Harbours review

Photo: Canva

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!

Short Stories

New rail service between Slovakia and Turkey

METRANS' container trains will be, as of 3 September 2022, connecting its terminal in Dunajská Streda with Halkalı with two weekly round trips.

Finnlines to kick off a new freight service

As of 23 July 2022, the company's ro-ro Finnpulp connects Rosslare and Zeebrugge with two weekly round trips. The 187 m long freighter offers 3,259 lane metres of cargo capacity. "We are delighted to support the growing post-Brexit Irish trade to the Continent and provide transport operators with an important alternative route, which will greatly benefit all stakeholders and the Irish economy. Finnlines provides cost-efficient and high-frequency liner services to its customers with the lowest CO_2 emissions per transported cargo unit," Antonio Raimo, Line Manager, Finnlines, said.

Hupac ups the frequency of its Germany-Poland service

The company has doubled the number of round trips between Samskip's Duisburg Rail Terminal (DRT) and METRANS' Terminal Hub Gądki to six per week. In addition, Hupac will launch two terminals in the coming months. First, in September 2022, in Brwinów near Warsaw, which will replace METRANS' Pruszków in the company's Gądki-Pruszków service (three/week). The 14 ha big terminal in Brwinów will offer four rail tracks for 750 m long trains, plus a 42k m² warehouse. Next, probably in 2024, Duisburg Hohenbudberg will become operational, taking over Hupac's operations from DRT.

Tallink Grupp charters out two more ships

Slaapschepen Public has, on behalf of the Dutch Central Agency for the Reception of Asylum Seekers, chartered two ferries up till now serving traffic in the Baltic. Silja Europa, previously sailing between Helsinki and Tallinn, started the new assignment in the Netherlands on 20 August 2022, while Galaxy (Stockholm-Turku) will join her on 20 September 2022. Both have been taken in for seven months, with an option for an additional quarter of a year. The charter covers Tallink Grupp's technical crew only. Silja Europa and Galaxy join Isabelle and Victoria I; the former provides accommodation for refugees in Tallinn, while the latter – in Scotland. In the meantime, the company's subsidiary Tallinn Swedish Line handed over the 1972-built 1,000 lane metres of capacity ro-ro Sea Wind to the new owners on 26 April 2022 in Tallinn's Paljassaare Harbour. Tallink Grupp has rearranged its schedules following the sale: the 2,087 lm ferry Regal Star was shifted from the Kapellskär-Paldiski service onto the Muuga-Vuosaari route according to Sea Wind's schedule. The 1,400 lm ro-pax Sailor has thus remained alone on the Kapellskär-Paldiski connection, though now serving extra departures.

New rail ferry for Estonia-Finland traffic – in the making

Fennorail has entrusted Deltamarin with designing a vessel for carrying trailers, trucks, and railcars. Eurocarrier will offer 2,500 lane metres of capacity, including 1,000 for train cargo (of the 1,520 mm gauge). Plans speak of connecting Estonia and Finland's TEN-T rail networks, with Paldiski as the receiving port on the Estonian side. According to Sjöfartstidningen, Eurocarrier will initially offer two daily round trips. The newbuild could enter traffic as soon as 2025. "We strive to make the train ferry climate-friendly and profitable. The train ferry will have multifuel marine engines that can run on either pure LNG [liquefied natural gas], a mixture of LNG and green hydrogen or marine gas oil (MGO)," Kaj Jansson, Member of the Board of Fennorail, highlighted.

Photo: Deltamarin

Hansa Destinations' capacity – doubled

On 25 April 2022, the subsidiary of Rederi AB Gotland deployed the ro-ro Eliana Marino (174 by 25 m, 2,500 lane metres of carrying capacity) on the Nynäshamn-Rostock service. The route served together with Drotten (1,650 lm) now offers six instead of three weekly round trips. The charter of the Italian-flagged Eliana Marino will last till January 2023.

Photo: Hansa Destination/Marc Ottini

Changes to BAX

Hapag-Lloyd has changed its Baltic Sea Express (BAX), with the new, as of 4 May 2022, loop including the ports of Hamburg, Helsingborg, Helsinki's Vuosaari, Tallinn's Muuga, and Rauma. The previous instance of BAX also included calls to Gdynia and Klaip da but didn't feature Helsingborg and Vuosaari.

New South-North Sweden shuttle in place

The Lund-based First Row Shipping & Logistics has kicked off a container rail service that connects Umeå's brand-new rail terminal with APM Terminals Gothenburg. The train set, which runs once per week in both directions, offers 68 containers of capacity. First Row Shipping & Logistics expects to add more round trips after the summer of 2022. "We see a huge need for this shuttle, and we have found goods flows that we barely knew existed that want to utilize it. The fantastic thing about Umeå, in particular, is that the goods are so diversified, with many players creating a broad mix of, above all, industrial exports," Nikolas Rowland, CEO of First Row Shipping & Logistics, underscored. The company's first container shuttle, the 1,400 km long Gothenburg-Piteå route, has grown over the months from one to three weekly departures.

Photo: First Row Shipping & Logistics

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New Czechia-Germany rail service

The Austrian freight haulier Rail Cargo Group (RCG) has added the Mělník-Wilhelmshaven container connection to its network. On their way, RCG's trains will pass the Czech Děčín and the German Maschen and Huden. Northbound, trains will leave Mělník on Mondays and return on Tuesdays.

New Germany-Sweden intermodal rail service

On behalf of Samskip Multimodal, TX Logistik has started connecting Duisburg with Katrineholm with two weekly round trips. The trains – 700 m long and carrying up to 42 cargo transport units (trailers and containers) – link the Duisburg Rail Terminal with the GDL facility in Katrineholm via Padborg, the Öresund/Øresund Bridge, and Malmö. The service mainly carries industrial and consumer goods.

Photo: Samskip

Brand-new ro-ro service between Latvia and Sweden

As of 1 June 2022, the Riga-based Scandic Line offers a new connection between the ports of Riga and Södertälje, with three weekly round trips. The crossing is served by the 108.5 by 17.5 m Midas, offering 1,030 lane metres of freight capacity for trucks & trailers, vehicles, and other cargo loaded onto mafi trailers.

Photo: Scandic Line

The Bettembourg-Poznań-Swarzędz rail service grows in frequency

CFL intermodal, a subsidiary of CFL multimodal, has increased the number of round trips by one to four a week between Luxembourg and Poland. Earlier, a Bettembourg-Poznań-Swarzędz train set consisted of up to 38 cranable and non-cranable trailers loaded onto 15 double-pocket for the former and four Modalohr wagons for the latter. From mid-June 2022, the composition changed to 11 pocket and eight Modalohr wagons.

Stena Estelle joins the Gdynia-Karlskrona service

The E-Flexer ferry arrived in Poland, docking in Gdańsk at Remontowa's yard for final adjustments before her first departure from Gdynia on 4 September 2022. The 240 by 28 m ro-pax offers 3,600 lane metres of cargo capacity and room for 1,200 passengers across 263 cabins. Stena Estelle will be joined by her sister ship Stena Ebba on the Gdynia-Karlskrona crossing in November this year. Freight-wise, each offers 15% more carrying capacity than the current E-Flexers. On her way to Europe, reports PortalMorski.pl, Stena Estelle took a one-off ro-ro load (construction vehicles) from the United Arab Emirates (Port of Jebel Ali) for unloading in the Netherlands (Vlissingen). On 13 August 2022, Stena Estelle made a test call to Karlskrona, after which she berthed in Gdańsk the following day. Stena Estelle was built by China Merchants Jinling Shipyard (Weihai).

Baltic Enabler enters traffic

Wallenius SOL's newest con-ro joined her sister ship Botnia Enabler across the Zeebrugge-Antwerp-Kokkola-Oulu-Kemi-Skellefteå-Travemünde string on 25 August 2022. Each 242 by 35.2 m 1A Super ice-class vessel offers 6,442 lane metres for wheeled cargo; there is room for up to 960 TEUs. Both feature multi-fuel engines that can run on liquefied natural gas (LNG), bioLNG, diesel, and synthetic diesel. "Because many of our customers base their entire operation on the green transition, we must match them. These vessels enable us to do so. The Enabler vessels emit 63% fewer greenhouse gases and substantially less NOX (96%), SOX (99%) and particulates (99%) than older vessels," Ragnar Johansson, Wallenius SOL's Managing Director, underlined.

Photo: Wallenius SOL

New France-Poland rail service

CFL multimodal has set up a new service for the Portuguese KLOG, connecting the French Sète (VIIA's terminal) with the Polish Swarzędz (CLIP's) with one weekly round trip that takes two days. The 1,600 km long Sète-Swarzędz service carries fast-moving consumer goods (up to 38 trailers) sourced eastbound to France from Spain (Barcelona, Madrid) while westbound from Poland domestically (Poznań and Warsaw). CFL cargo is responsible for the France-Poland traction leg; Captrain Polska takes it over within Poland.

Unifeeder's new Baltic-North Sea container service

The company has started connecting the ports of Klaipėda and Immingham with a weekly, six-day transit time crossing. Vessels leave the Lithuanian seaport (Klaipėda Container Terminal) on Fridays, while the English (Immingham Container Terminal) – on Mondays. The 158 by 23 m, 880 TEUs of capacity Elbspring inaugurated the Immingham-Klaipėda service.

New Italy-Poland intermodal rail service

As of mid-October, Hupac connects the Italian Pordenone and the Polish Gliwice with three weekly round trips. With traction provided by Mercitalia Rail, the Poland-to-Italy transit time is 16 hr and around 20 hr in the opposite direction. The service's trains stop at Hupac's terminal in Pordenone, and PKP CARGO CONNECT handles them at its container terminal in Gliwice. Dangerous goods are permitted for shipping. According to Hupac, taking the service results in 1.3t CO_2 savings per road consignment.

CargoBeamer links Rostock and Kaldenkirchen

With the help of its traction partner HSL Logistik, CargoBeamer offers six weekly round trips for craneable and non-craneable trailers as well as P400, refrigerated, silo, and container units by rail. The service's transit time averages 18 hr. CargoBeamer says the new route is carbon-neutral: per transported unit, 64% of CO_2 emissions are saved compared to road transport, with the remaining 36% compensated with CO_2 certificates. "The addition of Kaldenkirchen-Rostock is the first step in our plans to expand the CargoBeamers network with numerous new lines by the end of 2023. With unaccompanied long-distance transport from the Baltic Sea via western Germany to Italy or the French-Spanish border, we are creating a new, attractive offer for our customers. On the historically strong axis from the Iberian Peninsula via Central Europe to Scandinavia, this will provide a new opportunity to shift from road to rail, which will realise further CO_2 savings," Boris Timm, CargoBeamer's COO, highlighted.

Photo: CargoBeamer/Rostock Port/Nordlicht

DCT Gdańsk to grow with a new quay

The Budimex-Dredging International consortium will construct the T3 expansion, increasing the terminal's handling capacity by 1.7m TEUs to 4.5m/year. T3 will cover 36.5 ha of yard area and a 717 m long and 17.5 m deep quay wall. The project will also see DCT Gdańsk purchasing seven ship-to-shore cranes capable of serving the largest container ships and 20 semi-automated rail-mounted gantries. Operationally, T3 will come online at the end of 2024's second half, while the full commissioning is planned for Q2 2025.

The King's Line returns to Trelleborg

As of 2023, FRS Baltic's high-speed catamaran Skane Jet will change its Swedish port of call, starting to connect Sassnitz with Trelleborg. FRS Baltic will offer daily trips from April-October 2023, plus night departures during the summer months. In Trelleborg, Skane Jet (offering room for 800 passengers and space for 200 vehicles) will use berth No. 7 where train ferries used to call but which was converted to take care of rubber-tyred rolling cargo. The King's Line was running between Sassnitz and Trelleborg from 1897 till 2020, when Stena Line decided to scratch the link because of the coronavirus pandemic. FRS Baltic reactivated the service in mid-September 2020 with Ystad as the King's Line's port of call.

New Amber Train – tested

Together with its partners LDZ Cargo, LTG Cargo, HHLA TK Estonia, and Kaunas Intermodal Terminal, the Estonian Operail has dispatched the first Muuga-Kaunas train. "We'll see how the loading of goods, border operations and the exchanging of documents and data function. This time, we moved from roads to rails some timber material, peat and construction foam, which we are transporting for our clients to Lithuania," Raul Toomsalu, Operail's CEO, highlighted. In Kaunas, trailers were transhipped onto a standard-gauge train heading westward. One of the trail's customers, DB Schenker, had shipments destined for France and the Netherlands. The trail Amber Train was reloaded in Kaunas for its backhaul to Muuga. The new instalment of the Amber Train is set to become a regular, twice-a-week service. Though, the exact date of that is unknown. Riina Sikkut, Estonia's Minister of Economic Affairs and Infrastructure, underlined, "The Amber Train creates a connection between Northern and Western Europe. It provides an additional opportunity to develop freight transport that does not depend on Russia." The previous Amber Train, set up in 2018, connected Šestokai, Riga, and Tallinn.

Photo: Operail

Liebherr's new LHM series – presented

The latest product line features a new crane control system (Master V), advanced sensor integration, and digital information transmission. The position of the outrigger system is now monitored by sensors, forming part of the internal data processing. Using a new outrigger base in the field only requires a software update by Liebherr. Digital IP cameras are used for better monitoring of the crane interior and the external crane environment. An independent power circuit supplies the new control, meaning the machinery can be continuously monitored by cameras and protected without activating the crane ignition. The new series also features the Liebherr Pactronic 2.0 hybrid hydraulic drive system. An accumulator serves as energy storage and provides support when needed by supplying additional, temporarily stored power. Pactronic 2.0 offers two operating modes: Boost and Green. The former acts as a power amplifier, increasing lifting speeds. Liebherr says the new LHM with Pactronic 2.0 achieves the same performance parameters as a comparable device with two main units. The Green mode has been designed to save fuel or power consumption and reduce CO_2 emissions. During the lifting process, Pactronic 2.0 supports the main unit to such an extent that less power is required by the main drive, despite the lifting speeds remaining the same. By setting the individual lifting height, the power output of Pactronic 2.0 is adjusted accordingly. The additional energy is distributed over the entire lifting process. The new Pactronic reacts to changes in the outside temperature and the accompanying change in pressure in the reservoir. The cabin of the new LHM has also been redesigned to provide increased comfort, precision, and safety.

METRANS' new Czechia-Poland service

The company's trains have started connecting METRANS' terminal in Ostrava with the Deepwater Container Terminal Gdańsk (including a stopover in Dąbrowa Górnicza in southwestern Poland). The service runs three times a week in both directions. "We enable our customers in Central and Eastern Europe to get regular connections to the Port of Gdańsk. This is a welcomed, long-awaited connection, which brings new opportunities to the customers and the market," Peter Kiss, METRANS-Group's CEO, commented. He furthered, "The block trains between Gdańsk and Ostrava are optimised in length, which can reach up to 750 meters. That is increasing the capacity of a single train to 112 standard containers and helps to consume less energy per box."

Liebherr ships from the Baltic to the Med

Noatum's cargo handling fleet in the Castellon, Sagunto, and Tarragona terminals has grown with three mobile harbour cranes: two LHM 420s and one LHM 550. Liebherr Maritime Cranes loaded the machinery onboard the heavy load carrier MERI in Rostock for onward delivery to Spain. The LHM 420 model offers 124t and the LHM 550 – 144t of lifting capacity. They joined another LHM 420, acquired by Noatum Terminal Sagunto earlier this year. The gear features Liebherr's proprietary hydrostatic drive, in which closed hydraulic loops are used for all main functions, such as lifting, turning, and luffing. "The hydrostatic drive allows the operator extremely precise control. Additionally, service personnel benefit from a minimum number of components, and the operating company benefits from reduced fuel consumption," the manufacturer highlights.

Photo: Liebherr Maritime Cranes

Esbjerg orders another LHM 800

The largest and most powerful mobile harbour crane in Liebherr's portfolio will land at the Danish seaport in 2023, while it awaits delivery of an LHM 600 by 2022-end. It will be Esbjerg's second LHM 800 in a fleet totalling seven Liebherrs as of next year. The newest machinery will be used for handling the ever-growing wind turbines. LHM 800 alone can lift 308t; in tandem mode, using the Sycratronic system developed in co-op with the Port of Esbjerg, up to 616t can be pulled. Importantly, tandem lifts make it easier to handle long cargoes, such as rotor blades that can measure over 90 m in length. Sycratronic is a computerised assistance system for operating two cranes with one operator. The solution monitors operation to avoid overloads and compensate for the displacement of components being loaded. Some four-fifths of Europe's installed offshore wind energy capacity has been shipped out of Esbjerg. The port handles more than 0.5mt/year of wind turbine components. Esbjerg received its first Liebherr mobile harbour crane, an LHM 1080, in 1994. In 2019, the Danish seaport took hold of its first LHM 800.

Photo: Liebherr

Photos: Canva

Cyber hijack

by **Henry Clack**, *Associate, HFW*

As for all businesses, ransomware is a significant issue for the shipping industry. There have been a series of high-profile attacks on the sector in recent years. In 2021, Swire Pacific Offshore was reportedly the victim of a cyber attack. Whilst its fleet of roughly 50 vessels was not materially affected, the attack is understood to have caused a significant loss to the company. Historically, shipowners have viewed their ships as being relatively immune to these sorts of attacks as, due to their very nature, they have been 'air-gapped' from the rest of the owners' IT network. This is, however, no longer the case.

the software and hardware on board that monitors or controls the vessel's physical equipment (known as operational technology or OT) have increasingly been connected with the outside world. This equipment, which generally comprises computer systems that control engines, steering gear, pumps or valves, is now regularly linked to the outside world to allow for external monitoring by head office or third-party suppliers/manufacturers. Cybercriminals can exploit this vulnerability.

**An increasingly attractive
form of cyber crime**

Ransomware exploits are relatively straightforward to execute. They can either be purchased on the dark web as software packages or be of a bespoke design for a unique target. The code can infiltrate and encrypt computer networks, locking employees and IT teams out of the system until a fee has been paid in exchange for its release. The recent growth in cryptocurrencies has provided perpetrators with an anonymous payment system, making it an increasingly attractive form of cybercrime.

Regarding the payment of ransoms, it is important to note that the victim may face legal issues if it makes payment without carrying out due diligence. Whilst the payment of ransoms is legal as a matter of English law, this is not always the case in other jurisdictions. Similarly, it should be borne in mind that transferring funds to terrorist organisations is illegal, and this is particularly problematic given that some groups are arguably politically motivated and/or state-sponsored. Insurers should also exercise caution as UK law includes a specific offence for insurers who fund ransom payments to a terrorist organisation.

Finally, ransomware victims could fall foul of sanction rules. In September 2021, the Office of Foreign Assets Control (OFAC; a financial intelligence and enforcement agency of the U.S. Treasury Department) issued an advisory notice with specific information relating to ransomware. The memo states that individuals may be "held civilly liable even if such person did not know or have reason to know that it was engaging in a transaction

SURVEY RESULTS AND SUMMARY OF KEY FINDINGS

192 RESPONDENTS

- 16.1% SEAFARER
- 41.1% ASHORE FOR INDUSTRY SUPPLIER
- 42.7% ASHORE FOR SHIPPING COMPANY
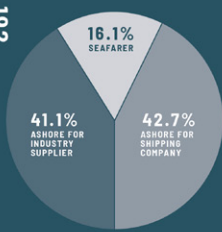
52% of industry professionals believe their organisation has a process in place for gathering intelligence on cyber security threats.

36% of industry professionals believe their organisation has been the victim of a cyber attack in the last three years.

BREAKDOWN BY SENIORITY ASHORE:
- 44% OF EMPLOYEES IN OPERATIONAL ROLES
- 37% OF EMPLOYEES IN MANAGEMENT ROLES
- 19% OF EMPLOYEES IN LEADERSHIP ROLES

3% of cyber attacks resulted in the respondents' organisation paying a ransom.

$3.1 MILLION ...Is the average ransom paid

73% of respondents believe their organisation has a cyber security incident response plan.

BREAKDOWN BY DEMOGRAPHIC:
- 90% OF SHORESIDE PERSONNEL AT SHIPPING COMPANIES
- 71% OF SEAFARERS
- 55% OF INDUSTRY SUPPLIERS
- 61% OF SENIOR LEADERS

34% of industry professionals believe their organisation has insurance in place to cover cyber attacks.

"We regularly conduct cyber security training and drills in my organisation."

83% of shoreside employees at shipping companies agree with this statement but only...

67% of seafarers agree.

54% of shipping companies spend less than $100K per year on cyber security management.

"My organisation has appropriately addressed cyber risks in the fleet's safety management system."

87% of seafarers and shoreside employees at shipping companies agree with this statement.

$182,000 An average, cyber attacks cost ship operators $182,000 per year.

For **1 in 12** ship operators (8%), the average cost of cyber attacks is:

$1.8MILLION PER YEAR

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that was prohibited under sanctions laws and regulations administered by OFAC."

Reconnecting

HFW, CyberOwl and the maritime innovation agency Thetius have released *The Great Disconnect*, a report which attempts to shed light on the cyber security readiness of shipping based on surveys and research interviews of more than 200 industry professionals.

Whilst the report deals with several cyber issues facing the shipping industry, the survey results were striking when it came to ransomware: 44% of industry professionals reported that their organisation had been the subject of a cyberattack in the last three years. Of those, 3% resulted in paying a ransom by the victim to the attacker, at an average cost of $3.1m.

The report makes four recommendations of practical measures for ship operators, industry suppliers, and wider stakeholders to take to reduce the risk of falling victim to these attacks.

First: set up a dedicated cyber security directorate within fleet operations that covers both IT and OT security. One of the most significant vulnerabilities uncovered during the research was the serious disconnect between senior leaders in organisations that operate ships, those responsible for the security of IT systems, and those responsible for protecting OT systems. Taking a holistic approach to cyber security that includes both IT and OT systems alongside physical security is therefore critical.

Second: implement a comprehensive cyber incident training and drill programme. Everyone in an organisation, whether at sea or ashore, must understand what actions are required of them during a live cyber incident. The programme should be based on practical scenarios that reflect the actual setup and security posture of the organisation, its people, processes, and technology. Senior leaders in organisations should understand the decisions they will need to make during a cyberattack to enable their organisation to deliver the best response to minimise losses and disruption. They should have confidence that systems and processes have been put in place to ensure that the right information gets to the right people to make the right decisions quickly.

Third: develop minimum security standards for suppliers and partners. It was clear from the survey and research interviews that maritime suppliers work to a much less stringent cyber security standard than the ship operators they serve. On average, industry suppliers reported a 10% lower score than those who work for ship operators across all of the self-assessment questions asked in the survey. We recommend that all shipowners and operators create a cyber security standard that is incorporated into the procurement or counterparty due diligence processes. This can be designed as a supplier code of connection which sets a minimum cyber security standard for the supplier before they are permitted to connect to vessel systems or access ship data.

Lastly: conduct an urgent review of insurance policies and seek guidance on ransom payments. Only 35% of respondents to our industry survey confirmed that their organisation has insurance in place to cover cyber risks. Though many organisations may believe they are covered under existing policies, for many policies, there are blanketing exemptions they should be aware of. Further, even if cyber threats are not specifically exempted, the circumstances of an attack and the failures of organisations to address earlier failures and vulnerabilities identified in cyber security systems and processes could lead to denied claims.

These recommendations should go some way to reduce the risks facing the shipping industry.

Thinking of transport & logistics?
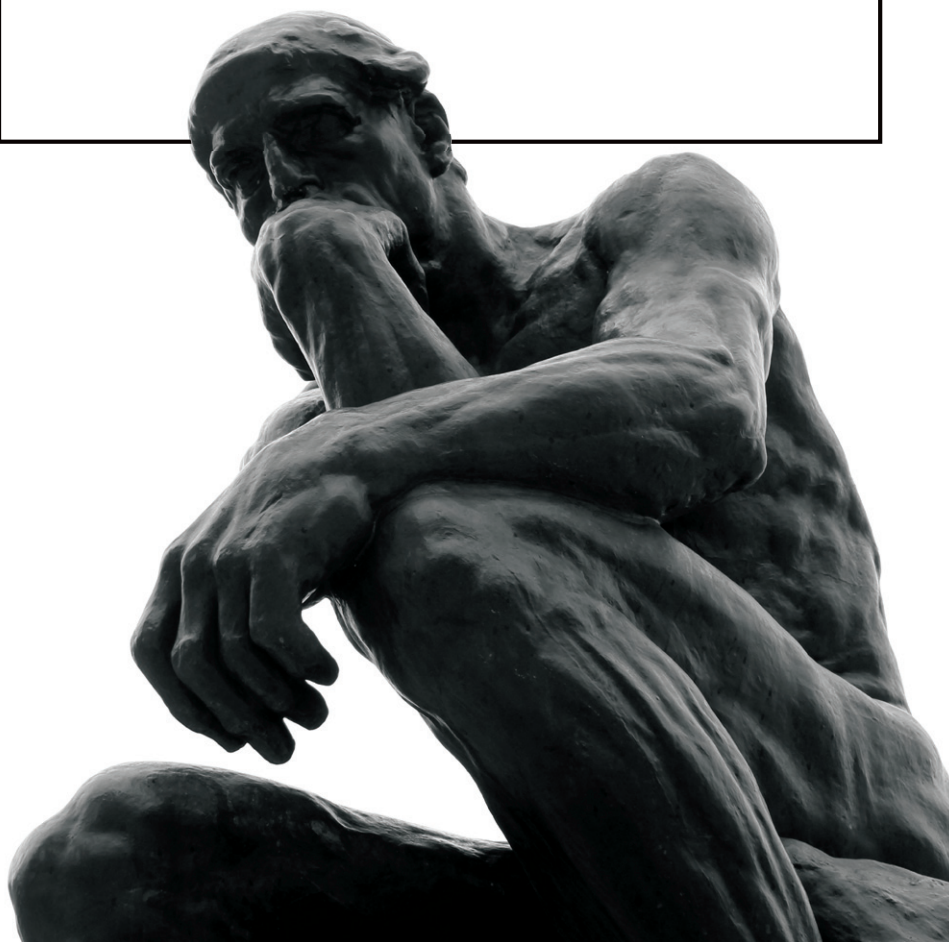
Photo: Canva

**The framework of sustainability:
why electrification isn't all good**

Think beyond

by **Matthew Wittemeier**,
Director Marketing and Sales, Terminal & Distribution Logistics Division, INFORM

At the IANA Expo 2021, I had the pleasure of sitting on the automation panel with several distinguished and undoubtedly more experienced professionals. The conversation ranged from practical steps toward automating today to innovations that will come to shape the industry in a decade. Somewhere in the middle, the moderator brought up the topic of "sustainability." I was the last to have an opportunity to voice my opinion – a fact that I'm grateful for because each of my fellow panellists talked about electrification – in any way, shape, or form – as being the primary focus of sustainability efforts in intermodal. I took a vastly different approach. I posited that while electrification is a positive step, it is merely scratching the surface of what could be achieved if we fundamentally rethink what sustainability is, what it means to our industry, and what would constitute a future-ready vision of sustainability in the transportation sector.

INFORM

I made the point that electrification of terminal assets principally moves the emission of CO_2 out of the terminal environment upstream to the energy producer – but the CO_2 is still being generated. Unlike our maritime cousins, who are actively building green energy production into their facilities, intermodal terminals in the US are still predominately receiving electricity generated centrally through the burning of fossil fuels. As such, while the terminal might see a decrease in CO_2 emissions on the facility, they're passing the buck to the energy producer, who will see a net gain. An improvement in environmental sustainability doesn't happen unless the terminal can guarantee that the electricity running their new electrified equipment is itself green.

Even worse, the increased demand for electricity to terminals adds strain to the electrical grids they're connected to, an issue, which in time, is likely to increase electrical costs for other system users. **DP World's Carla Grifo shared a very similar sentiment when I talked with her during a 2038: Future Visions interview**. In short, electrifying equipment is good, but only when the electricity is produced locally. True sustainability is about doing more with less and pushing the return of existing assets to their fullest.

What is sustainability?

The first thing that comes to most people's minds when considering the term "sustainability" is environmental sustainability. Yet, it is so much more. Sustainability is more a thinking framework than a singular end goal. The sustainability framework provides a way to consider the future impact of an action, a process, a system – on the planet and its creatures, including people. The environment, or the

planet, is a single side of the equation. If we set electrification against the broader framework, while potentially positive for the planet, if the cost of living is inadvertently raised for the people in the surrounding communities, then the true sense of sustainability isn't achieved.

While I have only been in the industry for the past five years, I have certainly seen a sector dedicated to improving the world around it. Rail freight transport on its own drives significant environmental benefits when compared to long-haul trucking. The discussions around electrification also indicate that the industry wants to improve its environmental sustainability outcomes. That said, we need to consider the broader framework of sustainability as discussed above when considering what actions to take.

In a January 2021 technical paper in *Port Technology*, my co-authors and I presented evidence from multiple studies of INFORM's optimisation modules looking at the impact of optimisation on traditional diesel-powered, horizontal transport equipment. One of the key takeaways was that reducing equipment to complete the same quantity of work was the most significant way to reduce CO2 emissions within the system.

Furthermore, multiple studies on the consumer automotive market conclusively show that the environmental cost of producing a new electric vehicle is significantly higher than the environmental cost of maintaining and using an already produced gas-powered vehicle. Naturally,

replacing end-of-life machinery with new electrified hardware is a solid argument.

However, these two points together make a compelling argument that replacing existing diesel-powered equipment for the sake of driving sustainability is, again, not a positive move towards sustainability.

A future vision of sustainability

We must look at the short and the long term as an industry. Concerning the former, we need to weigh the pros and cons of investments, including those sustainability-tagged. However, regarding the latter, we ought to challenge how we operate our terminals. Are the processes we have in place today the best

– or do they exist because that is how we have 'always done it?'

Rethinking sustainability starts with understanding and seeing the larger framework presented. But it can only truly be effective if we dare to be willing to reconsider the foundations on which we have built our industry. Innovation and new ways of doing things are all too often seen as scary, and risk-averse management structures prevent us from actually creating real positive change.

In closing, I encourage you to think beyond electrification. Think beyond your current operations. Think beyond the limits of what you have today and truly consider what would drive real sustainability in the industry. We have a saying at INFORM: old process + new technology = expensive old process.
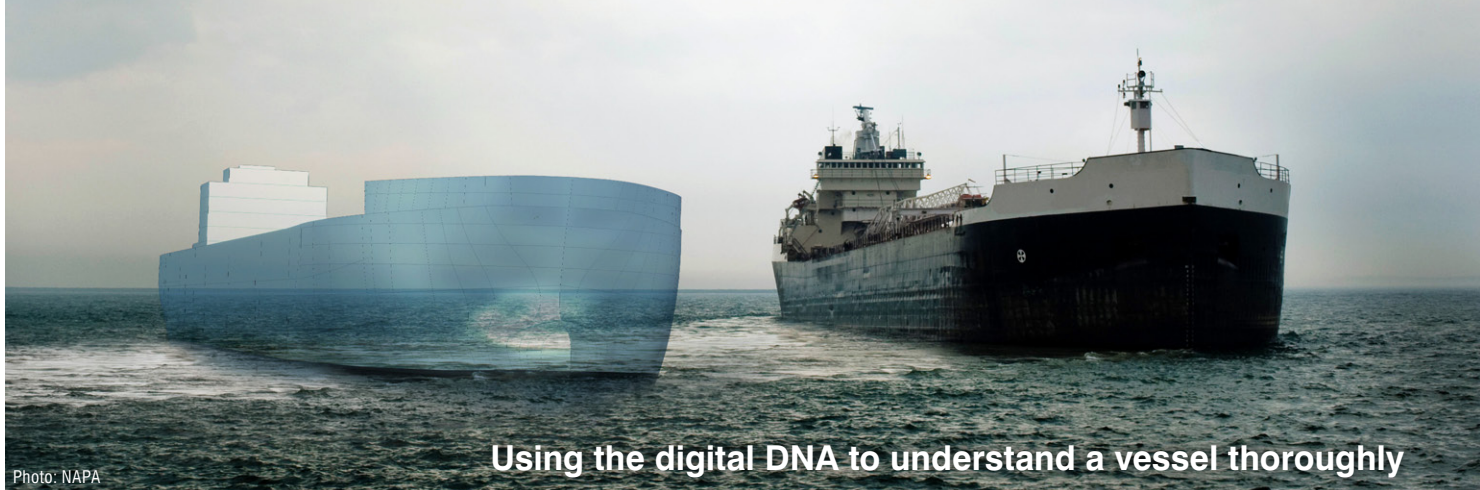
Photo: NAPA

Using the digital DNA to understand a vessel thoroughly

Sustainable at the core

by **Esa Henttinen**, *Executive Vice President, NAPA Safety Solutions*

The pursuit of sustainable shipping requires decisive action on two fronts. Ashore, shipyards are challenged to design the more efficient ships of tomorrow, while at sea, crews must ensure each vessel navigating today is operated safely and sustainably. On both fronts, it begins by understanding the data that makes each vessel unique – its 'digital DNA' – and making the most of these insights, from design to operations.

In its over 30 years of operation, the Helsinki-headquartered NAPA has become a global leader in developing and scaling software, services and data analysis for a safer, smarter, and more sustainable maritime industry. To date, NAPA has 420 user organisations for its design solutions, nearly 3,000 installations onboard vessels, and a growing number of subscribers for its cloud-based fleet services. Make your way to **www.napa.fi** to see more.

Modern ships are made of data just as much as steel. Well before its physical structure is welded together in a shipyard, a vessel exists digitally in the 3D models used to design it – what we call its digital DNA. As no two ships are exactly the same, this digital DNA is key to understanding a vessel's unique design, containing a wealth of information on its technical characteristics, propulsion systems, and any additional technology on board.

Importantly, these digital models are not fixed in time, and their role doesn't end once a vessel leaves the shipyard. A ship's digital twin evolves just like its physical counterpart, incorporating data on its operations, maintenance, and the sea conditions it has experienced to truly reflect its current state. This dynamic understanding of a vessel throughout its lifetime helps us predict its performance in a variety of conditions, which is crucial to making the best possible operational decisions to maximise efficiency while ensuring safety.

The capacity to understand each vessel thoroughly is an ace card for shipping as the sector faces the challenge of a generation: improving sustainability, both immediately and in the long term. On the one hand, already sailing ships need to reduce their emissions right now to meet the International Maritime Organization's (IMO) Energy Efficiency Existing Ship Index (EEXI) and Carbon Intensity Indicator (CII) requirements that are about to enter into force. On the other, the industry also needs to develop ambitious new designs, using them as efficiently as possible to meet the 2030 and 2050 decarbonisation goals.

In other words, we need a fundamental transformation of global fleets and of the way we operate them. This must begin at the granular level, and insights from digital DNA can help with three key aspects.

Tailored voyages

Firstly, the dynamic, vessel-specific insights provided by digital models represent an exciting opportunity to take weather routing to the next level. By using the ship's unique digital twin, we can estimate how fast and at what fuel consumption rate it can sail for a number of potential voyages – taking into account its design characteristics and details of its current condition, such as hull fouling and engine wear, for example.

Combining these vessel-specific insights with weather forecasts detailing
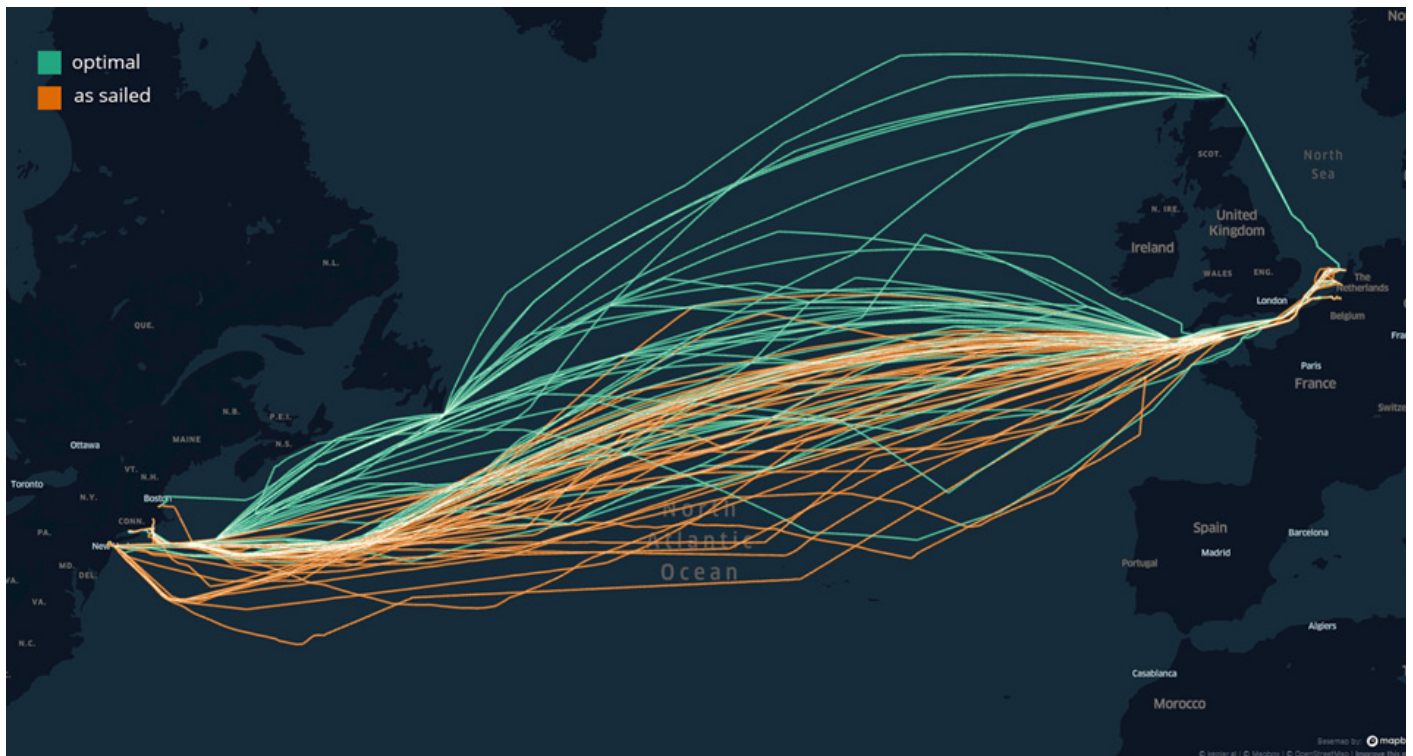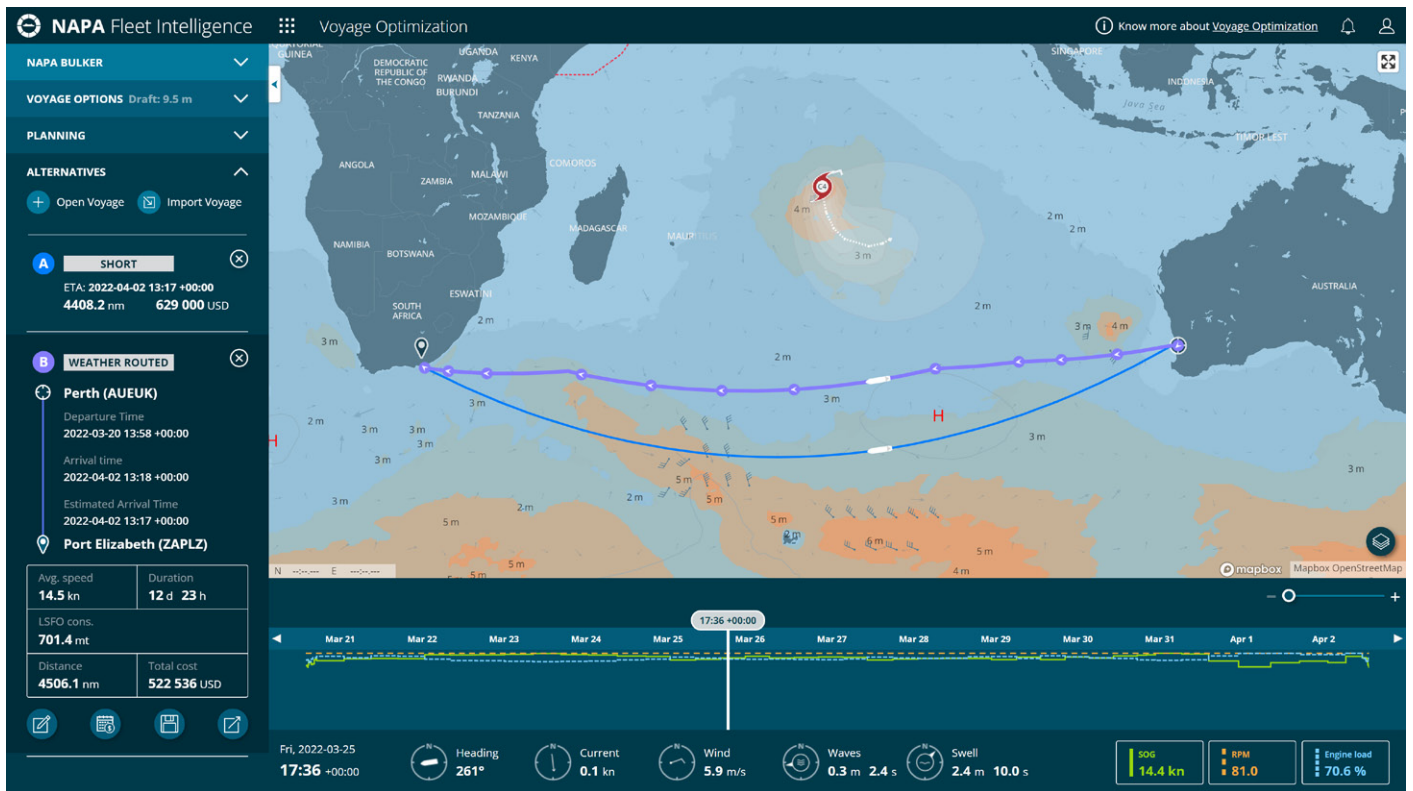
wind, waves, swell and currents, as well as information on safe routes, our NAPA Voyage Optimization solution can simulate hundreds of possible routes and predict their impact on estimated time of arrival, fuel consumption and emissions. From this, our algorithms can calculate optimal routes and speed profiles that will meet operational needs and desired arrival times, giving captains and operators better visibility of all possible options and enabling them to minimise their emissions for every voyage.

This is already making a tangible difference. NAPA Voyage Optimization cuts fuel consumption and emissions by an average of 5-15%, which has a substantial impact on fuel costs today, while also helping shipowners 'future-proof' their fleets for the crucial years ahead. Indeed, these emissions reductions can make the difference between compliance and non-compliance with CII regulations – or in other words, between keeping a vessel trading or seeing it become a 'stranded asset' prematurely.

Looking further ahead, the capacity to optimise operations for each vessel's unique characteristics will be even more valuable. It will enable operators to make the most of the unique combination of technologies on board by tailoring their

routes to maximise the benefits of wind propulsion systems, among others.

Safety as a prerequisite

The second key contribution of digital models is to provide vital insights to ensure the safety of global fleets throughout this period of rapid innovation. As the worldwide fleet integrates a variety of new fuels and technologies, both as retrofits and on newbuilds, safety must be a prerequisite. Ship-specific digital models also play a critical role here, giving a real-time picture of a vessel's vulnerability and the risks it faces at any given moment in a voyage.

Our NAPA Stability solution achieves this by combining a ship's digital DNA with the wealth of data continuously generated by the vessel's systems. Thanks to the latest advances in connectivity, several variables that may affect a ship's stability, from deadweight changes (cargo, bunkers, ballast) and loading conditions to the number of water-tight doors left open on the vessel, can be monitored constantly. This information is fed into a cloud-based system, alongside external data such as location from the automatic identification system, weather and precise maps that help build the most accurate picture possible. As a result, a wide range of calculations related to hydrostatics, intact stability, damage stability, and longitudinal strength can be made in real-time.

Crucially, this means that risk levels can be assessed constantly by the crew and shoreside teams alike, creating a more proactive approach to safety where any potential issues can be flagged and addressed before they ever become a serious problem. Moreover, if an emergency

does happen on board, the shared situational awareness between ship officers, onshore teams, and emergency services will facilitate an immediate and efficient intervention.

As a ship's safety can never be compromised, green and safety technology must work together to pave the way for zero-carbon shipping. For instance, data from NAPA's loading computer can also support environmental reporting requirements, such as the EU Monitoring, Reporting and Verification and the IMO Data Collection System, which require loading and cargo information. Moving forward, data-powered models will help ensure that innovative vessels remain safe at all times by enabling decision-making, implementation and execution of new green technologies that ensure a vessel's sustainable operations without ever compromising on safety.

Using today's experience to improve future designs

Last but not least, a deeper understanding of vessels' digital DNA supports shipping's sustainability transition by empowering shipyards to create the more efficient vessels needed to bring the industry to net zero.

Today, 3D models already support naval engineers and architects as they develop innovative designs by facilitating class approvals and enabling all stakeholders to work on a single 'source of truth.' A comprehensive 3D model enables fast design changes and reliable analyses across the domain: from hydrostatics, stability, ship weight estimation and hydrodynamics to steel structures and Finite Element (FE) analysis.

Quick design iterations and comprehensive analyses are particularly important

for innovative designs, enabling engineers to make the right choices early and understand the impact of new features on the integrity, stability, and efficiency of the global structure. It is also key to creating flexible designs, such as vessels ready to be converted to new fuels, that the industry demands in this period of uncertainty.

Moreover, the current digital era provides a goldmine of insights that will help optimise the future fleet. Real-life voyage data links theory and practice, providing shipyards with the unparalleled ability to analyse their vessels once deployed at sea – and further refine and iterate their designs to improve efficiency even more.

Additionally, historical data from thousands of real-life voyages at sea can be analysed to give a statistical picture of the weather conditions a ship is likely to encounter on specific routes, which helps inform decisions on required engine power for newbuilds that will navigate the same trade lanes. In other words, data from operations at sea helps fine-tune ships' digital DNA from the very start to make future vessels more sustainable and adapted to the routes and conditions they will encounter.

A tangible effect of the intangible

While the impacts of climate change are increasingly visible, one of the most powerful and efficient tools to reduce emissions from shipping – data – is intangible.

By deploying this tool through concerted and widespread action at the granular level, in the world's shipyards and on the tens of thousands of vessels navigating at sea, the industry can take its first tangible steps to surmount the monumental challenge of decarbonisation.

Photos: Innovez One

The role seaports can play in greening shipping – thanks to digitalisation

Data-powered, real-time port sustainability

by **Grant Ingram**, *CEO for the UK and EMEA, Innovez One*

As volatility is now a feature of life for ports around the globe, becoming 'smart' is more than just a buzzword. Digitalisation is at the core of these ports' sustainability strategy, helping them build resilience to not only improve their efficiency but also meet their long-term decarbonisation goals.

innovez·one

twhe Singapore-headquartered In-novez One, with offices in Jakarta and London, has been delivering expert maritime software solutions for the world's busiest ports and towage operators since 2004. That year was also marked by the digitalisation of the Port of Singapore's pilotage and towage operations by the company. With a vision to automate complex maritime operations for ports, towage and workboat operators worldwide, the Innovez One team has engineered and developed the marineM platform that helps to optimise critical maritime resource allocations for operations carried out by ports of all sizes. Go to **www.innovez-one.com** to find out more.

after over two years of supply chain disruption, it's no surprise that some-one has developed a digital tool to identify supply chain bottlenecks around the world. CNBC's new **Supply Chain Heat Map** was created in partner-ship with ten of the world's top maritime and logistics data providers, and it shows global supply chain challenges in real-time. There are many, and they are expected to continue to impact trade well into next year.

Not only is this causing shocks across global supply chains, but it's driving up emissions, both as ships idle outside ports and as they race to make the most of the higher rates that congestion brings. This is a major issue for ports around the world, many of whose long-term goals depend on them increasing efficiency and throughput but also developing the regions around them into new technology hubs. In the UK, for example, port areas are looking to play their part in the regional Levelling Up agenda, becoming hubs where supply chains, energy chains, and renewable technology intersect.

On the global stage, ports also have a significant role to play in making green shipping corridors a reality. As countries such as Australia, Japan, the UK, and the US have pledged to develop zero-emission shipping routes between selected port hubs, it is clear that these must be supported by a network of efficient, green ports. Smart ports will also play a key role in enabling just-in-time arrivals, which can curb emissions by 14% on a per voyage basis, **according to a recent study** by the International Maritime Organization.

As a vital component of global supply chains, ports must be ready to play their part – by reducing their own environmental footprint and by putting the right measures in place to help the visiting ships minimise their emissions in the critical 'first and last mile' of their journey at sea. Ports, and particularly the communities they support, cannot afford for congestion to undermine these goals. While the challenge is colossal, the starting point is clear: digitalisation.

No easy task

It is critical to understand where the bottlenecks are to mitigate the impact of congestion on global trade. With its MarineM solution, Innovez One is contributing its analytical power to a different aspect of the problem – building efficiency at the local level. By optimising tug, service, and pilot operations, we help ports tackle their emissions.
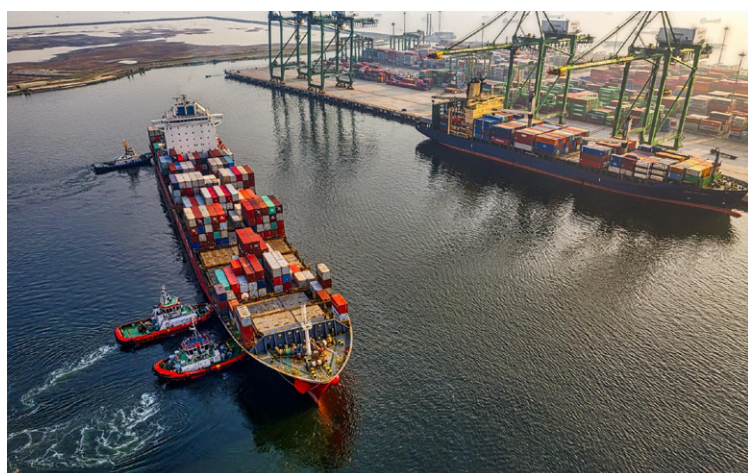
This is no easy task. More than just places where goods are loaded and unloaded, ports are complex ecosystems of their own, where numerous moving pieces (pilots, tugs, trucks, service boats) are dispatched to welcome vessels as they arrive or depart. Reducing the amount of carbon emitted by these marine service fleets requires organising them in the most efficient way possible to assign the right assets to each job and avoid unnecessary journeys.

We do this by using artificial intelligence (AI) to handle the vast amount of constantly-evolving variables that are essential to optimise all port resources. Where manual processes, spreadsheets and whiteboards fall short, algorithms can solve complex puzzles and calculate optimal resource allocation. AI can take into account additional constraints such as the need to assign pilots to specific vessel types and sizes depending on their licence, the types and number of tugboats required for each job, and even the shuttles needed to take the pilots to the correct boarding grounds.

By making the most of resources, digital solutions eliminate unnecessary journeys and reduce the overall distance travelled, which makes a significant difference in emissions. A tangible example is the Indonesian Tanjung Priok, the 22nd busiest port in the world. The implementation of MarineM's AI-powered scheduling reduced the overall distance travelled during tug/pilot operations by 20%, saving $155k in fuel annually. Not only did the port see tangible benefits in reducing port congestion, but it was also fiscally savvy, as the payback was a mere six months.

At an unmatched speed

Beyond that minute-by-minute, day-by-day logistics management function, our AI-powered MarineM system enables ports to simultaneously reduce emissions caused by having harbour craft and cargo ships idling unnecessarily in port waters. This makes it a long-term decarbonisation tool as well as a precious instrument

to minimise disruption in the first and last mile of shipping logistics chains.

One of the fundamental advantages of AI-powered algorithms is that they learn from historical data to predict the duration of each job based on many factors like weather conditions, vessel type, and the required level of service. This remarkable accuracy helps ensure all the moving pieces fall into place seamlessly, so everything is ready to welcome ships exactly when they arrive. Crucially, these algorithms can adapt to any changes in vessels' estimated time of arrival, updating schedules, and reallocating resources at a speed unmatched by manual systems.

This gives ports the flexibility needed to respond to problems or delays elsewhere in the supply chain, which is key to minimising the amount of time that vessels spend queueing outside ports with their engines on. Time efficiency-wise, in Tanjung Priok, MarineM has reduced the average waiting times for visiting ships from 2.4 hours to 30.6 minutes.

This increased resilience is even more critical in the context of the unprecedented congestion experienced in ports worldwide. Just like in traffic jams, congestion inflates idle time as vessels wait on anchorage, which inevitably leads to a spike in emissions. The congestion experienced during the coronavirus pandemic is no exception – emissions have doubled in the ports of Singapore and Los Angeles during this period, **according to a study by Singapore's Nanyang Technological University**.

Good governance

Digitalisation also helps ports of all sizes overcome some of the most immediate challenges that they face daily. Problems with ordering and scheduling are common: frequent order amendments for pilots, tugs and pilot boards, inaccurate job entries, and inefficient scheduling can all drive down productivity. The manual, paper-based processes still in place in the majority of the world's ports frequently lead to

billing issues, delays, lack of interoperability, and disputes.

One of the main benefits of digitalisation is its impact on good governance principles, another essential part of the sustainable development puzzle. MarineM captures job requests, automatically tracks the progress of each work, and generates invoices automatically – creating transparency and minimising the risk of errors or disputes.

Not only does this help users get paid on time, but the data collected also facilitates audits and accountability. By gathering data on the operation of fleets at a granular level, ports or service providers can more easily detect any irregularities, thereby preventing misuse of assets (e.g., illegal use of water or fuel theft).

More important than ever

The global discussion on how best to achieve a sustainable future will continue to gain momentum as the world looks ahead to the 2022 United Nations Climate Change Conference in Egypt this November.

Shipping has already been identified as a key area of concern. The disruptions of the past few years have demonstrated that ports must play a central role in the decarbonisation of global trade because they provide the efficiency and infrastructure needed for more sustainable voyages and port stays.

Many ports are already taking the lead, and others are looking to learn from them. For example, the Baltic Ports Organization's Digitalization Working Group met in June 2022 to discuss the results of a questionnaire of member seaports. The results indicated that port representatives believe cooperation and exchange of information regarding the development and implementation of digitalisation projects would be of great benefit for all actors in the maritime supply chain.

Globally, it is being recognised that digitalisation is now more important than ever to make ports more resilient to disruptions and to achieve decarbonisation goals, delivering real-time sustainability. ∎

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Terminology critical for developing autonomous ship regulations

The route to regulating MASS

by **Fitzwilliam Scott**

Following the April 2022 meeting of the International Maritime Organization's (IMO) Maritime Safety Committee, material steps were taken toward formulating an international regulatory framework for Maritime Autonomous Surface Ships (MASS). "However, outstanding questions on terminology and scope must be tackled for regulatory work to progress," says Capt. Marko Rahikainen, One Sea Ecosystem Lead.

ONE SEA
Autonomous maritime ecosystem

Established in 2016, One Sea is a high-profile ecosystem with a primary aim to lead the way towards an operating autonomous maritime ecosystem by 2025. The collaboration gathers together leading marine experts and is a strategic combination of top research, state-of-the-art information technology and business. Head to **www.oneseaecosystem.net** to discover more.

This year has seen significant progress in the work towards autonomous ship regulation. Three key committees at the IMO are involved in considering regulations for MASS – the Legal Committee (LEG), the Facilitation Committee (FAL), and the Maritime Safety Committee (MSC). After meetings held this spring, the outcomes of the Regulatory Scoping Exercises to assess how MASS could be regulated internationally resulted in work plans for the three committees.

April's MSC 105th session also agreed on a roadmap for regulating MASS and established the MSC MASS Correspondence Group to take the regulatory work forward. It is a live document that can adapt to change, but it has set the course for developing the much-needed regulations.

Now, the aim is for the IMO delegations to craft a non-mandatory instrument for a goal-based MASS Code by 2025 (for cargo ships in the first instance). Since most of the regulations need to regard maritime safety, the resulting code is envisaged to become mandatory from 2028's start. By making the code goal-based rather than prescriptive, the IMO seeks to make the instrument covering autonomous ships 'future-proof.'

That said, creating the MASS code will be a complex process as it requires working across multiple IMO conventions – not just the International Convention for the Safety of Life at Sea. Each IMO convention has its own processes and procedures for approving new regulations. In addition to the roadmap, the committees agreed to establish a Joint MSC/LEG/FAL working group to address common issues and ensure communication between the committees as the regulatory process progresses.

Why terminology matters

Currently, there is no common terminology for MASS. Terms and technology types are often used interchangeably; in practice, they have very different meanings. This situation is not acceptable in international regulation, where it would leave room for misinterpretation or 'implementation' at variance with what the regulators intended.

For instance, remote control and monitoring should not be confused with automation, as remote operations can be executed on ships where systems have various levels of automation. Again, automation and autonomous technologies are distinct concepts. A fully automated

Levels of Automation in Shipping

Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
Basic Operation	Assisted Operations	Partial Automation	Conditional Automation	High Automation	Autonomous
Human controls vessel	Hands-on Eyes-on Mind-on	Hands-off (at times) Eyes-on Mind-on	Hands-off Eyes-off (at times) Mind-on	Hands-off Eyes-off Mind-off (at times)	Hands-off Eyes-off Mind-off Human-off

LEVEL OF AUTOMATION INCREASES →

← **LEVEL OF HUMAN ATTENTION NEEDED INCREASES**

ONE SEA
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ship could still have a crew on board, for example, to manage operations, step in as necessary, or undertake modified duties. A fully autonomous ship could operate with or without a crew on board.

In addition, the general term "autonomous operation" is often used loosely when its intended meaning relates to navigational automation. There are other autonomous ship technologies which seafarers already take for granted – such as a ship's stabiliser and anti-heeling system.

The complex nature of the regulatory process offers a clue as to the significance of terminology in developing international regulations: terminology and definitions must be consistent and unambiguous to make progress on automation and autonomous technology regulations.

It is fair to say that, while regulatory developments on autonomous shipping at the global level have gathered pace, they remain behind advancing technology. The UK has already formulated a position on rule development for autonomous ships, while **the EU's SAFEMASS study** establishes a forward position on regulation. One Sea's stance remains focused on contributing to the development of common rules on MASS as the most effective means of avoiding ambiguity and ensuring consistency in maritime safety standards.

Defining the levels of automation

Earlier this year, One Sea published a new white paper, *Autonomous Ships: Terms of Reference for Rule Development*, which offers a route forward for developing and implementing an international regulatory framework for MASS. The publication calls for urgency in developing common terms of reference covering autonomous and highly automated ship operations that can be used across the maritime industry. It examines definitions of ship autonomy and levels of automation, exploring how they can be applied progressively to ship operations.

In his foreword, Capt. Eero Lehtovaara, Chairman of One Sea, writes, "The IMO Conventions which provide the safe operating framework for the entire shipping industry have been developed over many years, and amendments to accommodate autonomous ship operations demand painstaking work. Experts in digital technologies and seafarer welfare groups suggest that shipping should therefore establish not only priorities but a series of waypoints on its voyage towards autonomy, to support efficient and safe ship operation in the near-term."

At the core of the paper is a proposal for a scale for determining automation in shipping, based on the SAE Levels of Driving Automation and further developed by One Sea and its members, which describes six 'levels' that can be applied to various ship operations or an entire ship.

For the purpose of the Regulatory Scoping Exercise (MSC 100/20/Add.1 Annex 2), the IMO defined four degrees of autonomy, but many have interpreted this as a preliminary position. Adding to the confusion, class societies have developed their own gradations of autonomy, meaning multiple definitions are in use within the same industry.

However, during the Regulatory Scoping Exercise, it was acknowledged that the levels defined by the IMO required further consideration for regulatory progress to be made on MASS – and a more detailed description of the degrees of autonomy was required.

The human element

In One Sea's industry proposal for defining ship automation levels, it is only the last one that is defined as fully autonomous; others represent different levels of automation. Crucially, One Sea suggests that levels of autonomy should be determined on a scale based on the need for human attention/attendance rather than mixing the definition with crewing levels on-board a ship. In addition, the location of the human operator in the loop is not considered relevant when discussing the taxonomy of automation and autonomy: the operative can be based on-board the ship, aboard another ship or onshore without affecting the level of automation.

The development of international regulations for MASS is One Sea's top priority, and discrepancies in terminology are one of the main obstacles that must be overcome. The purpose of the white paper is to provide clarity and assist rule development and standard definitions for easy application across the industry. Regulations cannot be successfully developed if different definitions and interpretations of how to categorise levels of automation persist.

One Sea presented its proposal for defining the levels of ship autonomy at the latest meeting of the MSC. The Correspondence Group has been asked to consider amending the definitions of MASS and levels of automation. ■

The best of digital and human

by **Laurent Hentges**,

Vice-President, Digital Solutions and Transformation, Bureau Veritas Marine & Offshore

Ships are not the only ones becoming smarter. Classification services, too, are transformed by the latest advances in digital technology. 'Digital class' is emerging, enabling a shift from in-person to remote inspections and from interval-based to increasingly predictive machinery maintenance. This has the potential to reshape the full lifecycle management of vessels, enhancing safety and efficiency across the industry.

BUREAU VERITAS
1828

bureau Veritas is a world leader in laboratory testing, inspection and certification services. Created in 1828, the Group has 80,000 employees located in more than 1,600 offices and laboratories around the globe. Bureau Veritas helps its clients improve their performance by offering services and innovative solutions in order to ensure that their assets, products, infrastructure and processes meet standards and regulations in terms of quality, health and safety, environmental protection and social responsibility. Visit **group.bureauveritas.com** to discover more.

a ground-breaking digital transformation is taking place across the maritime sector, from the moment a vessel is designed and built in a shipyard to its operation on the world's oceans. The various systems onboard a modern ship generate an impressive 20GB of data a day, and vessels' connectiveness, where data is collected on board and then used by both crew and shore-side personnel to manage day-to-day operations, is expected to grow exponentially in the coming years.

This increased digitalisation is already transforming the way fleets are designed and operated. The use of fully digital 3D models is now widespread in shipyards, facilitating design developments, class approvals, and machinery integration aboard. Several shipping companies are already using data to improve their performance, monitor stability, comply with regulatory requirements, and reduce the environmental impact.

While ships are becoming smarter, the work of classification societies is also being transformed with the rise of 'digital class,' where digitalisation helps us optimise class processes and services. In essence, digitalisation enables two major transitions. Firstly, it makes remote inspections possible. Secondly, it lays the foundations of a more predictive and preventive approach to ship maintenance. Crucially, shipping companies can benefit from advances in digital class regardless of their own level of digitalisation or how 'smart' their fleets are today.

The rise of remote surveying

Remote inspection techniques (RIT) are set to become part of everyday life for ship surveys, enabling shipowners to move from physical to partly or wholly remote and augmented surveys. Our marine surveyors can now employ robots – including aerial drones, remotely operated vehicles, and crawlers – to take difficult-to-capture measurements and close-up images, often in real-time.

One of the main objectives of using RIT is to limit the use of costly and dangerous means of access by replacing them with safer and more efficient technologies during the structural inspection of the hull. Here, the marine surveyor's role is augmented by new tools that capture precise images and also by artificial intelligence using pattern-recognition software to bring the surveyor's attention to specific

problems or areas of interest. This leads to safer working conditions for marine surveyors. For shipowners, the use of RIT helps reduce costs and makes the most of the allocated inspection time for each asset.

Far from replacing surveyors, digital tools will enhance their role. The experience and expertise of our surveyors will be critical as we navigate this digital transformation, helping define new operating modes, design advanced digital solutions that are adapted to the realities on the ground, and make the best of digital and human tools in operation.

Lessons from the pandemic

Interest in remote inspections has boomed during the pandemic, as lockdowns and port closures made in-person inspections impossible. Working in collaboration with shipowners and managers during this critical period, we learnt some vital lessons that have helped us hone remote surveys – from the importance of the preparation phase, including collecting and reviewing the relevant documentation in advance, to the need to ensure the process does not overburden crews.

Furthermore, for remote surveys to be scaled up, challenges related to onboard Internet connectivity must be addressed, especially in confined spaces or below the waterline, such as machinery spaces where inspection is critical. The pandemic also highlighted the need for clearer regulatory guidance (a milestone was recently achieved with the publication of a **Unified Requirement on Remote Classification Surveys** by the International Association of Classification Societies).

Today, around one-fifth of Bureau Veritas' (BV) surveys have a remote component, in which inspections are conducted from an office rather than on-site. Reflecting our commitment to constantly improving the safety and efficiency of inspections, we recently expanded our RIT capacities. These include leveraging aerial drones and autonomous underwater vehicles and offering owners and operators new ways to survey their vessels through RIT operated by BV's own surveyors in France and across our eight remote service centres, enabling worldwide 24/7 capacity to perform surveys remotely.

Evolving digital twin capabilities

A key goal is for RIT to be used to develop 3D models for in-service ships. The aim would be to virtually reconstruct a 3D model of an existing vessel by using images collected by drones during surveys together with scanning and photogrammetric technologies. This would allow for hotspots and other vulnerable areas to be

recorded throughout the ship's inspection history using 3D visuals.

Ultimately, the development of digital twin technology will create a single source of truth for each vessel, creating a complete asset history and evaluating the current vessel condition. Data generated by the ship's systems will be combined with the digital model and databases containing information about the ship's condition. Based on this, surveyors will be able to flag problems like corrosion and plate weakening before they occur.

The digital twin technology will also enable shipowners and classification societies to anticipate the evolution of regulatory requirements and increase collaboration with real-time access to ship data. The end goal is to make it easier for owners to monitor their fleets through a wave of web and mobile applications that will enable them to digitally plan surveys, manage their assets, and access documentation.

Optimising machinery maintenance

New digital capabilities will also see classification services move from being entirely prescriptive, in-person and interval-based to being more remote, continuous and preventive. For shipowners, this can mean a reduction in both planned and unintended downtime for vessels, which will cut costs, improve performance, and potentially increase the lifetime of their assets.

Most modern ships have over 300 to 1,000 machinery equipment and components covered under the machinery maintenance surveys from classification. The International Safety Management Code requires all shipowners to have a maintenance system in place, defining how and when their equipment will undergo an inspection. For a standard machinery maintenance scheme, this process is done through an in-person inspection by a classification surveyor once every five years during the ship's certification renewal survey.

Today, a large part of the world's commercial fleet is applying more optimised survey schemes such as Continuous Machinery Survey or a Planned Maintenance

Survey (PMS), by which each machinery item is given an individual maintenance schedule and scope. Rather than undergoing complete maintenance every five years, owners can take a targeted approach to preserving equipment and inspecting machinery based on actual use.

BV's PMS is supported by the implementation of a computer-based machinery maintenance system (CMMS), where chief engineers can initiate the PMS process and manage the maintenance tasks for each piece of equipment via a software solution onboard the ship.

Transitioning to a PMS is a pre-requisite for Condition Based Maintenance (CBM), where maintenance is determined through condition-monitoring by performing diagnosis and prognosis on each machinery item's actual condition. This can open the door to predictive maintenance, an optimised version of CBM where the diagnosis and prognosis are based on complex algorithms instead of singular thresholds or standards. CBM and predictive maintenance can offer enormous benefits for shipowners, enabling them to take a targeted, based on actual use and condition approach to maintaining and inspecting equipment.

Supporting the transformation

As more shipowners and managers embrace digitalisation, there is an opportunity to further optimise maintenance planning, reliability and costs, and at BV, we are proud to support owners throughout the transition. CBM requires a very structured approach to data collection, and crews, managers and surveyors need training on how to make the most of the digital opportunities it presents.

As the smart ships of the future enter into service, the digital era also transforms the role of class – broadening its scope from being survey-focused to providing more technical support to ship managers as they introduce powerful digital solutions. By supporting key digital innovation, BV helps create the backbone of the safer, efficient, and sustainable shipping of the future. ◼

Driving innovation – in Europe and abroad

Photo: Canva

Make it happen!

by **Mitja Caboni**, *Acceleration Manager, PortXL*

Established in Rotterdam seven years ago as the world's first port accelerator, PortXL is dedicated to growing the economy while sustaining the ecology through innovating the port and maritime ecosystems. The organisation's main activity is running two concurrent yearly programmes. First is an acceleration track to help start-ups scale their business. Second, a business fast-track to assist scale-ups in connecting with potential clients and having a soft landing in the Rotterdam maritime ecosystem. The selections for the 2022 programme will take place on 6-7 September (check the infographic to see our impact over the past six years). Here are some key takeaways from our *2021 PortXL Impact Report* (as well as a peek into a recent event when nature has met innovation).

PORTXL
world port accelerator

PortXL was founded in 2015 in Rotterdam with the vision of cultivating a spirit of innovation within the global maritime industry. We want to change the way people think about the maritime sector. This is why PortXL is an ecosystem of start- & scale-ups, corporate partners and mentors – all change-makers, creative thinkers and problem solvers who work collaboratively to disrupt the status quo. Click **portxl.org** to discover more.

ten companies from eight different countries took part in the 2021 PortXL programme. Last year's cohort engaged in the first PortXL hybrid programme. With COVID-19 restrictions in mind, the agenda was planned to have an alternating schedule of live and digital weeks to accommodate the cohort's international part. This flexibility meant we had people from Australia tuning in and participating, making them feel part of the community. The 2021 cohort went on to sign nine collaborations during the contract signing ceremony, with four more confirmed in the following months.

Reefy & the Rotterdam Reef project

The most recent highlight has been **the Rotterdam Reef project**, where the start-up Reefy has signed a contract with Boskalis, the Municipality of Rotterdam, and Rijkswaterstaat (the Dutch Directorate-General for Public Works and Water Management) to test a modular artificial reef system that protects the shore from large ship waves, at the same time stimulating nature.

Since the end of 2013, the Municipality of Rotterdam, Rijkswaterstaat, the Port of Rotterdam Authority, and the World Wide Fund for Nature have been working together to create sustainable, natural riverbanks in the Nieuwe Waterweg and Scheur. One way they do this is with clean residual materials from the construction industry. Breakwaters are needed as foreshores to keep these natural banks in place and protect them from the waves of ships and the currents. Rijkswaterstaat and the Municipality of Rotterdam are looking for more sustainable solutions than the usual quarry stone. By testing these reef innovations in collaboration with Reefy, the Municipality of Rotterdam and Rijkswaterstaat hope to find a resilient and sustainable solution to restore the natural values in the tidal area of the river Maas.
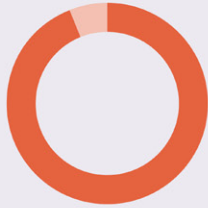
Our impact the past 6 years
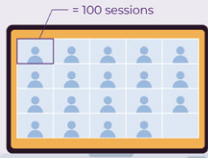
220+ pilot contracts signed

= 10 contracts

92% survival rate of PortXL alumni
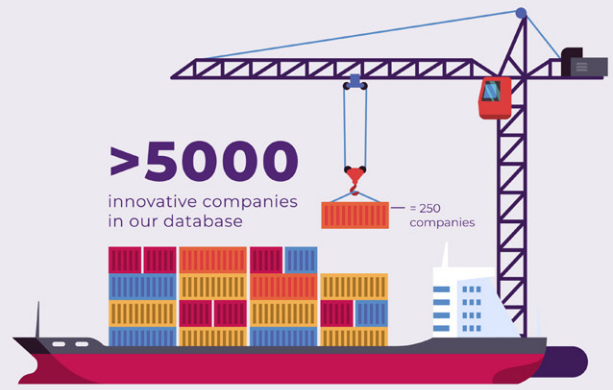
100 scale- and start-ups accelerated

= 10 SU's

= 100 sessions

1932 digital sessions organised

+10k followers on social media

>5000 innovative companies in our database

= 250 companies

5000+ people visit one or more events from PortXL
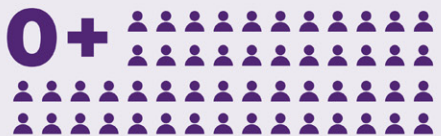
Global ports are strongly connected and share similar efficiency, sustainability, and digitalisation challenges. PortXL's mission to innovate harbours for sustainable growth is not merely a local ambition; we want to extend our reach to international seaports and help them realise their innovation plans to the fullest. Furthermore, it is exciting to work on maritime innovation abroad and learn and experience how Rotterdam is valued.

Quebec & Auckland

Using our experience with innovation and community building in Rotterdam, we successfully conducted a feasibility study with the Port of Quebec on establishing a port ecosystem in this Canadian city. After a few insightful workshops with the ecosystem, we presented a report with an implementation roadmap. The Port of Quebec is now considering the following steps, and we are optimistic about continuing our support with their future innovation journey. Quebec Port Authority's CEO Mario Girard had the following to say, "The open innovation management process is different from procurement processes and is new to most companies. In order to establish more mature open innovation management processes, it will be beneficial to set up a community in the ports and maritime industry that enables innovation in a collaborative way."

As in Canada, we conducted a successful feasibility study in New Zealand with the Port of Auckland. The collaboration was challenging, with the time zone difference playing a substantial part, but we persevered and delivered the report after engaging in workshops with the Auckland port community.

Taranto

The Faros accelerator lights the way for blue economy innovation in Italy. The organisation is accelerating seven pre-seed & seed phase start-ups this year, helping them grow and validate their business models. The best teams will have access to further investments. The programme will last for four months, during which the start-ups will participate in open innovation activities, develop a pilot project with corporate partners, and receive a pre-seed investment in equity up to €65k.

Faros has been set up by CDP Venture Capital with a|cube and with the support of the Port of Taranto, among partners. A total of €4.0m has been invested into the accelerator. PortXL's previous cooperation with the seaport and our combined efforts to create an innovation hub in the southern Italian city have played a significant part in the start of Faros. PortXL's role is that of a strategical partner, and we will support operations with our expertise.

SPEED

This European Interreg project aims to build an ecosystem for smart port app development in Belgium, France, the Netherlands, and the UK, bridging the gap between the worlds of European ports and the nascent data science – IoT market. PortXL is a proud partner of SPEED, and we have been participating in workshops and events organised so far, as well as hosted expert sessions during the 2021 programme. SPEED's contribution and support throughout the agenda were greatly appreciated.

AspBAN

The EU-supported Atlantic Smart Ports Blue Acceleration Network (AspBAN) is a project focused on developing a dynamic acceleration platform, helping EU Atlantic ports work as blue economy hubs. By becoming the main playground for developing new blue businesses, EU Atlantic Ports have the opportunity to diversify their revenue sources and work towards a sustainable ocean economy. Ports are one of the primary interfaces with the ocean, which means they will play a strategic role as launchpads for a new generation of blue companies. PortXL is proud to be one of the founding partners of AspBAN, and we look forward to sharing our experiences and working towards stronger maritime innovation in the EU.

Secretary-General of Fórum Oceano, the Portugal Blue Economy Cluster, Ruben Eiras, said of the initiative, "The main idea is to build – metaphorically – a blue Silicon Valley that uses the port as a network base for building a European & Transatlantic connection, using the ports as acceleration platforms, innovation hubs for blue economy business."

FORWARD TO THE FUTURE

The industry has significant challenges ahead of it, affecting the economy and ecology, the main ones being energy transition and digitalisation. The search for new maritime fuel is an endeavour that will shape shipping in the coming decades. The digitalisation of operations will aid knowledge transfer from one generation to the next – and improve the quality of work overall.

We all like to fantasise about how wonderful the future will be, with zero-emissions and futuristic appliances, but the journey there is the challenging part. One step at a time, technology development, testing and piloting are helping us along this path. The key is not to be discouraged by setbacks but to strive. Rotterdam prides itself on being the city with rolled-up sleeves and a 'Make it Happen' attitude, and we hope to inspire multiple global clusters to embrace open innovation. ∎

**Artificial intelligence
and maritime innovation**

Photo: Canva

Digital pivots

by **Mark Warner**, *Head of Marketing, Maritime Performance Services, Lloyd's Register*

Maritime companies should see artificial intelligence (AI) as a transforming technology that will allow them to get ahead of the market. Integrating AI in autonomous shipping, navigational support systems, and vessel performance optimisation solutions will deliver value to users when appropriately implemented. Admittedly, the adoption of this technology in the maritime industry is at a nascent phase, and its development will depend on the computing infrastructure and the connectivity solutions available. However, it is likely to be among the technologies that will soon experience industry-wide acceptance, given the level of investment being poured into the disruption of the global supply chain.

loyd's Register is a global professional services company specialising in engineering and technology for the maritime industry. We are the world's first marine classification society, created more than 260 years ago to improve the safety of ships. Our technical expertise is offered in more than 70 locations, serving clients based in 182 countries. Go to **www.lr.org** to learn more.

loyd's Register's new report, **Artificial Intelligence in Maritime**, produced in collaboration with Thetius, highlights that the maritime industry is forecast to spend $931m this year on AI solutions. That figure is forecast to more than double in the next five years to $2.7b, a compound annual growth rate of 23%.

This rapid growth is driven in part by investment in the sector. In the last 12 months, $331m has been invested in start-ups and small- and medium-sized enterprises developing AI solutions for the maritime industry, with a further $43m in grant funding being awarded to develop the technology for the maritime sector around the world.

AI affects all

A lot of the initial AI research & development has been focused on autonomy and sustainability, with the ambition of building the capability of a smart fleet of vessels. Many companies have begun by addressing incremental changes such as optimising individual ship performance, while others are experimenting with fleets capable of moving cargo remotely and safely.

As the regulatory landscape shifts the maritime industry's focus towards sustainability, how the market currently operates and plans to operate in the future will change. This does not only pertain to the environment but also to the people involved in the industry's growth. From the seafarers to the policymakers, every individual that is involved in enabling the maritime supply chain will be affected by how AI will take its place in the industry.

Currently, there are several use cases for AI in maritime that have begun to gain traction. This includes decision support solutions (autonomous navigation), its use for generating insights

into machinery health (digital health management and remote diagnostics), and its integration in autonomous ship systems, which enables an alternative future of commercial fleets without crew (virtual commissioning).

One area where Lloyd's Register's (LR) Maritime Performance Services, through its subsidiary i4 Insight, has developed vast experience is in the use of AI for vessel optimisation and helping to ultimately improve ship performance. "We have found that traditional and legacy data analytics only look at 10% of vessel data, whereas our AI models can now look at close to 100% of vessel data and process this data instantaneously to create extremely accurate vessel performance insights around fuel consumption, speed, trim, hull fouling and power consumption," highlights Andy McKeran, LR's Chief Commercial Officer.

Without question, the combination of massive investment and rapidly increasing demand means that AI is one of the fastest growing digital technology sectors in the maritime industry today. However, knowing how to capitalise on the AI opportunity can be difficult and fraught with risk. It calls for trusted advice.

To help maritime stakeholders find suitable AI providers and solutions for their business challenges, LR launched last December a standardised digital register of LR-certified AI providers and solutions – a first of its kind for the maritime industry. Using the **AI Register**, maritime companies can minimise the risk and cost of investing in AI while successfully benefiting from the technology's advances, improving business outcomes and their competitive advantage.

TOWARDS DIGITAL MATURITY IN SHIPPING

Digital transformation is reshaping the global maritime business, bringing a new era of innovative uses of data to help with the decarbonisation and optimisation of shipping. **A report by Thetius** at the end of last year highlighted that the pandemic accelerated digitalisation by over three years, powered in part by the need to move away from physical or manual processes.

In assessing maritime's progress on the digitalisation journey I have looked to what senior executives in all industries consider necessary for transformation – otherwise known as 'digital pivots,' as told by those execs to Deloitte. There are other 'pivots,' but I would say from my perspective of working with and talking to a number of shipping companies over the last 25 years, those highlighted below are absolutely key to digital maturity in shipping.

Here, I share an update on why we are closing in on the tipping point for maritime innovation by diving into detail around each pivot and its level of maturity in the sector.

A flexible, secure, and connected communications infrastructure both onboard ship and ashore

In a maritime context, this specifically relates to connectivity and the cyber resilience of that infrastructure. Connectivity can mean a lot of different things to different people, but from a commercial maritime perspective, there is a requirement for high-speed broadband as an enabler for digital transformation with at least speeds of between 4-8mbps and ideally more. Don't forget that until about seven years ago, there was just the Inmarsat L-Band global offering through Fleet Broadband which was only offering speeds of up to 564kbps. Since then, there has been a huge increase in the number of VSAT providers and the speeds and capacity available.

There's a widespread misperception that satellite communications are hugely expensive and, as a result, not widely used. In fact, what we're seeing is a real increase in satcoms usage, especially since the pandemic, both for crew welfare and operations.

Pre-pandemic, the average commercial merchant vessel was transferring around three gigabytes per day, on and off board. Now it's more like 12-14 gigabytes per day. That's a fourfold increase in data consumption per ship over 18 months. Satellite network providers are catering to this trend, with Inmarsat now fine-tuning its new ORCHESTRA all-in-one system, which includes LEO and terrestrial services, plus a host of new low Earth orbit satellite networks such as Starlink and Oneweb now actively targeting the maritime industry.

Capacity for connectivity is just going to increase and increase – Starlink is already offering downloads of over 100mbps for their initial maritime service. And with so much competition, the price of packages will come down as well, which means that we have reached a tipping point for this pivot.

On cyber security, there have been several high-profile maritime issues, so most companies now have their own IT and cyber security department or outsource this to a third party. The International Association of Classification Societies has also set recommendations on cyber security, and there are some very sophisticated cyber resilience packages in place, or they are being put in place; everyone realises you need a tight security blanket around your communications infrastructure.

Intelligent and automated workflows – including moving from digitising processes to full digitalisation and autonomy

Here, allow me to explain that merely automating manual processes – or 'digitising' – is not enough. Digitalisation requires a changing of business resources and processes as well. There's still confusion around automating workflows and data collection, but companies are starting to work out what needs to be digitised and what can be digitalised. In other words, change businesses processes, and bring in experts or 'digital talent' to assist with this.

Shipping companies are beginning to understand why data quality is important and maximising their use of data rather than creating data silos where software providers don't talk to each other. Let me give the example of flexible enterprise resource planning systems which work in an automated and intelligent way – such as that offered by Hanseaticsoft, LR's cloud-based ship management solution – which can be described as really 'sweating the data' and using across multiple functions from planned maintenance to procurement and crewing.

Data maturity – including the collection, transfer and analysis of data from ship to shore, and the avoidance of data silos

Transferring data ashore for its analysis and use requires a suitable platform for integrating all the collected inputs, and this is becoming even more important with requirements for emissions reporting and the new Carbon Intensity Indicator. Fuel monitoring, both for environmental and cost reasons, is going to become increasingly vital. I would say that we are not quite at the tipping point for this particular pivot, as there's going to be a real step change in how to get that data and how to get it off vessel quickly and use it in an intelligent manner.

Requirement of digital talent

I believe this point is hugely important but often overlooked in a sometimes conservative and inward-looking industry such as shipping. Therefore, it's probably the furthest away from a significant tipping point. If you haven't got people who are digital-savvy and understand how to use data and automate workflows, you're not going to be digitally mature. We're finding now that companies have digital strategies and positions like Chief Digital Officer, Digital Transformation Officer, 'data scientists' and the like. It is amazing how the conversation changes when you have digital talent in an organisation.

People who are coming in need to have a real understanding from a business perspective, not merely a technical one, of the needs of a shipping company that is undergoing digital transformation. They're being put there to change digital attitudes internally.

Collaboration and the establishment of digital spin-offs, partner ecosystems, and start-up accelerators

There has been a noticeable shift in companies working far more closely in the last five years. It's not just pairings between comparable businesses. Maritime accelerator programmes are focusing on key topics like decarbonisation or safety – Safetytech Accelerator, established by Lloyd's Register Foundation and LR, is a fantastic example of this. Others such as Rainmaking and Pier71 have developed their own accelerator programmes around decarbonisation in recent years.

Another trend has been for large- and medium-sized shipping companies and ship managers to spin out their own digital divisions so they can work with other companies – these include OrbitMI, AlphaOri and ZeroNorth. On the quayside, accelerators such as PortXL are doing their job in connecting the port industry with start- and scale-ups.

In short, I believe shipping is making good progress in adopting all five 'pivot points' that he sees the industry needs to fully embrace digital transformation, which in turn will prove the 'tipping point' for real innovatory change. ∎

"THE BEST MAP OF THE NEW SILK ROAD!

MARCO POLO*

* NOT A REAL QUOTE (BUT WOULD BE IF MARCO POLO WAS HERE WITH US – SCAN THE QR CODE AND CHECK FOR YOURSELF!)

Alleviating the reporting burden for better working conditions and improved ship operations

Obligation-turned-opportunity

by **Arnaud Dianoux**, *former Captain, Managing Director of Opsealog*

The promises of the digital era are high: data from onboard sensors and systems can provide unprecedented insights into a vessel's operations, while digital reporting should reduce workloads for crews. However, the reality on board is too often such that digitalisation isn't easing the reporting burden for seafarers, who instead see their workload increase. Reversing this trend will require companies to adopt a strategic approach to data collection and reporting – and truly make the most of these insights to deliver efficiency and sustainability.

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.

In an increasingly digitised world, data from onboard sensors is a goldmine of information – helping shipowners measure their emissions levels, giving them a fact-based picture of their compliance with regulations, and facilitating their reporting to authorities. It also enables them to identify operational inefficiencies and track actions they take to reduce fuel consumption.

This transparency and accountability will be increasingly important as the industry pushes ahead on decarbonisation and the use of new low-carbon fuels such as methanol, ammonia and hydrogen, all of which are likely to be more expensive than current fossil fuels. Data will be essential to better understand the advantages and disadvantages of each for a fleet's specific operational context, as the optimal fuel choice is likely to be made on a vessel-by-vessel basis.

Therefore, the industry is entering an experimentation phase in which several options are available, and shipping companies will need to determine the best fit for their ships. This exploratory period will have a huge impact on the work that seafarers have to do. And the burden of data collection on board is already increasing as more stakeholders are demanding access to vessel data from a growing number of installed sensors.

It has reached the point where some crews spend so much time on data reporting that it impacts their other responsibilities.

Like robots

Allianz Global Corporate & Specialty's recently published *Safety and Shipping Review 2022* has recognised the risks associated with seafarer workload. Crews stuck in heavily pressurised working environments are more at risk of making mistakes, and the insurer's data shows that three in four shipping incidents involve human error.

Seafarers consistently report on the issues in the latest editions of the Seafarers Happiness Index. In the recent report from Q1 2022, one seafarer said,

"The workload is getting increasingly high with minimum crews on board, rest hours are only complied with on paper, yet none of the authorities pay heed. Shipping has become a floating jail where you're just expected to work endlessly like robots without questioning the work scenario."

What went wrong? Obviously, new technologies should help ease data collecting and reporting. Why are then digital projects failing to deliver on this objective?

Optimising data entry

The reality is that digital tools are only one part of good data management. Digital technologies can help reduce the time spent by crew members inputting data on board. Still, if stakeholders fail to agree on which information should be collected and assessed, new reports will keep appearing, whereas existing ones will not disappear. All stakeholders, therefore, need to reach a consensus on what data is required and which key performance indicators (KPIs) should be used, rather than just insisting that information is collected to support their own KPIs in isolation from others.

Software solutions for daily reporting aboard vessels should not add to seafarer workload by forcing them to replicate data collected across multiple interfaces. Instead, the software should facilitate and optimise data entry while mitigating errors. The data should then be ready to be integrated and shared automatically, saving time and avoiding mistakes for shore-side personnel as well.

Project planning should include an analysis of data redundancy. To have a homogeneous reporting framework that works across different departments in an organisation, stakeholders need to agree on a common vocabulary and set of definitions. For example, this means having a shared understanding of terms such as "cargo," "incident," "delay," or "stand-by," with stakeholders agreeing on what each term actually means and what data is to be gathered and reported.

Front and centre

Crucially, what is commonly missing is an authentic dialogue about the realities at sea. Captains and crew should be front and centre in digitalisation projects. The importance of their personal experience cannot be overstated.

To be successful in digitalisation, project managers need people to talk about the realities on the ground and create a genuine dialogue. An excellent way to reduce emissions, for example, is to collect and analyse engine behaviour and utilisation data. In a perfect world, captains could easily boost the efficiency of their voyages by switching off engines or changing power configurations in response to relatively minor changes in weather or operational conditions.

However, so many times, this is not the reality experienced by crews. When faced with fast-changing schedules and meeting demands from ashore, captains and chief engineers must use the limited time available to deliver safe and efficient operations while also addressing administrative demands.

Organisations need to listen and ensure that digitalisation helps make work more efficient – and improves seafarer welfare and quality of life on board.

Collected data, lost insights

Beyond collection, data needs to be processed and analysed to fully deliver efficiency gains. Therefore, it is essential to choose what data elements will be meaningful. The difficulty in achieving this is a consequence of the size and complexity of shipping organisations and the maritime industry's digital ecosystem as a whole. There is often a lack of strategic planning and coordination in digitalisation projects, so while companies may not be struggling in digitising the reporting, they are not ensuring that data exploitation is optimised and workloads are reduced.

For instance, it's ubiquitous to see reports from maritime systems, including vessel monitoring systems and even paper logbooks, fed into a database and then largely forgotten. The data may have been gathered for compliance purposes, but the opportunity to use it to improve safety or operational efficiency is lost. Analysis of multiple events of a similar nature can reveal recurring issues or operational trends. Once those are identified, action can be taken to prevent recurrence or better prepare crews for future occurrences. In the longer run, data-driven insights may highlight the need for structural changes on newbuilds or inform decisions on new fuels and the energy transition.

Beyond software

Digitalisation is a long-term strategy. While it might be tempting to think that digital solutions are plug-and-play, delivering results instantly, the transformation goes beyond software, deep into the company's ethos. And ultimately, creating an onboard digital culture should alleviate the reporting workload of seafarers – not add to it. ∎

Why collecting and analysing data will make ship operations more sustainable and improve crew safety

Plug and play

by **Fitzwilliam Scott**

ioCurrents, a data analytics specialist, and ScanReach, a maritime wireless Internet of Things solution provider, have formed a strategic partnership to help ship operators and the offshore sector become more efficient and sustainable while safeguarding the safety of their personnel.

io**Currents**

digitisation gives you the data. ioCurrents' MarineInsight™ platform tells you the story. Through purposeful digitisation, we tell your team when, where, and why to pay attention to each asset on each unique vessel, offering the opportunity to gain efficiencies across fuel, maintenance, and voyages. Head over to **iocurrents.com** to discover more.

SCAN REACH
Onboard Wireless Connectivity

ScanReach's wireless IoT platform is custom developed for industry environments made of complex and confined steel environments such as vessels, rigs, and offshore wind turbines. The company aims to increase personnel safety and vessel performance with its solution, contributing to a more sustainable future. Go to **www.scanreach.com** to dive into more details.

ScanReach has spent years researching and testing its systems to confidently offer the industry a robust wireless technology that will collect vessel data from onboard sensors without costly and disruptive equipment installations. The company's wireless technology has been specifically developed for industry environments made of complex and confined steel environments, such as oceangoing vessels, offshore rigs, and wind turbines out there in the open sea.

The data collected by ScanReach is sent to the cloud and analysed by ioCurrents using artificial intelligence (AI) and machine learning to provide insights that will improve the safety and performance levels aboard vessels and on offshore installations. These real-time data sets allow ship operators to make informed decisions on key performance criteria like vessel voyage planning, maintenance schedules, and personnel safety. Depending on client requirements, alerts can be set up to notify operators on a variety of indicators.

Reliability-centred

The ioCurrents-ScanReach partnership will help to transform a client's maintenance planning from engine hours or calendar-based travel to data-driven decisions based on behaviour. By harnessing AI and machine learning, the ioCurrents system learns from each asset's behaviour, alerting the client to any unusual outcomes that may need attention.

This analytics technology can also be used to predict equipment failures after it has monitored a vessel's performance for as little time as a month. It does this by having AI automatically generate machine learning models that monitor assets for malfunction, identifying anomalous behaviour. As a result, decisions can be made in advance as to when and where to repair or replace parts, minimising downtime and the need to scramble to organise an expensive emergency spare part shipment.

A prime example is high-pressure diesel fuel pumps that can fail suddenly, ejecting metal and causing severe engine damage. Western Towboat, a customer of ioCurrents, has gone from multiple failures per year with high-pressure fuel pumps to zero in four years using this predictive technology.

Similarly, by analysing live fuel burns and fuel flow data, crews can make strategic decisions on adjusting voy-

Fuel Pressure (PSI)

Jan 29, 2021 00:00: **P.E. Fuel Pressure:** 64.89 **S.E. Fuel Pressure:** 58.54

Hours Avg.

Jan 22, 2021 12:00 - Feb 5, 2021 12:00

Alerts ^

Hours Avg. Data: View Minutes for Detailed Alerts Data

Marker	Alert Type	Alert	Sensor	From	To	*Hours Avg. Data
1	Predictive Alert	Stbd. Engine Fuel Pressure Anomaly	S.E. Fuel Pressure	Feb 5, 2021 12:24	Feb 5, 2021 12:34	View Minutes >
2	Predictive Alert	Port Engine Fuel Pressure Anomaly	P.E. Fuel Pressure	Feb 5, 2021 12:03	Feb 5, 2021 12:34	View Minutes >
3	Predictive Alert	Stbd. Engine Fuel Pressure Anomaly	S.E. Fuel Pressure	Feb 5, 2021 04:14	Feb 5, 2021 04:30	View Minutes >
4	Predictive Alert	Port Engine Fuel Pressure Anomaly	P.E. Fuel Pressure	Feb 5, 2021 02:33	Feb 5, 2021 02:37	View Minutes >
5	Predictive Alert	Stbd. Engine Fuel Pressure	S.E. Fuel Pressure	Feb 5, 2021 02:06	Feb 5, 2021 02:12	View Minutes >

Fuel Filter Diff. Pres. (PSI)

Jan 29, 2021 00:00: **P.E. Fuel Filter Diff. Pres.:** 8.70e-3 **S.E. Fuel Filter Diff. Pres.:** 0.01

Hours Avg.

Filter Change

Jan 22, 2021 12:00 - Feb 5, 2021 12:00

Alerts ˅

Fuel Actuator (%)

Warning Email / Alert

Warning Email / Alert

Critical Email / Alert

Apr 11, 2017 17:56: P.: 37... 8.: 45.33

Mar 29, 2017 14:38 - Apr 15, 2017 13:29

age routes to improve fuel efficiency, which will have the bonus of reducing greenhouse gas emissions. One example is that ioCurrents can alert shore-side teams and the master when vessels run idle for over two hours to reduce wasted fuel, carbon build-up in the exhaust, and unnecessary hours on equipment. Consequently, this 'heads up' can change a fleet's behaviour, encouraging captains to shut engines down when they know they will be waiting for extended periods. This will lead to reduced idle times, avoiding fuel burned unnecessarily, and prevent engines from running in their worst revolutions per minute bands to optimise the reliability-centred maintenance plan.

Saving – time & lives

ScanReach's technology can also be used for onboard personnel tracking and location pinpointing during emergencies to aid precision rescue team involvement and mustering counts. Each employee wears a wristband that can be activated in an emergency so the master or senior personnel can view their approximate location on a screen. This saves time and could be lifesaving by cutting down the duration that a rescue team requires to reach those needing help.

Also, this technology is expected to become particularly useful for offshore platforms as it can replace the manual clocking-in of staff. Any onboarding personnel wearing a wristband will be immediately logged as being present as soon as they enter the facility. ScanReach is already proven on ships, awaiting their first offshore platform installation pilot. Some companies also use this system to automate their walk-to-work gangway registration (e.g., to wind turbines or diver operations).

ScanReach's wireless solution makes data collection much more straightforward than installing miles of cabling on a vessel or offshore platform, meaning less downtime for the operator. The ScanReach system can be installed in a few days rather than the weeks needed to run cabling around a vessel or offshore installation. Their tried-and-tested technology works on even the most complex steel environments, and their 'plug and play' solution means that clients can do the whole set-up themselves with minimal operational disruption.

Teamwork

By working together, ioCurrents and ScanReach are providing their clients with actionable insights to help them improve their operational efficiency and, in doing so, reduce their impact on the environment. Equally, the technology also has the safety and welfare of crews as a priority, pinpointing the approximate location of personnel in emergency situations and reducing the time and risk taken to mount rescue operations. ∎

A rising tide

by **Jason Berman**, *CCO, S5 Agency World*

The past decade has made the global supply chain increasingly intricate and unpredictable. Over time, the amount of data available to the shipping industry has sky-rocketed, allowing deeper insights into ways of working. For port services, in particular, digitalisation has tantalising untapped potential to create greater visibility and understanding of port transactions and operations to help meet the industry's evolving needs and support more sustainable operations.

S5 AGENCY WORLD

S5 is a leading global port agency delivering services through more than 360 owned port offices. Our established presence in a competitive marketplace has been built on our reputation and ability to tailor our process-driven products to meet our client's specific and evolving requirements. Set a course for **s5agencyworld.com** to discover more.

Today, the rapidly decarbonising and digitalising shipping industry is changing at an unprecedented pace. Innovation and new technologies have been at the forefront of the movement to help drive the transition to a greener, safer, and more efficient shipping sector.

Still underutilised

Traditionally, various manual procedures, including emails and one-to-one phone conversations, have been used to handle port services. Some businesses still use desktop spreadsheets to coordinate port calls and track vessel status. This strategy is no longer viable for vessel owners and charterers in a world that expects greater responsibility, sustainability, and quicker decision-making from its supply chains. Those who have already adopted digitalised procedures are reaping the benefits. In turn, those who are yet to adapt face being on the wrong side of the sustainability movement.

Digitalisation reduces laborious administrative procedures, freeing up time for leaders to focus on more pressing business issues and creating an organisation equipped to operate sustainably in an increasingly more competitive market. Artificial intelligence is also used in contemporary software to speed up tasks like scheduling. Not only does the digitalisation of port services make operations more effective and frictionless, but it also reduces risk and creates opportunities for businesses to create more value.

At present, the potential of digitalisation remains underutilised. Less than half of all seaborne vessel movements currently use digital hub solutions for port services. This means there is vast scope for improvements in resilience, transparency, and sustainability across the board. At S5 Agency World, we want to make the digital transition accessible to everyone. We do this by linking our IT solution, Simply5, with the clients' platforms and helping to identify areas where we can drive efficiency and value.

As all cargo owners know, port call procedures are a complex ecosystem prone to last-minute adjustments and involving many diverse actors. This complexity necessitates high-level synchronisa-

ing fuel in port by making calls more efficient, future port emissions can be considerably reduced.

For port services especially, digitalisation can release untapped potential within businesses to help them meet their environmental, social, and governance goals. The benefits of greater transparency will help to raise standards further in the industry. Digitalisation will make it easier for teams with permission to access important information. This increased transparency, involving more accurate and precise records, will help individual companies comply with stricter governance requirements. In both the short-and-medium terms, a wide range of new compliance mechanisms are coming into play, with both net-zero targets for 2050 likewise the 2023-incoming Carbon Intensity Indicator and Energy Efficiency Existing Ship Index.

Lengthy port waiting times worldwide further demonstrate the need for quicker adoption of digitalised port services. Insight and analysis of data collected across thousands of port calls and available through a central, digital hub can help vessel and cargo owners optimise their approach to ports with long waiting times and continue to operate safely and sustainably.

The next generation

Another aspect of digitalisation is the draw it will have for a new generation working on and offshore. Gen Z and Millennials are digital natives who can provide a unique set of skills to the sector that will help it advance – but this workforce cohort does not always have the seafaring experience that so many companies find beneficial. However, when paired with the exchange of structural information and background from older generations with experience at sea, the influx of workers born in the digital age creates ideal conditions for the further digitalisation of working practices. The sector may benefit from a changing workforce by implementing meaningful operational change to contend with the dynamics that are fast altering the shipping business.

Digitalisation will provide a backbone for the transition to shipping's more sustainable future. Increased data access combined with greater transparency and info sharing will pull the entire industry forward as a rising tide lifts all boats. Those who fail to adapt to these new working realities will struggle to compete against more agile companies with more profound insights and an understanding of the pressures and areas for improvements in their businesses. This is critical for success in port services, paving the way to a more sustainable shipping & logistics industry. ∎

tion to accomplish efficient coordination. Business-critical papers, such as charter agreements, bills of lading, and port documentation, must be easily accessible. Thanks to a centralised, digital system, having documentation always on hand eliminates delays caused by lost paperwork, delivering smoother port calls and more efficient and sustainable operations.

Everyone suffers

Ports are essential in the shipping industry's broader decarbonisation and environmental stewardship ambitions. The effective and safe management of port activities by all parties can benefit economic growth, mitigate supply chain risks, and improve environmental protection. The COVID-19 pandemic has been a stark reminder that when ports are impacted, everyone suffers. It is in the industry and its customers' best interest for ports to run as efficiently as possible to reap the benefits of optimisation, which, in turn, leads to greater sustainability thanks to efficiency savings.

While ports play a central role in the functioning of the global economy, due to the reliance on heavy equipment, trains, trucks and ships to operate, they are also sites of significant air and water pollution generation. By adopting digitalised processes that reduce time spent burn-

Photos: Midstream

In a new light

by **Mark Nailer**, *Head of Maritime EMEA, Midstream Lighting*

The global ports system's resilience is being tested by a series of worldwide supply chain shocks: the post-pandemic trade rebound due to the accumulation of stranded cargo, sanctions against Russia, and climate change effects. Port operators, facing a juggling act to drive efficiency measures such as managing just-in-time operations, can potentially see their resilience compromised without the necessary support.

MIDSTREAM

from ship to shore, the right lighting is critical to the smooth and safe running of all port and maritime terminals – whatever their size. Whether it's for an international container port, a local facility, or for maritime crane equipment, we're dedicated to designing and delivering the most highly advanced, efficient, and innovative LED lighting solutions. Go to **www.midstreamlighting.com** to learn more.

Ports and terminals have become accustomed to defending against risks, and major stakeholders expect ports to do all in their power to ensure safe, flexible, and reliable operations. This often means planning for the worst and hoping for the best. In practice, port authorities and operators have to do everything possible to ensure they can withstand a disruptive event through operational flexibility and safeguards. Frequently, the most effective way of achieving this is to widen the window in which work can safely be carried out.

Visibility is often a key factor here. Clear weather can extend operating hours, with more cargo moved at night. Heavy rain or fog, on the other hand, reduces visibility, making the situation more difficult or unsafe for port staff. When a serious incident occurs, part or all of a port's operations may be suspended for several days – seriously impacting staff welfare, logistics, and insurance.

Delivered as infrastructure

Good lighting contributes to the overall effectiveness of high-performing ports – particularly by preventing unnecessary disruption or downtime. Strong, high-quality lighting that properly illuminates congested areas, such as those with stacked containers, can cut through adverse weather and safely extend a port's operating window.

The right solutions can also minimise the impact of dirty power scenarios in ports, whereby current pulses, voltage variations, frequency variations and surges occur, potentially damaging crucial equipment. Good design minimises the risks and creates more resilient systems with well-placed and appropriate circuit breakers, fuses, and switches.

However, achieving sound results is not as simple as selecting a single lighting level. Lighting has to be delivered as infrastructure that complements broader systems and operating conditions. Ports need to consult with lighting suppliers to create holistic systems that perform optimally in a real-world bustling activity harbour environment.

Sustainably superior

Our company works as a partner from the very early design stages to scope out

an operator's lighting requirements to create bespoke systems that deliver the highest quality of light and resistance to even the most extreme weather. High-quality LED luminaires can achieve this. Additionally, LED lighting can reduce energy consumption by up to 70%, minimise light pollution, and reduce waste due to its durability. The solution is sustainably superior to legacy technologies relative to cost, lifespan, and energy efficiency.

Midstream's LED systems are designed and tested to provide not only high lighting levels but high-quality uniform light distribution, allowing for superior visibility across the entire working site, often increasing light levels by more than 50% in a terminal's darkest areas. These systems, coupled with comprehensive design, deliver high colour rendering light that enables near-daylight visibility in the most critical areas.

Unlocking other performance gains

Lighting is an investment that will pay dividends in improved productivity, safety and security, as well as significantly reduce energy consumption and lower energy bills. LED lighting can also unlock performance gains in other aspects of port operations, such as opportunities to invest in greater levels of port automation, among other cargo handling technology. Investment in improvements like new cranes will only fulfil their potential – and their return on investment – if harbours also invest in upgrading their lighting infrastructure.

The fact that high-grade LED lighting can supercharge other aspects of performance is an attractive proposition for ports and terminals when it comes to large-scale investments in infrastructure – or when they have less access to capital but still need to find a cost-effective way to compete.

The multiplier effect of an investment in lighting adds to the benefits delivered by investing in other areas. In some cases, it can also offset the need for spending on other areas of infrastructure.

Within reach for all – and today

There has been considerable debate about the 'terminal of the future' concept. At the same time, there are proven technologies and solutions that should rightly take their place in today's terminals. Smart technologies, such as LED lighting, are one great example. Modern lighting is a tech solution that can unlock a range of performance, financial, safety, and environmental gains that are within reach for all ports and terminals and important to securing their future success.

Unfortunately, this is not widely understood, and it can take an accident to initiate lighting upgrades. According to a TT Club study from December 2019, lighting is recognised as a significant factor in the top 10 risks posed in container ports: either as an exacerbating factor if it is offgrade or as a valuable risk mitigator if it is up to modern standards.

The adoption curve for many new technologies often resembles a hockey stick, with slow initial growth before a sudden acceleration. The misconception that a technology such as LED lighting is a 'technology of tomorrow' is consistent with this. Still, there is no time to waste when it comes to decarbonisation, and LED lighting will play a vital role in the ports and terminals' ability to reduce the global supply chain's carbon footprint. This issue is rapidly accelerating in importance. Lighting accounts for nearly 5% of global CO_2 emissions, including logistics operations' share within ports and terminals. Adopting LED lighting is a big step forward in improving environmental performance, particularly in energy usage.

Resilience = competitive advantage

Climate change is inextricably linked to the market forces currently causing congestion, as it has already increased weather-related delays. This will continue to be an issue for ports. **HELCOM's Climate Change in the Baltic Sea 2021 Fact Sheet** indicates that annual mean precipitation is already rising in many parts of the region. In the future, many Baltic ports can expect a rise in sea levels and storm surges. The good news is that operators who want to build resilience and gain a competitive advantage can do so by putting the lighting infrastructure in their investment spotlight. ∎

Improved ship & freight planning: from drowning in emails to having the digital business intelligence edge

Photos: Wagenborg Shipping

Smooth flow of data – and cargo

by **Arto Viitanen**, *VP Product, Seaber.io*

There are few options to digitise processes for cargo owners that rely on contracts of affreightment (COA) and spot voyages. On one side of the equation, you have enterprise resource planning (ERP) systems, possibly several of them, from where the maritime transportation needs are derived. On the other side, you have the shipowner's voyage management systems (VMS), where seaborne transports are eventually created and managed. For almost every company, everything in-between is up to an offline protocol dependent on a mass (better still: mess) of emails and improvised spreadsheets.

Seaber.io

Seaber is a Finnish maritime software company dedicated to reducing inefficiencies, errors, costs, and the environmental impact of bulk and break-bulk shipping. Our bulk shipping software solution helps charterers and shipowners to plan, communicate, operate, and optimise cargo flows and fleet schedules, resulting in improved asset utilisation and profitability, streamlined port calls, as well as reduced fuel consumption and emissions. We are cooperating closely with charterer and shipowner companies to drive the digital transformation of maritime logistics of the entire shipping industry. Click **seaber.io** to learn more.

Most businesses have their low-tech way of performing the following core processes. First, sending COA cargoes or monthly volumes to shipowners; this is typically done using emails with spreadsheet attachments, either as monthly targets per commodity and port pair or as individual parcels.

Second, the COA vessel nomination process: after planning or chartering and the final schedule preparation of their fleet, a shipowner sends a vessel and laycan proposal to the cargo owner for approval.

Third, estimated time of arrival/berthing/departure updates and resulting delays; these often originate from vessel's noon reports or automatic identification system data and then are confirmed by ship operators (eventually, these data make it to all relevant stakeholders, like mills or consignees, in emails sent by agents or operators and/or logistics planners).

Fourth, loaded cargo amounts are observed by the agents in the loading ports and reported to logistics planners as emails and bill-of-lading documents. Sixth, agents typically submit fact statements

and demurrage calculations as email attachments.

Lastly, voyage cost estimations and reporting, with freight, bunker adjustment factor (BAF), and other invoices, are often collected into spreadsheets and bookkeeping systems.

The roadmap

This is precisely where a specific customer of ours was traditionally a frontrunner, but their in-house system was becoming technically obsolete. They were looking for a replacement and contracted us to build a unified scheme for managing these processes and communication flows.

The first step in the Seaber process is to create digital replicas of the COA contracts one has with shipowners. The next step is when the company's logistics planners make voyages by assigning the cargoes onto existing COA or new spot contracts.

Once planned and published, the voyages are booked and communicated to shipowners, who can finalise the vessel nomination and provide a more precise ETA for the load port. At the same time,

senders and receivers of the cargo are also made aware of the planned voyage, and agents get prepared to provide more detailed information about the port call.

The lifecycle of a voyage ends in the last discharge port, where cargo measurement, statement of facts, and all other documents and invoices are filed in Seaber. The journey is then available for reporting and analysis. All accumulated data can be pulled from the Seaber system into spreadsheets or business intelligence tools.

Next on the roadmap is the inclusion of demurrage and bunker adjustment factors, which, in combination with a third-party berth planning tool, congestion data and just-in-time arrival tools, will make it possible to predict the effect of schedule changes and related costs already in the planning stage.

Seaber provides user accounts and detailed data access policies for all stakeholders. The accumulated information and communication are stored within Seaber and shared automatically with all relevant parties.

Points of discontinuity

Seaber is bridging the gap between ERPs, shipowners, and all other stakeholders. This gap-bridging continues on the other side of the table with Seaber's Fleet Planning product, offered to shipowners and charterers with their fleet for optimising their chartering and vessel scheduling.

"We have the tools to ensure smooth information flow all the way from cargo owner ERPs to shipowner VMSes by eliminating all existing points of discontinuity. We can predict the costs and durations of bulk and break-bulk shipping operations to the degree that we can assist in generating very realistic schedules with longer planning horizons for cargo flows and fleets," Sebastian Sjöberg, CEO and Co-Founder, underlines.

After the cargoes are planned onto COA's, another significant point of discontinuity in the grand scheme of maritime digitalisation lies between the emails arriving in the shipowners' inbox and their transformation into voyages in a VMS. A couple of steps are essential for efficiency, but lack proper planning, analysing, and communication tools. This refers to the scheduling dilemma and the selection of market cargo.

The former is about efficiently planning fixed- and COA cargoes onto the fleet. It's incredibly hard to estimate the total cost and durations of a fleet schedule for a week. Making several scenarios of it and looking a few weeks ahead is a pipe dream.

Closely related to schedule planning, there is the question of identifying the most profitable market cargoes, which are opti-

mal for the entire fleet's efficiency. Simply looking for profitable cargo for a single open position might be suboptimal for the whole fleet's time charter equivalent. With the current tools, there's no way to truly discover, iterate, and compare different schedule alternatives.

One such alternative

Improving the shipowner's planning process might not directly affect the cargo owners' bottom line. Still, the increase in fleet utilisation, reduction of ballast voyages, and better schedule predictability will certainly positively impact freight rates and ensure more predictable and efficient operations.

As it will take decades before the world fleet can expect a significant decrease in fossil fuel consumption, it's essential to try to increase vessel utilisation and reduce ballast voyages in other (already doable today) ways. Seaber is providing one such alternative. ■
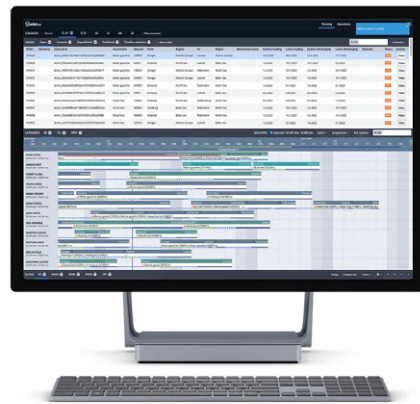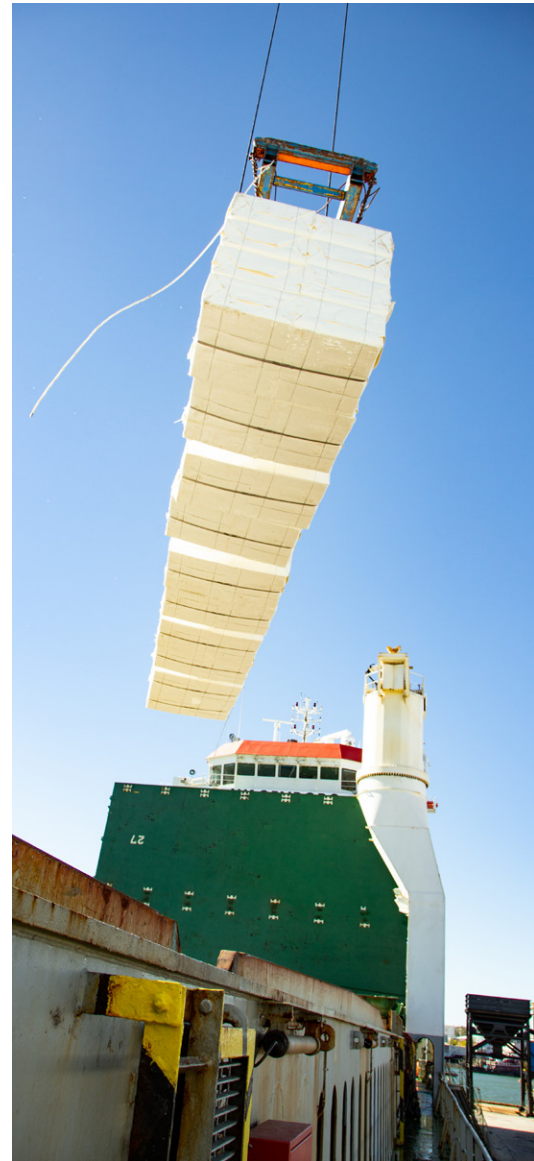

Photo: Seaber

VR & AR technologies in and around the ship

Photo: Canva

Extend your reality

by **Arbresh Ujkani** and **Markus Thielecke**, *Research Associates, Fraunhofer CML*

With the advancement of technology in recent years, the applications of efficient virtual (VR) and augmented (AR) realities have picked up speed. 360-degree head-tracking, offering a hi-res display and a high-frame rate, integrates the user with the digital environment stronger than ever. But it is not just the technology that's improving. VR and AR are increasingly used to create value-adding applications in various industries rather than solely for entertainment. The nautical sector itself offers many use areas for supporting already existing systems.

depending on the use case, AR and VR applications differ fundamentally. Reality is enhanced with digital objects in the case of the former, while you are wholly immersed in a virtual world with the latter. For this purpose, additional visual information or objects are displayed on an AR-capable device. All of this happens in real-time. AR and VR can work as standalone solutions or be combined to enjoy the best of both worlds in particular cases.

Consolidating knowledge

Training workers can be difficult and ineffective in the event of contact restrictions and time constraints of trained staff. Many instructions are location-bound and only possible at a specific period. Yet, learning success must be achieved. VR can help overcome these barriers. 'Boarding' a virtual world that the user can influence is ideal for knowledge-enhancing scenarios. VR can reproduce many work processes around the port and ship environment. Accurate train-

ing sessions in a virtual world can better prepare users for real-world events.

For example, Fraunhofer CML and FIP@S2-Novia worked on a fast rescue boat simulation. The user is on a ship deck, guided through the complete process: preparing the equipment, communicating with the ship's bridge, lowering the boat, rescuing a POB (person-overboard), and returning and reattaching to the vessel. Users can move freely in the virtual world, with interactive overlays helping to find their way around and interact with it through inputs. The necessary work steps can be brought closer to the user in various ways. This technology is already used in the Aboa Mare Maritime Academy and Training Center in Turku.

The big advantage is the immersion that the user is experiencing here. In combination with gamification, learning success can be increased. The scenarios are infinitely reproducible and modifiable. The applications can be launched at any time from home and do not take up

the time of several people. Examples include safety protocol sequences (fire extinguishing, doctoring) and training sessions (fast rescue boat, crane control).

Increasing maritime situational awareness

Other applications are AR-based. The fundamental difference compared to a VR application is that digital objects are projected onto the physical world. For this purpose, either special AR glasses or conventional smartphones are used. Since the perception of the real world is not affected by AR gear, they are particularly suitable for working around and on ships.

While sailing a vessel, navigators need to form a mental picture of the current situation to predict how a given decision might affect future situation development (the scientific term for the quality of this mental image is "situational awareness"). Nowadays, navigators receive a large part of the information about the vessel and the environment from sensors and all kinds of interfaces and systems: automatic identification, global positioning, radio detection and ranging, and automatic radar plotting aid. Furthermore, the electronic chart display and information system exhibit the vessel and its movement on an electronic navigational chart, likewise of nearby ships in the automatic identification system's range. Along with a compass, steering wheel, the global maritime distress and safety system, and communications with the outside world, these are instruments relevant to a safe navigation watch.

All told, keeping track of everything all the time is a mammoth task. Moreover, one disadvantage of conventional displays is their high degree of abstraction with which information is presented. A navigator, for example, must do a certain amount of thinking to make the connection between the information displayed next to an abstract symbol on an electronic nautical chart and a ship visible in the environment. In addition, a particular piece of information is only available when the person on board is at a specific workspace location: in front of the display showing the required information. Usually, the navigator's attention is evenly divided (or scattered) among several screens.

AR offers a solution to most of these drawbacks: data sets from different systems can be merged and visualised according to the same design guidelines. Instead of distributing the various system information across multiple monitors at different physical locations, the data can be bundled and made available on demand. With the ability to place information about the state of the ship in the user field of view, AR offers the advantage that this information is provided independently of the navigator's position on the bridge, avoiding a division of attention between observing with one's own eyes and receiving information from displays or manuals. This allows the navigator to spend more time watching the surroundings ('heads-up time'), which can save valuable time, especially in critical situations.

AR can also superimpose whole areas in the environment with a semi-transparent overlay, making it possible for the navigator to identify risk areas immediately and change the vessel's course to steer clear of danger.

One challenge when developing AR solutions is to find a user-friendly interface. The balance between showing relevant information and preventing the user view field from cluttering must be found. Consequently, AR usability depends highly on a logic that prioritises information display.

VR and AR combined

Both technologies can additionally be used together to achieve optimal development results. A great effort must be expended in testing to develop value-creating AR applications. Especially in the ship's bridge area, it is not always possible to create optimal conditions to test at any time. Entire ships are busy elsewhere, and personnel may be working at full capacity. Some trials require particular weather conditions or environmental situations to be reasonably conducted. The probability of certain variables coinciding with the planned test time is very low.

VR is optimal for addressing this issue. Solutions can be tested in a completely digital setting as an intermediate step to the real integration of AR applications. In this case, the 'external circumstances' can be changed and manipulated at any time, providing perfect test conditions. There is no time limit for the tests, and there is freedom in the design and distribution of the participants. As a result, workers are optimally prepared in the event of the integration of the AR application.

The Fraunhofer Center for Maritime Logistics and Services CML researches these modern technologies. Check our **Increasing Maritime Situational Awareness by Augmented Reality Solutions** white paper to learn more.　∎

short stories

Europe's challenges in transport decarbonisation

by **Ewa Kochańska**

The XXV EuroMed Convention From Land to Sea, organised by the Grimaldi Group at the Hilton Sorrento Palace near Naples, Italy, was a gathering of port and government leaders as well as policy and logistics experts in the European maritime sector. The event took place from 29 September until 2 October 2022 in Sorrento, where the attendees took part in seminars and panel discussions about the energy transition, intermodality, and the sustainable future of the maritime sector. The annual event aims to promote short sea shipping in the European Union to improve the continent's economic, environmental, and social life.

This year, while the Grimaldi Group celebrates 75 years of successful existence, some 800 delegates deliberated on various regulatory facets and transport demands of the transport sector and the motorways of the sea, such as the energy transition, its technological aspects, and intermodal solutions to deal with the constantly growing transport demand.

Regulation chasing innovation

The convention began with greetings from the Greek Minister of Shipping and Island Policy, Ioannis Plakiotakis, and European Coordinator for the Motorways of the Sea, Kurt Bodewig. Next, the Grimaldi Group Managing Director, Emanuele Grimaldi, gave his opening remarks, summarising shipping's biggest challenges, especially environmental sustainability. "Particularly now, in the gas crisis due to the Ukrainian war, we have a window of opportunity during 2023 to address the issue of global measures on carbon emissions," he said. Even in this unique geopolitical climate, Grimaldi is confident that an agreement on carbon taxation measures worldwide can be achieved.

The first panel, titled E*nergy Transition: a technological challenge for Europe's maritime sector*, debated EU policies and regulations, such as Fit for 55, the resulting taxes and their consequences, technological and investment challenges, and the need for, and too often - lack of, international collaboration. "I believe shipping has a very bright future ahead," said the panel moderator, Guy Platten, Secretary General of ICS, starting the discussion. "There are so many opportunities as we embark on our path to net zero emissions, and hopefully, 5% of ships will be burning the new, clean fuels by 2030 alone."

However, according to the panellists, what threatens the maritime sector at the

Ugo Salerno

Guy Platten

Annick de Ridder

Ricardo Batista

Mikael Makinen

Dario Bocchetti

Emanuele Grimaldi

"In welcoming port and industry leaders and experts from across Europe to the 25th EuroMed Convention From Land to Sea, Emanuele Grimaldi, Managing Director of the Grimaldi Group, spoke about the success of the 75-year-old company as well as the challenges facing the maritime sector, particularly concerning sustainability solutions and regulation.

While addressing the issue of environmental regulation, Grimaldi underscored that since environmental sustainability is a global problem, it must be handled with global taxation measures instead of regional ones. He pointed out that the EU Emissions Trading Scheme regulation could trigger other regional actions causing a patchwork of legislation. "This would be an administrative nightmare for shipowners and Ministers, bringing the less certain rule of law and a reduced effectiveness of the measures," he said. "A unique legislation, at IMO level, would do it much better." Since most countries agree on finding a global carbon solution, Grimaldi sees a window of opportunity to reach a common ground with a "fair distribution of costs and benefits."

Grimaldi offered the company's suggestions on the frame of market based measures in maritime, which include: taxing all ships over 5,000 GT based on their CO_2 emissions during a calendar year – around 250mt of fuel per year; one part of that tax revenue would reimburse majority (quantum of reward based on 80% of the average global price of conventional liquid fuel oil during the five years preceding the implementation of the measure) of the extra fuel cost born by pioneers consuming green fuels, possibly leading to 5% of zero-emission ships by 2030 worldwide; the other part of the tax revenue would go to developing countries for producing green fuels out of renewable resources such as sun or wind.

On an individual scale, the Grimaldi Group partners with various companies, such as RINA, Wärtsilä, and Corvus, seeking innovation and environmental solutions like autonomous ships, microplastic filters, atomic ships, battery packs, hydrogen-fuelled port equipment, and own patents as well.

This year, the Grimaldi Group is also celebrating 75 years of ongoing success. Grimaldi highlighted that despite various challenges throughout the decades, most recently the COVID-19 pandemic and the war in Ukraine, the Group has never closed a year in a loss. He attributed this achievement to company strategy, including reinvestment policies, fuel consumption reduction, and R&D activities.

In conclusion, Grimaldi thanked his clients, stakeholders, and all employees of the Grimaldi Group but most notably, the seafarers whom he praised for their patience and dedication. "After the COVID crisis, it became evident the necessity to have even more consideration for the seamen's health and welfare," said Grimaldi..

moment is a patchwork of environmental regulations from the EU, the IMO, and individual governments worldwide, creating uncertainty for stakeholders. A regulatory certainty in the sector would encourage sustainable innovation and solid investments with a clear pathway forward. Another concern mentioned was the need for better communication with communities regarding sustainability. **Annick De Ridder**, the chairperson of the Antwerp Port Authority board, said that at the moment, the general public views businesses, factories, and shipping lines as the problem and the reason for the environmental crisis. "They have to make this mental shift because our companies are part of the solution," she said, adding that there has been a lot of innovation and investments in sustainability and that it should be better communicated to the public.

Energy and operational efficiencies

The speakers also underscored that it would be a mistake to move away from nuclear power in Europe due to false narratives about safety concerns. Ugo Salerno, the managing director at RINA, called nuclear power generators "the safest technology" and "the least [environmentally] impacting power production that humans have discovered." But because of Chornobyl, Europe has very strict regulations when it comes to nuclear generators, even though there have only been three accidents related to nuclear power in human history. Nowadays, nuclear power technology is much safer than in the last incident in Fukushima. "This is a safe technology and a friend of the environment," said Salerno. This view was also supported by De Ridder, who stated that the wisest plan for sustainable energy in Europe includes a mixture of green fuels and nuclear. "I think it's a huge mistake to step out of nuclear power as Europe," she said.

But it is not only fuels that play a role in making shipping operations environmentally sustainable. Ship efficiency related to "silicone paint, the Air Lubrication System (air bubbles covering the vessel's hull bottom), special propellers, and so on, can reduce 20% or so of the energy consumed," said **Mikael Mäkinen**, Corvus Energy chairman of the board. This is in addition to ports and ships, which are also inefficient at present. For example, ports have bottlenecks of vessels queueing at the entrance waiting to be processed, all the while ships, around 40% of which are not fully loaded, speed to the port, wasting additional fuel. "So, if you had fully loaded ships running at the right

speed, having the right efficiency, with modern technology, you could save a lot of energy," Mäkinen pointed out.

To deal with some of these challenges, the EU should aid companies, ports, shipowners and other stakeholders in the energy transition rather than overtaxing and overregulating, according to some of the debaters. "Shipping and motorways of the sea should be seen as a partner for decarbonisation in Europe and not only as somebody to tax," said **Dario Bocchetti**, Head of Energy Saving, R&D and Ship Design at Grimaldi Group. Bocchetti suggested that if taxation is too high and regulation too restricting, it will force more trucks back on the roads. Moreover, there need to be more investments directed towards sustainable technologies in Europe, and relevant regulation must be consistent with innovation; regulations cannot stifle progress in sustainability. As an example, Mäkinen mentioned battery production, which is dominated by Tesla and non-existent in Europe due to the lack of lithium. "There is [a lithium mine] starting up in Finland, which could be a 10% addition to the world lithium," said Mäkinen. "And now, it is fighting with the environmentalists that we should not dig for lithium in Finland to make clean cars or clean batteries. So, I think that we are in a stupid situation here."

Navigating uncertainty

Ricardo Batista, Policy Officer at the European Commission DG-Move, acknowledged the above issues pointing out that "the regulator cannot be a monk, isolated in a church, drafting the regulations and then spelling them out." However, he also highlighted challenges with varying technological and economic developmental levels among countries as well as difficulty in bringing everyone on board, for example, China or India, who still have not agreed to the 2050 carbon neutrality target. Nevertheless, Batista reiterated that a patchwork development of regulations is not acceptable in the sector. "Maritime transport is an important pillar of the economy, and regulations cannot destroy this pillar or make this pillar more fragile," said Batista. "Quite the opposite, the regulatory development has a responsibility of reinforcing this pillar and making this pillar of our economy ready for the future."

The regulators also pointed out that the European Union policy is already in place to assist companies and ports in the transition. On the energy efficiency side, the Emissions Trading Scheme (ETS) at the EU level will "allow having a return on investment on energy efficiency technologies." The way that Fit for 55 is designed is to ensure that there is regulatory certainty and investment in infrastructure development. Strictly on the fuel side, FuelEU is "a regulation to promote the uptake of [green] fuels." There already are many collaborative developments regarding fuels and fuel certification framework, advanced biofuels and synthetic fuels. "I think the value of the industry alliances is key," said Batista. "The regulation in itself is an empty statement. It needs commitment from the operators, it needs facilitation and support of the industry." Addressing the issue of battery production, the European legislators seem to be looking past lithium mining. "At the European level, we have the European Battery Alliance (…), which is looking beyond lithium," said Batista. "There is an important work of technology cooperation that looks beyond lithium, and I believe that looking beyond lithium is part of the future sustainability of patent systems."

Multimodality for sustainable transport

The second panel of the day, Intermodal transport in the Mediterranean area: which toolbox for a sound growth?, focused on ambitious intermodal investments and developments in rail, road, and maritime in Southern Europe. Capitalising on intermodality expansion, the region is creating ports that are not only able to resolve bottlenecks outside their entryways but can expand their capabilities; for example, the Port of Gioia Tauro, thanks to its new railway gateway "set the international competitiveness standard for rail cargo." The panellists mentioned that in the switch to an intermodal system of transport in the south of Europe, cooperation has been crucial. In ports, shipowners and terminal operators have to work together to develop solutions that make the whole operation more efficient. Additionally, initially wary of the modal switch away from roads, trucking companies are now satisfied to create a win-win relationship in the new environment; they have been able to keep their drivers working in a reduced area, where they are more efficient. And unlike the previous panel about energy transition, here the speakers called for more concrete regulation efforts from the government to simplify the processes necessary for intermodality in order to refine operations and procedures and create a "slim, lean" easy-to-navigate system.

Further, the convention included a press conference followed by the Grimaldi Excellence Awards Ceremony and a formal Gala dinner. ∎

Photo: Pixels