

PORT GEAR

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PORT GEAR IS A SPECIAL ISSUE OF

Baltic Transport
Journal

bimonthly-daily companion



The Port of Opportunities

The Port of HaminaKotka is a versatile Finnish seaport serving trade and industry. The biggest universal port in Finland is an important hub in Europe and in the Baltic Sea region.

Welcome to the Port of HaminaKotka!



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Location, location, location.

Let's repeat that one more time. Location. It's important for every property. And perhaps especially so for ports. Take the Port of Oxelösund for example. Draw a circle around the whole Baltic Sea and we're pretty much in the middle. Close to everything. Convenient for transports. And speaking of logistics, how about our direct access to both railway and motorway E4? And our 16,5 meter port depth, ice-free all year round? That's what we call location, and it's worth saying more than once.

The Port of Oxelösund is more than a port. We are a business partner who solves your logistical challenges and helps optimize your goods' journey, from start to finish. Our goal is to be the Baltic's leading port terminal, with Europe's best stevedoring services.

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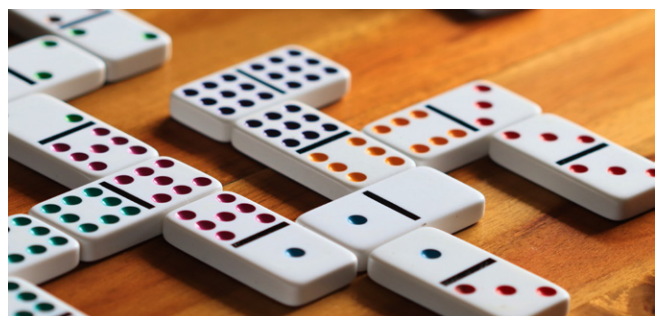
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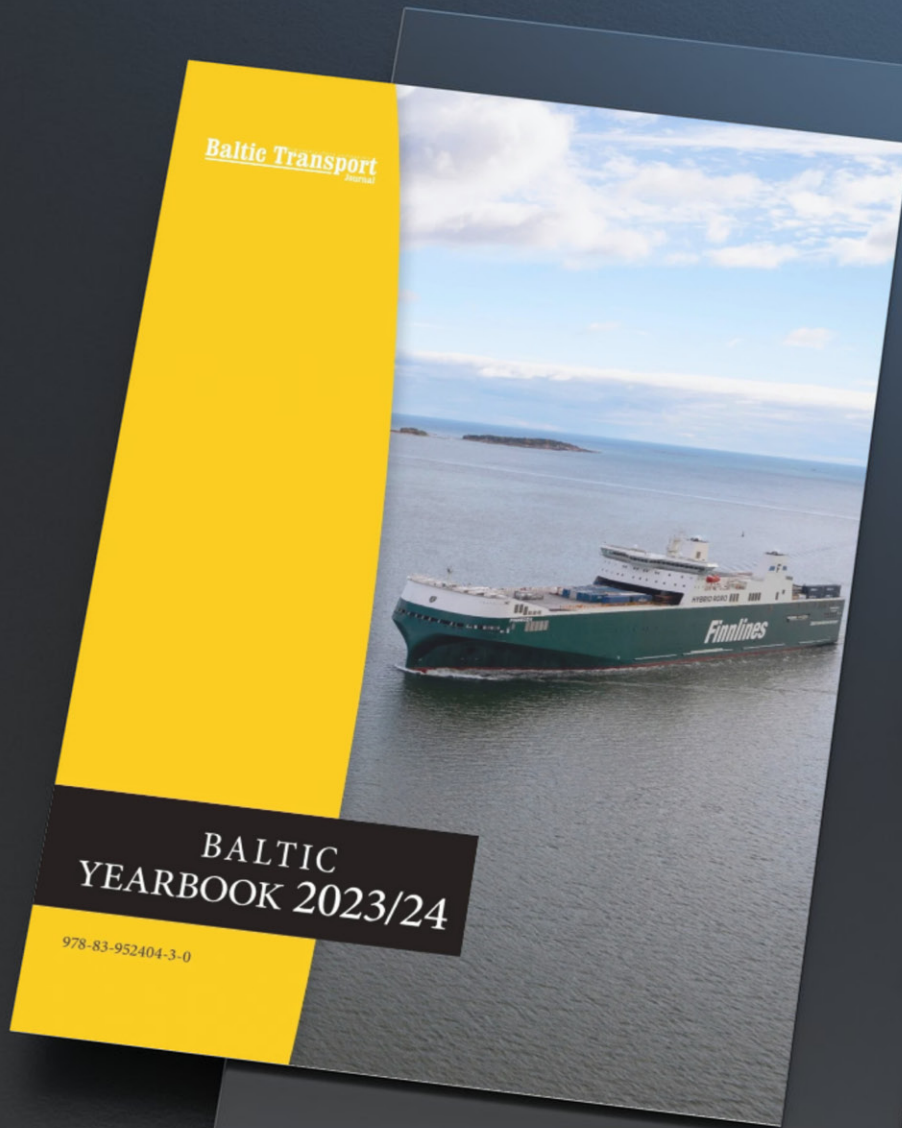
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EMIL BERLIN AND JOHANNA STAPELBERG



Baltic Yearbook 2023/24 is out!



preview



PREVENTION OF PEST CONTAMINATION OF CONTAINERS: JOINT INDUSTRY GUIDELINES FOR THE CLEANING OF CONTAINERS – UPDATED

The Bureau International des Containers, the Container Owners Association, the Institute of International Container Lessors, and the World Shipping Council (WSC) – joined this time also by the **International Cargo Handling Coordination Association** – have released the latest version of the easy-to-use **best practices to avoid carrying unwanted stowaways**. “Every year, 250 million containers are transported across the world with food, clothes, electronics and other goods we all need. While crucial for the smooth functioning of the global supply chain, containers and their cargoes can also harbour and transfer

contaminating pests. [...] Experience shows that the introduction of new pests can severely upset an existing ecosystem, with serious ecological consequences and possibly billion dollar impacts on a nation’s economy,” the parties highlighted in a press release. Lars Kjaer, Senior Vice President of WSC, added, “Each party in the international container supply chain has a custodial responsibility to make sure cargo and containers are clean when they arrive and when they leave their care. If we all live up to these standards, containers will reach their destination faster, and our agriculture, forestry and natural resources will be protected.”

TT CLUB JOINS TFG

The freight insurance specialist has become a part of the UK’s **Department for Transport industry-led Task and Finish Group (TFG)**, set up to explore raising standards in truck parking facilities to improve driver welfare and cargo security. “TT applauds the UK Government’s initiative and is grateful to add its experience of trends in cargo theft and the modus operandi of criminals in order to encourage adoption of standards at truck stop facilities,” said **Mike Yarwood**, TT Club’s Managing Director of Loss Prevention, who chairs one of the working groups looking at parking standards. In recent years, TT Club has ramped up its campaign to increase awareness of the risks associated with overnight parking of trucks, not just in the UK but across Europe as a whole. **The insurer emphasised in a recent report**, penned together with **BSI**, that over 70% of cargo thefts in 2023 around the world were from trucks. TFG offers an opportunity for a unique gathering

of individuals from industry bodies, truck park and motorway service operators, the police force, standards organisations, insurers, and users to explore, identify and understand the blockers to and opportunities for better security and safer rest facilities for those dubbed the ‘knights of the road.’ TFG will survey why those operators of secure facilities adopt current standards, identify the highest crime locations across the last four years, explore greater use of automatic number-plate recognition/closed-circuit television equipment, and map violent crimes against drivers. “The extent to which the UK and EU economies rely on trucking is staggering. As industry stakeholders, we must strive to both increase the safety of drivers and decrease the loss of cargo. That is why it is hoped that this TFG will result in longer-term strategies to improve the current truck parking landscape in the UK, and, in addition, that useful guidance can be offered to EU legislators,” added Yarwood.

MANDATORY REPORTING FOR CONTAINERS LOST AT SEA

During its 108th meeting, the **International Maritime Organization’s (IMO) Maritime Safety Committee** adopted amendments to the **International Convention for the Safety of Life at Sea (SOLAS)**, mandating as of 1 January 2026 that all containers lost at sea should be reported. “The new regulations, specifically amending SOLAS Chapter V Regulations 31 and 32, mark a significant advancement in maritime safety and environmental protection. By ensuring prompt and detailed reporting of lost and drifting containers,

these amendments will enhance navigational safety, facilitate swift response actions, and mitigate potential environmental hazards,” commented **Lars Kjaer**, Senior Vice President at the **World Shipping Council**. His organisation, in anticipation of introducing mandatory reporting requirements, has since 2008 gathered information from its members on the number of containers lost at sea. **The latest report** speaks of 221 boxes lost in 2023 (with a recovery rate of about 33%), a reduction from the previous lowest-ever loss of 661 the year before.

CARGOES OF CONCERN

The **Cargo Integrity Group** has identified 15 commodities, commonly carried in containers, that, under certain conditions, can cause dangerous incidents. While these are usually transported safely when regulations and guidelines are followed (such as the **Quick Guide to the CTU Code**), the Group has created this list to highlight cargoes that can become hazardous if mishandled. The industry bodies forming the Group emphasise that cargoes that are mis-declared or have incomplete or incorrect information about their identity are more likely to be involved in incidents. The Cargoes of Concern list is not exhaustive, but each item illustrates a common type of hazard, divided into three categories. First, reactive hazards: these can catch fire and cause significant damage and casualties in specific circumstances. Second, spill or leak risks: these commodities can present a risk if not packed properly or if they are damaged; spills or leaks from such cargoes can harm the health of people cleaning up the spill as well as the environment. Third, improper packing: cargoes that are poorly or incorrectly packed or secured in the container can lead to injuries to personnel or damage to nearby containers, property, or other

shipments; such incidents can cause severe accidents at sea or on land, like truck rollovers and train derailments. The Cargo Integrity Group also plans to publish additional guidance on the identification and safe handling of these cargoes. “The combined experience of our organisations has been harnessed to identify these categories and result in pinpointing some commodities where the risks are perhaps less obvious. While the potential dangers of transporting, for example, calcium hypochlorite or lithium-ion batteries might be more widely appreciated, the combustible qualities of seed cake or the hazards associated with cocoa butter or vegetable oils, will be less well-known,” shared **Peregrine Storrs-Fox**, Risk Management Director at TT Club. **Lars Kjaer**, Senior Vice President of the **World Shipping Council**, added, “Every actor in the global container supply chain is responsible for the health and safety of not only their own people but also those at any onward stage of the container’s journey. Complying with regulations and following the advice in the CTU Code saves lives, and we appeal to everyone shipping, packing and handling commodities that fall within the categories of these Cargoes of Concern to be particularly diligent.”

LEX MARITIMA

After a decade of work under the Comité Maritime International's (CMI) International Working Group, the 25 major global principles of maritime law have been put on paper for the very first time. **The Draft CMI Lex Maritima** was prepared on the initiative of Eric Van Hooydonk, a Ghent University Professor and a lawyer in Antwerp. In 2014, he argued in the *Journal of International Maritime Law* that, although the existence of a common Lex Maritima is accepted worldwide, the principles in question have never been precisely identified nor formulated in a set of rules. At the Professor's suggestion, the CMI launched a project to draft the Lex Maritima. Van Hooydonk carried out research on national legal systems to

distil the major, globally accepted common principles from them and drafted the instrument. "It was a fascinating job to search for the deepest, universal core in the vast multitude of international and national maritime rules," he commented. The *Draft CMI Lex Maritima* comprises principles on fundamental issues, such as the interpretation and sources of maritime law, the status, ownership and management of ships, the responsibilities and liabilities of ship-owners and operators, the shipmaster, the pilot, the limitation of liability, maritime contracts, chartering agreements and contracts of carriage, collision, salvage, general average, wreck removal, liens and mortgages on ships, arrest and detention of vessels, and time bars.

PARIS MOU PERFORMANCE LIST

The Paris MOU Committee approved at its 57th meeting the 2023 inspection results and adopted new performance lists (in use from 1 July 2024 to calculate the ship risk profile) for Flag States and Recognized Organizations. The **White, Grey and Black (WGB) List** presents the full spectrum, from quality flags to those with poor performance that are considered high or very high risk. The WGB List is based on the total number of inspections and detentions during a three-year rolling period for flags with at least 30 inspections in that period. The White List represents quality flags with a consistently low detention percentage. Flags with average performance are shown on the

Grey List; their inclusion may serve as an incentive to improve and move to the White List. "At the same time, flags at the lower end of the Grey List should be careful not to neglect control over their ships and risk ending up on the Black List the following year," Paris MOU stressed in a press brief. The latest WGB List features 71 flags: 42, 17, and 12, respectively (vs. 2022's 66: 39, 18, and nine in the respective categories). The Baltic Sea region's Denmark tops the White List, with Finland in the Best 10 in 6th place. Sweden (15), Germany (21), Estonia (28), Lithuania (34), and Poland (40) are also on the White List, whereas Latvia (43) opens the Grey List.

THE FUTURE OF MARITIME SAFETY REPORT

The 2024 version of Inmarsat Maritime's **report** reveals that Global Maritime Distress and Safety System (GMDSS) calls decreased by 7.6% in 2023 over the previous year. Despite this decline, the service was still triggered on 788 occasions and remains close to the six-year annual average of 799 calls. As well as providing a snapshot of current safety metrics, Inmarsat wants to use The Future of Maritime Safety Report as a call to action for the maritime industry to embrace data sharing and collaborative problem-solving as the sector strives to navigate through significant changes (including the transition to greener propulsion technologies and escalating geopolitical tensions). The report suggests that any concerns regarding data pooling related to confidentiality or reputational damage could be addressed by anonymising casualty and incident data. It recommends that the shipping industry establishes a list of standard data points to monitor and report, including casualties

and incidents, injuries or deaths at sea, and near misses. It also endorses trend analysis to support the development of safety measures, with a particular emphasis on developing risk treatments for well-known and recurring issues. Peter Broadhurst, Senior Vice President Safety and Regulatory at Inmarsat Maritime, said, "By harnessing the power of anonymised safety data, we can identify trends, develop specific mitigation measures, and enhance the overall safety of our ships and crews." He furthered, "Although progress has been made, shipping continues to experience significant casualty rates. We collect vast amounts of safety data, yet the current siloed-working model hinders our ability to fully leverage the actionable insights available to us. By pooling data, we can create a more holistic and objective view of maritime safety to inform performance improvements and ultimately reduce the occurrence of preventable safety incidents to save lives at sea."

SEAFARERS GO DIGITAL

The European Community Shipowners' Associations (ECSA) and the European Transport Workers Federation (ETF) have launched the initiative in question to identify and address the challenges of digitalisation for shipping and people working offshore. The **Seafarers Go Digital** project recognises the need to adapt international regulations, training programmes, and operational practices so that digital technologies are embraced while the employment rights and well-being of seafarers are safeguarded. The initiative raises awareness in key areas such as onboard digitalisation, cybersecurity, Internet access, e-certification, digital skills, and attractiveness of the maritime profession, putting forward policy recommendations for further cooperation between the industry and the unions, policymakers, and other relevant stakeholders. "Supporting shipping and seafarers in the digital transition is a key priority for European shipowners. We need to

ensure that seafarers are upskilled and reskilled to work safely with the new digital tools and technologies. Digitalisation can help make the profession more attractive and more diverse, offering career opportunities on board and ashore and enhancing the participation of women and underrepresented groups," underscored Sotiris Raptis, ECSA's Secretary General. Livia Spera, ETF's Secretary General, added, "The Seafarers Go Digital initiative responds to the need to prepare the maritime professionals for the digital age. Having in mind the need to safeguard the rights, welfare and safety of seafarers, we want to promote a fair and inclusive digital transition. Digitalisation can be an opportunity and can help improve the attractiveness of the maritime professions. Through this initiative, we commit to working together to benefit the most from the digital transition while mitigating its risks and contributing to a sustainable and attractive future for seafarers."

COUNTERING SHIP FIRE PROLIFERATION

Prompted by the recent spate of container ship fires – two in port (including an explosion in the Port of Ningbo-Zhoushan) and two at sea within the last couple of months – the international freight and logistics insurance provider TT Club stresses the greater need for all players in the global supply chain to recognise their responsibility for accurate and effective communication between all parties for the transport of dangerous goods. “The causes remain under investigation,” says Peregrine Storrs-Fox, Risk Management Director at TT Club, about the four incidents, furthering that, “However, there are strong indications that potentially explosive chemicals and fire accelerators, such as lithium-ion batteries, may be involved in at least two of the cases. As with historical incidents, it is likely that various errors occurred as the shipments were initiated and the exact nature of the cargoes was communicated to supply chain counterparties, giving rise again to ‘perfect storms.’ Every participant in the process needs to act in the best interests of safety at every point in these cargoes’

THE INNOVATION IN SAFETY AWARD – OPEN FOR ENTRIES

The TT Club-sponsored and the International Cargo Handling Coordination Association (ICHCA)-organised Award – established for those making a significant difference in safety in cargo transport – is ready to welcome candidates for the latest prize distribution (applications are accepted till 15 November 2024). “Now, more than ever, the challenge to everyone in the global freight industry is to drive safety forward,” TT Club highlighted in a press release. The international freight and logistics insurance provider continued, “Developing technologies combined with knowledge and experience at all levels can significantly enhance how we manage very real risks to our people, cargoes and services. Risks such as explosion, fire, fall, crush, run over and moving objects require ongoing control in ports and on board ships. The better industry gets at this, the better the results for life, limb, cargo and infrastructure, the better the work for workforces and the more sustainable and successful the organisations that we depend on. The opportunity exists not just to prevent headline-grabbing events, but also day-to-day incidents that may be less in the media spotlight but can affect both shore-side workers and ships’ crew.” Mike Yarwood, TT Club’s Managing Director of Loss Prevention, commented, “The good news is that cargo handlers, carriers and the developers of technological devices and systems of all shapes and sizes are diligently producing innovations to improve risk control. I am pleased to say that working with ICHCA, our efforts in encouraging such innovation are having a positive effect. This Award plays a significant role in those efforts.” Richard Steele, CEO of ICHCA, added, “Our list of previous innovative ideas to increase the safe working of our industry is impressive. We are pleased to have had the opportunity to spotlight their passion and creativity for not just doing the right things right but doing them better. Every year, we speak to people who have genuinely innovated but just see it as part of their job. We urge all those who have made positive changes to the way they do safety, either for themselves or for others through their products or services, to enter this year’s Award. The most exciting part of the Award is the resultant sharing of knowledge and forward-looking thought that can deliver valuable advancements in safety. They will make a difference now!” The safety solutions up-to-date competing for the Award included a netting system to prevent fatal falls in cargo holds, a device for enhancing mooring safety, a standardised digital platform for terminals to carry out vessel inspections, improvements in the safety and stability of containers on board ships, a digital temperature alerting system for tank containers, an effective way of fighting onboard container fires, and a video analytics solution that helps prevent in-terminal collisions of heavy cargo handling equipment.

journeys.” According to TT Club, the exact number of containers carrying dangerous goods that are shipped annually is difficult to estimate due to mis- and non-declaration. Partly in response to the issues around inaccurate declaration, the International Maritime Organization amended in 2022 the **Guidelines for the Implementation of the Inspection of Cargo Transport Units** to urge governments to inspect all unit types, regardless of the declared cargo. The recently released consolidated results for 2023, from just eight countries (or 5% of the signatory states), evidence continuing safety concerns. Among others, TT Club points to a rapidly worsening trend in stowage and securing (within units) over the last five years and the worst position since these reports began in 2001. The insurer also notes the five-year worsening trend relating to errors found in documentation. “This spike in serious container ship fires is reminiscent of the spate in 2019, although the 30-year average frequency may remain one every 60 days – but any life-threatening event is one too many,” TT Club warns.

IMPROVING SEAFARER WELL-BEING: PRELIMINARY FINDINGS FROM THE DIVERSITY@SEA PILOT PROJECT

The report, produced by one of the Global Maritime Forum’s initiatives (and within the All Aboard Alliance), urges the global shipping industry to improve working conditions, better seafarer well-being, make life at sea safe and inclusive, and future-proof against the changing needs of the maritime labour market to attract future generations of seafarers. These conclusions come from a 10-month global collaboration involving 400 seafarers from 12 ships (each belonging to a different shipping company) that generated over 50 thousand data points. “It is our hope that these preliminary findings and learnings will be embraced by stakeholders across the maritime industry who are looking to make working at sea more attractive and considered by policymakers as valid input for a discussion on minimum standards to ensure that rules and regulations not only keeps pace with the evolving nature of maritime work but also increases inclusivity and safety at sea,” underscored the report’s authors.



ALL ABOARD
ALLIANCE
GLOBAL MARITIME FORUM

Improving
seafarer
well-being



Preliminary findings from the
Diversity@Sea pilot project



Diversity@Sea
Report no. 2

TRAINING STANDARD FOR HANDLING ALTERNATIVE FUELS IN THE MARITIME SECTOR – RELEASED

With a 10-part scheme of work, **the Standard**, published free of charge by The Nautical Institute, provides guidance to training providers to offer programmes of learning that ensure seafarers will have the knowledge to handle bunkering of alternative fuels safely and confidently. “As the first milestone in the IMO’s [International Maritime Organization] 2023 GHG [greenhouse gas] strategy approaches with the requirement for between 5% and 10% of the world fleet expected to be powered by zero or near-zero GHG emission technologies, many shipowners have had to take a decision on how they will fuel their fleets before all the variables have been fully tested. The result is that we can expect vessels powered by a number of different fuels such as ammonia, methanol and hydrogen to be launching within the next few years before the IMO will be able to establish STCW [the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers] competency requirements,” underscored The Nautical Institute in a press brief. “This standard doesn’t replace the STCW requirements that will be established in the coming years. Rather, it seeks to offer interim support that bridges the gap until that time and, having been designed as a living document, it will be able to evolve with industry best practice,” added Capt John Lloyd FNI, CEO of The Nautical Institute.



Training Standard for Handling Alternative Fuels in the Maritime Sector

Ammonia, methanol and hydrogen

A guide for trainers and training managers

TT CLUB'S LATEST TT TALKS

The global insurance provider released this autumn a series of its TT Talks, covering a broad range of safety and legal topics concerning the transport & logistics sector. **Legal Eagle** reflects on relying on a ‘force majeure’ clause; **Slips, trips and falls** focuses on the most common safety-related incidents faced by businesses operating in the supply chain; four other ‘managerial’ TT Talks look at **asset management in the face of climate change**, **leadership in supply chain risk management**, **spare part inventory management**, and at **port environmental sustainability from a ballast water management** point of view; another TT Talk delves into **incident response strategies for logistics**. The two latest highlight the **UNCITRAL project** (on negotiable cargo documents and electronic cargo records) and the importance of **personal protective equipment** (as the last line of defence).

THE INTERNATIONAL MEDICAL GUIDE FOR SHIPS – IN NEED OF UPDATING

Marine Medical Solutions is calling on the International Maritime Organization (IMO) to update the May 2007-published Guide, which it sees as essential for providing medical care on board ships and that serves as the primary reference for pharmacies that supply the list of essential medicines for seafarers. The company has raised concerns about the outdated nature of the Guide, emphasising that advancements in medicine over the past 15 years have not been reflected in the current recommendations. “[...] without regular updates from the IMO, seafarers are at risk of not receiving the most effective care. A doctor’s insight is crucial in ensuring that the medical supplies on board are not only adequate but also improved for current medical standards,” underlined Doctor Jens Tülsner, CEO of Marine Medical Solutions. His company outlines that flag states and other organisations have become active in improving the situation, e.g., the **Maritime Medical Service** of the German Flag published a completely revised version of the Maritime Medical Handbook for ships flying the country’s flag in 2019/2020 (German/English version), including adaptations of the medical equipment on board. In 2023, the International Chamber of Shipping provided a new handbook aimed at improving onboard medical care. However, Marine Medical Solutions notes that none of them have been adopted by the IMO. “By updating the Guide and ensuring that it reflects modern medical practices, we can provide better support and care for seafarers, who often face challenging and isolated conditions at sea,” Doctor Tülsner urges the global body.

KNOW YOUR CUSTOMER!

Following a multi-year development project, Baltic Exchange has partnered with Moody’s to launch the **Know-Your-Customer** (KYC) data platform for the maritime sector. The initiative utilises the latter’s Orbis for Compliance database, which covers over 445 million entries both in shipping and non-shipping, along with its Global Regulatory Information Database (GRID) that provides 12m+ records on known or suspected corrupt private and public sector figures, fraudsters, illicit financiers, money launderers, and more. “KYC is a regulatory requirement in the banking and financial services sectors to ensure businesses do their due diligence on customers to prevent fraud, money laundering, and terrorism financing. With shipping a vital part of global commerce, the need to manage the risk of fraud and compliance with regulatory sanctions have become paramount, particularly surrounding reputational management and liability issues,” Baltic Exchange said in a press release. KYC is available to both members and non-members who can purchase credits in order to undertake the required checks and scans (with the former receiving a discount when using the platform).

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Baltic Sea region far & wide,
visiting 13 seaports
in Sweden & Finland in 2022-24.**

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a visit in 2025!**

ELME TO ADD GROWTH SPACE

The Swedish spreader manufacturer will erect 1,700 square metres within its four-facility-strong base in Älmhult this autumn. “The plan is to facilitate for increased manufacturing capacity in the existing product range as well as for new products that are planned to be launched within the truck and crane segment,” the company highlighted in a press release. Gösta Karlsson, ELME’s CEO, added, “Our investments in product development have turned out

well, and we can see an increased demand in Europe as well as Asia and the US. In 2025, we are scheduling several exciting launches, and to meet future capacity needs, we are now investing in larger premises.” The manufacturer, celebrating its 50th anniversary this year, has recently been focusing on developing their crane spreader segment, including talent acquisition and purchasing new machinery to make the production process more efficient.



PHOTO: ELME

ARENDAL 2 GOES ONLINE...



PHOTO: PORT OF GOTHENBURG

The Port of Gothenburg has inaugurated the operations of the brand-new 144,000 square metres terminal it has been working on for the past six years at the expense of €60 million. Among others, some 180k m³ of contaminated materials were dredged from the Göta River, which were then contained, stabilised, and solidified to form the foundation of the new (asphalted) terminal area. Gothenburg RoRo Terminal already uses a section of Arendal 2. “Parts of the new spaces will be used by Stena Line when the shipping company begins relocating its local operations from its current locations in the central parts of the city to the outer port area. The project has included preparations regarding filling, channeling, and water purification for a future ferry terminal,” the Port of Gothenburg added in a press brief. Göran Eriksson, CEO of the Swedish seaport, also commented, “This terminal began planning as early as the 1990s and then we talked about future-proofing. Now that future is here, and this terminal is needed to meet the transportation needs of the Swedish industry today, which are also expected to continue growing over time.”

VARBERG'S NEW FAREHAMNEN – ONLINE

The Danish construction firm Aarsleff completed the project it had been working on since 2021, erecting a brand-new 90 thousand square metres terminal area that the Ports of Halland will use to ship more forestry products. The works included dredging from two to 11 metres and setting up a 360-metre-long

quay plus a 140-metre-long pier. Construction involved ramming 255 steel piles of 600 millimetres in diameter and measuring 35-to-50 metres as the foundation for the quay wall, upon which 223 slabs weighing 60-to-165 tonnes rested on 253 pile tops (both produced at Aarsleff's cement factory in Poland).

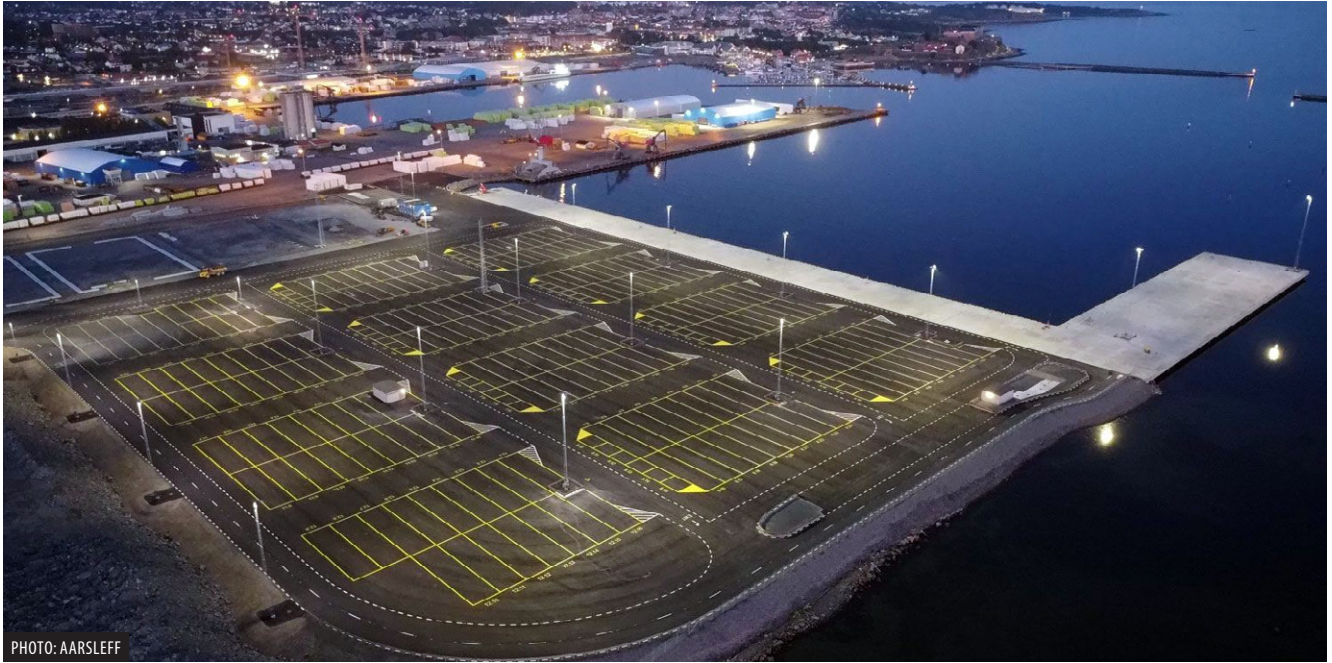


PHOTO: AARSLEFF

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NEW POLAND-SPAIN RAIL SERVICE

GEODIS has put in motion a 2,200-kilometre-long connection that links Łódź in Central Poland with Barcelona. The first train set, carrying 44 cargo transport units, left Spain on 11 June 2024 and arrived in Poland three days later. According to GEODIS, the rail service spares the environment some 79% in emissions vs. a road alternative. “We have great ambitions for this new line, as we plan to increase the frequency to two trains per week in the near future,” said Marc Vollet, Chief Operations Officer at GEODIS European Road Network.

NEW SOUTH-NORTH SWEDEN RAIL LINK

As of 23 May 2024, a new twice-a-week service (for craneable and non-craneable units) connects Trelleborg and Umeå, with TX logistics providing rail traction. The transit time for the 1,280-kilometre-long route is about 40 hours.

NEW POLAND-NETHERLANDS SERVICE

PKP CARGO and AGROMEX have partnered to rail-connect the former’s new multimodal terminal in Zduńska Wola-Karsznice with Rotterdam. The twice-weekly crossing uses the T3000E rail wagon platforms suitable for carrying trailers and containers (including tank). The November 2023-opened facility in Zduńska Wola-Karsznice (Central Poland) spans over 13 hectares, including 33 thousand square metres of yard area. The terminal can handle train sets up to 750 metres in length; its yearly handling capacity amounts to 500 thousand cargo transport units.

LAKEWAY LINK’S FIRST SAILING

Lakeway Express, the ro-ro of the Swedish JV between Greencarrier and Wallenius, set sail for her first 22-hour-long voyage between the ports of Gdynia (OT Port Gdynia) and Södertälje on 21 May 2024. The 1,625 lane metres capacity freighter, flying the Swedish flag, plies three times per week in each direction. Following the reconstruction of the Södertälje locks in 2026, the service is expected to expand to include the Port of Västerås on the Lake Mälaren. “This is the first step in our introduction of a new, innovative waterway transport solution directly into Central Sweden and the Mälaren region. Our solution is a very competitive alternative to traditional road transport, providing a shipping option with comparatively low environmental impact,” Fredrik Hermansson, Lakeway Link’s CEO, underlined. He furthered, “Additionally, our service addresses the severe shortage of truck drivers. Being non-driver-dependent, drivers leave their trailers at the quay, and the trailers are driven on board from there.”

METRANS TRIALS POLAND-UKRAINE ROUTE

The intermodal rail arm of HHLA, with the help of Ukrainian Railways, has organised the first train run between Dąbrowa Górnicza and Mostyska. The companies intend to make it a regular service, linking it with other Ukrainian cities, like Kyiv and Odesa (where HHLA runs a container terminal; the company also owns the domestic Ukrainian Intermodal Company).

DFDS SELLS OFC

The Swedish Gotland Company will take over the Oslo-Frederikshavn-Copenhagen (OFC) service for around DKK400 million (about €53.6m) from the Danish shipping & logistics firm. The deal includes the crossing’s ferries Crown Seaways (room for 2,168 passengers and 1,482 lane metres for wheeled cargo) and Pearl Seaways (2,044/1,370), port agreements, and terminal equipment. Some 800 employees in route operations and support functions will also move to Gotland Company (no layoffs are planned as part of the route transfer). DFDS will, after completion of the agreement subject only to customary closing conditions, provide certain support services to the buyer for an agreed and limited period. The deal, which also includes a potential earn-out payment, is expected to be closed in October 2024. The OFC, kicked off together with DFDS’ establishment in 1866, mainly functions as a cruise ferry service nowadays.



PHOTO: DFDS

POLFERRIES’ NEW SHIP SETS SAILS

The Polish ferry line deployed the 216-metre-long newbuild Varsovia, offering room for 920 passengers and 2,940 lane metres for cargo, on the Świnoujście-Ystad crossing on 27 July 2024. The ship, built by Visentini Shipyard in Italy according to a design by NAOS Ship and Boat Design, replaced the company’s Cracovia (650 pax/2,196 lm) and Baltivia (250/1,408). The former went on a charter in the Mediterranean as of 1 July 2024. Polferries has chartered Varsovia for 10 years.



PHOTO: POLFERRIES

FINNLINES ADDS SOUTHEASTERN ENGLAND TO ITS FINLAND-BELGIUM-SPAIN RO-RO SERVICE...

As of 23 September 2024, the company's three Finnecos (each offering 5,800 lane metres of cargo capacity) call to Peel Ports' London Medway in the Port of Sheerness on a weekly basis. The rotation links the ports of Helsinki/Kotka-Sheerness-Antwerp/Zeebrugge-Bilbao/Vigo. "The launch of our new service from Sheerness secures an important trade route between England and the Continent, further solidifying our position in the market," Merja Kallio-Mannila, Finnlines' Commercial Director, commented. Richard Goffin, Port Director for Peel Ports Group – London Medway, added, "Location is everything, and as a port, London Medway's proximity to the nation's capital and distribution networks means it is perfectly placed to connect importers and exporters with their markets. We expect this new service will be popular with both established and emerging markets, which are seeing strong growth in the South-East of the UK, and, in particular, forest products, which are in high demand. London Medway also handles a vast array of cargo, including automotive, steel and ro-ro, so we expect a wide variety of commodities to be transported on Finnlines' versatile fleet, placing the port as a key interchange between the Scandinavian and Iberian markets."

NEW DIRECT SERVICE SWEDEN-FAR EAST ASIA

COSCO Shipping Specialized Carriers has kicked off a one-per-month route that will see vehicles transported between Gothenburg, Singapore, Xinxin, Tianjin and Shanghai, with room for project cargo as well. Cars made in Sweden and China will flow in opposite directions, with heavy-duty vehicles also transported increasingly more from Asia to Europe. The new service will be operated with COSCO's latest series of vehicle carriers that are 199.9-metre long and 38 m-wide, each offering a capacity of 7,500 CEUs across 13 decks (four of which are height-adjustable, designed to accommodate high and heavy shipments). The carriers run on liquefied natural gas. According to COSCO's own calculations, these gas-run vessels offer 27% CO₂ reduction vs conventional fuel propulsion. "With this service, our Swedish customers can also avoid transshipment in other ports or pre-transportation by road to more distant ports. Overall, this provides significant advantages for those looking to reduce their transport emissions," added Erik Lund Eriksen, Partner Director at COSCO Shipping Lines Nordic. The Port of Gothenburg's Senior Business Development Manager, Richard Mellgren, also commented, "A direct ro-ro line to Asia is a fantastic addition to the port's overall offering, which really strengthens both the port's and our customers' competitiveness. It's exciting that the service is now up and running and that the initial calls have attracted such strong interest." In Gothenburg, COSCO's carriers of the new service berths at the Car Terminal operated by Logent Ports and Terminals (which also takes care of other vehicle services – of Wallenius Wilhelmsen and Höegh Autoliners that connect the Swedish seaport with North America and Oceania & South America, respectively). Lund Eriksen said in this regard, "Gothenburg is an important automotive hub in Northern Europe, but until now has lacked a direct ro-ro connection to Asia. We are very happy to start this service, which is highly demanded by our customers."

WALLENIUS LINES BUYS TWO RO-ROS

The 2,774-lane-metre-capacity Thuleland and Tundraland, operated by Wallenius SOL in the Baltic, have left the fleet of Baltic Container Shipping. The 190.8 by 26.44 metres ships, built at Aker Yards in Rauma in 2006-07, will continue to fly the Swedish flag and remain under Wallenius Marine's management. They will also carry on sailing under a long-term charter for Wallenius SOL (which is owned by Wallenius Lines and Swedish Orient Line).

ANOTHER (ELDERLY) FERRY LEAVES THE BALTIC

The Greek Paxos Island Maritime has taken over Mercandia VIII from Öresundslinjen, with the 1987-built (by North East Shipbuilders in the English Sunderland) ferry leaving Landskrona, where she was laid up as a reserve ship for Piraeus. The 95.8 by 15 metres ro-pax, renamed Corfu Star, offers room for about 400 passengers and 290 lane metres for wheeled cargo/cars.

...AND ALSO RE-ARRANGES ITS WEST FINLAND-BALTIC GERMANY RO-RO SERVICE

The company has re-established its Turku-Uusikaupunki-Travemünde rotation, this time with the addition of the Port of Rostock. The new service is operated with Finnulp, offering 3,259 lane metres for cargo.



PHOTO: PORT OF UUSIKAUPUNKI

KING'S LINE SCRATCHED – AGAIN

FRS Baltic ceased sailing between the ports of Sassnitz (Mukran) and Trelleborg with its high-speed Skane Jet catamaran ferry. The company cited increased operational costs as the reason behind the termination. "We have experienced significant increases in almost all operating costs, especially fuel. In addition, significant new expenses were added, such as CO₂ taxes introduced in 2024 and the fairway fees in the Port of Sassnitz," commented Moritz Bruns, FRS Baltic's CEO. One day before the announcement, the Swedish Transport Administration carried out an inspection on board Skane Jet, recording 19 points of concern. "We noted several serious deviations against fire protection. There were emergency exits and fire doors that did not follow the regulations. The line sailed with open emergency exit hatches, which affects both fire safety and the risk of water penetration in the event of an accident. It obviously made us extremely worried, including how the routines were followed to operate the ship in a seaworthy and safe manner," Mårten Dahl, Inspector and Maritime Safety Expert at the Swedish Transport Administration, said to Trelleborgs Allehanda. The newspaper also reported that conditions in the engine room (among others, insulation had been removed from the pipes), the lack of routine manuals, and the crew's working conditions also caused concern. "Evacuation procedures are vital to this type of ship because you have a very limited time in the event of an accident. You must be able to evacuate the vessel as soon as it only catches fire," Dahl added. Bruns also commented to Trelleborgs Allehanda on the inspection, "The very same day, we corrected 17 points that we received criticism for, checking off one of the two remaining afterwards. We are working on the insulation. Our experts do not fully agree with the Administration on what insulation type is necessary. But they are the ones who decide, so we have to comply." The, originally launched in April 1897, King's Line was closed by Stena Line in the spring of 2020; the coronavirus pandemic put forth as the nail in the service's coffin (plus the significant loss of freight volume over the preceding years). In the autumn of the same year, FRS Baltic re-established the crossing, replacing Trelleborg with Ystad. Later, the company returned to the former Swedish seaport.

AARHUS AND GOTHENBURG INCLUDED IN MSC'S SWAN SERVICE

In February next year, MSC will put in motion its new Far East Asia-Northern Europe container rotation, with the ports of Aarhus and Gothenburg included in part of the Baltic Sea region. The weekly service will connect the ports of Ningbo, Shanghai, Xiamen, Singapore, Le Havre, Rotterdam, Gothenburg and Aarhus before going back east through Port Klang, again Singapore, Laem Chabang, Vung Tau and Busan. The transit time between Shanghai and Gothenburg is to be 40 days.

ONE RESHUFFLES ITS NORTH SEA-BALTIC FEEDER SERVICE

As of 20 October 2024, the Scandinavia Baltic Express (SBX) loop, served by two container ships, connects the ports of Antwerp, Rotterdam, Fredericia, Gdynia, Rauma, and Gävle, with the Polish seaport enjoying two calls per week. The former SBX set-up comprised the ports of Wilhelmshaven (EUROGATE), Hamburg (HHLA's Container Terminal Altenwerder), Fredericia (Fredericia Container Terminal), and Gdynia (Gdynia Container Terminal of Hutchison Ports).



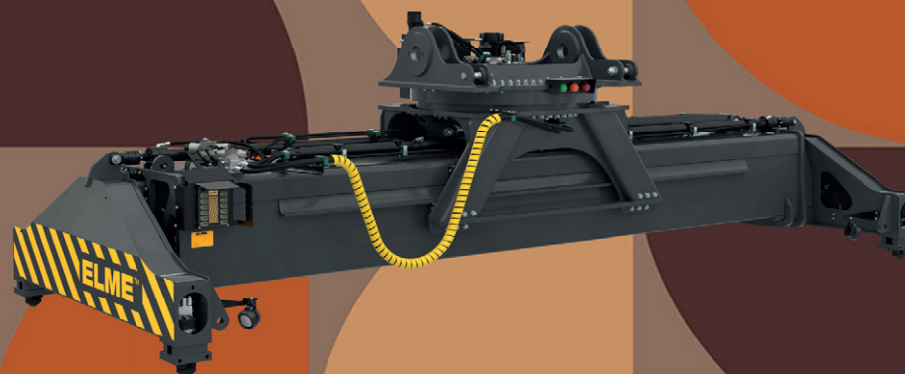
PHOTO: GDYNIA CONTAINER TERMINAL

MSC TO HAVE ITS OWN TERMINAL IN DENMARK

The Group's container terminal operator, Terminal Investment Limited (TiL), has signed a deal with the Port of Aarhus for leasing around 170 thousand square metres at the now under construction Omniterminal. The facility is scheduled to be up and running by 2027, meaning Aarhus will have two full-fledged sea container terminals then (the other being APM's). "We are pleased that the MSC Group and TiL see the Port of Aarhus as an attractive port and are now choosing to invest in establishing a container terminal. This provides businesses with more opportunities to trade with the world, strengthens our competitiveness, and reinforces our role in ensuring Danish supply to the benefit of businesses and Denmark," underscored Thomas Haber Borch, the Port of Aarhus' CEO. Søren Toft, CEO of MSC, also commented, "The Port of Aarhus offers a good location for the future network plans we have made. We will be introducing a direct mainliner between Asia and Aarhus next year and, in combination with our own terminal, we can provide our customers with a practical logistics solution."

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Examples from the OSV sector of how digital systems can cut fuel consumption, increase vessel utilisation, improve charter parties, heighten safety, and more

DATA OPENS NEW EFFICIENCY HORIZONS

by Arnaud Dianoux, *Founder and Managing Director, Opsealog*

Today, the maritime offshore market is at a crossroads, driven towards greater fuel efficiency by several factors. The market is recovering after years of stagnation, leading to vessel shortages and significant increases in day rates and bunker prices. This tightening situation is prompting shipowners and charterers to invest in data-driven optimisation and fuel efficiency. At the same time, the sector is also exploring the untapped potential of digitalisation that goes beyond cutting the bunker bill.

Digitalisation in the offshore support vessel (OSV) sector is not something ‘nice to have’ but a necessity in the face of increasing regulatory pressures and market demands. High fuel prices and day rates at levels not seen since 2008 are driving charterers to adopt digital systems for operational monitoring and fuel efficiency, aiming to reduce costs in a rapidly evolving market. Meanwhile, shipowners are incentivised to maximise vessel availability to make the most of a favourable market, but high interest rates make financing and newbuild orders

less appealing. Consequently, the industry is focusing on vessel life extension amidst persisting uncertainty regarding new fuels and regulations.

More data = less fuel

The successful implementation of digital tools in the OSV industry illustrates the potential of digitalisation in enhancing fuel efficiency across the wider shipping industry. Prime examples are our work with ADNOC Logistics & Services, the logistics arm of the ADNOC Group, and BOURBON, an international provider of services to

the oil industry (both continental and offshore).

Opsealog’s initial proof-of-concept trial with 11 of ADNOC L&S’ vessels achieved a not insignificant 12% reduction in fuel consumption and CO₂ emissions. These efficiencies were achieved through meticulous analysis and adjustments in operational practices, such as optimising engine running hours and implementing mooring buoys to reduce fuel consumption during idle times. These results saw ADNOC L&S embark on a long-term partnership with our company, recognising an opportunity to

replace various manual reporting processes with a single digital interface to improve speed and accuracy and to support timely decision-making.

Similarly, BOURBON and Opsealog partnered to reduce emissions across the former's 104-strong fleet through data-driven optimisation. The collaboration involves real-time fleet monitoring and enhanced digitalisation of vessel reporting processes, which enables teams to identify potential efficiency improvements and recommend best practices to ship management teams. Following a successful half-a-year pilot on 25 OSVs that saved 45-50 tonnes of CO₂ per vessel each month, the agreement extends these measures fleet-wide.

These results offer a snapshot of how digital solutions can transform traditional fuel and fleet management approaches, drawing on data integration from multiple sources to enhance operational efficiency and environmental sustainability in the marine offshore sector.

The multifaceted potential

The use of data-driven insights will expand beyond fuel consumption and emission reductions to optimise fleet utilisation and management more broadly. In practice, charterers are already using digital systems to ensure that the right ship type and size is assigned to the right task and to identify specific needs for the next vessel to be chartered. For shipowners, smart data can optimise maintenance schedules to reduce costs and track the number of days a vessel is technically unavailable due to breakdowns.

One of the most promising applications of digitalisation in maritime will be in helping to determine if performance clauses defined in charter party agreements have been met. As costs increase, pressure to monitor each party's obligations and enforce contract performance is likely to grow from all sides. This shows the importance of a trusted, independent platform to monitor and report on all parties' contractual obligations.

Furthermore, digital systems will play a pivotal role in upholding health and safety standards. This includes collecting data on drills conducted on board and enforcing stop-work policies, which help maintain safety protocols and enable teams to address safety

concerns proactively. This highlights the multifaceted potential of data, supporting not only operational, financial, and environmental goals but also empowering the industry's most valuable asset: its people.

Nurturing the culture of digital

However, several significant barriers hinder the wider adoption of digital technologies in the offshore sector. These also offer valuable insight into how the broader maritime industry can overcome the challenges of digitalisation.

To sustain the momentum of and accelerate digitalisation, it is essential to address uncertainties that keep many shipowners and charterers in a 'wait and see' mode. Despite the abundance of digital systems available, shipowners often find themselves lacking a clear understanding of the return on investment these solutions offer and how they can potentially complement each other. From a supplier perspective, showcasing the pragmatic business case for digitalisation is essential: highlighting it as a 'low-hanging fruit' that doesn't require significant capital expenditure and can deliver immediate efficiency gains and fuel savings.

Additionally, the development of data standards for e-reporting under various global and regional regulations, such as the EU's Monitoring, Reporting and Verification or the International Maritime Organization's Carbon Intensity Indicator, is crucial. While some industry-led initiatives are emerging, this process requires time and the officialisation of these standards by regulators will be vital to transition from paper and spreadsheets to fully digitised reporting.

The adoption and reinforcement of a digital culture will play a key role in driving and sustaining progress. As the number of digital system providers grows exponentially, the capacity to connect and integrate data will become increasingly important. Without interoperability, companies' data ecosystems risk becoming fragmented puzzles with mismatched pieces, undermining the potential benefits of digitalisation. This

calls for a more collaborative approach, with greater data exchange and integration between different providers of digital systems working for the same company, ultimately benefiting the end customer.

The digital pathway

As the offshore marine industry navigates market dynamics, the push towards data-driven optimisation unveils a wealth of untapped potential, stretching far beyond fuel efficiency. The pioneering efforts of companies like ADNOC L&S and BOURBON to embrace new technologies illustrate how smart data utilisation can profoundly enhance operational efficiency and environmental sustainability. The experience in the marine offshore sector also brings into the limelight the transformative potential of digital tools in revolutionising fleet management, vessel utilisation, and maintenance scheduling.

The digital revolution is knocking on the maritime industry's door. Lessons learned from the offshore sector's advancements highlight critical elements necessary for widespread adoption: robust interoperability, comprehensive data integration, and the cultivation of a digitally receptive culture. Addressing existing barriers, such as the lack of standardised reporting frameworks and fragmented data ecosystems, will be pivotal. Industry stakeholders must prioritise collaborative approaches, ensuring seamless data exchange to unlock the full potential of digitalisation.

In this rapidly shifting landscape, embracing digital transformation is not just about immediate savings but a necessity for future-proofing businesses and driving innovation across the maritime sector. As digital solutions continue to advance, they offer a pathway to unprecedented efficiencies, cost savings, and environmental benefits. The maritime industry's journey towards comprehensive digitalisation promises a future where data not only drives operational excellence but also fosters a more sustainable and economically resilient industry. ■



Opsealog is a French company specialising in performance management for the energy and maritime industries. Regarding the latter, Opsealog guides maritime leaders in their digital transformation, offering no-hardware-needed solutions that add to flexibility and agility by making data actionable. Head to www.opsealog.com to discover more.

PULLING POWER

by Fitzwilliam Scott

Robust and economical rail loading is the name of the game for efficient port logistics and other heavy-duty industrial operations. The shunting system should be as flexible as possible but also operational 24/7. In the Finnish Port of Pori, rail operators have lately started relying on a shunting robot from Vollert to move freight trains. These power pack machines capable of pulling train loads between 300 and 7,000 tonnes from the German manufacturer – remote-controlled, cable-connected, diesel-electric or battery-powered – have been in use worldwide for decades, including in other Baltic countries: Estonia and Latvia.

In Pori, ferrous sulphate is stored and loaded in bulk in a weather-protected manner. For handling by a wheel loader, the freight trains move into a loading hall and are later made available for further transportation outside. This task has recently been taken over by a shunting solution from Vollert: the Tandem DER 150 robot. A Stage V diesel-electric drive, which powers the four electric motors on the machine's four axles, provides the thrust. The DER 150 has a total weight of 100 tonnes on the rails; its tensile load of 150kN allows the reliable pulling of up to 2,000t at a speed of half a meter per second.

Pori's shunting robot is controlled remotely, enabling the wheel loader driver to operate across the entire freight train on a 500-m-long track. Besides the actual driving control, the wagon roofs can also be opened and closed hydraulically. The shunting robot's coupling system is also compatible with both Eastern and Central European systems. Vollert ensures reliable transmission of the control data in and outside the track system through several repeaters along the 500-m-long radio link. For optimum control of the transmission and reception power, the system automatically switches between the stations.

Strong, connected, weatherproof

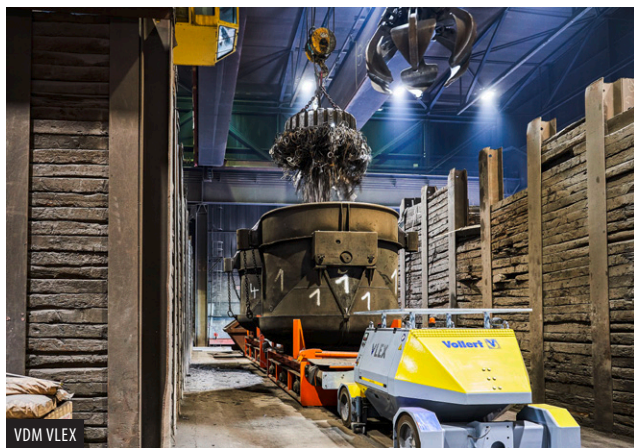
The technology is also proving its worth at Bogatyr, the largest opencast coal mine in Kazakhstan. Here, five Tandem DER 300 shunting robots from Vollert accelerate and automate rail loading. The Wi-Fi-controlled shunting machines, each with a tractive force of 300 knots, move trains with a length of around one kilometre and a total weight of up to 6,900t.

For data transmission and control, Vollert used Siemens components to set up a Wi-Fi route along the 1.3 km-long shunting network. Eleven access points with directional antennas connected via fiber optics reliably transmit the data signals from the control system to the machines and vice versa. In addition, thanks to the Wi-Fi control system, the robots can operate freely on all tracks. This enables the rolling use of the five shunting robots on the four tracks and guarantees fail-safe operation around the clock.

Remote maintenance access also enables remote control of the shunting robots and therefore fast and direct support from the Vollert service team in Germany at any time. All the robots' performance data, such as operating hours and consumption, can be evaluated over longer periods on a dashboard.

Bogatyr plans to increase its yearly production capacity from 32 to 40 million tonnes using the automated conveyor technology. An automatic coal wagon loading system has been installed for this purpose: two trains, each with around 70 wagons, can be loaded in parallel in just three to four hours. The staff controls the shunting robot from the loading facility. When the process starts, the coal is transported into the empty wagons of the freight train while the shunting machines continue to move. The mainline locomotive then takes over the train again for transportation to the customer while the shunting robot starts its journey to handle the next one.

Each of the five shunting machines consists of a six-axle tandem version with a control trolley and motor trolley and a drive power of 180kW. A CAT power generator, tailored to the specific requirements on site, provides the drive power. Temperatures from -30 to +30°C, plus daily temperature fluctuations of +/-30°C, require tried and tested, robust technology. With heated components, a diesel tank integrated into the frame, automatic couplings and a sanding system, Vollert ensures smooth operation even under these harsh climatic conditions.



VDM VLEX



BOGATYR ROBOT PRO-TANDEM DER 300



PHOTOS: VOLLERT, BOGATYR ROBOT PRO-TANDEM DER 300



PORI ROBOT TANDEM DER 150



PORI ROBOT TANDEM DER 150

Making Riga dust-free

In Latvia, coal-handling facilities in the Port of Riga are also gearing up with modern technology. The terminal operator SIA STREK relies on a Vollert shunting robot. The handling process was reorganized into a closed loading hall in 2018 to get rid of the dusty coal loading process in the centre of the Latvian capital. Every three to five minutes, three wagons are completely turned and emptied into an underground bunker without polluting the environment. SIA STREK noticed Vollert's flexible shunting solution because of its many years of positive experience at the Tallinn coal loading terminal in neighbouring Estonia. Unlike conventional shunting locomotives of this size, STREK's robot allows the cab driver to see both the surroundings in front of and behind the vehicle. This means that the driver does not have to get out and shift cabs when changing direction. This is made possible by an exceptionally narrow drive unit, which ensures a clear view of the track area (a particularly low access height also facilitates convenient access to the cab). Here, too, steering is conveniently carried out through the control panel, by radio, or from inside the vehicle.

Eco-friendly robots

Dust and soot avoidance are not the only issues when taking care of coal. Emissions of the drive machines themselves in loading terminals, ports, and industrial plants are also increasingly coming into focus, not least due to increasing international noise and exhaust regulations. In-plant transportation in particular poses special requirements with regard to diesel exhaust protection rules. Vollert has therefore long been offering fully-electric versions of its shunting robots – with identical performance values. In addition to battery-powered versions, these also include cable-connected machines for continuous outdoor and indoor use.

The VLEX road-rail robot is a special version of the emission-free range. In one-person operation, this radio-controlled all-round vehicle switches quickly and easily

from track to road and back again, and, despite its compact design, enables shunting operations of up to 600t. Its inventive vehicle geometry, with articulated steering and four individually controlled wheel hub motors, makes it extremely manoeuvrable and economical. An oscillating axle ensures that all four wheels remain in continuous contact with the ground and rails so that potholes, height differences in the track, or minor obstacles can be overcome with no loss of traction. And thanks to its emission-free electric drive, the hardy solution earns its spurs both in rough railroad operations on sidings and in enclosed storage and production areas. The VLEX shunting solution has been put to use at the South Korean metro in Seoul, for shunting tank and freight wagons at Lanxess and Rheinkalk in Germany, and at a plant of the Swiss rail vehicle manufacturer Stadler. ■



As an innovator, Vollert Anlagenbau develops economical shunting systems for branch and connecting lines. Since the 1950s, the company's stationary, cable-bound shunting systems have been used worldwide for the handling of railroad wagons and trains. Vollert also offers self-sufficient shunting vehicles (shunting robots), heavy-duty transport vehicles, and transfer cars for reliable and efficient processes in refineries, mines, ports, steel and cement works, in explosion protection areas, train washing facilities, and for maintenance operations. Head to vollert.de/en/home to discover more.

NEVER COMPROMISE

by Przemysław Myszka

There is time and place for fire: in a fireplace, a bonfire during midsummer, or as part of an artistic performance. Conversely, one would very much like to avoid property catching fire, including costly machinery engines. We are talking with Fogmaker's Fredrik Rönqvist and Gustav Stigsohn about their company's system, what makes it stand out, and the latest eco-friendly version. We also put the spotlight on Fogmaker's history, values, and sustainability efforts. In closing, we're discussing lithium-ion battery fires and what we can currently do about them as a first response.

■ How did Fogmaker come about?

The company got started in 1995 by the inventor Kennerth Samuelsson in Växjö in Southern Sweden. He was interested in rally car racing and noticed that the fire suppression systems weren't really fit for the job. Kennerth came up with a new solution that essentially gave birth to Fogmaker. The system we offer today is still based on that initial innovation, refined throughout those nearly three decades.

The beginnings were rough, to say the least, and the company struggled to stay afloat. Back then, we sold five-six systems per year versus today's 32 thousand. The development hasn't been linear. Things got rolling in 2004 when Fogmaker entered the bus market. The last ten years were a real boom – the business truly exploded. That makes us confident when setting ambitious annual targets, which even if we miss by a small margin of, say, one million euros, it does not throw us off balance. Long story short, Fogmaker has risen from a handful of people and scant sales to a workforce of 100 and a yearly turnover of 40 million euros. There's still a lot of room for business growth, in- and outside Europe. Fogmaker will be significantly bigger in three-to-five years.

■ What makes up the company's sales base?

Without a shadow of doubt, buses continue to be our sales engine, especially the European market. We are obviously very strong on our home turf here in



GUSTAV STIGSOHN, PRODUCT MANAGER



FREDRIK RÖNNQVIST, KEY ACCOUNT MANAGER



PHOTOS: FOGMAKER

Sweden, but concurrently see growth potential in overseas markets, particularly North America.

Obtaining approvals is the single most time-consuming thing when expanding our offer. We are, after all, talking about safety equipment that simply must work when push comes to shove. That is why different certification authorities take their time to validate the system's reliability and efficiency. This process may take up a few months; it may consume an entire decade in the most extreme case. Given the legal green light, which on average takes six-to-12 months, it's mainly footwork, footwork, and even more footwork by us and our dealers.

We are also increasingly focusing on attracting customers from other industries, be it material handling, forestry, construction equipment, agriculture, mining & tunneling, and, of course, the port sector. Regarding the latter, we've joined the Port Equipment Manufacturing Association. This move gave us greater visibility in the market and channeled more interest into our work. We have also observed a noticeable rise in safety awareness throughout the port business, not only in fire suppression systems but across the board.

■ What drives the company at its core?

Fogmaker is driven by expertise, commitment and integrity, the three values that resonate the most with



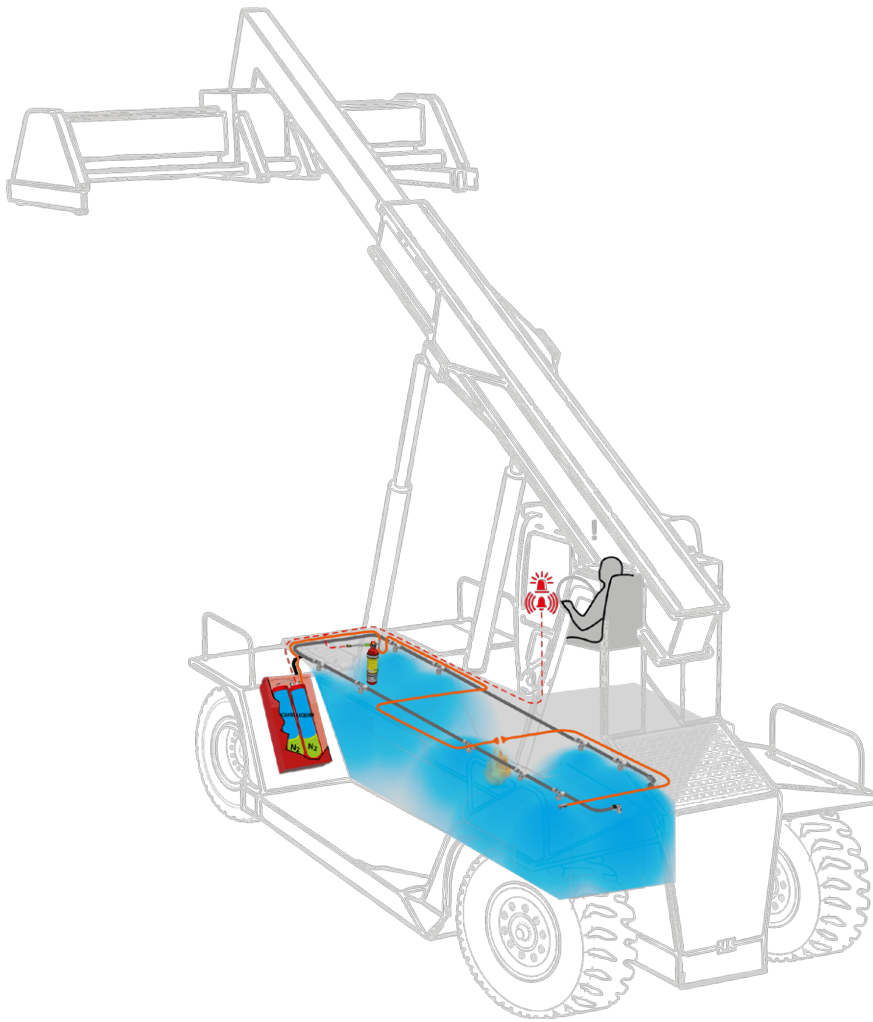
our employees. We aspire to be the most knowledgeable people when one approaches us to talk about fire suppression systems for machines and vehicles. We are committed to doing our best in ensuring that clients get all the information, feedback, and support they need.

Integrity is about trustworthiness across everything we do – that the company is a good employer, that customers are taken care of, but also that everything is alright with our supply chain: Fogmaker does not tolerate any dodgy business. Whenever we appoint a new dealer, we always go above and beyond to make sure there's no workplace mistreatment,

bribery, child labour, illegal material sourcing, etc., involved. Luckily, as Fogmaker has grown over the years, it has become easier to vet and distinguish between the partners we want to work with and all the rest. We have also launched the Fogmaker Academy to help the people wanting to work with the company know us: both the system and our values. In most cases, partners come to us to Sweden, with occasional trips in the opposite direction. Technicians who want to work with our system need to be certified by our trainers.

■ Can you walk us through what is your solution and how it works?





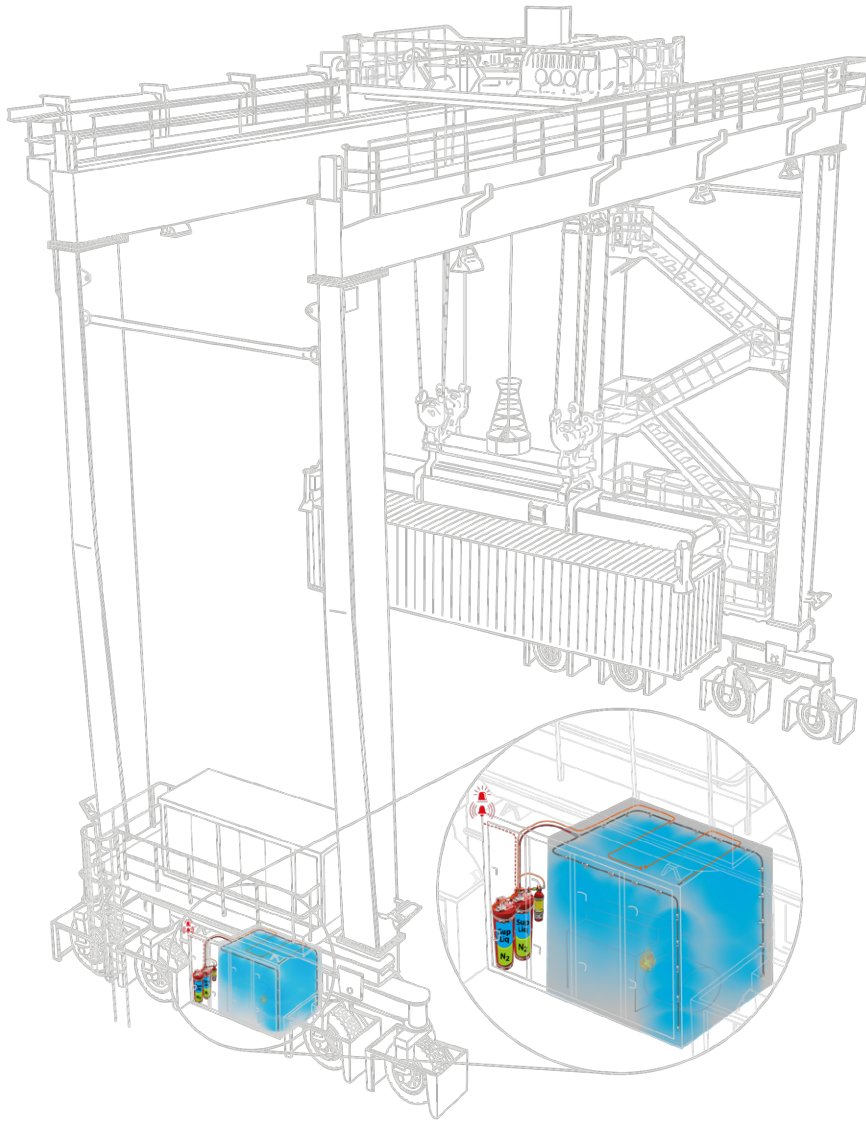
One could say that we have one product: the Fogmaker fire suppression system. Then again, the solution is so universal it's scalable and modular, from small to big applications. For the port business, that means it can be installed inside a forklift or on the biggest mobile harbour crane or a quay gantry. The system is also customisable and our company will be more than happy to assist clients in getting the optimal set-up for whatever is in their machine park. The operational environment plays a crucial role here, too. We recommend our clients from the port and mining businesses to have a system with a higher degree of stainless steel to account for the salty conditions they're operating in. Fogmaker is more than keen to assist companies in their fire suppression journey. As we only do machinery and equipment, our focus lies there. Upon client request, we will investigate what

and where they're operating. That step includes risk analysis and designing the particular set-up together with the customer's team. Here, we are often asked why experts in fire suppression need help, but the customer's team are the specialists who know their machines inside out. Their aid is invaluable. Whatever we discuss during these phases is protected by a non-disclosure agreement: all the details and designs are kept safe. Altogether, the port and shipping sectors are well aware of the many perils a fire can bring upon them. We at Fogmaker are ready to help guide them in doing their best to save lives at sea and in harbours, as well as to avoid property damage and costly downtime. Our solution is an investment for years. First, if checks and maintenance are carried out properly, the system is ready for action indefinitely. There are annual check-ups, small service

after five years, and a big one after a decade. We are catering to the automotive sector's demand of ten-to-15-year-long serviceability, but there are 'Fogmakers' that have 20 or 25 years under their belts and still in excellent condition. Worth adding is that ours is a multi-use system. After suppressing a fire, it naturally needs to be cleaned, refilled, and its parts checked and replaced if need be. But when that's done, the system can be used again. The aftermarket is well taken care of. We like to use the fire triangle to explain how our high-pressure, water-based mist system works. Fire needs three components to break out: heat, fuel, and oxygen. As such, Fogmaker's solution attacks all of them. Water is the best agent one can use for cooling in enclosed spaces, like engine rooms. The water-based mist evaporates, taking off heat by creating a steam that also gets rid of oxygen (one liter of water can create 1700 litres of steam). High-pressure goes hand-in-hand with the system's longer activation time: more heat is taken out through a longer period (typically 45-60 seconds compared to 20 for low-pressure solutions). Another crucially important feature distinguishing our system is its 'mechanical' nature, meaning it's operational 24/7/365 independent of any source of electricity. Our liquid also contains certain additives, including a foaming one. It functions as a chemical fire blanket over a pool of fuel, preventing it from fuming, hence igniting. There are anti-freeze agents (salts), too, that ensure readiness when it's cold; and, as an added value, these also increase the overall efficiency of fire suppression.

■ What difference brings the Eco I version of your fire suppression system?

The liquid in the latest iteration of our system is free of per- and polyfluoroalkyl substances (PFAS). After three or four years of development and experimenting with alternatives (neither of which satisfied us), we decided that an in-house-made PFAS-free solution was the way to go. It wasn't a simple swap, PFAS for environmentally friendly components, and we also had to adjust the nozzles to make systems with Eco



I as efficient as the standard version. We burned diesel counted in cubic metres during the final fine-tuning tests to make sure the new product doesn't compromise on performance. Eco I was designed with the environment in mind and is GreenScreen Certified™ at the silver level. PFAS are extremely stable, non-biodegradable molecules that make their way into groundwater and then end up in plants and animals – and in humans as we consume them. The EU is also debating on banning PFAS chemicals, with the decision likely to be made next year. We therefore wanted to be fully prepared for a PFAS-free future potentially coming in 2026-27. As things stand, Eco I is slightly more

expensive, but that's CAPEX only; operation-wise, the cost is the same. Eco I must also get new certification as the liquid composition is different. A lot of effort, time, and money went into developing Eco I, but interestingly enough, clients began asking for it faster than we first expected.

■ **And what is the company doing on other sustainability fronts?**

We have got the ISO 14001 environmental management certification. Our diesel vehicles run on hydro-treated vegetable oil, while others are hybrid or electric (with all internal transports being electrical, plus bicycling is highly encouraged). We have also changed much of the

lighting to LED. Our buildings have the overall B score on an energy efficiency scale from A to G (with the latter given for the worst performance). We also recycle; our system is mostly made of aluminium and we try to source recycled materials as much as possible. We keep air business travelling to a minimum.

The supply chain team checks the suppliers not only for the best price and quality but also scrutinises their environmental practices and footprint. That and the fact our supply network is relatively short, meaning Fogmaker doesn't have to use air freight to a considerable degree (that's also because our system goes without electronics). That also had the added benefit of COVID not affecting us all that much. In fact, none of our clients had felt the impact (also because we usually keep our stocks high).

■ **How do battery fires differ from other ones?**

As things stand today, it is virtually impossible to suppress a lithium-ion battery fire. We aren't aware of any solution capable of doing that. Stating otherwise should be a red flag for any client planning to invest in a fire suppression system. Fogmaker has been very upfront and integral in sharing that inconvenient for some message. Curiously enough, hybrid or fully electric vehicles do not burn so often as those with combustion engines, but if they do, such events immediately hit the news headlines. Statistics show that more than half of the fires start outside the battery packs. The focus in such instances is on suppressing the fire before it reaches the batteries. Extinguishing a battery fire is so difficult because the whole thing is encapsulated. The source of fire is, therefore, almost absolutely obscured. The best what the fire suppression industry can do now is to cool down the batteries with a water-based mist for as long as possible to buy time to evacuate people, save other vehicles, or isolate the burning one for firefighters to employ other measures. The long activation time of our system proves very handy in such situations. ■

Wind-assisted propulsion first of the line in shipping's race to net zero

UNDER FULL SAIL

by Romain Grandsart, Chief Operating Officer, OceanWings

Even with the best of intentions – and the latest technologies – shipowners face a challenging time ahead as they prepare for ever-increasing carbon accountability. Wind-assisted propulsion offers them a solution today, many years before new fuels become readily available, and with no requirement for dedicated infrastructure.

The latest **HELCOM annual reporting** shows that the most significant contributors to CO₂ emissions in the Baltic Sea are ro-ros (ferries and pure cargo) and tankers. International Windship Association's figures meanwhile suggest that at least 20% could be shaved off shipping's carbon footprint if wind-assisted propulsion was rolled out across the existing fleet and integrated into newbuilds.

Enter *Canopée*, the first modern purpose-built wingsail ro-ro cargo ship in commercial operation. She is a demonstration of how wind energy can help deliver the decarbonised shipping sector of the future. The 121-metre vessel, designed by VPLP Design in France and built by Neptune Yards in the Netherlands, entered service last year, transporting components of the Ariane 6 space launcher from continental Europe to French Guiana for the Ariane Group. Owned by Jifmar, *Canopée* is operated by Alizés (a JV between two French shipowners: the Jifmar Group and Zéphyr & Borée). It makes up to 12 return trips to Guiana every year, carrying 5,000 tonnes of freight at an average speed of 16 knots.

Canopée is powered by two Wärtsilä 6L32 main diesel engines (rated 3,480kW each at 750 rpm) and four articulated semi-rigid OceanWings® covering 363 m² apiece. The vessel's hull form is optimised for sailing, with the controllable pitch propellers able to run in feather mode when the wind-assist system alone delivers sufficient power.

The proportion of wind power used varies between 20% and 50%, depending on the required speed and the available winds. *Canopée* was designed to enable

the wing sails to cut fuel and emissions by approximately 30% on her regular trans-Atlantic route. Data gained by OceanWings over four years of global testing indicate that the wingsail design would be capable of providing up to 50% savings on some ships and routes.

Ahead of regulatory timetables

Canopée is an important demonstration of wind-assist technology because it has become operational at a time when shipowners need to act on reducing emissions, whilst engine and fuel cell manufacturers are still developing new technologies.

Meanwhile, the shipping industry is considering how well-to-wake accounting can be introduced so that CO₂ emissions are not simply pushed further up the new bunker supply chain. New fuels, such as biofuels and methanol, and even hydrogen and ammonia, can be made from different feedstocks using varying processes and requiring delivery from disparate locations.

No single well-to-wake carbon accounting equation is going to represent this diversity equitably. The combination of vessel type and fuel diversity means that settling on the regulatory details is going to be a protracted process. **As the International Chamber of Shipping stated earlier this year**, a global greenhouse gas (GHG) pricing mechanism for shipping is urgently needed to de-risk investment in zero GHG marine fuels and to provide billions of dollars of funds to support developing countries.

At this stage, regulators are also still coming up with ideas for fair, realistic,

and achievable emission requirements that are workable across the broad range of commercial vessels in operation. As an example, **Interferry recently highlighted that ro-ros are a special case** for the International Maritime Organization's (IMO) Carbon Intensity Indicator (CII). The emissions from these vessels are highly route-dependent and significantly impacted by their relatively high number of port calls. Ro-ros and ro-paxes are often purpose-built for the crossings they serve, so swapping an older vessel to a more 'CII-friendly' route to reduce emissions wouldn't necessarily lower a fleet operator's overall GHG output. This raises the spectre of making sub-optimal investments in existing ships, and Interferry is proposing an alternative compliance mechanism – fleet-balancing – which it plans to submit to the 82nd meeting of IMO's Marine Environment Protection Committee later this year.

The emission benefits and fuel cost reductions of wind-assist technology are not dependent on regulatory timetables. Wind doesn't suffer from the 'chicken and egg' conundrum that currently limits the uptake of new fuels. Bunker-agnostic, it's a resource that can go in just about every 'basket' of decarbonisation solutions to meet regulatory goals, even those set as early as 2030.

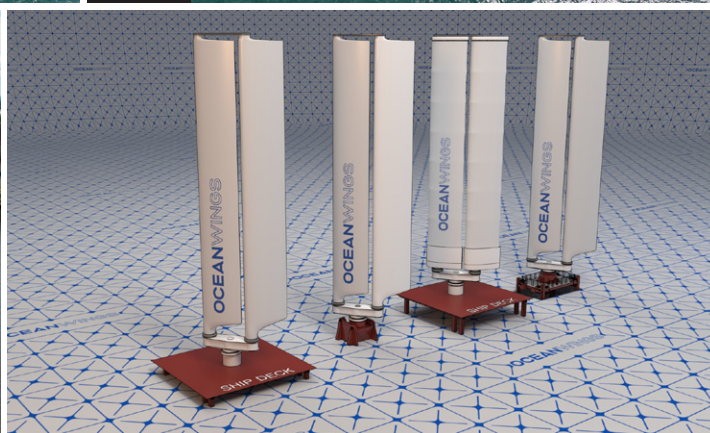
Canopée again offers an example of this expedient way forward because the latest-generation wind-assist technology incorporated on the ro-ro is suitable for retrofitting on virtually all ship types as well as newbuildings. OceanWings' solutions are now available across multiple segments and



PHOTOS: AYRO



PHOTO: JIFMAR GROUP/MADFLY.Y. DERENNES



sizes, including for tankers, bulkers, car carriers, and cruisers. For ro-ros, OceanWings leverages its lightweight design and a very low centre of gravity to match the stability objectives of such vessels.

Sails of the future

Canopée's wing semi-rigid design and a new rigid range designed so the position of the wingsails can be changed for cargo load- and unloading in port share the same unique 'two flap variable camber' idea, which is already proven to deliver industry-leading fuel savings over most operational scenarios and environmental conditions.

The OceanWings product range now also includes critical configuration options such as a tilt mechanism to address air draft requirements and an elevator mechanism specially designed for container ships to comply with their port operation constraints while minimising the impact on their carrying capacity. The original semi-rigid OceanWing design is reefable, which is a critical feature for vessels where tilting or lowering the entire wingsail is not an option.

Rigid wingsails from OceanWings are made from the same modern composite materials and follow the same manufacturing processes as wind turbine blades. This provides advantages in resilience and

lifespan, for instance, for bulkers and tankers, and leverages a global manufacturing infrastructure to drive competitive pricing and the ability to scale to large volumes. The new modular design also optimises transportation and installation.

Wing technology continues to develop, though OceanWings' wingsails are already fully automated and require only minimal oversight from crews. Sensors on the ship can measure the wind in real-time, and software systems analyse the data (also on the go) to send instructions to the actuators controlling the wings, which can then adjust the angle of attack and the camber of each wing independently. The OceanWings® product range also features a 'safety-by-design' flag mode, automatically protecting the wings and the vessel when wind or sea conditions exceed specific thresholds. As digitalisation increases, solutions such as OceanWings® also come with an on-board routing system through an external router that will advise crew on the best crossing for maximising performance.

Transformative change

We are witnessing the comeback of the long seafaring tradition of sailing with the wind, which for centuries powered maritime trade. Now that the industry needs to abandon oil as the single source of power for ships, a wind revival is underway.

Alongside other technologies, wind can help create hybrid zero-emission ships. As necessary as the IMO's work on future fuels is, shipowners can act with wind power now. Indeed, it is imperative that they do: 2023 was the warmest year on record for the planet, and nowhere is this more obvious than the Baltic Sea, which, as a marginal sea, has warmed more than any other. As HELCOM stated, "Transformative changes are needed in all socioeconomic sectors interacting with or affecting the Baltic Sea environment in order to protect and rebuild ecosystems and halt existing negative trends." Wind is free, everywhere, and ready to deliver double-digit GHG emission reductions today. ■

OCEANWINGS OceanWings is a French industrial start-up that designs, manufactures, and delivers wingsails to support the shipping industry in reducing its carbon footprint, enabling lower emissions for all types and sizes of ships transporting goods by water. Sail to oceanwings.com to learn more.

How fit for purpose data can simplify vessel performance

NO CRYSTAL BALL NEEDED

by Christian Rae Holm, *Managing Director, Coach Solutions*

Digitalisation presents both technical and philosophical challenges to the shipping industry. How can smaller shipowners improve vessel and fleet performance effectively – and can this be done by making better predictions about the future?



As for the first challenge, the answer is to seek a solution that fits your way of working; much will depend on the number of vessels, their age, and the fleet size profile. This matters because it's very easy to look at the current state of maritime digitalisation and conclude that change is happening too slowly. The problem from the buyer's perspective is: do software and solution providers truly understand my business?

As regards prediction, we can't promise to tell you where the market will be next quarter, but we can give you a simple, data-driven analysis that makes forecasting vessel performance more accurate.

(Small) data empowerment

We understand that many owners currently like to use the charterparty (CP) as the primary form of risk management rather than working with data, which can help them anticipate with accuracy if their ship will perform as predicted.

The problem with that is that you won't know until the end of the voyage whether the vessel has performed against expectations. Being able to predict how a ship will perform in the expected conditions is a better position than hoping to avoid a performance claim by negotiating on optimistic CP terms.

But let's not forget the technical challenge. At Coach, we don't think you should have to equip all your fleet with sensors, nor should you need to invest heavily in a complicated voyage management system. Unlike some software companies, we don't promise to save you money on your vessel operations or get you better rates. What we do instead – using small amounts of data collected by the crew – is create a reliable prediction of vessel performance that can

be incorporated into your CP. We also provide tools to monitor performance against the CP terms so users can see if the ship is operating in compliance during the voyage.

The data you collect and the analysis we perform gives you better visibility of your ships' actual performance. What you do with that is up to you, but we believe it can help owners understand the consequences of their decisions and make more well-informed choices.

We understand that not all owners can shoulder significant investments to improve vessel performance. But does knowing how your ships will perform in practice give you a stronger position from which to make commercial decisions? You don't need a crystal ball to know the answer to that is 'yes.' ■



We at the Copenhagen-headquartered Coach Solutions create software tools for the shipping industry to optimise vessel performance and voyage planning to maximise profit and minimise CO₂ emissions. In other words, we do it to simplify sustainable shipping. Go to coachsolutions.com to discover more.

THE IMAGE OF HEALTH

by Kishor Arumilli, Vice President – Engineering, ATAI

Freight containers, essential to global trade, are prone to various damages due to harsh environments, frequent handling, and constant physical stress. Assessing the condition of these containers from a damage perspective – also known as their health – is crucial for all entities involved in the logistics supply chain. Typically, container terminal operators conduct damage surveys for all incoming (and sometimes outgoing) containers, a procedure that is time-consuming and also has direct implications for personnel safety. As a result, automated container damage surveys are increasingly seen as a promising solution to this issue.

Container damage is any kind of structural deformity that may reduce the container's value. The ISO 9897 standards codify these damages, enabling various stakeholders to effectively communicate the damage type, location, and severity.

However, the relevance, significance, and impact of the damage vary among stakeholders, resulting in differing purposes for container damage surveys. Each container terminal has its own criteria/rules for what they consider as damage to the container (usually, a deep sea port

terminal may overlook surface dents and rust patches). Additionally, the handling procedures for the damaged container vary from terminal to terminal. This variability in implications and procedures regarding what container damage means presents the real challenge.

The why's and how's of surveying container damage

Damage to the container may lead to the damage of freight inside and also impair the container's utility. In the process of transporting cargo from seller to buyer, the box undergoes handling by various entities and is susceptible to damage at each stage. As per the current practice, the liability is with the entity responsible for the damage. Keeping this in view, a terminal conducts the container damage survey when it enters the terminal (entry at the terminal gate, container unloading from the vessel or rail). As a standard practice, clear pictures of the damaged container are taken as evidence, and a sign-off is obtained from the relevant entities.

Besides protecting the terminals against liability claims, the container damage survey also helps in making operational decisions. Specific damages make it unsuitable for using certain container handling equipment. For example, damage to the corner cast may make a container unsuitable for spreader-based handling, but fork-based handlers can still move such boxes. Based on the cargo type and the damage assessment, the terminal may, too, change the container storage location in the yard. This also leads to a change in procedures for the downstream activities related to that

container. These operational decisions hinge on the container damage surveys performed for the incoming boxes.

Initially, damage surveys were conducted manually by surveyors, who physically inspected the container from all visible sides and documented the information on paper. Additionally, pictures of the damage were taken and stored for further reference. An improvement to this method involved providing a live visual feed of the container from all visible sides to the operator sitting at a workstation. Because of the constrained space environment at the terminals, the full container picture was constructed using line scanners or image stitching techniques.

Computer vision and deep learning have significantly helped automate container damage detections. A stitched image (from the line scanners) of the incoming container is provided as input to the trained artificial intelligence (AI) algorithms to infer the damages as seen on the container image and classify them according to the damage classification. This process also helps generate a damage report along with the relevant evidence. This minimizes the need for the surveyor to

meticulously document all the damages found, resulting in a significant efficiency boost at the container operational points.

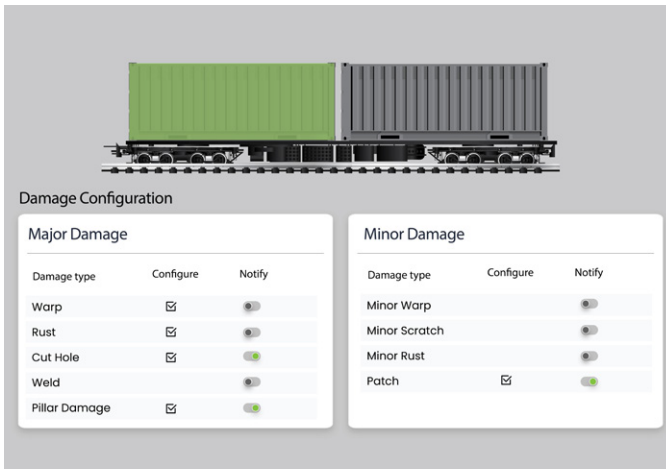
That said, the hard reality is that the AI-based solution for container damage survey is less efficient (not able to capture damages consistently and completely) and lacks flexibility (any change in environment or physical conditions, etc., requires huge retraining). The root cause of this problem is a lack of sufficient training data, as well as of the digitalized ground truth for run-time validations. At the terminals, this is generally compensated by implementing stringent operational procedures (e.g., containers should move at a uniform speed and in a straight line while passing through the portal), stringent installation procedures (e.g., cameras need to be installed at a precise location and angle as even a slight change in camera orientation has a huge negative impact on the inferencing results), and investing additional effort in data reconciliation. The complexity of the problem further multiplies due to the lack of consistent, usable damage definitions across the industry, making ground truth definitions during training become less applicable in practice.

The SMART container damage survey

At ATAI, we have taken a drastically different approach, using computer vision and deep learning algorithms to develop the SMART container damage survey solution,

overcoming the aforementioned challenges. This innovation has helped us address the ground-level, real-world challenges effectively. Seamless deployment of this solution,

even at the container exit points, helps to improve damage liability protection for the terminals. Key fundamental changes in our approach include the following.



The defining framework – driving uniformity in damage definition

Our solution provides a framework, based on the ISO 9897 standards, to define the damages according to the individual needs of every terminal. The framework allows a terminal to define the damage by specifying (a) the types of damages and localized classification names, (b) the significance or impact of

the damage, (c) the rules of engagement for the given type and impact for a damaged container – this and many more.

Such an approach helps the terminals capture all the damages for a particular container and act on them as per their local definitions. This novel approach enables keeping the complete history of

the container's health, picking out the boxes that require special handling only when warranted. The SMART container survey framework also offers flexibility, enabling terminals to quickly adjust the damage definitions and operating procedures through configurational changes.

Raw images vs stitched images

Traditionally, the damage detection algorithms were fed with the stitched container side image as an input. Operational space constraints (full container view capture by camera frame requires a larger distance between the camera sensor and the subject or a very wide field of view sensor leading to image distortion) and the need to identify the location of the damage on a container (mapping and localizing) necessitated this approach.

However, stitching images to construct a full container picture is a computationally complex operation when we take the

on-the-ground operational aspects into consideration (the container may be passing with varying velocities in front of the camera, the horizontal distance may vary across frames of a container, etc). This leads to distortions in the final stitched image if these dynamic variabilities are not compensated for. A distorted container image might lead to damage detection failures, false alarms, or damage misclassifications.

Contrary to this approach, ATAI has innovated in accurately mapping and localizing a given captured imagery on

the overall container. This novel approach enabled the possibility of feeding the raw damage frames to the algorithms, resulting in more accurate detection and classification. It also allows for the usage of the damage images captured by other cameras from a different angle/perspective. While these images were ignored in the traditional approach (as they couldn't be used for stitching), ATAI has put these images to work to create a more complete training data set, which also helps to provide damage evidence from multiple perspectives.

Accuracy vs miss rate

Unlike the common usage of AI in the terminal industry, where the focus is on improving the accuracy of the algorithms, the container damage algorithms need a different approach. This is because the damage-related data sets are not a balanced data set (the percentage

of 'damage' vis-à-vis the percentage of 'no damage' is more skewed towards the latter category). Additionally, the cost of handling false positives (incorrectly inferring damage when none exists) is very high due to the manual nature of exception handling.

Because of the above, the algorithm training for damage detection should be more tuned towards increasing precision or sensitivity rather than accuracy. As such, ATAI's SMART container damage survey system prioritizes minimizing the miss rate rather than solely focusing on improving accuracies.

Training data set – a realistic synthetic data creation framework

Access to the training data set for container damage poses significant challenges, as it requires capturing vast amounts of raw data, creating the ground truth, and ensuring the availability of sufficient data for each type of damage. This data creation process is time-consuming and

sensitive to environmental and location variations, affecting the algorithm's outcomes.

Recent advancements in technology have enabled the creation of synthetic data. However, the challenge with it lies in the accurate representation of damage and the loss of useful information in the process

of transposition from a 3D to a 2D representation. Environmental and location factors further influence this loss of data.

At ATAI, we focused on creating a 3D data set for damage data that incorporates environmental and location-specific variability. We developed a comprehensive framework

for synthetic data creation using AI, image processing, and 3D rendering to generate the most authentic data set for container damage. By not relying on stitched images,

our synthetic data avoids certain lossy transformations. Additionally, our data's richness is enhanced by utilizing different perspective views of the same damage. The

common damage model also enables us to deploy the SMART container damage survey at the exit points seamlessly, thus providing better liability protection for the terminals.



SYNTHETIC DATA CREATION – 3D RENDERING TO ENVIRONMENT CREATION

Damage validation mechanism – absence of the ground truth

In general, AI relies on probabilistic engineering and typically requires the digital ground truth to validate its outcome. As container damage detection algorithms cannot depend on the availability of the digital ground truth for

exception identification, every instance of detected damage has to be considered for processing.

ATAI's container damage detection solution overcomes this model by (i) ensuring that algorithms are tuned for

precision to ensure no damage is missed and (ii) through the availability of complete history from prior visits regardless of the terminal's damage definition. This approach helps minimize the handling of false positives.

Static model vs continuous learning

An essential and differentiating component of the container damage survey solution is the framework that enables it to incrementally learn from the accumulated feedback on the outcomes vis-à-vis ground truth.

This framework has also allowed us to create common models across various operational points of the container. For example, the damage detection algorithms used for a quay-side container survey are the same as the model used at the gate or rail sides

of the container survey. Besides continuous learning, the framework has resulted in providing a consistent outcome across the terminal. It also helps the individual terminals to fine-tune the algorithms according to their specific needs and requirements.

Beyond ISO containers

The benefits of ATAI's novel approach in addressing the challenges in a container damage survey at customer terminals have reiterated our leadership in innovation

and customer-centric attitude. ATAI has extended this framework to encompass box damages for non-ISO containers, such as swap bodies, semi-trailers, and tank containers.

This novel framework allowed us to deploy and use common models across various types of terminals, including barge, intermodal, ro-ro, and inland container depots. ■



DAMAGE DETECTION FOR SWAP BODIES, SEMI-TRAILERS, AND TANK CONTAINERS



ATAI is an applied AI company driving digital transformation in the maritime, logistics, and supply chain industries. Focused on improvements in productivity, sustainability, and cost efficiency, ATAI offers end-to-end problem-solving solutions powered by AI algorithms and cutting-edge technologies. Head to atai.ai to learn more.

LESSONS FROM THE (PAST & PRESENT) FRONTLINES OF LOGISTICS

by Thomas Bock, CTO and COO, FERNRIDE

Before the 1950s, shipping was a chaotic ballet of barrels, crates, and sacks, each piece of cargo loaded individually onto ships. Then came Malcolm McLean, a trucking entrepreneur with a vision for efficiency. He imagined a world where goods traveled in standardized containers, transferable between trucks, trains, and ships with ease. This 'intermodal' system, as it came to be known, was met with resistance. Shipping lines balked at the cost of new ships and port infrastructure. Unions worried about job displacement.

But McLean persisted, demonstrating the power of his idea with a converted tanker ship, *Ideal X*, which set sail in 1956 carrying 58 containers. This marked the beginning of a revolution in logistics, one that continues to shape how we think about efficiency and scale in transportation.

Just as containerization transformed global shipping, the shift toward automated logistics and autonomous fleets presents both immense opportunities and unique challenges.

What can terminal operators learn from the impact of containerization?

Containerization has forever changed global trade. This transformation wasn't achieved simply by switching to a new type of box. It required a system-level shift, demanding a focus on consistent quality and reliability to ensure smooth intermodal transport across oceans and continents. It also demanded a rigorous approach to testing and validation to ensure the safety and integrity of this new system. And finally, it required a commitment to creating systems that were not only efficient but also adaptable to future changes and advancements, allowing containerization to keep pace with the evolving demands of global trade.

These principles remain essential for navigating the complex challenges facing terminal operators today. To scale your

terminal operations, you need to ensure consistent quality and reliability through stringent standards, embed rigorous testing and validation in all processes for safety and efficiency, and develop scalable and adaptable systems to accommodate future changes and advancements.

Sourcing for success: a shared challenge

Quality, adaptability, and rigorous testing – these aren't just buzzwords. They are make-or-break factors for any industry undergoing a major transformation, especially the shift toward automated logistics. Just as containerization relied on a robust network of dependable suppliers, so too does the success of autonomous fleets.

At FERNRIDE, we understand this challenge intimately. We have navigated the complex world of sourcing hardware for our autonomous vehicle technology (demanding the same high standards that fueled the containerization revolution) and terminal automation.

We also understand that terminal operators face similar hurdles, such as finding experts: locating partners with proven experience in terminal operations and a track record of delivering reliable solutions is no easy feat. There are also compatibility concerns: ensuring new technologies can integrate with existing equipment, systems, and workflows within a terminal's complex

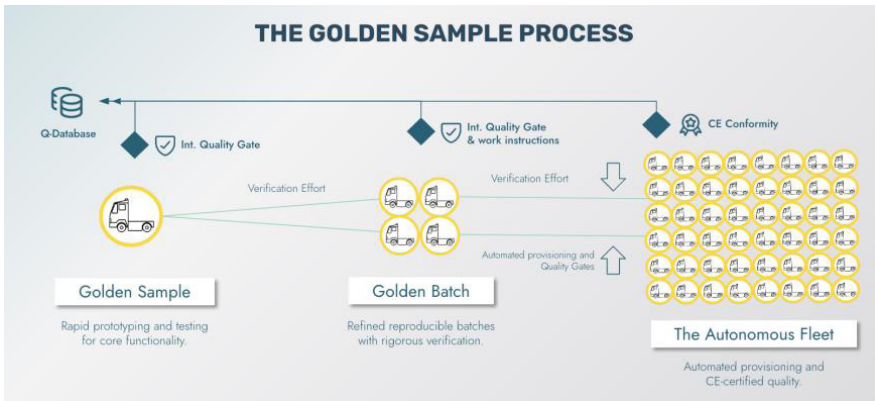
ecosystem is crucial. Compromising on high standards is absolutely off-limits: embracing innovation while upholding the stringent safety and reliability standards of a terminal environment demands careful vetting and due diligence. Finally, there are procurement hurdles to jump over without breaking your leg: lengthy and complex processes add another layer of difficulty to sourcing mission-critical technologies.

These shared challenges underscore the need for open communication, strong partnerships, and a collective commitment to success between technology providers and terminal operators.

The blueprint for autonomy at scale

At FERNRIDE, we recognize this fundamental truth: we're never just building one autonomous vehicle; we have to plan for a fleet of thousands right out of the gate. Our Golden Sample Process is a rigorous framework that bakes scalability into every step of our autonomous vehicle development, allowing us to engineer our solutions from day one to perform at mass scale, ensuring the highest standards of quality, reliability, safety, and security.

The Golden Sample Process is a three-stage approach to developing autonomous solutions that are both rapidly deployable and scalable. First, the titular Golden Sample itself: we start with rapid prototyping to quickly design and



Tab. 1. The Golden Sample Process, while designed for autonomous vehicle technology, embodies principles crucial for success in both autonomous innovation and modern terminal operations

Lesson	FERNRIDE's Golden Sample Process	Terminal operations
Standardization for scalability	Golden Batch refines prototypes into reproducible units with detailed instructions, ensuring consistency as we scale.	Standardized cargo handling procedures and equipment maintenance schedules minimize variability and support operations scaling.
	Rigorous documentation and acceptance criteria guarantee every vehicle meets the same standards.	Standardized data formats and communication protocols in new technology and system integration.
Rigorous testing & validation	Extensive testing (in simulations and real-world settings) identifies and mitigates potential issues before deployment.	Safety audits, equipment inspections, and performance monitoring identify and address risks.
	Specific verification steps in each stage to validate performance against predefined acceptance criteria.	Pilot programs for new technologies; controlled testing and validation within live terminal environment.
Data-driven optimization & adaptation	Continuously analyze vehicle performance data to identify areas for improvements and adapt to changing conditions.	Leverage data to optimize terminal layout, traffic flow, and resource allocation.
	Use data insights to refine algorithms, optimize vehicle behavior, and inform future development decisions.	Implement systems for continuous monitoring and analyzing of KPIs to guide decision making.

test a solution that meets the core functionality of the target use case, prioritizing fast interaction and learning.

Second, the Golden Batch: the prototype is refined into a reproducible batch, complete with detailed specifications, acceptance criteria, and work instructions. A comprehensive verification effort ensures we can consistently meet these standards and gain crucial knowledge about scaling production. This stage may include CE certification as well as early deployments for real-world feedback.

Third, the Production Line: the focus shifts to automation and high-quality documentation. Work instructions and acceptance criteria are refined to support series production, ensuring every vehicle

meets the highest quality and safety standards (including CE certification).

The key principle is a strict separation between the rapid iteration of early development and the predictable quality required for series production. This allows us to innovate and test new ideas quickly in the early stages while maintaining the highest standards of quality and reliability as we scale up to mass production.

How does it look in practice?

First comes identifying a critical process: we start by selecting a crucial element that directly impacts your terminal's efficiency, such as navigating a complex, mixed-traffic scenario within a terminal or precisely aligning with a ship-to-shore

crane for the container handover.

Then, we move on to developing and documenting the ideal solution: our engineers design and thoroughly document the optimal way for our autonomous vehicles to perform this process, taking into account all relevant safety and efficiency factors.

Next, it's time for rigorous testing and refinement: the Golden Sample solution undergoes extensive testing in simulated environments and real-world settings, allowing us to identify and address any potential issues or edge cases.

This is followed by establishing the benchmark: once validated, the solution becomes the 'yardstick' for all future iterations, ensuring consistent quality and reliability as our technology evolves.

Lastly, ensuring compliance with the highest safety standards stands for implementing critical measures to meet CE certification safety requirements. It marks crucial progress for the entire industry when it comes to validated hardware generation.

The Golden Sample Process is a continuous cycle of improvement; it is also how we achieve both speed and quality. By rigorously testing and refining our autonomous solutions early in development, we can learn fast without disrupting the scaling process and series production down the line. We understand that in the world of terminal operations, downtime is not an option.

Building a future together

The journey toward a truly automated future in logistics won't be a solo mission. It demands the same collaborative spirit and commitment to excellence that once fueled the containerization revolution. Below is what we can learn from history and apply to the future of automated logistics.

Scalability is key: just as standardized containers unlocked global trade, autonomous solutions must be designed for mass adoption from day one. Quality and reliability are non-negotiable: rigorous testing, robust systems, and a commitment to continuous improvement are essential for building trust in autonomous systems. Collaboration is crucial: technology providers and terminal operators must work together to ensure seamless integration, shared standards, and a unified vision for the future. ■

FERNRIDE FERNRIDE offers scalable automation solutions for yard trucking that increase productivity, promote sustainability, and improve worker safety. Employing a human-assisted autonomy approach that allows for remote takeovers of trucks when necessary, FERNRIDE's technology has been seamlessly integrated into logistics operations in ports and terminals run by industry titans such as Volkswagen, HHLA, and DB Schenker. Go to [fernride.com](https://www.fernride.com) to discover more.

SAILING BLIND?

by Ossi Mettälä, Product Manager, NAPA Shipping Solutions

FuelEU Maritime might be the new kid on the block, but it has teeth and will bite. Coming into effect at the start of 2025, the Regulation is part of the EU's Fit for 55 toolkit to help the block achieve climate neutrality by mid-century. Representing a new age of legislation, FuelEU Maritime provides clear incentives for change, not only through high financial penalties for non-compliance but also by shifting calculations on asset value. If the industry needed any more reason to transition to alternative fuels, look no further.

FuelEU Maritime is poised to succeed where the International Maritime Organization's (IMO) Carbon Intensity Indicator (CII) has failed. The former stands apart from the latter with more stringent and enforced penalties, unlike CII, which relies on market acceptance. In other words, FuelEU Maritime wields a stick – but it also offers a carrot.

Penalties for non-compliance are robustly enforced and, at €2,400 per tonne of very-low sulphur fuel oil (VLSFO)-energy equivalent, they are high enough to encourage investment in low-carbon bunkers and alternative-fuel 'ready' vessels. A recent analysis by OceanScore also affirms that penalties could reach an average of €520,000 per vessel annually for passenger ships and €214,000 for container carriers. The stakes are high whether the market likes it or not.

The benefits of compliance are tangible. **According to an 'explainer' by the Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping (MMMCZCS)**, in 2025 itself, paying the premium for blending biodiesel will generally be cheaper than paying the penalty on a per tonne of abatement basis. Further, vessels that are compliant or in excess will open the door to new business opportunities for their owners through pooling. Ultimately, this could increase asset value and provide access to easier financing.

With the business case for taking FuelEU Maritime seriously now clear, how prepared is the industry? According to DNV, there could be up to seven times more deficit than surplus of compliance units across the industry when the data

for 2025 is finalised. This shows that from year one, the majority of shipowners will have to take some form of action, be it pooling, borrowing, or paying a penalty. The urgency is, therefore, clear: shipping must take immediate action to avoid penalties and seize emerging opportunities.

Shipyard order books show the tides are turning. **The latest data from Clarksons Research** shows that around a third of all newbuild orders in the first half of 2024 were for vessels capable of using alternative fuels, including liquefied natural gas (LNG), methanol, ammonia, liquefied petroleum gas, and hydrogen.

The importance of preparation

FuelEU Maritime will not exist in a vacuum. When looked at holistically, this Regulation will build on the foundations of the EU Emissions Trading System (EU ETS) to accelerate shipping's decarbonisation and will help the industry take the leap towards new fuels as it targets fuel greenhouse gas (GHG) intensity. It also comes at a time when the industry has already been exposed to the impacts of the IMO's CII and the EU ETS. One of the key differentiators of FuelEU Maritime is, therefore, that shipowners and charterers are learning the importance of preparation and the underpinning role of data in informing compliance strategies.

Larger companies, naturally, have an advantage in being able to plan ahead, while smaller operators may struggle to get on the front foot. Faced with resource constraints and knowledge gaps, many lack the bandwidth to take a proactive approach to FuelEU Maritime and, by this time next

year, will end up 'playing firefighter,' scrambling to find drop-in fuels or pooling solutions to avoid paying hefty fines. Fleet data is, therefore, a critical asset for making informed decisions. As well as monitoring compliance deficits and surpluses, it also allows owners to weigh the cost-benefit analysis of different compliance strategies.

Simulations based on NAPA's performance models and pooling cost estimates released by the MMMCZCS already reveal a snapshot of the scale of the potential costs involved – although exact prices will be set by the market. Consider a typical Capesize bulk carrier operating between Brazil and Rotterdam that consumes approximately 16,700 tonnes of fuel annually (both VLSFO 380 CST and low-sulphur marine gas oil). With a GHG intensity of 91.4 grams of CO₂/megajoule, the vessel would face a compliance deficit of 703.70t CO₂. This represents nearly €450,750 in penalties for 2025, adding 5.1% to bunkering costs. Alternatively, based on MMMCZCS' estimates that external pooling will come at the price of around €420/t, the cost increase would instead be 0.9%.

By contrast, a ro-ro vessel equipped with rotor sails and operated between EU ports in the Northern Atlantic can generate a compliance surplus of 1,750t/year. One such vessel can, therefore, offer significant 'excess' through pooling and offset the emissions of nearly 2.5 bulkers from the first example. Considering the €420/t estimate for the price of pooling, the surplus could generate just under €207,000 in additional revenue through pooling, which represents a reduction of nearly 3% in bunkering costs.

PHOTO: CANVA

The missing piece of the puzzle

Going above and beyond compliance with regulations has its rewards. Surplus compliance has value and can create an additional source of revenue for shipowners through pooling.

Early movers who invested in LNG or low-carbon-fuelled vessels or wind-assisted propulsion will benefit from 'excess' compliance – while the emission reductions mandated by FuelEU Maritime stand at 2%. This gives these owners a strategic advantage and opportunity to 'pool' such vessels with others in fleets that fall short on compliance – or look at opportunities to pool their ships with other companies for a defined period.

As new opportunities arise, markets for surplus exchange are expected to follow. Several new companies have already cropped up to facilitate the pooling option across companies. Tapping into this opportunity depends on being able to quantify the extent of a fleet's current and future compliance (or non-compliance). The missing piece of the puzzle is data.

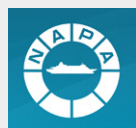
While there's still no definitive test for how prepared the industry is for FuelEU Maritime, we can see that scale, alternative fuel pricing, and bunker availability all continue to pose challenges to compliance.

In this climate, short-to-mid-term strategies to prepare for the Regulation for most owners are likely to be based on either adopting drop-in biofuel and/or wind-assisted propulsion, as well as pooling, borrowing, or simply paying penalties for others. In practice, there are several more variables at play. From vying for and securing the availability of alternative fuels at ports to navigating the cost of pooling, there are many considerations for companies looking to assess those options against the cost of paying penalties.

Digital platforms, like NAPA's FuelEU Maritime module (part of NAPA Fleet Intelligence), help streamline this wealth of information to give shipowners and charterers all the facts to make decisions based on data and evidence. Using data from noon reports on the quantity and type of fuel consumed on board, the module enables owners to visualise compliance shortfalls or surpluses for every ship – even on a voyage-per-voyage basis. Critically,

it allows shipping companies to test different compliance strategies, including pooling, banking or borrowing, and see how each option would move the dial on their fleet's compliance status. They can compare these approaches with the cost of potential penalties, as well as gain an accurate estimate of how much surplus they will be able to offer through pooling, be it with other vessels in the fleet or with other owners. **The module's initial roll-out across 1,500 vessels through ClassNK's ZETA platform** demonstrates its potential to help owners-operators understand the carbon and bottom-line impact of the new Regulation on their operations.

The role of digital technologies in shipping's green transition is to ensure that companies have a robust understanding of their operations and compliance options to avoid sailing blind. As such, digital technologies can ensure compliance, profitability, and strategic advantage during the industry's energy transition. ■



With 35 years of operation, NAPA is a leading maritime software and data services provider to enable safe, sustainable and future-proof shipping. With 90% of new vessels built by NAPA customers, NAPA's design software is the global standard. For ship operations, NAPA provides vessel stability and data management, and its cloud-based solutions for performance monitoring and optimization support shipping decarbonization. Visit www.napa.fi to see more.

THE AURA OF APPLIED DATA ACCURACY

by Ilari Leinonen, Product Owner, Elomatic

The maritime industry is experiencing a significant period of transition. The introduction of increasingly ambitious regulatory frameworks, as well as concrete commitments to adopt more sustainable operations that drive decarbonization, has placed current industry practices under the spotlight. At the same time, significant technological advancements and increasingly more sophisticated systems, amidst the onset of industry digitalization, are enhancing operational efficiencies across a range of different sectors.

The shipping industry creates a vast amount of operational, commercial, and environmental data. Despite this, the sector has been largely left behind by the digital transition that other industries have benefited from, still often relying on outdated systems that fail to harness the power of modern digital solutions. This failure to grow with the latest advances in technological innovation has led to a seeming acceptance of operational practices that other industries would not.

The shift to digital couldn't be more timely, especially as the industry confronts the pressing challenge of the climate crisis. Digitalization can enhance and accelerate the energy transition. Heightened stakeholder pressure, a stricter regulatory environment, and the reality that scalable alternative fuels are still years away have forced the industry to double down on energy efficiency. To achieve the International Maritime Organization's greenhouse

gas emission reduction targets, the industry is having to consider new technologies (including ship upgrades) and infrastructure interventions (low-carbon bunkers). Additionally, the shipping sector must implement methods to measure and validate the impact of these modern technologies.

In response to this, we marine engineers and consultants at Elomatic have partnered with Europe's largest artificial intelligence (AI) lab, Silo AI (part of AMD), to develop the Aura Asset Performance Management (APM) system, a highly customizable, 360-degree solution that is designed to utilize advanced AI technologies to support enhanced operational efficiency.

Moving beyond just ticking the box

The current industry standard for computerized maintenance management systems in maritime operations is a regulatory requirement for accessing and sharing data. These systems are often seen as unhelpful obligations,

which reduces their utility to basic 'tick box' exercises.

Yet, with a shift in approach, current maintenance management can evolve into essential tools that enhance operational efficiency with minimal intervention. By engaging with new and innovative technologies, the maritime industry can harness the wealth of data insight that is available. Through a combination of high-quality data from crew inputs and equipment sensors, these systems could significantly improve vessel operations by providing better overall awareness.

For instance, traditional maintenance practices hold to rigid schedules with the aim of preventing costly breakdowns. However, these processes often rely on outdated inventories and scattered documents, which can compound busy workloads and still result in breakdowns at sea. Optimizing maintenance schedules through clean, accurate, and accessible sensor data provides a clear picture of where & when maintenance is truly needed.



While sensor data plays a significant role, it is part of a broader preventive maintenance strategy that also benefits from manually imported data, equipment history, and general usage. Our evolving approach aims to enhance this process with more intelligent solutions, minimizing unnecessary interventions, reducing costly downtime, and improving safety.

Implementing the unthinkable

With accurate data and measurements, consistent methodologies, and real-time information, systems such as Aura can identify the small margins that will achieve savings with a degree of accuracy that would have been unthinkable just a decade ago.

Advancements in high-speed connectivity now allow for real-time intervention from land-based teams, supporting decision-making that was once confined to onboard crews. This includes ensuring necessary inventory is always at hand, enabling transparent collaboration between environments, and maintaining a clear digital trace of actions & operations on board. Ultimately, the integration of machine learning and AI within an APM system is likely to greatly increase the scope and application of the data that can be gathered in the future.

By integrating advanced AI models into APMs like Aura, the model plays a crucial role in the stages following initial data access (including consolidation, harmonization, utilization, and analysis). This enables shipowners and operators to adjust routing speeds, establish operational parameters that reduce emissions, and optimize entire fleets effectively.

Leveraging engine sensor data integrated into the platform, Aura can provide automated service planning, resource allocation, and supply chain management functionalities. This capability allows for proactive maintenance and optimal resource utilization, ultimately improving operational efficiency for those owning and operating ships. More than just an APM system, Aura represents an intelligent cloud solution that integrates with a vessel's existing computing capabilities and onboard IT infrastructure.

The incorporation of machine learning and AI within the APM framework may significantly expand the scope and application of the data that can be collected and analyzed in the future. In time, Aura will evolve to offer actionable asset health information and maintenance support, further transforming how the maritime industry approaches operational efficiency and sustainability.

Aura is designed to simplify asset management by offering comprehensive data insights. One of its key features is its 360-degree approach, which integrates maintenance, repair, and optimization processes into one user-friendly platform. By streamlining inventory management, planning and scheduling, the system not only saves time but also

reduces operational costs, helping operators avoid unplanned downtime.

Clarity and confidence

As AI technology continues to develop, the maritime industry stands to benefit from enhanced decision-making capabilities, improved resource management, and a more sustainable operational framework. This revolution will not only optimize efficiencies but also position the industry to meet the pressing environmental challenges it faces today.

Aura provides a clear example of how modern digital solutions can provide the clarity and confidence needed to navigate this period of significant transition within the maritime industry. The goal of Aura is not to introduce complex software integrations that compound busy workloads. Instead, it is a tool that aligns with existing systems, enhancing the tonnage's lifetime value, reducing costs, and supporting more operationally sustainable & safer vessels.

The maritime industry must move on from outdated maintenance practices and fully embrace the digital transition. Utilizing clean, accessible, and digestible data from the ship's sensors, whilst including user-originated logs of action, work order reports, and documents, is a necessary step towards a more sustainable and energy-efficient future. ■



Elomatic is an international consulting and engineering company that provides top-level expert services, products and turnkey solutions to process, machinery, marine, energy and pharmaceutical industries. We are focused on continuous improvement and sustainable development, and we are committed to design solutions that increase the wellbeing of people and the environment. Established in 1970, Elomatic employs 1,300 professionals, and has customers in more than 80 countries across the globe. Go to [elomatic.com](https://www.elomatic.com) to discover more.

STRIKING THE RIGHT NOTE

by Fitzwilliam Scott

Warehouse automation and robotics have become buzzwords in the logistics industry, promising increased efficiency and reduced labor costs. However, it's crucial to recognize that these solutions are not one-size-fits-all. Implementing automation can be complex and expensive, requiring a tailored approach to ensure a positive return on investment (ROI). "While automation devices show great potential in enhancing warehouse efficiency, their isolated implementation often leads to unforeseen challenges. It's not just about deploying technology; it's about ensuring that these technologies work together seamlessly to deliver value," cautions Smitha Raphael, Chief Product & Delivery Officer at Synergy Logistics.

The challenge with integrating individual automation devices lies in understanding their overall impact on warehouse operations. A piecemeal approach often results in inefficiencies and redundancies, negating the benefits that automation can offer. What warehouses need is a system that provides a comprehensive view of the entire operation, linking all automated devices on a centralized, easy-to-manage platform.

This is where the concept of a 'warehouse orchestra' comes into play. Just as an orchestra requires a conductor to synchronize different instruments, a warehouse needs multi-agent orchestration (MAO) software to harmonize its diverse range of automation tools and robots. The solution has emerged as a game-changer because it offers seamless and efficient control over all devices within the four walls of a warehouse, ensuring they operate in concert rather than in isolation. "Think of MAO software as the conductor of your warehouse orchestra. It ensures that every device, from conveyor belts to robotic arms, works together in harmony, maximizing efficiency and productivity," explains Raphael.

Continuous dialogue

To leverage the full potential of MAO software, selecting the right system for your business is crucial. Not all MAO solutions are created equal, and the difference often lies in their ability to facilitate two-way communication. Effective MAO systems are designed to enable seamless data exchange between the platform and devices, allowing for automated decision-making and real-time adjustments. "The secret to successful warehouse orchestration lies in two-way communication," shares Raphael. "This continuous dialogue between the platform and devices ensures that each machine's operational value is automatically assessed, enabling optimal performance decisions to be made in real-time."

This dynamic communication allows the system to evaluate each device's performance continuously, making informed decisions that enhance overall warehouse efficiency. However, it's essential to recognize that not all MAO solutions provide the same level of functionality and flexibility. To ensure scalability and growth, businesses should seek MAO software that is easily configurable and capable of integrating new devices as needed.

Selecting the right MAO

Picking a piece of software that works for (instead of against) you is critical for any warehouse looking to optimize its operations. To guide organisations in this decision-making process, here are 10 essential questions to consider.

First, integration: are your current tech solutions operating cohesively, or are they functioning in isolated silos? Second, device compatibility: does the solution seamlessly connect with a diverse range of devices and systems? Third, task prioritization: can the software efficiently orchestrate and prioritize tasks? Fourth, task allocation: does it automatically allocate or reassign tasks and workflows based on real-time data?

Fifth, device matching: is the system capable of selecting the most suitable robotic device for specific operations? Sixth, data insights: does the software capture data to evaluate device performance? Seventh, real-time switchover: can it facilitate rapid transitions between devices to maintain workflow continuity? Eighth, task buffers: does it have mechanisms to delay tasks when necessary without disrupting overall operations? Ninth, traceability: is the software equipped to handle product expiry



A robust solution provides a clear, efficient roadmap for scaling automation without locking businesses into a rigid framework. “Next-generation automation control doesn’t have to come with a hefty price tag or extended implementation timelines,” Raphael says. “With the right MAO system, warehouses can achieve tangible labor savings, make accurate asset management decisions, and realize rapid time-to-value – all without the constraints of multi-phase projects.”

Warehouse automation is not merely a passing fad – it’s a necessity. However, the key to maximizing ROI from automation investments lies in selecting the right orchestration software. By choosing a versatile and robust MAO solution, businesses can ensure their diverse ‘warehouse orchestra’ operates in perfect harmony, driving efficiency, reducing costs, and supporting scalable growth. “Just as an orchestra needs a conductor for harmony,” Raphael concludes, “today’s warehouses require advanced multi-agent orchestration to deliver on their full potential.”

By considering the critical criteria outlined above and learning from successful implementations, such as SnapControl, businesses can make informed decisions that align with their operational needs and long-term goals. The right MAO software will not only enhance current operations but also future-proof warehouses against the evolving demands of the industry. ■

dates and ensure traceability? And, finally, exception handling: can it manage exceptions effectively without causing downtime?

“If the answer is ‘no’ to any of these questions,” Raphael advises, “it may be best to continue your search. The right ‘conductor’ for your warehouse orchestra is out there, but finding it requires due diligence.”

One such solution that has shown significant success in the field is SnapControl, a device-agnostic MAO platform that speeds up integration and allows warehouse operators the flexibility to choose automation and robotic devices tailored to their specific operational needs. In a real-world example, SnapControl’s implementation in a US-based online retailer’s warehouse has showcased its transformative capabilities. By optimizing task allocation between human workers and automated resources, SnapControl increased productivity sixfold. Over 61% of the workload was automated, leading to labor

savings exceeding half a million dollars and achieving a swift payback of just 23 weeks. Raphael highlights, “This example illustrates how a well-chosen MAO solution like SnapControl can transform warehouse operations, driving efficiency and delivering substantial cost savings in a short timeframe.”

A (perfect harmony) necessity

As retailers and third-party logistics providers anticipate increased levels of automation and robotic integration in the coming years, adopting the right MAO software becomes a strategic imperative.



SnapControl is a multi-agent orchestration platform that provides a device-agnostic, unified approach to automation. Extending the functionality of the robust and flexible rules engine in the SnapFulfil Warehouse Management System (also brought to you by Synergy Logistics), SnapControl provides seamless and efficient control of any and all warehouse devices and robots – all with a low total cost of ownership and rapid time to value. Head to [synergy-logistics.com](https://www.synergy-logistics.com) to discover more.

TAMING THE TRAFFIC TIDES

by Emin Nakilcioğlu, Research Associate, Fraunhofer CML

In an innovative study, we explore the challenges facing container depots in managing traffic surges and operational volatility. Collaborating with HCS Hamburger Container Service, we have developed a sophisticated probabilistic model that predicts hourly workload and traffic volumes with high accuracy, enabling dynamic resource allocation and improved operational efficiency.

The forecasting model, built on Bayesian Neural Networks, uses real-world data from a container depot alongside external data sources to effectively capture the interdependencies between a multitude of variables, such as truck arrival patterns and container specifics, while also accounting for the complexities and uncertainties associated with global trade fluctuations and port congestion. By introducing advanced forecasting techniques to depot management, we aim to initiate industry-wide discussions on the future of predictive analytics in container logistics, paving the way for more resilient and adaptive container depot operations with the help of data-driven solutions.

Real-life innovation

Since the global shipping industry began recovering from the COVID-19 pandemic, containerized trade volumes surged in 2021 before experiencing a steady decline, culminating in their lowest levels by 2023. Now, as the industry embarks on a path of gradual recovery, it confronts new challenges in managing inland logistics and depot operations effectively.

At the heart of this evolving landscape are container depots, critical components of the inland logistics network. These facilities serve as essential hubs for the management of containers owned by leasing and shipping companies, providing storage, safety checks, and maintenance services. Their role as hinterland buffers is crucial in balancing the peaks and bottlenecks experienced at ports. While these facilities are designed to maximize efficiency and space productivity, they are not immune to the fluctuations in container traffic. Companies like HCS Hamburger

Container Service have been facing significant challenges as they navigate surges in demand for their services.

To address these complexities and uncertainties, we have partnered with HCS to develop an innovative solution aimed at managing periods of high volatility while also optimizing day-to-day operations. HCS has provided us with extensive operational data from one of their depots, which is strategically situated within the Port of Hamburg (with private rail and barge connections). The dataset includes comprehensive information on the daily traffic of container trucks, a critical component of depot operations.

With over three decades of expertise in the repair and stock-keeping of empty containers, HCS stands as a vital partner in our research initiatives. This collaborative effort underscores the importance of advanced forecasting techniques in managing the complexities of container depot operations and in ensuring that our solutions are both practical and industry-focused. By merging hands-on knowledge with scientific expertise, this joint effort demonstrates the power of collaboration in tackling the complexities of depot operations, making sure our forecasting solutions are both innovative and aligned with the real-life operational needs of container depots.

Forecast and act preemptively

The day-to-day operation of a container depot is subject to seasonal and daily traffic fluctuations, leading to challenges in workforce planning, equipment allocation, and space utilization. Factors like congestion at ports and container truck traffic compound this unpredictability. For operators, accurately forecasting these peaks and troughs has always been a complex task.

In traditional forecasting methods, a deterministic approach assumes fixed outcomes based on historical data, often overlooking the inherent variability in real-world operations caused by uncertainties. To address this limitation, we based our model on Bayesian Neural Networks, which capture the interdependencies between variables such as truck arrival patterns, container details, and external factors like port schedules and information from pre-announcement data interfaces (e.g., the TR02 one in the Port of Hamburg). Due to its ability to estimate unknown parameters and quantify the associated uncertainty in a principled manner, our method offers a more robust and dynamic solution for mitigating the uncertainties that traditional models often overlook. Since the predictions are continuously updated as new data arrives, the model can help the depots respond more effectively to unexpected peaks in the upcoming traffic volume that would otherwise catch them off-guard.

For example, by predicting potential congestion early, operators can make proactive decisions about resource allocation or truck arrival schedules, reducing the risk of bottlenecks that could disrupt depot efficiency. The ability to forecast and act preemptively reduces operational risks, improves service delivery, and helps depots stay on top of fluctuating demand.

Given the volatile nature of inland logistics, tighter operational planning and resource adjustments are necessary to maintain smooth operations. With a probabilistic model, operators can ensure that the facility is prepared for potential traffic increases, ensuring the facility's resources are always in optimal use.



PHOTO: CANVA

Complex supply chains

Operational forecasting doesn't just benefit single depots – it's scalable across networks. Our model can be applied to multiple facilities, enabling a cohesive view of traffic across a company's entire logistics operation (provided the facilities keep records of their operational data, which then can be used for developing a customized forecasting model). This flexibility is particularly useful for companies managing complex supply chains or multiple hubs where traffic volume can shift rapidly between locations.

Additionally, forecasting models like ours can contribute to the sustainability of logistics operations. By optimizing truck movements and container handling, depots can reduce fuel consumption, lower emissions, and minimize unnecessary container moves, aligning with broader industry goals for reducing environmental impact.

Furthermore, with accurate predictions of traffic flow and container handling, depot operations can be structured to maximize the effectiveness of available personnel. This approach allows for dynamic adjustments to workflow, such as identifying non-essential tasks that can be temporarily postponed during expected busy periods or staff shortages, consolidating tasks or temporarily adjusting processes to match the workforce with anticipated demand. Even when short-staffed, by focusing on core operations and

providing employees with advance notice of expected busy periods, workers can better prepare mentally and physically for challenging shifts. This foresight may help reduce the impact of under-staffing on individual workers, potentially lessening fatigue and improving overall safety. While it cannot completely offset the challenges of staff shortages, this method can help create a more supportive work environment by demonstrating a commitment to employee well-being through informed planning and communication.

Respond (more) effectively

Integrating advanced forecasting models into depot operations is no longer just an option; it's becoming ever more essential in today's dynamic logistics landscape. As container flows become more unpredictable and global trade continues to evolve, the ability to predict, plan, and

manage traffic surges will be critical for maintaining smooth operations and delivering high-quality service.

Our forecaster offers a robust solution that not only enhances operational performance but also contributes to risk management and sustainability. As depots face increasing pressure to operate efficiently while minimizing environmental impact, advanced forecasting tools will play a crucial role in helping operators meet these challenges.

By investing in predictive technologies and data-driven approaches, the logistics industry can enhance its ability to navigate uncertainties and optimize depot operations. While external factors may still affect the flow of goods, these advanced tools enable depots to respond more effectively to disruptions, potentially minimizing their impact and maintaining operational efficiency – even in challenging circumstances. ■



Emin Nakilcioğlu completed his BSc in mechanical engineering at the Istanbul Technical University and his MSc in mechatronics at the Hamburg University of Technology. During his master's degree, he specialized in intelligent systems, robotics, and deep learning. Since August 2020, he has been a Research Associate at the Fraunhofer Center for Maritime Logistics and Services, contributing to artificial intelligence- and data-driven digital innovations in maritime logistics. His work focuses on developing solutions for automatic speech recognition, natural language processing applications, time-series forecasting and workload prediction, alongside providing software development and technical support for maritime-specialized projects.

SEEKING (A REVOLUTIONARY) CHANGE

by Satish Gutta, Director, ATAI

Ports have long served as the arteries of global commerce, facilitating the seamless transit of over 80% of goods worldwide. As international trade burgeons in complexity, the necessity for dynamic, high-performance logistics systems capable of handling escalating cargo volumes has never been more critical. At the core of this evolution lies containerized cargo operations, a cornerstone of port logistics that demands precision, speed, and scalability.

In today's evolving logistics landscape, ports are critical to ensuring the seamless flow of goods. By integrating advanced technologies into existing brownfield operations, they are driving significant improvements in efficiency, throughput, and process optimization. These incremental advancements enhance visibility and accountability, enabling ports to adapt to the growing demands of global trade in an increasingly competitive environment.

The Inland Container Depot (ICD) stands as a cornerstone of India's trade and logistics network. As the country's largest dry port and a flagship facility in the region, it serves as a crucial multi-modal link, connecting the extensive hinterlands of Northern and Western India to key gateway ports. However, operating a terminal of this scale requires more than just robust infrastructure; it demands the integration of advanced technological solutions to achieve operational excellence and efficiency.

This is where ATAI has redefined operational paradigms. Leveraging its pioneering suite of applied AI solutions, our company has transformed ICD into a model of efficiency, reducing dwell times, enhancing safety, and addressing operational inefficiencies that once impeded its potential.

Operations before automation

The day at the terminal commenced with vehicles lining up at the gates, where drivers navigated a series of formalities that often proved time-intensive. Each driver was required to disembark repeatedly to fulfill approval procedures with a surveyor, an officer of the Central Industrial Security Force, and, in certain cases, a customs official. For vehicles carrying loaded containers, customs inspections involved verifying seals and documentation, adding further complexity. This process, while routine, was inherently protracted and often led to queues that disrupted the smooth flow of operations.

Once admitted, a vehicle's path depended on its purpose. Containers depending on the need were either kept in the yard or proceeded to the warehouse for the stuffing or de-stuffing process. However, the warehouse presented its own set of challenges. Space allocation was largely unstructured, with vendors utilizing areas as required without precise oversight. This lack of systematic monitoring often resulted in goods exceeding designated boundaries, leading to inefficiencies in space utilization and potential revenue losses. The yard posed an additional challenge. Identifying the exact location of containers relied heavily on basic documentation, requiring

equipment operators to manually search through rows of containers.

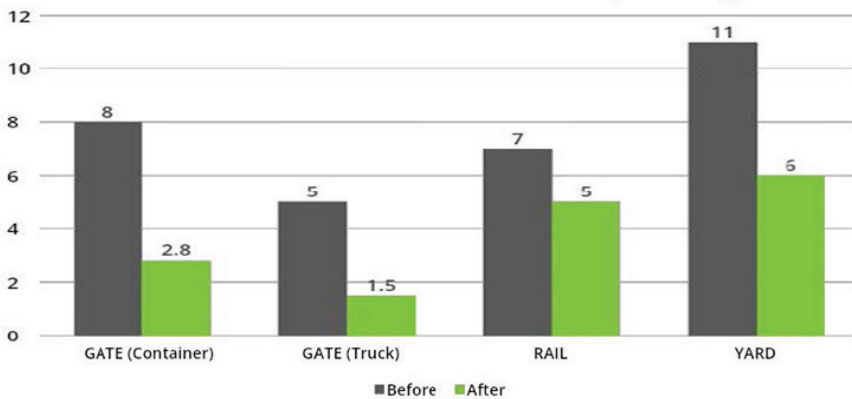
This lack of precision extended operational timelines, placed an undue strain on heavy machinery, and introduced redundancies into the workflow. The rail yard, however, represented the most critical intersection of risk and inefficiency. The coexistence of heavy machinery and human intervention created a high-stakes environment where precision was paramount. Loading and unloading containers onto wagons required meticulous coordination, yet the process relied on manual assignments that were susceptible to delays and errors. The proximity of personnel to large equipment further amplified safety concerns, heightening the risk of severe incidents.

Across all facets of the operation – gates, warehouses, yards, and rail – the reliance on manual workflows limited efficiency and increased vulnerability to errors. Tracking container movements, ensuring transparency, and maintaining safety standards were persistently challenging, often giving rise to disputes over damages or mismanaged cargo. This fragmented and labor-intensive system consumed valuable time and resources, leaving little room for optimization. Without integrated real-time data systems, operations often felt cumbersome and uncoordinated, limiting the terminal's ability to achieve optimal performance.



PHOTO: CANVA

Time Reduction after Rollout (in min)



ROLLOUT OUTCOMES

58%*
Increased Throughput

45%*
Increased Revenue

40%*
Reduced Operational Cost

PHOTOS: ATAI

Operations after ATAI

The transformation of operations at the ICD stands as a testament to the power of digitalization driven by artificial intelligence (AI). From the moment

a container enters the terminal to its departure (ingress to egress points) via rail, ATAI’s innovative suite of solutions – ATGate, ATRail, ATYard, and ATWarehouse – have streamlined every

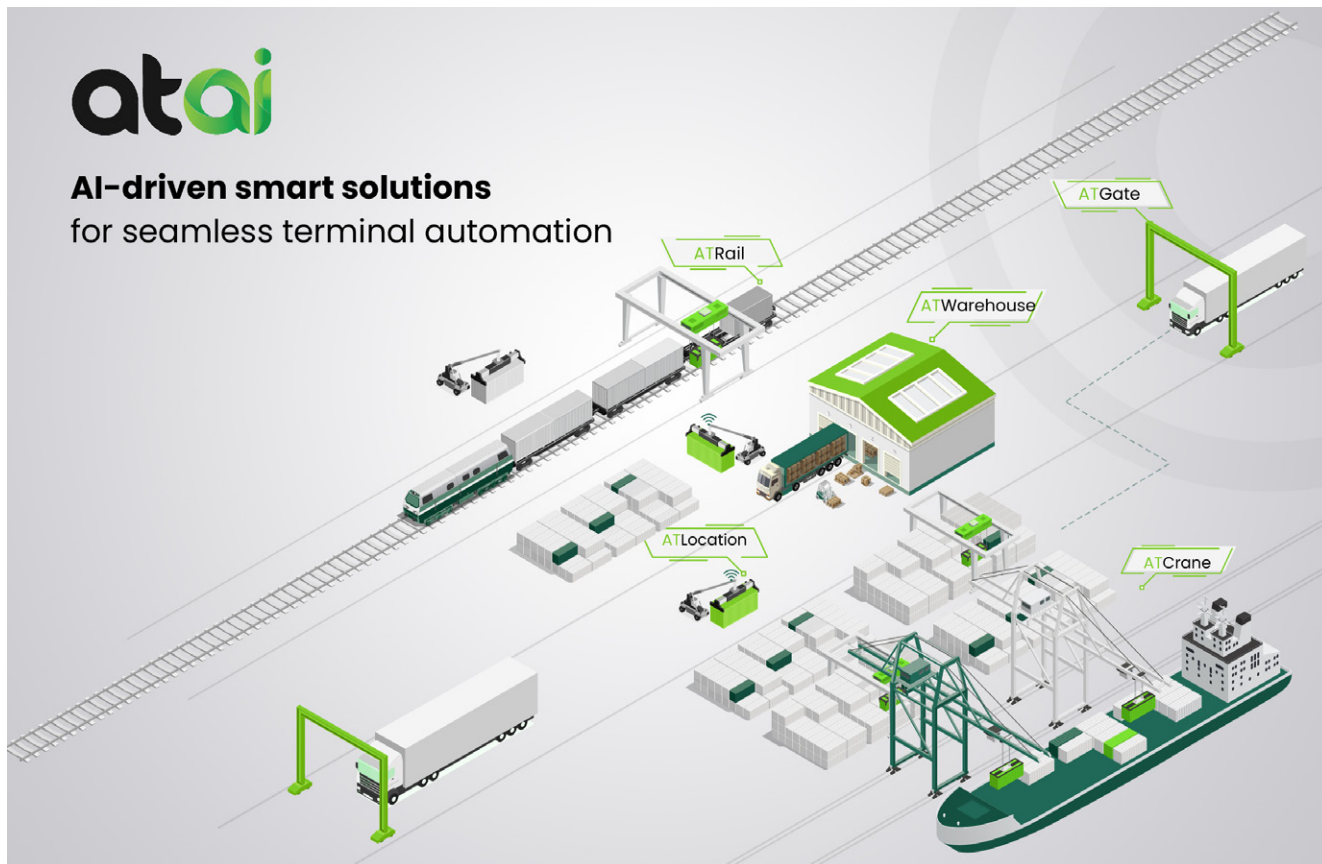
stage of the process, delivering unprecedented levels of efficiency, transparency, and safety.

ATAI’s automated gate solutions, ATGate, have transformed the way vehicles enter and exit the terminal. Upon arrival, each vehicle passes through an automated boom barrier, ensuring a controlled and efficient flow. Video cameras and sensors then capture critical details, like container number, ISO code, license plate number, seals count, **container damage status**, and other important attributes. This automation ensures a swift, hassle-free process, eliminating the need for manual checks and reducing congestion at the gates. Additionally, the visual evidence and data captured at this stage provide a reliable reference for resolving disputes, increasing transparency and accountability across the board.

Once inside, ATWarehouse transforms how goods are managed. Using advanced AI-driven systems, storage areas are allocated precisely, and any overuse of space by vendors is detected in real-time. This ensures fair billing and optimal utilization of warehouse capacity, eliminating the inefficiencies of manual monitoring. The solution also enables seamless cargo tracking, with real-time insights into dwell times and storage conditions. This precision has reduced warehouse operational time by 55%, improved transparency, and fostered smoother interactions between vendors and terminal operators.



AI-driven smart solutions for seamless terminal automation



ATYard brings intelligence to container movements. The solution leverages global navigation satellite system-enabled sensors and AI algorithms to track containers in real-time, eliminating the guesswork in locating specific units. Every container is assigned an optimal position, reducing unnecessary movements and saving valuable time. Another key feature of ATYard is its automated First In, First Out system. Traditionally, containers stacked on top were removed first for convenience, often delaying those that arrived earlier. ATYard ensures that containers are handled in the exact order they arrive, providing fairness to customers while maintaining operational efficiency. These improvements have optimized job assignments for heavy equipment, such as cranes and stackers, minimizing delays and ensuring smoother workflows across the yard.

At the rail side, ATRail has revolutionized container loading and unloading.

By automating wagon & container mapping, the solution ensures that boxes are accurately assigned to their designated wagons. Cameras at the rail portal capture the details of the wagons and containers, providing end-to-end visibility. The system's intelligent job assignment capabilities have achieved a 40% reduction in rail turnaround times, enabling faster processing and lowering operational costs. Additionally, safety has improved markedly, as ATRail minimizes human interaction in high-risk areas, significantly reducing the potential for accidents.

The rollout of ATAI's solutions at ICD has delivered outstanding results: 1.6x improvement in terminal throughput; 45% boost in revenue; 40% reduction in operational costs; and 60% reduction in emissions. ATAI's solutions have not only optimized the terminal's capacity but also aligned its operations with global sustainability goals.

A proven path to success

The transformation of ICD through ATAI's AI-driven solutions is a testament to the immense potential of technology in revolutionizing logistics. From seamless gate operations to efficient yard and warehouse management, ATAI has tackled long-standing inefficiencies, enhanced safety, and elevated transparency across every touchpoint of terminal operations.

ATAI's vision goes beyond solving today's challenges: it's about creating smarter, more connected systems that align with the future needs of global trade. As the logistics industry continues to evolve, our company remains steadfast in its commitment to innovation, ensuring its customers lead the way in efficiency, reliability, and sustainability.

For organizations seeking to transform their operations and embrace cutting-edge technology, ATAI provides a proven path to success – one driven by intelligence, rooted in technology, and focused on delivering measurable results. ■



ATAI is an applied AI company driving digital transformation in the maritime, logistics, and supply chain industries. Focused on improvements in productivity, sustainability, and cost efficiency, ATAI offers end-to-end problem-solving solutions powered by AI algorithms and cutting-edge technologies. Head to atai.ai to learn more.

MARITIME'S NEXT GREAT REVOLUTION

by Arnaud Dianoux, Founder & Managing Director, Opsealog

*Data standardisation – the creation of consistent formats and definitions for digital information – promises to revolutionise the offshore marine industry, as the introduction of the shipping container did for global trade in the 1950s. Standardised data is more than a technical necessity; it is the foundation for modernising a traditionally fragmented industry. As regulatory and economic pressures mount, data standardisation emerges as a tool not only for compliance but also for achieving industry-wide excellence. Opsealog's latest white paper, **Creating Value from Data Standardisation**, unpacks how this shift can unlock unparalleled opportunities in efficiency, environmental compliance, and strategic growth.*

Modern maritime operations, particularly in the offshore sector, generate substantial amounts of data from diverse sources – up to 20 gigabytes per vessel per day from sensors, engines, noon reports, etc. However, for the majority of ships, this dataset largely remains confined to onboard systems, with only daily reports and other spreadsheet-based summaries being transmitted ashore. While real-time data sharing from sensors is currently limited to a few vessels, this capability is expected to expand significantly in the coming years.

Standardisation provides a common language for interpreting this vast data pool, ensuring accuracy and reliability. For example, when measuring speed, one nautical mile-per-hour (1.0 knot) is different from one 'statute' mile-per-hour, with 1.0m/h being about 15% faster than 1.0kn. If those units are confused, this could lead to significant cumulative errors in the data. As such, data standardisation is at its core about creating a shared frame of reference. Just as English became the international language of shipping to facilitate global collaboration, data standards can serve as the universal 'tongue' for digital communication across fleets, regions, and stakeholders.

Beyond (present & future) compliance

While regulatory requirements from bodies like the International Maritime Organization (IMO) and the EU are significant drivers of data standardisation, its

benefits reach far beyond meeting compliance mandates. Standardised data offers a host of strategic advantages that can transform maritime operations, enabling companies to optimise efficiency, enhance transparency, and align with sustainability goals.

One of the most immediate benefits is enhanced operational performance. With standardised data, operators can more effectively monitor key performance indicators, including fuel consumption, fleet capacity usage, engine efficiency, and emissions. Real-time tracking and analysis not only enable operators to optimise fleet utilisation but also reduce downtime, increase technology availability, and minimise the risk of marine logistics breaches. These capabilities allow for targeted interventions to address inefficiencies and measure their impact with precision.

Another critical advantage is the potential for predictive maintenance. By leveraging standardised datasets, operators can detect early warning signs of equipment failure, enabling them to address issues before they escalate. This proactive approach reduces downtime, extends asset lifespans, and boosts overall operational reliability – key factors in maintaining competitiveness in a demanding market.

Standardisation also brings improved transparency, particularly in commercial relationships. When shipowners and charterers operate within a common data framework, it becomes easier to objectively assess performance, ensure contract compliance, and resolve disputes. This level of

clarity fosters trust and efficiency in business transactions, reducing friction and enabling more collaborative partnerships.

Streamlined ESG reporting is another critical benefit as industry stakeholders increasingly demand accountability in environmental, social, and governance metrics. Standardised reporting simplifies the process of compiling and sharing ESG data, ensuring that information is presented consistently and reliably. As well as strengthening trust among stakeholders, it also enables industry players to consolidate data, share benchmarks – which can be done anonymously – and collectively progress towards shared sustainability goals.

The maritime industry is teeming with untapped data potential. From fuel monitoring to dynamic & global positioning systems, modern vessels are equipped with tools that can generate actionable insights. However, without standardisation, this data often fails to deliver its full value. For example, comparing fuel efficiency across a fleet requires consistent data formats. Standardisation ensures that data from various sources can be integrated and analysed cohesively, revealing insights that drive operational improvement.

Moreover, automation enabled by standardisation can reduce the burden on seafarers, who often spend significant time inputting data manually into various formats and systems. By automating data collection and reporting, crews can focus on operational tasks, improving efficiency while reducing errors.

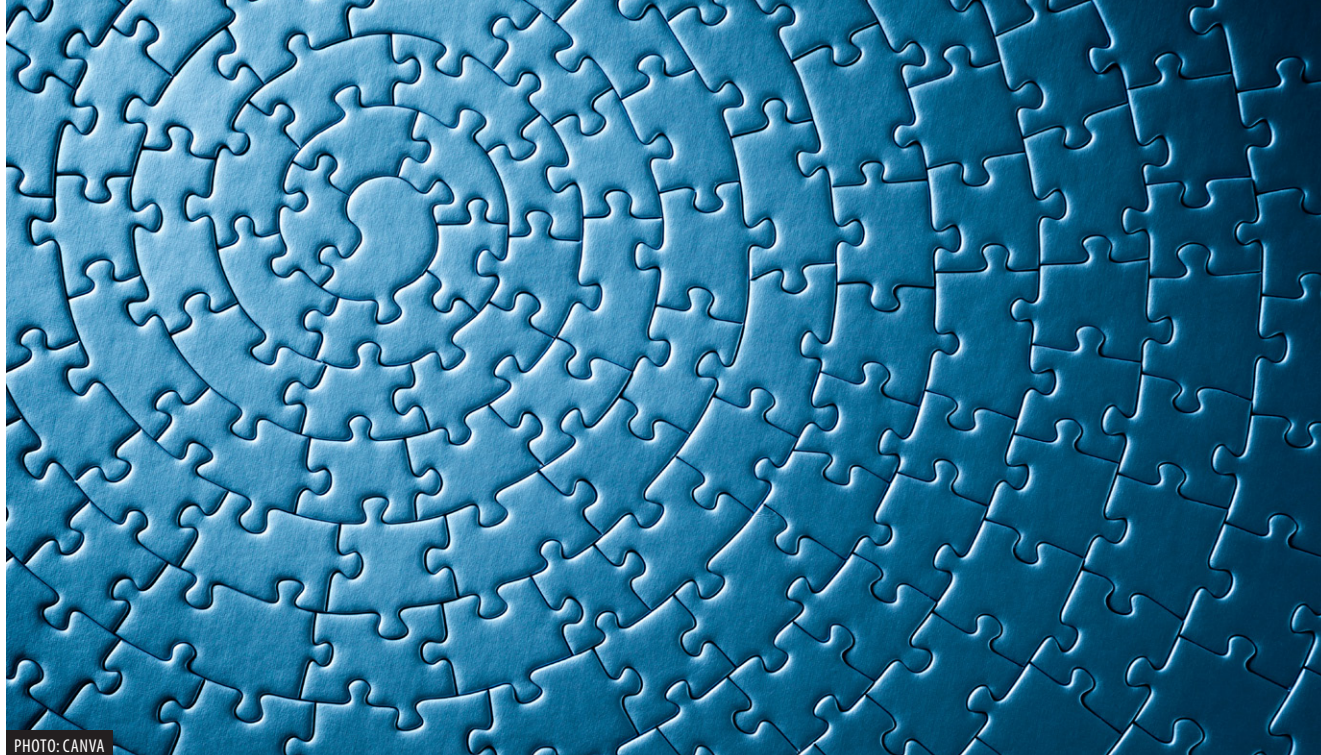


PHOTO: CANVA

The long-term benefits of data standardisation are thus immense. As fleets adopt multi-fuel capabilities and integrate clean technologies, operators will require increasingly granular data to assess performance and make informed decisions. Standardised data provides the foundation for evidence-based decision-making, enabling operators to identify inefficiencies, plan retrofits, and build next-generation vessels. Also, data standardisation prepares companies for future regulatory changes. By establishing robust data systems now, operators can adapt more quickly to emerging requirements, positioning themselves as leaders in a competitive market.

Laying the foundation – together

Encouragingly, the maritime sector is already taking meaningful steps towards embracing data standardisation, with industry groups leading the charge. These collaborative efforts demonstrate the sector's recognition of standardisation's transformative potential and highlight the progress being made in laying the foundation for a more efficient, transparent, and sustainable future.

The Smart Maritime Network has made significant strides by releasing **Version 1.0 of the Standardised Vessel Dataset for Noon Reports**. This initiative provides a standardised dictionary of names, units, and formats, simplifying data exchange and ensuring consistency across reporting systems. By establishing a shared framework, the Network is setting a benchmark for improving data interoperability throughout the maritime industry.

Similarly, Energy LEAP, an initiative supported by majors the likes of Shell and TotalEnergies, has developed the **Vessel Emissions Reporting Standard**. This framework standardises data elements and reporting events for emissions tracking, aligning with IMO compliance requirements. By streamlining emissions data reporting, Energy LEAP is helping to address critical environmental challenges while simplifying regulatory adherence for operators.

The International Support Vessel Owners Association (ISOA) has also prioritised data standardisation as a core element of its agenda. Recognising its critical role in decarbonisation efforts, ISOA emphasises the importance of transparent performance reporting. Through initiatives like these, the Association is advocating for a standardised approach to data that enhances accountability while promoting environmental sustainability.

These examples reflect a growing consensus within the maritime industry that data standardisation is not just a regulatory necessity but a collaborative opportunity to drive efficiency, sustainability, and innovation. However, despite its promise, the road to widespread data standardisation is not without obstacles. An example of this is the complexity of

offshore operations, where vessels perform diverse and specialised tasks, which makes creating universal data standards particularly challenging. Additionally, concerns about data security and ownership may slow adoption. Overcoming these challenges requires strong data governance policies and a commitment to ensuring data security and confidentiality. Collaborative approaches, as demonstrated by the above industry initiatives, will be critical to aligning stakeholders and building trust.

To the revolutionaries go the rewards

At Opsealog, we believe that data standardisation is not just a technical exercise – it is a revolution that will define the future of maritime operations, particularly within the offshore support vessel market. The findings of our latest research outline how this transformation can empower owners-operators to achieve greater efficiency, sustainability, and profitability.

The journey toward standardisation will require collaboration, innovation, and investment. But the rewards are clear: a smarter, more transparent, and more sustainable maritime industry. Those who embrace this change will not only comply with regulations but also unlock new opportunities for growth and leadership. ■



Opsealog is a French company specialising in performance management for the energy and maritime industries. Regarding the latter, Opsealog guides maritime leaders in their digital transformation, offering no-hardware-needed solutions that add to flexibility and agility by making data actionable. Head to **opsealog.com** to discover more.

BEYOND IMAGINATION

by Chad Van Derrick, VP of Software Product Management, Tideworks Technology

In early December 2024, Jack Ma, the Co-founder of the Alibaba Group, made a rare public appearance discussing how, over the next two decades, "AI will change everything." According to [The South China Morning Post](#), Ma stated that "from today's perspective, the changes brought by artificial intelligence in the next 20 years will go beyond everyone's imagination, as AI will bring a greater era."

Such visions of artificial intelligence (AI) are becoming more commonplace from today's executive suite, and certainly, many claim that the ongoing stock market bubble is, in fact, not a bubble but indicative of the potential value that AI will produce for companies across many industries.

What, then, is the impact on marine terminals, and how can operators prepare now to reap this value and establish themselves as leaders in an AI future? Let's start by dissecting these acronyms and how they apply to our industry.

AI, ML, and GenAI

Artificial intelligence is the broadest term, referring to any system or algorithm designed to mimic human intelligence. It encompasses tasks such as learning, reasoning, and problem-solving. AI includes rule-based systems, robotics, and more advanced techniques, like machine learning (ML) and generative AI (GenAI).

Machine learning is a subset of AI focused on developing algorithms that can identify patterns in data. ML is typically used for predictions, classifications, and decision-making tasks, relying on techniques like supervised or reinforcement learning for improvement. ML examples include spam filters, recommendation engines, and fraud detection (and yes, your last Netflix watch was probably recommended or influenced by ML). And those CAPTCHA systems that verify that you're a human – like identifying buses, crosswalks, or traffic lights – often contribute to supervised learning, helping to train ML models for image recognition tasks.

Generative AI is a specialized subset of ML that focuses on creating new content that mimics existing data, such as text, images, music, or code. ChatGPT, Microsoft Copilot, and Google Gemini are all examples of the so-called large language models. GenAI excels in creative tasks, among others, generating images, writing text and code, and producing synthetic data for training other models.

This is where GenAI can help

As you may have guessed, our industry has already begun adopting AI, from optical character recognition at the gate to automated rubber-tired gantries and terminal tractors, all of which leverage technologies such as AI, ML, and robotics to achieve their tasks.

So, does this AI-driven future result in fully automated terminals? Not necessarily. The goal should be to achieve greater efficiency and improve the ability to effectively manage uncertainty driven by factors, including climate change and geopolitical challenges.

This is where GenAI can help. Many think of it in terms of chatbots, and while terminal operating systems (TOS) will certainly incorporate these for support, other use cases could have a more meaningful impact. For instance, terminal management could use GenAI to draft detailed operational or compliance reports by analyzing real-time data and summarizing terminal activities.

Taken a step further, GenAI could help complete or even create entire simulated datasets to train and test TOS algorithms, particularly when real-world data, like inventory, is incomplete or contains biases. To upskill staff in better managing uncertainty, GenAI could create training scenarios simulating various operational challenges, such as equipment breakdowns or weather disruptions.

Layering tomorrow's TOS

But we're just scratching the surface here. Let's go up a level to ML and how it can analyze data patterns to improve operations. ML models could detect unusual container movements or patterns in gate transactions to flag potential security or operational issues. By analyzing historical data, ML could predict peak traffic times for gates or specific cargo types, allowing better resource planning. ML could even learn from past container movement patterns to improve routing for cranes and yard equipment, minimizing travel distances.

Leveraging these technologies and others, AI could automate and optimize decision-making processes across the terminal. AI algorithms could allocate container storage locations based on current yard utilization and vessel schedules, ensuring efficient stacking and retrieval. AI could evaluate scenarios, such as berth allocation, to suggest optimal strategies considering multiple constraints (e.g., vessel size, arrival time, and required machinery). AI-powered systems could predict when equipment might fail, enabling proactive repairs and minimizing downtime.

Tomorrow's TOS could integrate all three technologies. AI could improve resource allocation and suggest real-time operational adjustments, ML could identify trends in container flow and optimize equipment usage, and GenAI could generate realistic simulation environments for training and testing 'what-if' scenarios. This layered approach ensures operational efficiency, predictive insights, and creative problem-solving.

The unsung heroes of TOS innovation

So, where do we start? AI, including ML and GenAI, requires data – and a lot of it! Data platform solutions, like Tideworks' Data Platform, collect and standardize data across the TOS suite in near real-time, ensuring data is accurate, timely, normalized, and ready for AI applications. Our solution also includes the Data Governance application, providing data-quality monitoring and stewardship tools that ensure data completeness and accuracy. For terminals, such platforms function as an enabler, preparing data to be fed into ML and GenAI systems that can produce insights that enhance the use of TOS tools, strengthening decision-making and operational outcomes.

When choosing a data platform for integration into TOS, terminals should consider several key factors to ensure the system accurately represents data for use across functions like GenAI. First, near real-time data movement: merge widely used open-source tools and industry-standard architecture for near real-time data movement. Second, visibility and transparency: allow terminals to present easy-to-understand findings to business stakeholders through a robust data catalog. Third, security: isolate each customer's data – and the type of it (e.g., isolate financial data, ensuring data and intellectual property protection). Fourth, efficient yet flexible data management: provide available, trustworthy data and fast development.

Implementing the right building blocks

Before selecting any sort of AI solution, it's important to define the issue you want to solve. If it's a matter of automating and improving operational precision, your TOS provider should help direct AI efforts toward high-impact applications with clear return-on-investment potential. An AI vendor should be able to take your terminal's historical data and provide a simulation of the amount of savings they could affect. Visibility to savings helps determine if proceeding is financially viable and worth the investment.

Starting with small pilot projects is a pragmatic approach to test AI's potential for TOS while minimizing risk. Such trials also help to gain buy-in and adoption of your staff, a critical necessity for any optimization project to succeed. TOS providers will likely focus on limited-scope proofs of concept, which can help terminals validate the technical solution and its impact on key performance indicators, such as productivity and safety. These pilot projects help build confidence in future ML and GenAI usage, allowing for gradual, evidence-based scaling within TOS.

Adopting ML and GenAI into TOS doesn't require a complete overhaul; it's about implementing the right building blocks. Leading tech companies have adopted a similar approach, creating foundational GenAI tools that allow businesses to build their own custom applications rather than relying on off-the-shelf solutions.

At Tideworks, we take a core-and-extend approach by utilizing a core TOS and extending it with enhancements like ML and GenAI. Adopting a modular AI foundation empowers terminals to work with solutions that address their specific needs. This modular approach also provides future flexibility as the terminal operator's needs change. Lastly, modular approaches also help with adoption among terminal personnel.

Where all thrive

Integrating AI, ML, and GenAI into terminal operations presents significant opportunities, but success depends on a strong foundation of timely data and robust data tools. Implementing a platform that collects, standardizes, and governs data creates an environment where ML, GenAI, and TOS all thrive, enhancing decision-making, efficiency, and operational excellence.

With careful planning, clear objectives, integration of data tools, and workforce engagement, terminals can leverage GenAI's transformative potential in a smart and fiscally responsible manner. ■



Chad joined **Tideworks Technology** with over 20 years of experience delivering innovative large-scale products and services to markets across a range of industries. Heading Tideworks' Product Management organization, Chad is responsible for injecting innovation, continuous improvement, and increased stability across the company's product suite. Chad was named Most Innovative Technology Consultant in the United States by *Wealth and Finance International*. As an executive, entrepreneur, author, and speaker, Chad has had a cross-industry impact on businesses through cutting-edge tech and critical foresight. Prior to joining Tideworks, Chad was Vice President at SAP, where he led their Universal ID offering as part of the company's Customer Data Cloud product and directed data management products and services supporting the migration to SAP S/4HANA ERP.

SMOOTH SAILING

by Kazuaki Masuda, Corporate Officer, Technical Division Director, Nippon Paint Marine

Since the earliest days of ocean transport, microorganisms, plants, algae, and animals attached to vessel hulls have been a (literal) drag on the maritime industry. Biofouling has a significant effect on operational performance, not only slowing ships down but impacting manoeuvrability and significantly reducing energy efficiency. Biofouling has been found to reduce vessel speed by up to 10%. Without dealing with it, maintaining speed can require as much as a 40% rise in fuel consumption, increasing operational costs and hindering efforts at regulatory compliance.

Historically, the response of the shipping industry to this challenge was to coat vessel hulls with compounds which were toxic to sea life but reduced the build-up of plants, algae, and other organisms. Lead, mercury, and arsenic were eluted into the ocean to prevent the build-up of organic matter on vessel bottoms. Due to the negative impact that the use of such coatings had on non-target organisms, they have, with the support of coatings manufacturers, been banned.

While preventing the destruction of marine life in our oceans is a positive outcome of the declining use of highly toxic compounds, if shipping cannot solve the challenges of decarbonisation linked to emissions from high energy consumption, the life in our seas and oceans will nonetheless remain under threat. Coatings that restrict biofouling and reduce friction between the hull and the seawater are a proven means of significantly reducing fuel consumption by preventing speed loss. Such hull coatings offer an immediately accessible and sustainable solution for managing energy efficiency and cutting carbon emissions.

The 'secrets'

At Nippon Paint Marine, we have turned to the natural world for inspiration. For more than 140 years, we have pursued ongoing product innovation

to help our customers in the maritime industry meet the evolving needs and challenges they face. Today, the R&D programme at our company helps shipowners push forward their decarbonisation efforts while protecting the marine environment and ocean ecology.

Since 2001, Nippon Paint Marine has followed the principles of biomimicry in its innovation efforts. It is a research methodology that attempts to develop innovative and sustainable technologies by copying strategies and solutions found in nature. What works 'naturally' has been tested by time, and by understanding the 'secrets' of these solutions, we can work to replicate them and develop new technologies to solve human challenges.

Hydrogels are a key example of technology developed through the study of biomimicry. Nippon Paint Marine has incorporated hydrogel technology into our hull coatings in an attempt to smooth water flow around the hull and reduce hull-to-water friction. The hydrogel developed by our R&D experts – HydroSmoothXT™ – is a polymer network that holds water. By reducing frictional resistance and lowering drag, this hydrogel improves energy efficiency, reduces fuel consumption, and helps to cut emissions significantly.

Hydrogels are known to exist on the body surfaces of many marine organisms and have been credited with contributing to the high swimming speeds that certain

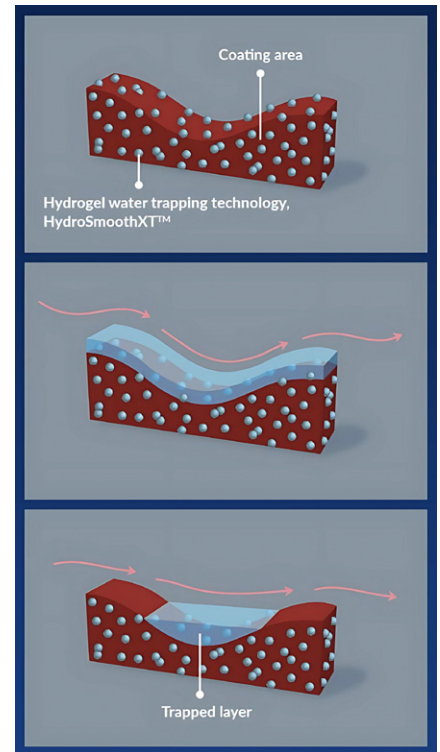
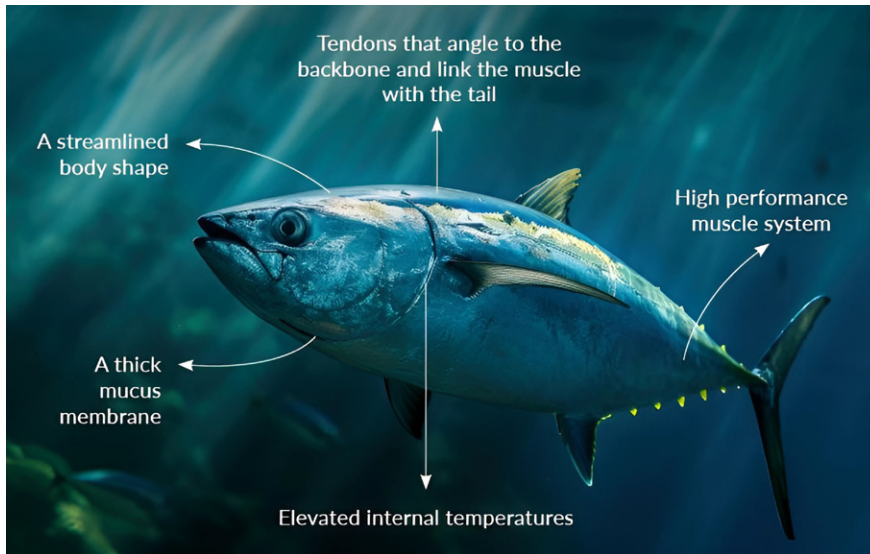
marine animals can achieve. By studying such natural phenomena and taking a scientific approach to reproducing their natural characteristics in our products, the R&D team aimed to create technologies that could provide innovative solutions to the issues our customers faced.

Tuna-efficient

Across its biomimetics programme, Nippon Paint Marine researchers have sought out partnerships with experts to inform their research efforts to better understand these natural phenomena. The programme looked at the best ways to develop subsequent technology, commercialise it, and identify which industrial patents would be required. In developing a hydrogel to reduce friction, the research team looked at two supremely fast marine animals: tuna fish and dolphins.

The former can swim at speeds reaching 100 kilometres per hour. They have physiological adaptations to support such high speeds, including body shape, elevated internal temperatures, and a high-performance muscle system. But they also have hydrodynamic systems, special substances on the surface of their bodies, that reduce friction & drag and aid faster swimming speeds.

Nippon's R&D team focused on the thick mucous membrane that tuna have, which secretes viscous substances with a high affinity for water, a process often



PHOTOS: NIPPON PAINT MARINE

which has featured in our LF-SEA, A-LF-SEA, and FASTAR coating lines for over 15 years and applied to more than 5,000 vessels. Crucially, in trials, we have been able to identify fuel and emission savings of up to 14% for ships using these coatings compared with conventional technology.

Breaking new ground

Nippon Paint Marine’s commitment to constantly innovating our product line to meet clients’ evolving needs is a core pillar of our business. To adapt to the increasingly challenging operational environment, the maritime industry needs to embrace new and innovative solutions that support continued commercial competitiveness.

Biomimetics represents one such means by which Nippon Paint Marine has broken new ground in hull coating performance, enabling our customers to operate more sustainably and reduce their impact on the marine environment. ■

argued to support lower resistance. We persisted with research to imitate this natural phenomenon and design a hydrogel that could be included in our paints. The theory was that this would create a hull coating that ‘trapped’ a layer of seawater in a surface boundary membrane, which would deliver more controlled turbulence generation on a vessel’s hull and reduce friction.

Over a five-year programme, Nippon Paint Marine scientists worked with colleagues at Osaka University to develop the hydrogel as a practical application. Investigating the relationships between surface roughness and fluid dynamics,

understanding the chemical properties of hydrogel materials, and designing them into hull coating formulations. Having delivered a product that would reproduce the effects observed in nature, the team developed an industrial process for Nippon Paint Marine’s unique water trapping technology, HydroSmoothXT™,



Nippon Paint Marine offers innovative marine coating solutions that are biocide-free, self-polishing, and nanotechnology-based. The company’s antifouling and other systems have been applied to over 40,000 vessels, from tankers and container ships to cruise liners and yachts. Nippon Paint Marine also supports customers throughout the lifetime of their asset, providing technical, training, and ongoing monitoring services to ensure its continued integrity and performance. Visit nipponpaint-marine.com to learn more.

POTENTIAL DISRUPTOR

by Jin Wang, Director of Technology, ABS

Nuclear power has the potential to make a transformational impact on carbon emission reduction across the electricity, industrial and transportation sectors. Its ability to provide clean alternative power generation options in shipping has already attracted attention, and the journey to cleaner maritime energy is gaining momentum. ABS believes that nuclear energy's potential can be viewed as two stories: nuclear for ships and nuclear for future fuels.

Nuclear power for ships holds out the prospect of using advanced small modular reactors (SMRs) as propulsion, while nuclear for future fuels includes scenarios where SMRs are positioned near shore to produce power for ports and support the production of alternative fuels.

From the perspective of achieving the International Maritime Organization's 2050 net-zero ambitions, it would be a mistake to ignore nuclear as a part of the fuel mix. However, progress will not happen without regulations that provide a foundational basis for how nuclear-powered systems in the maritime sector could look.

Nuclear energy has the potential to be a disruptor for the maritime sector. Enabling it to be successfully and safely integrated into the shipping industry requires a new kind of collaboration. Developing the technology that could power merchant vessels, provide shore power and generate clean fuels means bringing together players in marine and offshore design with builders of nuclear systems to fill knowledge gaps and exchange ideas. ABS is playing a leading role in helping government and industry work towards the adoption of advanced nuclear technology in commercial maritime, including key research with the U.S. Department of Energy (DOE) and multiple New Technology Qualification and Approval-in-Principal projects with industry.

Both marine and offshore sectors represent high potential demand, sharing as they do an increased focus on clean energy usage. The offshore market exhibits immediate demand due to the power requirement created by ports and other industrial users.

ABS unveiled the industry's first comprehensive rules for floating nuclear power plants at a forum for nuclear industry leaders held jointly with Idaho National Laboratory.

The event saw presentations on the latest reactor technologies from leading companies and the publication of a detailed study from ABS and Herbert Engineering Corporation (HEC) modeling the design, operation and emissions of a floating nuclear power plant. The **ABS Requirements for Nuclear Power Systems for Marine and Offshore Applications** provide the first classification notation for nuclear power service assets, such as floating nuclear power plants or nuclear-powered floating production, off-loading and storage units. Uniquely, the requirements are agnostic to specific reactor technologies and propose a framework for nuclear regulators to collaborate with flag administrations and ABS for complete regulatory oversight and license.

Feasibility study for a floating power barge

ABS believes that nuclear energy's potential in the maritime domain is much more than a reactor on a ship. Instead, nuclear energy can link demand across the electricity, industrial and transportation sectors to optimize energy generation and support decarbonization of shipping and industry.

With advances in nuclear engineering and the development of many types of advanced nuclear reactors come opportunities to implement the technology for floating nuclear power plant applications. Besides net-zero emission electricity created by a small modular plant, the power barge concept could be extended towards the production of alternative fuels, like pink hydrogen and pink ammonia, for consumption by on- and offshore facilities.

In a joint study, ABS and HEC designed the Navigator platform, with supply to the shore grid in mind, to increase the available power to support maritime decarbonization in port. This study reviewed existing

ports fitted with onshore power supply in the US and the typical energy consumption from large ships such as cruise vessels. With these parameters in mind, a platform supplying a maximum of 70MWe to the port's electric grid was considered sufficient to meet the needs of up to six visiting cruisers at once. The ability to deliver the floating platform to its site location and connect to the local grid from the pier can ease many landside challenges of increasing available power for port operations.

The modular reactor philosophy can successfully be carried over to the floating platform design with significant advantages in terms of safety and cost. Furthermore, the modularity concept allows the power output to be reasonably flexible in adapting to the cold-ironing needs of large ports. Refueling cycles of approximately five years allow the design to be compact and simple, with no need for fuel or high-level radioactive waste to be handled on board.

To conceptualize the possible design, the design team invited a reputable small reactor designer to provide information regarding the use of their reactor design for the floating nuclear power plant. This reactor design has been supported by DOE's Advanced Reactor Demonstration Program to demonstrate the commercial viability of SMRs.

That said, the main conclusion of this study is that the maturity of advanced nuclear technologies that may be implemented for a floating platform is currently low. Therefore, the level of detail provided in the study is limited to engineering information available from the design of terrestrial applications for engineering postulation and recommendations for future design optimization.

Feasibility study for an LNG carrier

ABS also worked with HEC on the high-level design of a standard liquefied

Simplified Example Arrangement of Nuclear Power Service Vessel

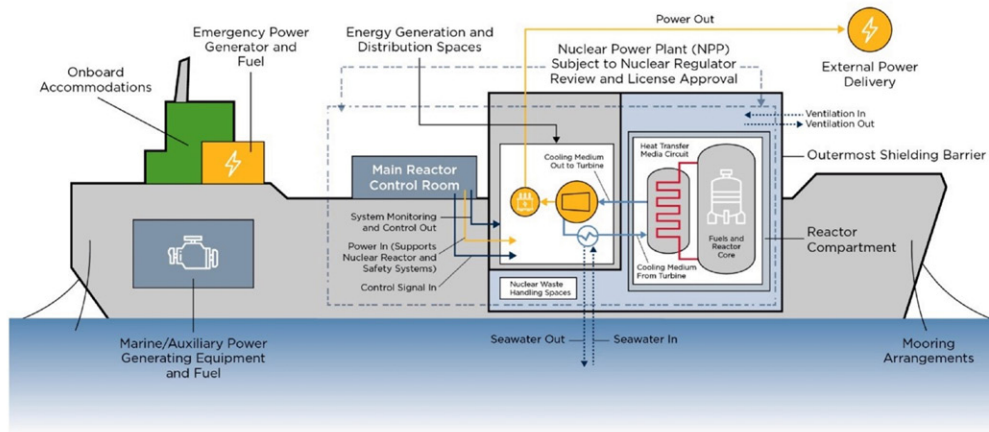


PHOTO: ABS

natural gas (LNG) carrier to illustrate how one type of advanced nuclear fission technology could be applied for shipboard power in the future, with an emphasis on what aspects of vessel and reactor design may require further investigation to guide the development of the integrated technology and regulatory framework.

The main conclusions of this study of nuclear-powered commercial vessel designs are that nuclear power would be a supportive means of drastically abating shipping emissions, but significant hurdles remain in public perception and international regulations before this can be achieved.

However, the maturity of advanced nuclear technologies that could be implemented for ship propulsion is low. Therefore, also here, the level of study-detail provided was limited to engineering information available from the design of terrestrial applications for engineering postulation and recommendations for future design optimization.

The modular reactor philosophy imposes significant restrictions on ship design, among others, a fixed maximum SMR power output per reactor corresponding to a set lifespan of its core. It is advantageous if the nuclear power plant equipment and fueling life cycles align with the vessel's life. Challenges with access to suitable shipyards or other support facilities and the physical removal of the reactors could be avoided by addressing them in the design stages.

Although it is possible to operate an SMR at a lower constant power level, this may cause the reactor's end-of-life to not line up with the ship's standard dry-dock schedule, thus imposing significant additional operational costs. This means

that SMRs would be better suited for just a few sizes per ship type (mostly larger ones). In the design presented in the study, the SMR is considered to have an output capacity of 17.5MWe associated with a core lifespan of five years. This matches well the total power requirement of a 147k m³ LNG carrier, imposing the use of two reactors and a core switch at each special survey.

However, if the same SMR were considered for a QMax LNG Carrier (262k m³) with a total energy need of approximately 56MW, four SMRs would be needed, operating at around 80% of their maximum power. This would imply a core switch approximately every six years and three months, which would represent the primary driver for service scheduling. This SMR feature may impose limits to ship capacity that can be offered to the market.

The ability of nuclear power plants to tolerate higher accelerations due to ship motions and vibrations can allow for flexibility in the overall design. While there are significant safety benefits to keeping the plants at midships, for specific vessel types like oil tankers and LNG carriers, the midships location would not be feasible or would significantly penalize cargo capacity.

The degree of redundancy required by a nuclear-powered vessel may be higher than a more conventionally powered ship for safety, which causes a decrease in performance. The presented nuclear vessel

design has two separate power, propulsion and steering plants, which provide a high level of redundancy compared to no redundancy typically accepted of single screw vessels driven by marine diesel engines. Opportunities for optimization exist on many levels for future design iterations.

Further investigation

Nuclear energy has the potential to be a disruptor for the maritime sector. Our focus is on bringing together major players in marine and offshore design with designers of nuclear systems. ABS can help facilitate filling knowledge gaps that nuclear power companies may have around marine and offshore – and vice versa.

With the feasibility demonstrated for SMRs on board large container ships and gas carriers as well as offshore platforms, it is likely that regulation and reactor licensing will prove the primary driving force in realizing full-scale projects. With renewed interest in building new technologies that are feasible for the marine sector, it will be up to regulators to support the ambition of reducing carbon emissions by enough to meet the 2050 targets.

While the regulatory landscape continues to develop, ABS is encouraging both modular system providers and vessel designers to establish further joint industry projects that can investigate challenges and opportunities. ■



ABS

Founded in 1862, ABS is a global leader in providing classification services for marine and offshore assets. Our mission is to serve the public interest as well as the needs of our members and clients by promoting the security of life and property and preserving the natural environment. ABS' commitment to safety, reliability and efficiency is ever-present. Visit ww2.eagle.org to learn more.

YESTERDAY'S FOSSIL FUEL INFRASTRUCTURE – TOMORROW'S CLIMATE SOLUTIONS

by Alexa Ivy

The Dutch climate tech start-up SeaO₂ has announced a bold vision to turn the ocean into a climate solution, harnessing innovative technology to remove carbon dioxide at a gigatonne scale. The company has recently secured over €2.0 million in funding to accelerate the development of its **Direct Ocean Capture** (DOC) technology. Their approach targets extracting CO₂ directly from seawater, hence addressing the dual challenge of climate change and ocean acidification. The recent investment will enable SeaO₂ to transition from prototype development to a fully operational pilot plant, set to launch by mid-2025 and scale its tech towards the ambitious goal of removing one gigatonne of CO₂ annually by 2045.

At the core of SeaO₂'s approach lies its innovative technology. Unlike land-based carbon capture solutions that face limitations in scalability and cost, DOC leverages the vastness of the oceans. As the world's largest natural carbon sink, oceans absorb around 25% of global CO₂ emissions per year. However, this process has contributed to rising ocean acidification, threatening marine ecosystems and biodiversity.

The company's technology directly tackles these challenges by extracting CO₂ from seawater and returning carbon-free water to the ocean. This process effectively resets the equilibrium, enabling the ocean to absorb more atmospheric CO₂ while mitigating acidification. "Our goal is to create a sustainable, scalable solution that delivers measurable climate benefits while protecting the oceans," underscores Ruben Brands, CEO and Co-founder of SeaO₂. The captured CO₂ can be permanently sequestered in geological formations or utilised in industrial processes, supporting the transition to a growing circular carbon economy.

A multifaceted platform for combating climate change

SeaO₂'s long-term vision involves establishing offshore DOC hubs, a transformative concept designed to repurpose decommissioned oil & gas platforms. This is a significant opportunity, given S&P Global's forecast that worldwide offshore decommissioning expenditures could reach nearly \$100 billion between 2021 and 2030. These hubs will serve as integrated sites

for carbon removal, powered by renewable energy from offshore wind farms, something that will not only support the relatively energy-intensive DOC process but also assist with grid balancing. "We see an incredible opportunity to turn yesterday's fossil fuel infrastructure into tomorrow's climate solutions," says Brands.

SeaO₂ envisions creating offshore hubs co-located with geological CO₂ storage facilities, enabling the permanent sequestration of captured carbon. These hubs will serve as scalable solutions for DOC, addressing the gigatonne-scale carbon removal challenge. To speed up global deployment, SeaO₂ plans to implement a licensing model that empowers partners globally to establish their own hubs, creating a robust, interconnected network of carbon removal and storage facilities.

These hubs will additionally unlock broader decarbonisation opportunities by supporting hydrogen production through third-party collaborations. The captured CO₂ and produced hydrogen can be combined to generate green methanol, providing offshore access to net-neutral fuels. This vision aligns with efforts to decarbonise hard-to-abate sectors, such as maritime transportation, enabling ships to bunker sustainable fuels directly at these offshore hubs.

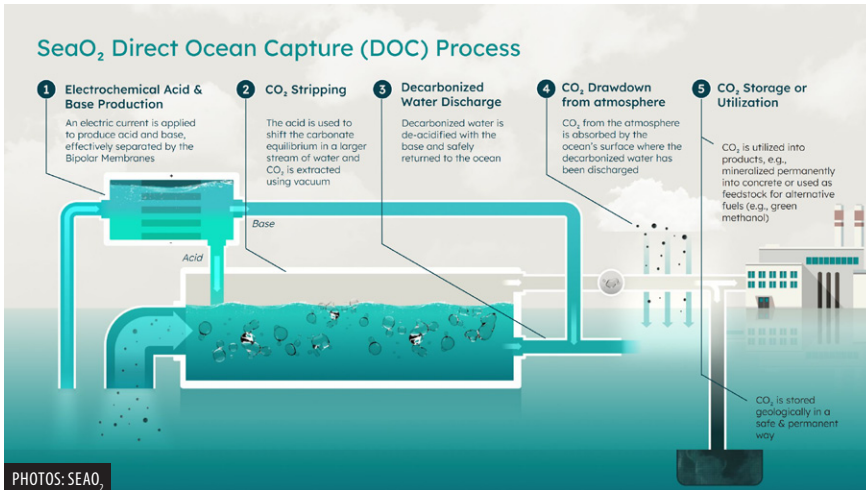
By integrating carbon removal, storage, and renewable fuel production, SeaO₂ aims to transform offshore infrastructure into a multifaceted platform for combating climate change and advancing the energy transition.

From lab- to giga-scale

The €2.0+ million funding round – led by investors such as DOEN Participaties, NOM NEW-TTT fund, Future Tech Ventures, CarbonFix, and Transavia Ventures – marks a significant milestone in SeaO₂'s journey. This investment will enable the company to build its first pilot plant with an annual capacity of 250 tonnes of CO₂ removal. The facility, scheduled for launch in the summer of 2025, represents a key step towards demonstrating the commercial viability of SeaO₂'s technology.

"This funding is a recognition of the hard work and dedication of our team," underlines Brands. "It allows us to transition from lab-scale prototypes to real-world implementation, bringing us closer to our goal of removing one megatonne of CO₂ by 2030 and scaling to a gigatonne by 2045." To this DOEN Participaties added, "We are investing in SeaO₂ because current carbon removal methods are not yet effective at the required scale. Therefore, innovations like SeaO₂ are urgently needed, and funding is essential to drive the sector forward and unlock its potential for global impact." CarbonFix, another key supporter, highlighted, "CarbonFix is proud to have helped build this coalition. Our role in the ecosystem is to catalyse networks, funding, and talent to unlock innovative pathways in the fight against climate change. SeaO₂ is a prime example of this impact."

Apart from building the pilot plant, SeaO₂ will use the funding to enhance its team and develop a robust monitoring, reporting, and verification system. This ensures that the company's carbon



removal efforts are transparent, verifiable, and aligned with industry standards.

In the meantime, SeaO₂ has established strategic partnerships with leading organisations, including XPRIZE Carbon Removal, the Delft University of Technology, Wetsus, and Redstack. These collaborations have been instrumental in advancing the company's technological innovation and market reach. Notably, SeaO₂ participated in a successful carbon removal project with Paebbl in the Wadden Sea as well as achieved recognition among the top 100 teams in the prestigious XPRIZE competition. The company also delivered award-winning pitches at high-profile events, including The Next Web, Tech Tour Oceans, and Tech Tour Water. "Our journey has been accelerated by these partnerships and the insights we've gained through programmes like XPRIZE, PortXL, and Ocean Vision," Brands shares. "Each step brings us closer to scaling our impact globally."

Pump and process

While the long-term vision focuses on offshore hubs, SeaO₂ is taking immediate steps to integrate its technology with industries that already use seawater in their operations. These include thermal power plants that utilise water for cooling, desalination plants, wastewater treatment facilities, and aquaculture operations.

By collaborating with these sectors, SeaO₂ can leverage existing infrastructure to reduce costs and step up deployment. This tactical approach allows the company to demonstrate the feasibility of its technology and establish early success stories, building momentum for larger-scale adoption. "Working with industries that already pump and process seawater is a pragmatic way to achieve short-term impact while paving the way for our larger vision," Brands explains.

A powerful ally

SeaO₂ aims to remove one gigatonne of CO₂ annually by 2045, a target that aligns with global efforts to achieve net-zero emissions. By combining innovative technology with strategic partnerships, visionary funding, and a clear roadmap, the company is well-positioned to meet this ambitious target. "Our vision is to transform the ocean into a powerful ally in the fight against climate change," Brands shares. "With the right support and collaboration, we can scale our impact to the level required to make a real difference."

By integrating its technology into existing industries and establishing offshore hubs powered by renewable energy, SeaO₂ is creating a scalable and sustainable framework for global carbon removal. As the company moves towards large-scale implementation, it stands as a beacon of hope in the battle against climate change. ■

SeaO₂ The mission of SeaO₂ is to protect our planet from getting warmer and warmer – by reducing the CO₂ concentration in the ocean and indirectly in the air. To keep us all cool. To de-acidify our oceans so pH is restored. To benefit biodiversity. Founded in 2021 and born from tech developed in the Delft University of Technology and Wetsus' laboratories, SeaO₂ provides cost-efficient atmospheric carbon removal by leveraging our biggest ally in battling climate change – the ocean. Check seao2.com to learn more.

INTO PERSPECTIVE

by Emil Berlin, *Partnership Officer*, and Johanna Stapelberg, *Senior Officer, Corporate Communications, ERTICO – ITS Europe*

Artificial intelligence (AI) is driving a paradigm shift in transport and mobility, presenting solutions to some of Europe's most pressing challenges in sustainability, efficiency, and safety. ERTICO – ITS Europe, a thought leader in the digitalisation of transport and innovation in mobility, has explored this transformative potential of AI in its recently published **Perspectives on Artificial Intelligence in the Domain of Transport & Mobility** white paper. Through its unique role, ERTICO unites public and private stakeholders to shape the future of mobility through the development and promotion of innovation and cutting-edge technologies – including AI.

The technology in question enables transport systems to process real-time data, optimising operations on an unprecedented scale, with traffic management being one of its most impactful applications. By analysing congestion patterns and dynamically adjusting traffic signals, AI can reduce journey times, lower emissions, and enhance road safety. These advancements align with Europe's sustainability goals and the broader push for greener urban environments.

Public transport is also set to benefit significantly from AI-driven innovations. By predicting passenger demand, operators can dynamically adjust schedules and routes, ensuring reliability and improving the user experience. This adaptability encourages greater use of public transport, reducing dependence on private vehicles and contributing to lower emissions.

Many a promise

In logistics, AI supports predictive operations by optimising delivery routes, managing inventories more effectively, and minimising resource waste. For Europe, where efficient logistics is key to maintaining its competitive edge in global markets, AI offers solutions that enhance reliability and sustainability. AI-driven predictive analytics enables logistics operators to anticipate demand surges, optimise inventory management, and improve supply chain responsiveness. For example, machine learning algorithms can process historical and real-time data to forecast delivery requirements, ensuring goods are transported efficiently and without unnecessary delays.

Route optimisation is another significant benefit of AI in logistics. By analysing traffic data, weather conditions, and delivery

schedules, AI systems can design the most efficient routes for fleets, reducing fuel consumption and emissions. This is particularly crucial for meeting Europe's carbon neutrality targets under the Green Deal. In addition, AI contributes to warehouse automation. Smart robots, and AI-driven management systems streamline inventory processes, improving accuracy and reducing labour costs. These technologies ensure faster order fulfilment and support the increasing demand for e-commerce, which relies on timely and precise deliveries.

Collaborative logistics platforms, supported by AI, are also gaining traction. These allow multiple companies to share resources, such as transport fleets and warehouse space, to reduce waste and maximise efficiency. Such innovations not only lower operational costs but also contribute to an overall more sustainable logistics ecosystem.

AI underpins the development of automated and connected vehicles, which are central to the future of European mobility. These technologies rely on AI for tasks such as predictive maintenance, real-time decision-making, and vehicle-to-infrastructure communication. By improving safety and operational performance, AI accelerates the deployment of autonomous vehicles, which promise to transform transport by reducing accidents, optimising fuel consumption, and expanding mobility options.

Beyond vehicles, AI facilitates the creation of smart infrastructure. Roads, intersections, and urban environments equipped with sensors and communication systems enable seamless coordination between vehicles and their surroundings. This connected environment benefits all users, including drivers, pedestrians, and cyclists, creating safer and more efficient transport networks.

Challenges to integration

While AI's potential in transport is immense, several challenges must be addressed to ensure its successful integration and adoption. One of the most significant hurdles is regulation. **The European Union's AI Act** aims to establish clear standards for the ethical and safe use of AI, particularly in high-risk applications like autonomous driving and intelligent traffic systems. Compliance with these regulations requires collaboration between policymakers, tech developers, and industry leaders.

Data privacy is another critical issue. AI systems rely on extensive data sets to function effectively, raising concerns about ownership, transparency, and ethical use. Establishing robust data governance frameworks is essential to protect user privacy and to build public trust. Without these measures, the adoption of AI technologies may face resistance from both users and regulatory bodies.

The publication of the first draft of the **General-Purpose AI Code of Practice** by independent experts, as part of the European Commission's Digital Strategy, provides additional guidance for AI integration. This Code offers voluntary guidelines for the ethical use of general-purpose AI, addressing concerns such as bias, accountability, and transparency. By aligning with these principles, stakeholders in the transport sector can ensure their AI solutions meet high ethical and operational standards, fostering trust and innovation.

Additionally, addressing the workforce skills gap is critical. Integrating AI into transport systems requires expertise in, among others, data science, machine learning, and system management. Upskilling programmes and educational initiatives



PHOTO: CANVA

are necessary to equip workers with the tools they need to support and manage advanced AI systems effectively.

Actionable insights

The white paper outlines a vision for AI's role in creating a smarter, safer, and more sustainable transport ecosystem in Europe. Central to this vision is the need for investment in AI research, particularly in areas such as safety, ethics, and inclusivity. By prioritising solutions that benefit all users, including vulnerable groups, AI can contribute to a transport system that is not only efficient but also equitable.

International collaboration is highlighted as a cornerstone of success. Harmonising standards across borders and sharing best practices will enable the seamless operation of AI systems, ensuring interoperability and scalability. This approach is notably important in Europe, where cross-border transport and logistics play a vital role in economic and social cohesion.

Building trust in AI technologies is another key focus. Transparent communication about how AI systems work, coupled with clear governance and regulatory oversight, is essential for fostering public confidence. Trust is the foundation for ensuring the widespread adoption of AI in transport and mobility.

Perspectives on Artificial Intelligence in the Domain of Transport & Mobility provide several actionable insights for stakeholders in the European transport and mobility sectors. First, invest in AI infrastructure by building smart infrastructure capable of supporting AI-driven applications, such as intelligent traffic systems and connected vehicles. Second, address

ethical and regulatory challenges by developing robust frameworks to ensure AI systems are safe, transparent, and aligned with EU regulations (particularly the AI Act). Third, foster public trust by implementing transparent data governance practices to protect user privacy and promote the ethical use of AI. Fourth, upskill the workforce by providing training and education to address the skills gap, this way enabling workers to support and manage AI technologies effectively. Lastly, promote collaboration by working across borders to harmonise standards, share best practices, and develop scalable solutions.

Already contributed

As part of its commitment to advancing intelligent transport systems, ERTICO is involved in numerous initiatives that exemplify AI's role in transforming mobility. Innovation platforms, such as TN-ITS, leverage AI to enhance traffic flow and map accuracy, while EAVP (Enhancing Automated Valet Parking) demonstrates how AI can streamline urban mobility with intelligent parking solutions. The MaaS Alliance (Mobility-as-a-Service) also showcases the potential of AI in offering personalised, on-demand mobility through integrated digital platforms.

AI-based applications have already contributed to the enhancement of road traffic safety and efficiency. Through the recent adoption of the EU AI Act, implementation steps are progressing with special attention to several traffic management use cases, which have been qualified as high risk in the AI Act. ERTICO's TM2.0 Innovation Platform promotes and deploys interactive traffic management solutions. It has recently established

guidelines to facilitate the integration of AI in an innovation-driven and practical manner while enhancing road safety and the competitiveness of the EU and the traffic management sector. These guidelines, detailed in the **TM2.0 Position Paper**, further explain how to categorise AI systems within traffic management to create a working solution in which innovation is supported while risks are controlled (an update of the paper is foreseen in the near future).

This topic will remain at the forefront of discussions in the transport sector and will take centre stage at the 16th ITS European Congress in Spanish Seville on 19-21 May 2025. Organised by ERTICO, the event will bring together industry leaders, experts, academics, and researchers to explore the future of mobility, including the transformative role of AI in transport systems. The Congress provides a unique platform for shaping the next phase of innovation in intelligent transport systems. The call for contributions to the Technical Programme is open until 10 January 2025, inviting stakeholders to share their insights and solutions.

How Europe can lead the (AI) way

From optimising traffic systems to enabling autonomous vehicles, AI offers solutions that can revolutionise how transport systems operate. However, the successful integration of this game-changing tech depends on addressing regulatory, ethical, and societal challenges.

By embracing innovation, building public trust, and fostering collaboration in alignment with ethical practices like those outlined in the AI Code of Practice, Europe can lead the way in creating a connected, efficient, and sustainable transport network. ■



ERTICO – ITS Europe is a public-private partnership of over 120 companies and organisations representing service providers, suppliers, the traffic and transport industry, research, public authorities, user organisations, mobile network operators, and vehicle manufacturers. Together with our partners, we develop, promote, and deploy Intelligent Transport Systems and Services (ITS) through a variety of activities, including European co-funded projects, innovation platforms, international cooperation, advocacy, and events. Our work focuses on connected & automated driving, urban mobility, clean mobility, and transport & logistics.



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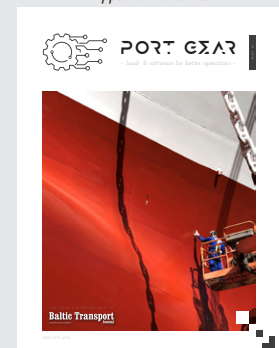
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