of the study, alongside the market overview, is to outline what applications from the AI field can already be used in terminal operations today and what can be expected from them in the future in terms of greater efficiency, higher productivity, increased safety and cleaner operations.

The researchers distinguish between three "innovation paths". According to their analysis, AI is primarily used in decision support systems that are based on an evaluation of very large, connected data sets. Deep-learning algorithms and neural networks can thus uncover patterns in data with a size too large and complex for insightful analysis. This is particularly relevant for forecasts, which become more accurate thanks to the use of AI and also require less user input and maintenance compared with conventional forecasting techniques.

Secondly, the Fraunhofer scientists see a lot of potential in solving optimisation problems that often occur in terminal operations in areas such as congestion planning or scheduling. For example, AI systems are able to create duty rosters that meet predefined operational requirements with minimal input and in a short time. The study also sees similar potential for other optimisation problems.

Timely repairs, fewer failures

The third innovation path relates to maintenance and repair modules. For example, AI-supported TOS are expected to contribute significantly to predictive maintenance by assessing wear and tear more reliably. Tedious and expensive interruptions due to repairs or failures, which in the worst case bring the entire terminal operation to a standstill, could thus be reduced or avoided with the help of AI.

The authors point out that the implementation of AI in TOS requires some preliminary work. Since the systems presented are usually controlled by data and not, as is the case with conventional systems, by user input, a comprehensive data infrastructure must be built up in advance.

In view of the dynamics in the further development of TOS, the researchers recommend that terminal operators and providers should cooperate closely in the further development and implementation of this still comparatively young technology. In this way, requirements and needs from daily work can be taken up by the TOS providers and taken into account in future adaptations of the IT systems.

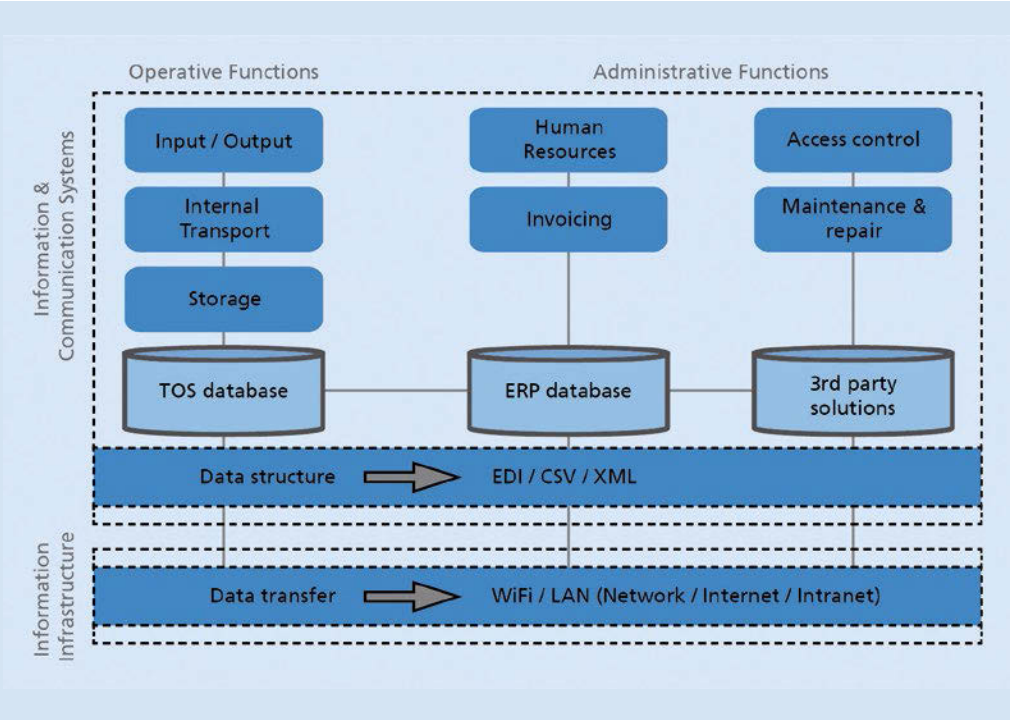


Figure 2: Typical IT architecture of a terminal operating system

Meanwhile, expensive bad investments in unsuitable or less suitable approaches can be avoided through good advance information. The study "Terminal Operating Systems 2021" offers terminal operators a sound and comprehensive basis for making informed decisions and finding individually suitable suppliers and partners.

Partners claim first digitally controlled port arrival in Tangiers

KOBE EXPRESS | Wärtsilä Voyage, Tanger Med Authority, and Hapag-Lloyd are claiming to have successfully undertaken the world's first digitally controlled port arrival recently when the 4,612-TEU *Kobe Express* docked on time at the end of a voyage from Cartagena in Colombia to Tangiers, Morocco. The Hapag-Lloyd vessel, managed by Anglo Eastern, was digitally linked to the port by Wärtsilä Voyage's Navi-Port system and, through real-time communication, had its speed adjusted for just-in-time (JiT) arrival, thereby saving fuel and avoiding waiting time at anchor.

Wärtsilä Voyage and Tangiers, Africa's largest container port on the Strait of Gibraltar, are jointly developing a Port Management Information System (PMIS) together with port consultants, PortLink. The system incorporates Wärtsilä's Navi-Port system as a key facilitator in implementing JiT arrivals.

Project partners have all been positive about the successful results. Describing the outcome as a "momentous accomplishment", Dmitry Rostopshin, general manager for Ship Traffic Control at Wärtsilä Voyage, declared: "We have moved beyond pilot and testing projects to real-life applications, and we see this as kick-starting a trend that will make both shipping and port operations more efficient and less carbon-intensive."

Khalid Samir, Harbour Master at the north African port, said: "Tanger Med is committed to providing high-level services to shipowners and international maritime alliances to ensure calls in the best condition. This is an important milestone in our joint project with Wärtsilä."

Speaking for Hapag-Lloyd, the company's managing director of Digital Business, commented: "Technology is moving forward quickly in the shipping industry, and this world-first achievement is evidence that we are entering an era of high efficiency and better environmental performance, which will benefit all industry stakeholders. Congratulations to Wärtsilä and Tanger Med Port Authority for helping to make this happen."

The project, completed at the end of June, has significant implications for the global ports industry. Experts have recently warned that many ports and terminals have failed to keep up with latest digital developments. Worsening congestion at key container ports in Asia, United States and Europe during July and August has provided clear evidence.

Heavy-lift owner chooses all-in-one performance monitoring package

Roll Group will install a combined We4Sea-Inmarsat performance monitoring and communications package across its fleet of specialised vessels Source: We4Sea

WE4SEA | Netherlands-headquartered heavy-lift and project cargo specialist, Roll Group, has chosen to install a combined We4Sea-Inmarsat performance monitoring and communications package across its fleet of specialised vessels. The company's decision comes after trials on board the semi-submersible heavy-lift ships, *RollDock Star* and *RollDock Storm*, without upfront costs.

This was possible because We4Sea is now an Inmarsat certified application provider (CAP) and so the We4Sea Fleet Data performance monitoring system and Inmarsat's Fleet Xpress is available as a turnkey package. We4Sea is now one of more than 40 Inmarsat CAPs who can offer applications via the Fleet Xpress network.

We4Sea's performance monitoring application does not require hardware on board ship. It uses a digital twin as a basis for optimal data which can then be compared with real-life reports. Any variations are then flagged as inefficiencies that need action or attention. The We4Sea cloud analytics uses dedicated Fleet Data bandwidth to secure always-on, or on-demand connectivity between ship and shore via an application programming interface.

Inmarsat's Marco Cristoforo Camporeale, head of Maritime Digital, sees the combination of free-of-charge Fleet Data and the no-risk application testing as a "tipping point" for maritime digitalisation. "This is the first example of a future-proof IoT setup for ships that allows owners to investigate digitalisation without commitment," he declared.

"They can assess the applications off the shelf and, if they work, agree on terms. In this case, the We4Sea trials on the *RollDock Star* and *RollDock Storm* helped optimise speed and generator efficiency that led to a significant cut in fuel consumption."

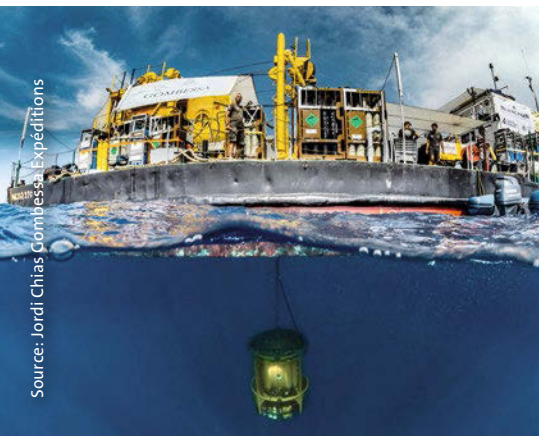
Roll Group Fleet director, Michiel van der Knapp, said: "We4Sea and Inmarsat's solution improves our monitoring possibilities and increases the effectiveness of communication with vessels. In this way we can keep investing and improving our state-of-the-art vessels."

Dan Veen, founder and CEO of We4Sea, commented: "A lot of owners understand that their vessels should be connected to the internet, but still think in terms of remote monitoring based on conventional connectivity using expensive bandwidth. Using an IoT-based platform, We4Sea has proved itself to be able to deliver measurable performance improvements, even when connecting to only eight standard shipboard datasets at a fixed monthly fee.

"We are delighted that our solution is now available under the terms of Inmarsat's Certified Application Programme," he added. "Having established our solution on container ships, bulk carriers, and heavy-lift vessels, we are now very much in the scaling-up phase."

Inmarsat's Camporeale concluded: "Building Fleet Data capability into Fleet Xpress has allowed Roll Group to make up its own mind about third party applications based on individual merit and without upfront costs. The fact that the customer moved so swiftly from trial to fleet-wide commitment is a testament to the We4Sea application and the embedded Fleet Data as a true digital enabler."

Upgraded satcoms support data transfer in Mediterranean research project


Source: Jordi Chias Gombessa 6 Expéditions

The Gombessa 6 saturation barge and the submerged turret

GOMBESSA 6 | Maritime satcoms provider, Marlink, has enabled the high-speed transfer of large data volumes in a recent Mediterranean research project, Gombessa 6, undertaken by French environmental research group, Andromède Océanologie. Project partners were studying coralligenous atolls close to Cap Corse on the northern tip of Corsica.

During the three-week mission, connectivity provided by Marlink enabled the team to stream video, and to collect and transmit large data files relating to the atolls from the platform supply vessel, MV *Pionnier*, operated by SeaOwl, a maritime services company, on behalf of the French Navy. Satcoms systems on board the ship had been upgraded by Marlink in preparation for the project at a port call in Toulon in June.

Tore Morten Olsen, president, Maritime, Marlink, commented: "Marlink's support to Andromède Océanologie is a real-life example of how we go 'Above and Beyond' to support vital research initiatives evaluating the ecological status of the world's oceans. By providing research teams with the smart hybrid connectivity, they need to better understand the impact of human activities on our oceans, we play our part in sustainability and demonstrate stewardship of the planet."

Ship&Offshore

THE INTERNATIONAL PUBLICATION FOR OFFSHORE & MARINE TECHNOLOGY

www.shipandoffshore.net
www.schiffundhafen.de
www.dvvmedia.com

› IMPRINT

PUBLISHER
DVV Media Group GmbH
Postbox 10 16 09, D-20038 Hamburg
Heidenkampsweg 73-79, D-20097 Hamburg
+49 40 23714 - 02

MANAGING DIRECTOR
Martin Weber

PUBLISHING DIRECTOR
Manuel Bosch
manuel.bosch@dvvmedia.com

EDITORIAL STAFF
Editor-in-Chief
Dr.-Ing. Silke Sadowski
+49 40 23714 143 | silke.sadowski@dvvmedia.com
Deputy Editor-in-Chief
Kathrin Lau
+49 40 23714 237 | kathrin.lau@dvvmedia.com
Offshore Advisor
Dr.-Ing. Walter Kuehnlein
+49 40 2261 4633 | walter@kuehnlein.me

ADVERTISING
Advertising Director
Markus Wenzel
+49 40 23714 117 | markus.wenzel@dvvmedia.com
Advertising Sales
Lisanne-Christin Groß
+49 40 23714 248 | lisanne.gross@dvvmedia.com
Alissa Holtei
+49 40 23714 283 | alissa.holtei@dvvmedia.com
Gerald Ulbricht
+49 6195 9769734 | gerald.ulbricht@dvvmedia.com
Director Technical Department
Pascal Hofer
+49 (0)40 23714 130 | pascal.hofer@dvvmedia.com
Technical Department
Sabriany Harun
+49 40 23714 263 | sabriany.harun@dvvmedia.com

Advertising rate card:
No 13 valid from January, the 1st, 2021

ADVERTISING REPRESENTATIVES
Germany, Austria, Switzerland
Gerald Ulbricht
+49 6195 9769734 | Mobile +49 170 3859573
gerald.ulbricht@dvvmedia.com
Scandinavia
Örn Marketing AB
+46 411 18400 | marine.marketing@orn.nu
Japan, South Korea, Taiwan, Australia, New Zealand
Alan Ross
+ 852 28714282 | alan.ross.extern@dvvmedia.com
Singapore
Marimark Pte Ltd., John Bodill
+65 6719 8022 | john.bodill@marimark.com.sg
China:
Ship Engineering Editorial & Publishing House,
Wang Nana
Telefon: +86 21 54256515, Fax: +86 21 54595766
cbsb2012@gmail.com

SUBSCRIPTION/DISTRIBUTION
Director Sales + Marketing
Markus Kukuk
+49 40 23714 291 | markus.kukuk@dvvmedia.com
Readers'/Subscribers' Service
+49 40 23714 260 | service@shipandoffshore.net

SUBSCRIPTION TERMS
The minimum subscription period is one year. Subscriptions may be terminated at the end of any subscription period by giving six weeks' notice. The publishers accept no liability if it is not possible to publish the magazine due to force majeur or any other cause beyond their control.
Additional digital subscriptions
Acquisition on request.

ANNUAL SUBSCRIPTION RATES
Abonnement
Germany EUR 138.00 (plus 7% VAT) per year | outside Germany EUR 175.00 per year;
Single copy
EUR 28.70 (incl. VAT).
GMT members receive the magazine within their membership.

PRINTING HOUSE
Silber Druck OHG, Lohfelden

ISSN: 2191-0057

MEMBER

Deutsche Fachpresse
Auflagenkontrolle

SHIP&OFFSHORE IS OFFICIAL ORGAN OF THE ASSOCIATIONS:

GMT
German Association for Marine Technology

FSM
Forschungsvereinigung Schiffbau und Meerestechnik e.V

› ADVERTISERS


KONGSBERG
OFF
SHORE
WIND
EXPERTS
KONGSBERG's proven state-of-the-art technology solutions are powering the green evolution.
Shaping the future of the offshore wind industry.
kongsberg.com/maritime/campaign/offshore-windfarm/
Autorisierte Auflage zur Verbreitung bei der Husum Wind 2021

QUALITY MEDIA FOR MARITIME EXPERTS

Test now!

New Ships ▶ Informs about the most important developments in the international shipbuilding industry

Ship&Offshore ▶ The world's leading specialist medium for maritime technology

Maritime Archives ▶ Expert knowledge for the entire maritime market

DVV Media Group

www.shipandoffshore.net/trial

New Ships Ship&Offshore Maritime Archives

Test now!

CONVINCE YOURSELF!

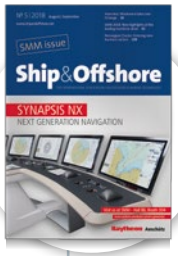
New Ships

- exclusive information service in English language
- provides worldwide reports on "Prospects and Orders" of new ships
- publishes brief summaries on the most important developments in the global shipbuilding industry

MEDIA PACKAGE

- **E-paper:** every Thursday as PDF by E-Mail
- **Online:** access to all New Ships content on www.new-ships.net
- **Archive:** full access to all articles from Schiff&Hafen and Ship&Offshore since 2010 as well as to the issues of New Ships
- **App for smartphone and tablet:** all issues available on your mobile devices

▶ **Annual Subscription abroad: EUR 650,- excl. VAT**



Ship&Offshore

- international magazine for shipbuilding, offshore and marine technology
- is supplemented by special country and thematic editions
- reports on current trends and developments in all areas of the maritime industry

MEDIA PACKAGE

- **Print:** 6 issues per year
- **E-paper:** already informed in advance with the PDF issue
- **Archive:** access to all Ship&Offshore content since 2010 in the Maritime Archives
- **App for smartphone and tablet:** all issues available on your mobile devices

▶ **Annual Subscription abroad: EUR 175,- excl. VAT, incl. Postage**

Maritime Archives

- comprehensive specialist database for the maritime industry
- all articles from Schiff&Hafen, Ship&Offshore and New Ships combined in one archive
- instant download of all articles in original layout and with fixed URL

▶ **Annual Subscription: Basic: EUR 185,76 excl. VAT • Premium: EUR 650,- excl. VAT**
▶ **30 days premium access: 49,- incl. VAT**

kundenservice@dvvmedia.com | +49 40 237 14 240
DVV Media Group GmbH, Heidenkampsweg 73-79, D-20097 Hamburg

DVV Media Group

www.shipandoffshore.net/trial

New Ships Ship&Offshore Maritime Archives