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Enclosed space entry drills provide an opportunity to enhance competence.
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"The Seafarer" is a perpetual focus globally among maritime leadership, conferences and discussion, and June 25, 2023 will again mark the official "Day of the Seafarer" as designated by the IMO. In the global maritime media, we talk incessantly about the importance of the seafarer to the world economy, to national interests and security. But what have you done to promote, enhance or make better the condition of any seafarer, anywhere? If the answer is 'nothing really,' here's a chance to make amends.

MarTID is the *Maritime Training Insights Database*, an annual survey of global maritime training practices, surveying vessel owners, maritime education and training institutions, and seafarers, too. MarTID is a 100% non-commercial endeavor, created in 2018 with partners World Maritime University and Marine Learning Systems to deliver objective and comprehensive data on how maritime manages and conducts training for shipboard competencies and the effects of drivers, such as technology, on this training.

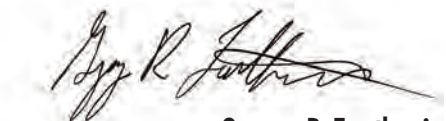
This data, updated annually by means of a global survey, provides insights that can lead to enhanced policy-setting, decision-making, benchmarking and operational optimization by industry and regulatory authorities at all levels.

Recognizing that everyone is busy, the survey by its nature is designed to be short and sweet, taking only 20-30 minutes to complete. Check out the 2023 survey at **www.MarTid.org**, or simply scan the QR code above.

This month's cover story is an interview with **Garry Noonan, Director, Innovation, Ardmore Shipping**. I met Garry earlier this year at an industry dinner, and while half of our discussion centered on my upcoming trip to Ireland, the better half was dedicated to the sweeping technological changes throughout maritime, and the reality of the energy transition and future fuels. In our subsequent follow up interview for **Maritime Reporter TV**, Garry offered some amazing insights on technologies that Ardmore has found to significantly reduce fuel burn and emissions from its tanker fleet. (My personal favorite: **Ardmore invited two coatings companies to each paint one half of an Ardmore ship to really determine which paint performed the best.** The test is still ongoing!)

But in retrospect, one of his most telling comments was in regards to the melding of technology and the seafarer.

"We're trying to get across to the seafarers that they're not there to support us, we're there to support them. At the end of the day, we're a shipping company. Without ships, without seafarers, none of us would have a job. If you have 900 people looking for a problem, you'll see a lot more avenues for generating savings then you will if it was just 10-12 people in the office."



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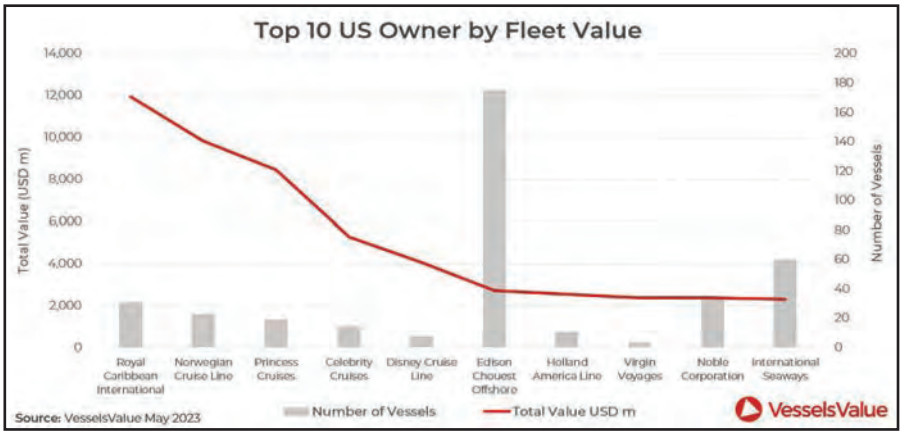
US Shipowners

U.S. Shipowners are in focus this month, and courtesy of our friends at Vessels Value find below a snapshot of the make up and value of the U.S.-owned fleet.

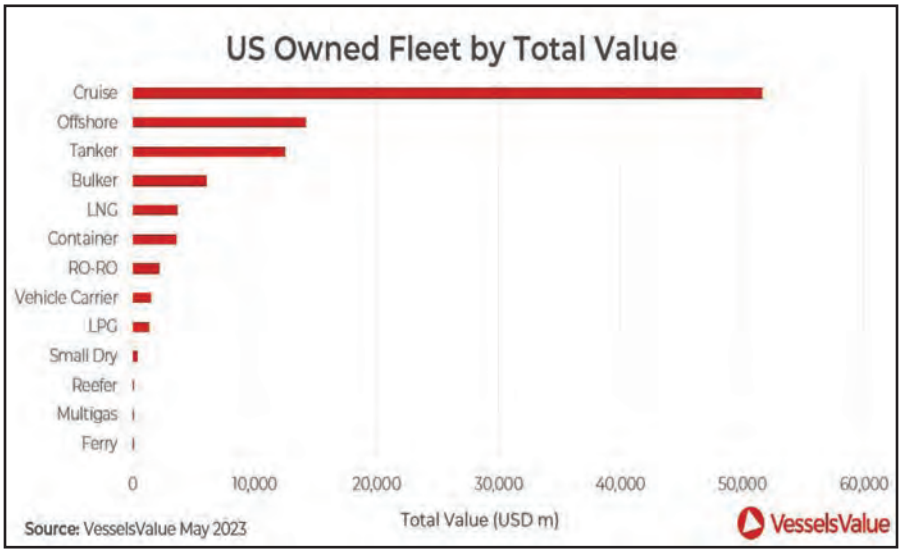
Top 10 US Owners

Type	# of Vessels	Value ($)
Royal Caribbean Intl.	27	8,117
Norwegian Cruise Line	18	5,757
Princess Cruises	15	4,842
Celebrity Cruises	13	3,837
Disney Cruise Line	5	1,537
Edison Chouest Offshore	175	2,713
Holland America Line	11	2,544
Virgin Voyages	3	1,782
Noble Corporation	33	2,381
International Seaways	59	2,151



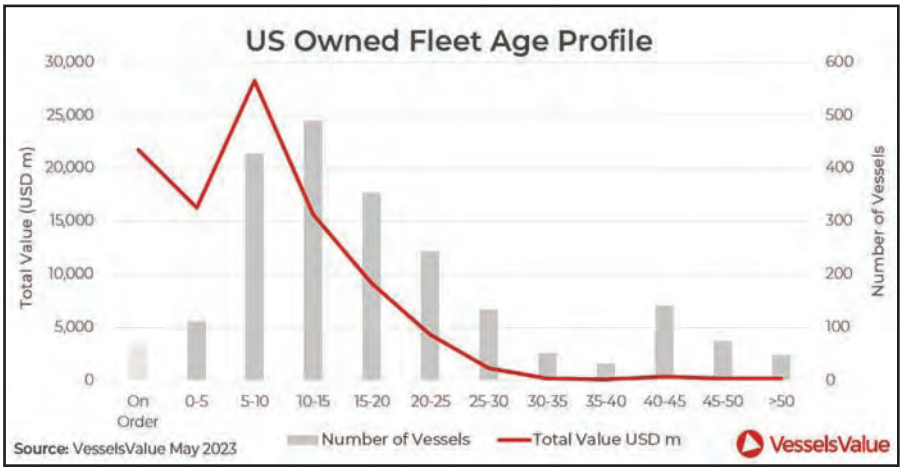
US Owned Fleet, by Value

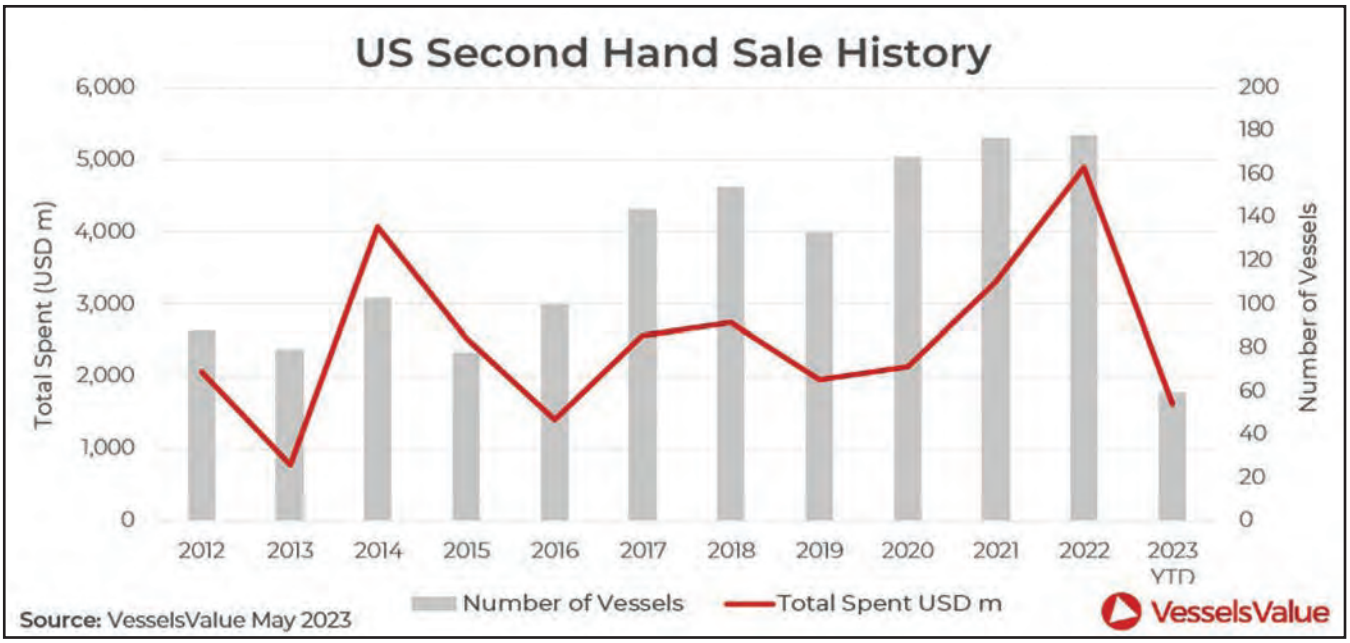
Type	# of Vessels	Value ($)
Cruise	162	33,141
Offshore	1,128	13,789
Tanker	269	12,006
Bulker	261	5,891
LNG	15	2,212
Container	96	2,931
RO-RO	37	2,212
Vehicle Carrier	25	1,499
LPG	25	1,330
Small Dry	58	358
Reefer	19	115
Multigas	2	49
Ferry	1	12
Grand Total	**2,098**	**75,545**



US Owned Fleet Age Profile

Age Group	# Vessels	Total Value ($)
On Order	67	21,732
0-5	110	16,289
5-10	427	28,270
10-15	490	15,618
15-20	353	9,157
20-25	242	4,267
25-30	133	1,118
30-35	51	127
35-40	32	91
40-45	140	328
45-50	73	149
>50	47	130




US Second Hand Sale History
Total Spent (USD m)
6,000
5,000
4,000
3,000
2,000
1,000
0
Number of Vessels
200
180
160
140
120
100
80
60
40
20
0
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023 YTD
Number of Vessels
Total Spent USD m
Source: VesselsValue May 2023
VesselsValue

Empowering Seafarers with AI:
Enhancing Safety and Professionalism Onboard

In the maritime industry, seafarer safety and professionalism are critical to ensuring smooth operations and minimizing risks. As technical advancements continue to reshape every industry including ours, large language models like ChatGPT and Bard have the potential to directly assist seafarers in performing their duties more safely and professionally. So, how can a seafarer leverage these tools to enhance their onboard performance? Let's look at some examples.

One example is in providing instant, human-readable access to regulations and guidelines. A seafarer could ask ChatGPT, ***"What are the requirements for fire safety on board a ship?"*** ChatGPT would then provide a summary of the relevant regulations, including the specific requirements for fire detection, prevention, and suppression.

Navigating the complex landscape of maritime regulations and guidelines can be challenging. ChatGPT can serve as an on-demand reference tool for seafarers, providing instant access to needed information. By simply asking the AI model about a specific regulation or guideline, seafarers can receive a concise summary, helping them stay informed and compliant with the requirements.

A second example is using ChatGPT or Bard as a translation tool. A seafarer could ask it to translate a message from English to Chinese. The tool would then provide the translation in real time, allowing the seafarer to communicate effectively with a crew member who speaks Chinese. Effective communication is critical to ensuring safety and collaboration among crew members. These tools can help seafarers improve their onboard communication by offering real-time language translation or providing guidance on how to convey complex concepts more clearly.

A third example is the use of ChatGPT or Bard to help brainstorm solutions to problems. A seafarer could ask the tool, "What are some possible causes of a loss of power on board a ship?" It would then provide a list of possible causes, along with potential solutions. Seafarers often face unexpected challenges and need to find solutions quickly. These tools can act as a virtual assistant, helping seafarers troubleshoot issues and offering potential solutions based on the information provided.

Another good example is the use of Bard to help a seafarer stay up to date with industry best practices. For example, a seafarer could ask the tool, "What are the best practices for loading and unloading cargo from a ship?" Bard would then provide a summary of the best practices, including the specific steps involved in loading and unloading cargo safely and efficiently.

A final example is the use of these tools for ongoing learn-

ing and professional development. ChatGPT or Bard can facilitate this process by offering personalized learning resources, such as articles, quizzes, or scenario-based exercises, tailored to a seafarer's specific needs and interests. For example, a seafarer could ask ChatGPT to create a quiz on the International Safety Management (ISM) Code and its key elements. ChatGPT would then create a quiz that is tailored to test the seafarer's knowledge and understanding of the ISM Code.

ChatGPT and Bard have the potential to be powerful tools for seafarers, helping them access crucial information, enhance communication, troubleshoot problems, and continuously develop their skills. However, there are real limitations. **One key limitation of ChatGPT is that it is only currently aware of information from before October 2021 and therefore may not have up to date responses. And while Bard does not have this same limitation, in my experimentation with both, ChatGPT tends to give more complete and useful answers.**

It is also very important to remember that these tools are far from perfect and while they will typically offer very useful and even insightful information, they can sometimes offer information that is incomplete or even totally incorrect. As such they are far away from being a substitute for professional expertise. But when this is understood, they can still serve as a great resource for brainstorming and gathering preliminary information. As with any technology, the key to success lies in striking the right balance between leveraging AI-driven tools like ChatGPT or Bard, and relying on the knowledge, experience, and judgment of seafarers themselves. By adopting a thoughtful and responsible approach to using large language models, the maritime industry can empower its workforce to excel in their roles and create a safer, more efficient operating environment for everyone involved.

The Author

Goldberg

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Image courtesy Abby van Hemmen

Dealing with the Whale in the Bight

By Rik van Hemmen

This is going to be about whales, but it will actually be an engineering discussion rather than a nature discussion. Let's start with an easy truth. ***Whale deaths due to offshore wind activities is utter nonsense. It has no basis in fact, and is a total fabrication by truly malicious characters.***

There, now let's get into more interesting stuff. Whale deaths caused by humans is a complex issue that will never be solved completely, but, with careful adjustments, can be reduced. There is a possibility that occasionally there are whale COVID style epidemics that cause unusual levels of mortality, but we have to accept that there will also always be whale deaths due to human activity and the vast majority of those deaths are vessel strikes and debris entanglement.

Right now, in the US North East Atlantic, we are actually dealing with two different types of whale mortality that have entirely different drivers and causes. We have North Atlantic right whale mortality and humpback whale mortality.

From a nature conservation point of view, one is quite scary and the other is not so scary.

Let's talk about right whales first. North Atlantic right whales are incredibly endangered. They were hunted to near extinction because they were the easiest whales to hunt. They were relatively slow and floated after they were killed. Hence their name; right whale. After commercial whaling was shut down in the second half of the last century, there were only a few hundred right whales left in the North Atlantic. There is a much larger South Atlantic population but the two do not intermix because they generally will not cross the equator and also apparently do not like strange whales to breed with. (The North Pacific right whale population is even more endangered)

Contrary to other whale species, which generally have made strong comebacks, the North Atlantic right whale population is not growing and may actually be harmed by global warming. This has resulted in special shipping regulations in the form of speed restrictions to reduce the chance of ship strikes when right whales are in the general area and some fiercely resisted fishing regulations. Despite that, right whales are still being struck by ships and killed by entanglement.

Then there are the humpback whales. Since they were quicker and do not float as well after being killed, they were

Diorama of commercial whale slaughter. Bahrs collection.

more difficult to hunt with traditional rowed whaleboats. But especially after WWII, they became fair game with the use of high-speed motorized whale hunters and compressed air to keep them afloat. In 1960 the worldwide population was estimated at only 5000 whales, but with the cessation of commercial hunting, the population has recovered to well over 100,000 and probably many more. (Although there are still a few struggling local populations.)

With regard to human interest, the humpbacks are the stars of the game. They are the whales that sing so well and are fun to watch. Whale watching relies to a very large extent on these whales. Bottom line: Humpback whales are an international win win success story. We have both preserved a wildlife species and created a new industry. Who can argue with that? And it is a big industry, estimated at over $2 billion per year worldwide and, with increasing whale stocks, can be expected to grow in the years to come.

But what about these whale deaths? It depends, any North Atlantic right whale death is a near disaster and if we want to preserve the North Atlantic right whale population, we will have to be extremely vigilant and it will require extraordinary and expensive measures.

A single humpback whale death is a different story. It is probably fair to say that nobody would like to see a humpback whale die for no good reason, but it is not inherently a disaster.

Since there is no evidence that offshore wind will have a significant impact on either right or humpback whales with the mitigation measures imposed by BOEM & NFMS, the best way to reduce whale deaths is to prevent vessel strikes and human commerce entanglements. This is quite similar to how we deal with wildlife management ashore, and quite frankly there are many land animals such as deer, moose, cougars, wolves and turtles that get in the way of transportation and commerce. A dead deer or wolf along the side of the road is factually no different than a dead entangled whale on a beach. Although in the US North East, a dead wolf may be cause for great concern, while we would probably try to ignore a dead deer.

Regardless, wild animals, and occasionally even humans, will die and the trick is to manage that downside as humanely as possible. (And hunting (culling) may even be the most humane solution). Human/wildlife interactions are a reality, and if that is the case, the only solution is to make the interaction

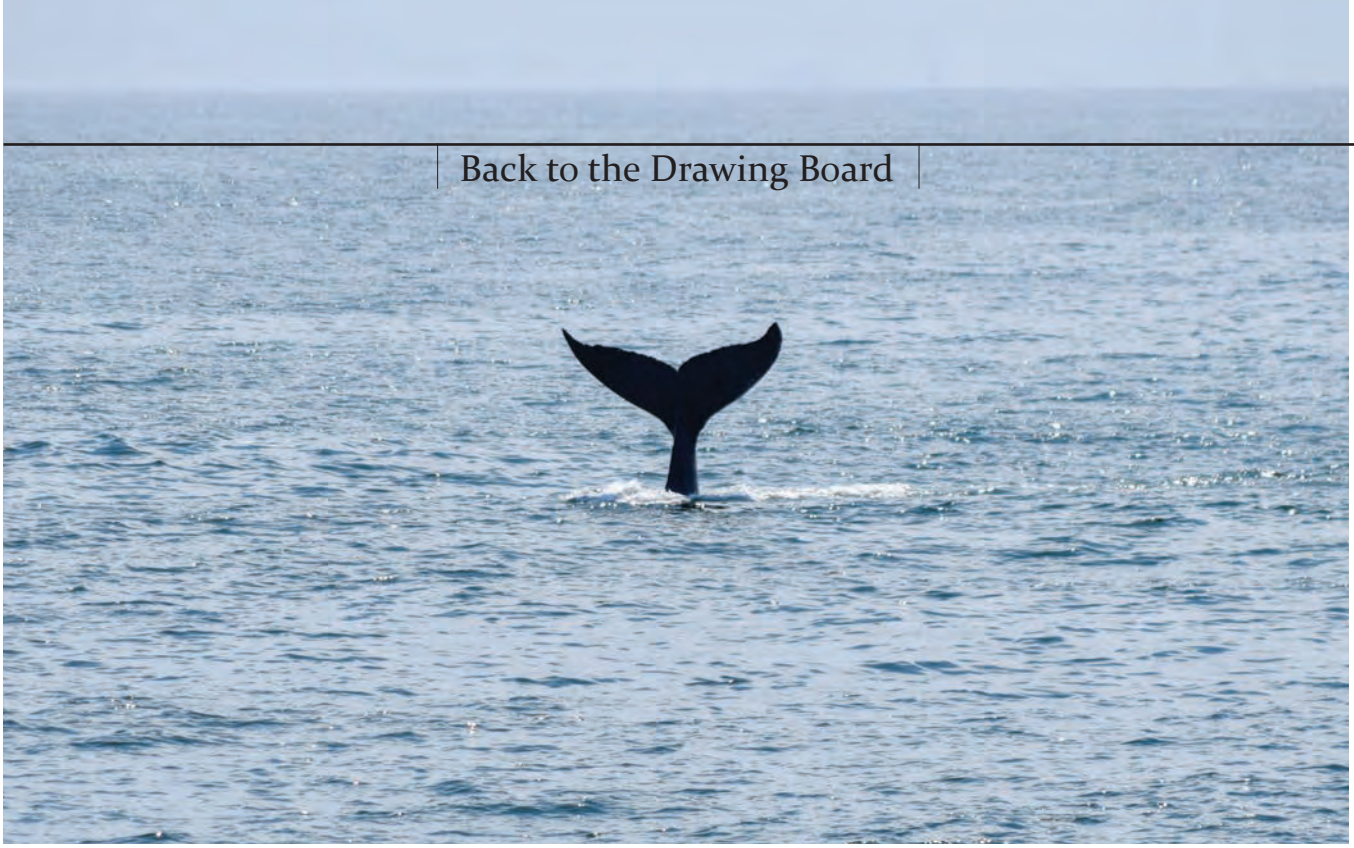

Image courtesy Abby van Hemmen

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Image courtesy Abby van Hemmen

as meaningful and painless as possible and it is an inherent technical fact that, therefore, there will be no single solution. There will only be partial solutions that get optimized through careful balancing of a wide variety of push and pulls, and careful analysis without distractions by bad data and lies.

That is complicated, and requires much more space to fully discuss than is available in this column, but some actions, like reducing entanglement trash, have no downside and should be pushed hard.

Increased situational awareness can also be very effective. Just knowing where whales are present can be very helpful in allowing crews to adjust course and speed. AIS can be of great help in that regard. Fitting right whales with AIS transmitters, if technically feasible, would be an excellent approach to avoiding collisions with right whales.

Noting that humpback whales are not as "valuable" and much more numerous, fitting them with AIS may not make sense, but recording whale locations (including right whales) in real time using AIS would be of great help. This could be accomplished with the addition of a simple record button on a ship AIS. A ship's crew sees whales, pushes the button when they pass the whales, and chart plotters on ships in range display a whale location just like it displays a ship with AIS. This whale position will gradually fade once it gets older, so the screen does not get overloaded, but the data can be stored and processed forever. This will provide somewhat messy data because whales move, but such data can provide a lot of insight in the long run and is an easy message to a following ship that they need to keep an eye out when they pass through an area where whales have been spotted. Not every watch stander would bother to do this, and obviously it would not work at night, but, in this case, partial data is better than no data at all. (There is partial data out there. NOAA provides right whale locations, but it is an unintegrated website **whalemap.org**, and there are also private companies that provide whale tracking services.)

There are a substantial number of vessels out there that would actually be interested in hitting the button whenever they see a whale. A whale watching boat can even hit the button whenever they see a whale surface and it would provide a great track for further research and analysis. Unfortunately, I have been told that there are whale watching operators who actually turn off their AIS to keep competing operators from knowing where the whales are. This should be very strongly condemned, because the AIS track of a slow-moving whale watching vessel already signals to other vessels that there are whales in the area and that they should pay closer attention. Moreover, sharing whale locations between whale watching operators reduces CO2 emissions since much less time and fuel is wasted looking for whales independently. Taking turns unnecessarily wasting fuel is particularly uncool if you are in the environmental business.

Who else would provide good whale tracking data with this system? How about the offshore wind vessels, which, by permit obligations, are required to carry whale observers. Yes, if we do not stop offshore wind development, there will be more whale observers, which, with proper technology, will reduce the possibility of vessel strikes for all. Situational awareness. Gotta love it.

For each column I write, **MREN** has agreed to make a small donation to an organization of my choice. For this column I select Gotham Whale, New York City's own whale research and advocacy organization.
www.gothamwhale.org

GAC Ship Agency

The Logistics of Offshore Wind

From geopolitical trials to a squeezed supply chain, the offshore wind sector is facing stronger headwinds than ever before. Third-party logistics partners are increasingly an option to help developers circumnavigate these issues.

Erland Ebbersten, Group Vice President – Energy & Marine, GAC

The global drive to harness offshore wind power is making it a busy time ahead for the sector as countries seek ways to wean off fossil fuels, produce more zero-carbon power and become more energy-independent.

But it is a journey fraught with challenges. Like other sectors, offshore wind projects face global inflationary and supply chain pressures which raise uncertainties in long-term commercial and investment decisions.

Further, their financial viability is coming under question amid rising energy prices and costs of raw materials used in the construction and servicing of offshore installations. This is especially the case as offshore wind farms become bigger and more widespread than ever.

Although significant, such challenges should not deter investments in offshore wind as advancing technologies are making the construction and maintenance of offshore wind farms more viable, cheaper and operationally safer. Most importantly, harnessing wind power is a valuable way for countries to bolster renewable energy capacity and secure a greener future.

Taiwan's Renewable Energy Goals

A prime example is Taiwan which has ambitions to become an offshore wind powerhouse. The island aims to increase the share of renewables in its electricity supply to 70% by 2050,

with an expansion of wind deployment earmarked as a natural and necessary step in that process.

Half of that capacity is on track to be built by 2035 with more than 130 offshore wind farm projects currently under development including the Greater Changhua wind farm project, which is being supported by global shipping and logistics services provider GAC.

Two of the windfarms – Changhua 1 and 2a – were delivered last year. Once operational, they will have a capacity of 900 MW, generating enough power to meet the needs of a million households.

Technology, particularly unmanned surface vessels (USVs), played a critical role in this project. They reduced the on-site work force and manpower costs, and minimized the need for technical experts and diving teams to operate in high-risk situations.

USVs enable operations and maintenance players to collect on-site data to aid faster and smarter decision-making. Information gathered related to weather patterns, water currents, seabed conditions and more are valuable when planning other offshore wind farm projects.

Operational Challenges

Since the Changhua wind farm project began in 2018, it has faced a number of operational challenges. First, developers have had to meet Taiwan's local content requirements for the use of the country's supply chain, manufacturing industry and regional labor.

Second, the Taiwan Strait is prone to severe weather conditions which pose difficulties and delays for construction of offshore wind farms. Taking typhoon seasons into account, developers only have a six-month window to carry out installation projects.

To overcome these challenges, as well others relating to project equipment and labor shortages caused by global supply chain squeezes, developers need to carefully plan ahead and seek the right support during early stages, particularly since these projects can take several years to materialize.

Strengthening Support

GAC opened a new office at Taichung Port in Taiwan in November 2022 to strengthen offshore operations support for projects like Greater Changhua. GAC Taiwan draws on the Group's global experience from other offshore projects to deliver world-class services to the country's burgeoning offshore energy sector.

Taichung port has undergone a number of infrastructure upgrades, including tailor-made wharves and new quays to support both pre-construction and under-construction offshore wind farms off Taiwan's west coast.

GAC provides offshore support, in addition to ship agency and husbandry services, barge and tug support, crew transportation and emergency response: all vital and sometimes unsung components of offshore energy projects.

Gathering Pace

Beyond Southeast Asia, offshore energy construction and maintenance projects are also gathering pace. Mainland China, the United Kingdom, and several countries in Northern Europe are clear market leaders in the sector, while Brazil and the United States are ramping up production.

Based on data from leading energy trade association RenewableUK, the output of the global offshore wind sector now stands at 1,174 GW across 38 countries – an increase of 508 GW over the past 12 months. It is in these offshore hubs that GAC developed the experience that it is now applying to support other projects in Taiwan, India, Singapore and the Middle East.

All are vulnerable to their own regional challenges but the core issues they all face - geopolitical, inflationary or environmental - can drastically impact the overall supply chain, as well as the cost of key items such as turbines, blades, substructures and electrical components.

Increasingly, the sector is being called upon to be flexible to remain competitive, ensure projects stay on schedule and keep costs low. Project managers need to work closely with their partners and support networks to adapt to the ever-changing risks, especially as offshore wind farms grow in size, output and global significance.

GAC Ship Agency

Maritime CyberInsecurity… *and how the law is changing*

By Gene F. Price, Frost Brown Todd

The maritime industry depends on automation to quickly and efficiently perform each task required to load, navigate, and ultimately unload a vessel. Operators of these automated systems could work for the vessel itself, the different ports the vessel visits, or the logistics, maintenance, or service support companies it interacts with along the way. Many will be distant from the ship or port, using remote technology to perform their work. Larger merchant vessels further require operational technology (OT) networks to ensure a seamless, profitable voyage. These include systems relating to ballast, stability, cargo, propulsion, power, navigation, and weather systems.

Ironically, these essential systems can be turned into weapons against the operators. It is quite possible for a savvy and resourced attacker to create a pollution incident, disrupt ports and critical infrastructure, or cause harm to the ship itself. The complexity of these systems isn't unique to vessels either. Sprawling networks amalgamated into a "system of systems" are used by ports, terminals, and vendors. Each can create vectors for cyber-attacks in and of themselves or through connections to other supply systems.

Cyber-criminals are brazenly targeting the maritime community, and their attacks have become prolific. In 2020, cyber-attacks affecting the Maritime Transportation System (MTS) increased by 400%, with a 900% increase over the prior three years. Even the International Maritime Organization (IMO) experienced what it called a "sophisticated cyber-attack" that took down its web portal in September 2020.

As indicated above, there are many possible vectors for infecting maritime systems. Security researchers believe that electronic chart display and information systems sometimes used on MTS vessels are vulnerable to attack, which are frequently linked to GPS-connected autopilots. This in turn can provide access to some OT systems lacking in adequate defenses. For instance, hackers allegedly compromised the steering and maneuver controls of a German-owned container vessel in February 2017, and an IT team was forced to come aboard to help the crew regain control.

If you were watching the automatic identification system (AIS) in 2021, you might have noticed two NATO warships

just two miles from Russia's Black Sea Fleet headquarters. But eyewitnesses and webcams proved both ships were tied to a pier almost 200 miles away, demonstrating a capability to compromise navigation equipment. The incident received global attention and was attributed to AIS spoofing techniques, displaying vessels where none were present.

Ransomware has also hit the MTS when global shipping and logistics giant Maersk fell victim to the devastating "Not-Petya" cyberattacks of 2017, bringing Maersk's global operations to a standstill. The fact that Maersk was not even the intended target of the attack underscores how vulnerable the MTS is. Criminal gangs aggressively exploited vulnerabilities at the Port of Antwerp, collecting payments from fraudulent bills of lading on its information systems for two years.

Against this backdrop of costly cyber-attacks and mischief, the federal government has issued several laws, directives, and advisories designed to improve national cyber-hygiene. In May 2021. the Biden administration's Executive Order 14028 mandated federal agencies to secure their cloud services, adopt "zero-trust" architectures, and deploy multifactor authentication and encryption on federal networks. It also established software development security standards, using the federal government's purchasing power to force industry to build more secure IT products.

The National Institute of Science and Technology (NIST) issued detailed guidance on how to develop incident response plans (IRPs) for the inevitable cyber-attacks. IRPs define the "players" for different response situations, their roles in an attack, and immediate actions to take. While not yet a requirement for the MTS, IRPs are strongly recommended for victims to have an organized means of quickly "fighting back".

The U.S. Coast Guard recently released the Maritime Cybersecurity Assessment & Annex Guide (MCAAG) to help MTS stakeholders address cyber risks. This voluntary guide addresses cybersecurity assessments and IRP development, particularly for Facility Security Assessments and Facility Security Plans required by MTSA. In 2021, the Coast Guard released an updated version of the Cyber Strategic Outlook (CSO), placing responsibility to "prevent and respond" to MTS cyber incidents on its shore commanders. One notable statement in the CSO is that it will use its "existing framework for prevention and response activities to mitigate cyber risks," which allows the Coast Guard to use its Captain of the Port authorities to prescribe cybersecurity conditions and restrictions for shore facilities before an incident and oversight afterward.

One important new statute is the Cyber Incident Reporting for Critical Infrastructure Act (CIRCIA), which created reporting requirements for "covered entities" who operate "critical infrastructure" in 16 sectors designated under federal law, including transportation systems and commercial facilities. CIRCIA requires these entities to report cyber-incidents and payments to the Cybersecurity and Infrastructure Agency (CISA). CIRCIA's regulations will be announced in the next year, so details are uncertain. At a minimum, covered entities must report cybersecurity events within 72 hours and ransomware payments within 24 hours.

The MTS is still uniquely vulnerable to cyber-attack and will likely remain so for the foreseeable future. While these new federal requirements will improve our defenses, they also present a host of compliance challenges for the maritime industry. That in turn will mean a significant investment in cyber defense and resiliency efforts. At a minimum, vessels, ports, terminals, suppliers, and maintainers should examine their networks and prepare now. If an entity lacks firewalls, or multi-factor authentication, or tailored IRPs, or encryption for its sensitive documents, it should invest now.

The Author

Price

Gene F. Price has substantial real-world experience in cybersecurity and focuses on Frost Brown Todd's privacy and data security practice and incident response planning. Recently retired from the U.S. Navy as a Rear Admiral after 36 years of service.

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Image courtesy National Cargo Bureau

HazCheck Detect helps to Minimize Mis-Declared Cargoes

By Matthew Bonvento

Fire at sea is an ever-present danger. According to a 2018 Allianz article, a modern containership fire resulting in a total loss could cost upwards of $1 billion. With containerships reaching upwards of 24,000 TEU, a fire could result in significant financial strain to the industry. Fires such as the Cosco Pacific, Yantian Express, Maersk Honam, MSC Daniela, and the MSC Flaminia highlight how dangerous a fire on board a containership can be. It is impractical to expect every container to be inspected prior to shipment on board. Additionally, screening of cargoes at entry points of terminals is conducted on such a small scale in comparison to the global freight level, the likelihood of catching an undeclared or mis-declared cargo is negligible. Therefore, other options had to be cultivated to better serve the needs of the industry.

The other option has come in the form of a software screening tool that has the capability of catching potentially mis-declared and undeclared hazardous cargo. Known as HazCheck Detect, this software developed by Exis technologies, the software division of the National Cargo Bureau group, which according to the NCB description "is an API based (meaning that it can be linked to other software such as a container line's booking software), integrated, cargo screening solution that detects mis-declared and undeclared dangerous goods in containerized shipments. Hazcheck Detect uses constantly evolving libraries of rules. It can accept full customer booking data, and screens whenever changes are made within clients own systems (generating a new API

each time), with the aim of identifying suspicious cargo to users for thorough investigation."

According to Ken Rohlman of Hapag-Lloyd the concept of HazCheck Detect is not a novel one. In fact, Hapag-Lloyd had developed as far back as 2010. The results were shocking, and they highlighted what is an industry problem. What was discovered was an in-house product like Hapag-Lloyd was not widely accepted by competitors. So when National Cargo Bureau purchased Exis, carriers such as Hapag-Lloyd support the industry wide available cargo screening tool.

By utilizing a library of keywords the program can identify shipments which may be questionable. The information is then forwarded to the carrier for further investigation. In order to validate the shipment, carriers will proceed to seek further documentation and clarification from the shipper. An evaluation of documents and possibly pictures or a container inspection will be requested. Verified mis-declared cargo will be reported back to HazCheck Detect to update the database. According to Hapag-Lloyd this is where the shipment "disappears." Once identified, the shipper will often cancel a booking and try to re-book with another carrier. Herein lies an insurmountable safety issue. Carriers are prohibited from sharing information about shippers with other carriers which means that the shipment may then be placed unbeknownst on another vessel due to anti-trust and anti-monopoly laws in Europe. The fines that carriers issue on shippers mis-declaring cargo can hardly be enforced. Therefore there are few repercussions.

The system is currently evolving to include the component of Artificial Intelligence. It is using Natural Language Processing, learning from historical data to further assist the container lines to improve rule generation and hit quality.

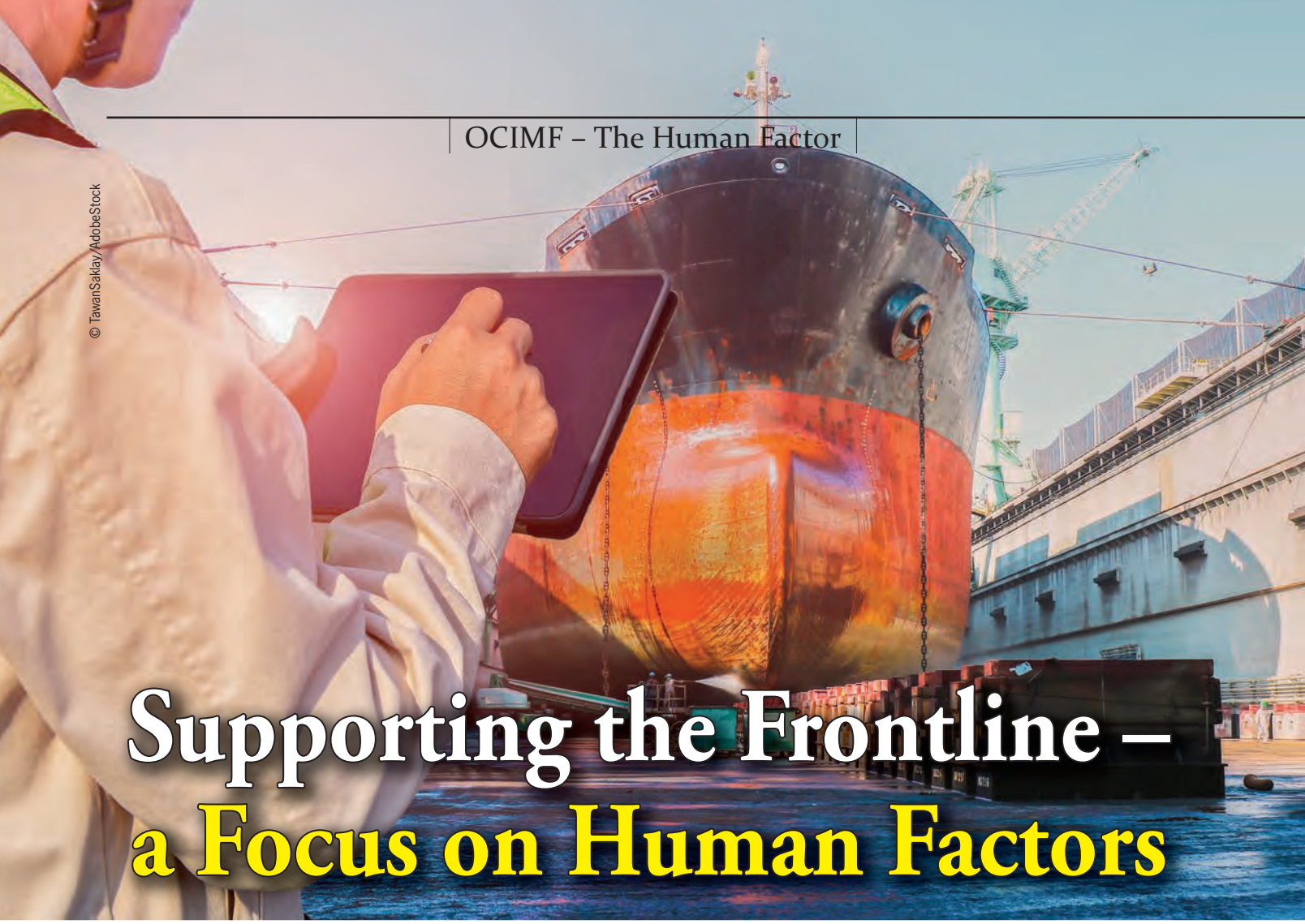
The next step will be to expand the AI capabilities by introducing additional data points, such as container inspections, to increase confidence of hits to further reduce risk.

As software evolves and carriers feedback is integrated into Hazcheck Detect, the algorithms will be able to pick up even more suspicious bookings. In the future it is hoped that the software will be able to detect inconsistencies in cargo weight versus declared product and other inconsistencies that raise red flags. In the meantime, we are glad to have this software available to increase the safety of our ships and for our mariners.

The Author

Bonvento

Matthew Bonvento an Associate Professor of Nautical Science at the United States Merchant Marine Academy. Previously he served as Senior Manager for Safety, Security, Regulatory, and Quality Compliance for Vanuatu Maritime Services Ltd.



Supporting the Frontline – a Focus on Human Factors

OCIMF explains how the new vessel inspection program, SIRE 2.0, will benefit those onboard

OCIMF's Ship Inspection Report Program (SIRE) was launched in 1993 to address concerns about sub-standard tanker shipping. In the intervening years, the paper-based inspection reporting process has undergone seven iterations to meet significant developments in industry regulation, understandings of best practice and the changing ways of working (both onboard and ashore). For 30 years it has served and governed the industry well as a crucial tool for vetting vessel quality and safety.

It is against this backdrop that the existing SIRE program with its paper-based questionnaire will soon be replaced with the much-anticipated SIRE 2.0, designed to obtain a more holistic assessment of the condition of a vessel and its crew on an ongoing basis. The OCIMF secretariat and the dedicated Vessel Inspection Program project team is busy preparing SIRE 2.0 for a phased roll out this year.

Once complete, the static paper-based questionnaire carried by inspectors during an OCIMF tanker inspection will be replaced by a secure tablet device, with specialist software that generates a unique question set for each inspection.

While this new reporting mechanism is a significant departure from the current inspection regime, perhaps the biggest step change for industry in relation to SIRE 2.0 is the program's increased focus on human factors.

Human factors are the physical, psychological and social characteristics that affect human interaction with equipment, systems, processes, other individuals and work teams. OCIMF believes that by addressing and understanding these interactions, incidents can be reduced and in the case of tanker shipping, vessel reliability and safety improved.

"The shift from paper to tablet device inspections is innovative," said OCIMF Programs Director, Aaron Cooper "but OCIMF's increased focus on human factors in SIRE 2.0 is really significant and original.

"OCIMF is a real advocate for human factors in maritime,"

he said. “It is about giving people the right equipment and environment to perform tasks successfully and safely,” he asserted, noting that the International Maritime Organization (IMO) and a number of classification societies are also doing great work on human factors.

“Maritime is learning from aviation, space, healthcare and search and rescue, all industries that recognize that if you support the frontline, everyone gains,” he said.

Objective not Subjective

The term ‘human factors’ may suggest that the focus is solely on the person who is carrying out the task, but Cooper explains this is not the case. When considering human factors the main focus is on the conditions that set people up to be successful (carry out tasks safely and efficiently) in important tasks, also known as performance influencing factor (PIFs).

The inspection program’s primary purpose is to present an accurate picture of the operation of the ship, including equipment, procedures and capability of crew.

“Poorly designed equipment and difficult working arrangements lead to problems. People tend to manage this by struggling on and making the best of the conditions they are in, which can result in accidents and incidents,” said Cooper.

Under SIRE 2.0, it will be easier to identify where tasks are affected by equipment or working conditions and if necessary to show operators where they can make improvements which will make the tasks more effective and safe,” explained Cooper, adding that the CLASS acronym (see below) has been designed to help operators reflect on what can be learned from an inspection finding.

OCIMF recognizes that frontline workers are the experts at operating the vessel safely and efficiently using the tools and equipment available to them and understands that in real-world scenarios on the frontline, processes will be adapted to fit the conditions to ensure smooth sailing. “It’s the same across all industries. There is ‘work as done’ and the idealistic view of ‘work as imagined’. “No matter how well we design our equipment and procedures, it’s the people that make it work, in real conditions,” said Cooper. “OCIMF wants to get close to how work really happens on the frontline, and ask does the task do what it has to do to protect the ship?” he explained.

In this way, SIRE 2.0 is geared towards ensuring an objective report on the operating standards of a vessel is obtained, as opposed to a subjective report of the crew members. It’s an important distinction and easy to forget, commented Cooper who understands that onboard crew may find OCIMF inspections unnerving, but that they needn’t be. “This is about understanding the conditions that make tasks difficult for the crew, and helping the ship to be better”, he asserted.

Good to Talk

OCIMF has worked tirelessly to ensure that SIRE 2.0 produces accurate reports and Cooper argues that the new regime will better represent seafarers. For example, for the first time in a vessel inspection, crew will be able to demonstrate best practices and have excellence recognized. SIRE 2.0 inspections will not be a surprise examination. The detailed scope of an inspection is generated by the tablet’s software and is available to view now on the SIRE 2.0 section of the OCIMF website. It has also been shared with all program users.

OCIMF

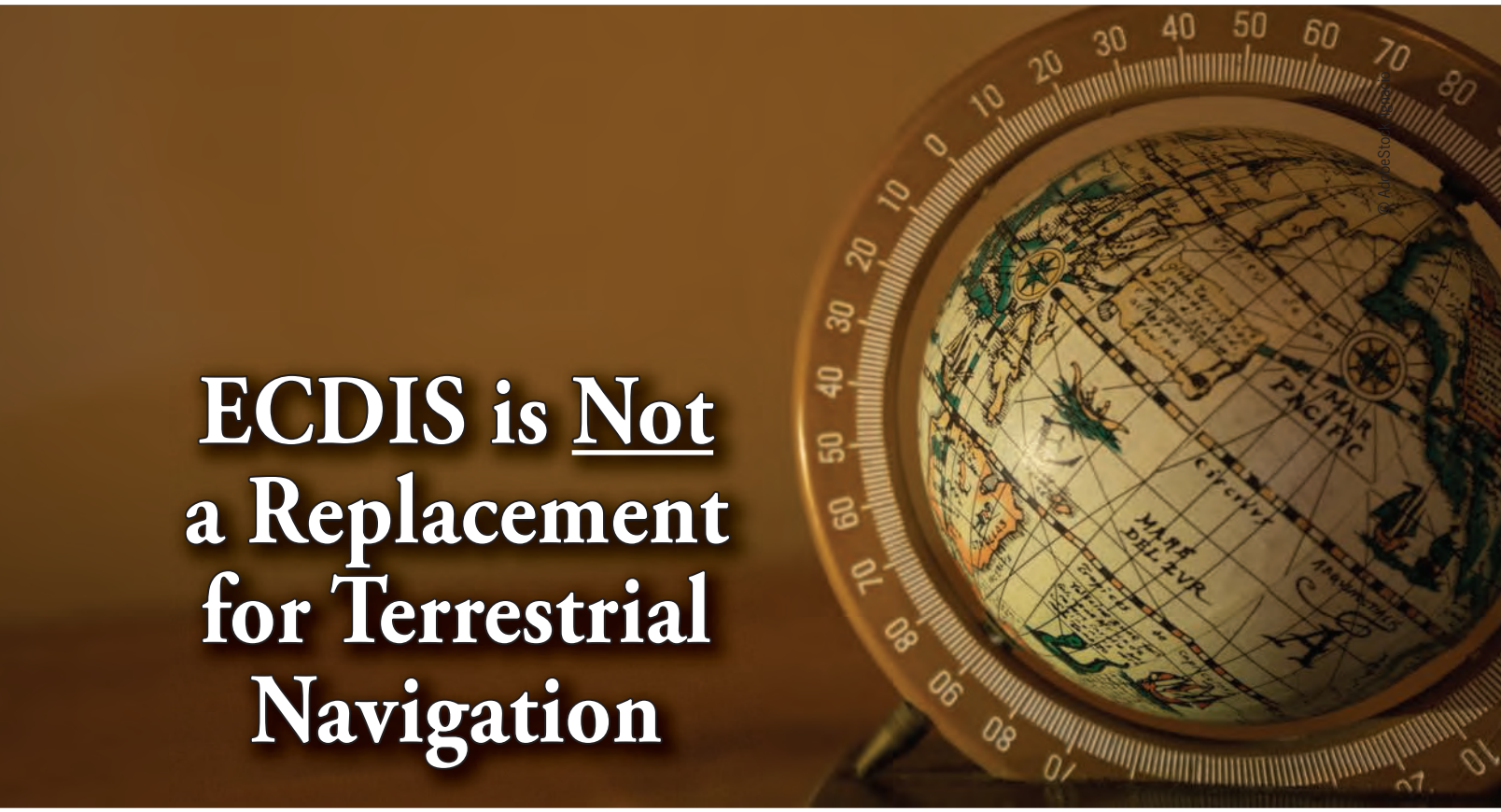
“The shift from paper to tablet device inspections is innovative. But OCIMF’s increased focus on human factors in SIRE 2.0 is really significant and original.”
Aaron Cooper, Programs Director, OCIMF

The focus on human factors and the vessel-specific question set are central to SIRE 2.0 and enables seafarers to voice their opinions and concerns more easily. This front line information can then be fed back, within the inspection report, to the vessel operator to learn from and respond to. As Aaron points out, “this is a win-win situation, where transparency will be a major outcome from SIRE 2.0. Capturing seafarers’ feedback ensures they are being heard, improves morale and can improve safety. While giving operating companies better quality information to learn from”.

Through SIRE 2.0 and its new approach industry can continue to learn and develop best practices that keep up with the rapid pace of changing regulations, technologies and ways of working onboard.

CLASS acronym

- **Choose to learn, not blame**
- **Learn from those who do the work**
- **Address Performance Influencing Factors**
- **Systematic action across fleet**
- **Share feedback with the crew**



ECDIS is Not a Replacement for Terrestrial Navigation

By Captain John Ryan

I guess it was only a matter of time. After years of debating whether or not Celestial Navigation should be taught it is now time to debate the relevance of Terrestrial Navigation. The argument is same: why do I need to know this if there is technology available to do it for me. The answer is also the same. If you want to be a professional mariner than your knowledge base and skill sets should far exceed that of a weekend boater that follows the direction of their chart plotter around the bay.

In most nautical schoolhouses Terrestrial Navigation is almost always the first navigation course students receive. The reason for this is simple. Terrestrial Navigation is the foundation on which we build all other navigation courses. Terrestrial Navigation orients new mariners to the globe. It teaches us about angles, distance, time and the relationship between them. We learn how to compute and apply set and drift, compass error, gyro error, turn bearings and dead reckoning. It's where we learn about chart scales and the different types of chart projections. These are some of the most basic and essential building blocks required to produce a skilled Navigator. As such they should be reinforced at every opportunity, not simply written off as some outdated form of navigation.

At USMMA we incorporate the use of paper chart plotting into multiple courses. In addition to our Terrestrial Navigation and license seminar courses we incorporate plotting exercises in our ECDIS, RADAR, Bridge Watchstanding and Bridge Recourse Management courses. Our student will also complete chart plots as part of their sea projects. This constant reinforcement goes a long way in building that solid foundation. There is no way that a single course will provide a student with the skills or experience needed to pass a license exam or even more importantly function as an officer in charge of a navigation watch.

When I first started sailing with an ECDIS all I needed to learn was how to operate the machine. I had years of experience as a Navigator. The required tasks of fixing my position, laying out track lines and creating voyage plans were tasks I was already quite capable of performing. Transferring those skills from one format to another was not very difficult. Today's mariners don't get the opportunity to gain that experience. They are taught Terrestrial Navigation but much of

their time as cadets is spent working primarily with ECDIS. Whether you are on a ship or in a training environment Terrestrial fixes are looked at as a secondary position source. They are added to the ECDIS as a backup while the ship is in piloting waters but beyond that there are very few requirements or opportunities to gain any additional experience fixing your position. If we fail to develop our Terrestrial skills during our initial training process, there may be little opportunity to improve as we progress.

ECDIS gives the user the ability to display, or not display, a tremendous amount of information. Your capacity to properly groom the ECDIS so it displays the necessary information, in the correct format, will in a large part come from your understanding of Terrestrial Navigation. An electronic navigation chart is still a chart, you need to understand everything that chart contains no matter what the format.

Instead of using technology as the reason for eliminating core navigation skills we should use it to teach them more efficiently. Simulators for example have greatly increased our ability to teach chart plotting. A chart-plotting exercise on a simulator can be just as effective as an underway watch. Fixing your position on a moving vessel ingrains a sense of urgency that you can't ever get from a paper plot exam. It forces the student to choose the navigation aids and land masses they think should be used to fix their position. The underway process is where most students begin to fully comprehend so many of the concepts they've recently learned. If you don't understand something chances are you will avoid doing it all together. We should train our future navigators to understand the responsibility of fixing their position. That sense of responsibility can easily be replaced by complacency if we lack the experience of being actively engaged in the navigation process.

Being able to manipulate an ECDIS does not make you a skilled Navigator. Neither does passing a chart- plot exam that you've practiced a half dozen times and maybe even memorized the answers to. If we treat Terrestrial Navigation the same way the many view Celestial, like an outdated practice that has no real relevance in the modern world, then that is exactly how it will be perceived by current and future mariners. ECDIS should be considered the next step in Terrestrial Navigation, not its replacement.

The Author

Ryan

Captain John Ryan holds an Unlimited Masters License. He has sailed on commercial, military and training vessels. He currently teaches Navigation and Collision Avoidance at the United States Merchant Marine Academy.

Author's Disclaimer
The views expressed in this presentation are my own and do not necessarily represent the views of the U.S. Merchant Marine Academy, Maritime Administration, the U.S. Department of Transportation, or the United States.

Photo courtesy Ocean Technologies Group

Exploring case studies, play-through scenarios and gaming techniques can all be effective in testing the application of knowledge.

1

ENCLOSED SPACE SAFETY:

ONE LIFE LOST IS TOO MANY

As an industry, we should strive for zero loss of life inside enclosed spaces

By Wendy Laursen

"You're at the bottom of a 100-step ladder. It can feel claustrophobic and fearful when inside 30,000 cubic meters of a VLCC, ballast tank, or forepeak tank. What reassures you is your trained crew working as a unit with everyone looking out for each other."

Captain Dave Watkins, Deputy Director, CHIRP Maritime

It's nearly 45 years since the tragedy on the ANCO Duke where seven crew died at the bottom of the tank they were cleaning.

"I was working on chemical tankers then. All the crew felt this terrible loss of life and took on tank entries with a heightened safety focus," says Captain Dave Watkins, Deputy Director of the confidential near-miss reporting service CHIRP Maritime. Since then, enclosed space deaths still occur, although not in the number they did.

Watkins has years of experience on chemical and VLCC tankers as an officer and master, and has undertaken hundreds of enclosed space entries on tankers, bulk and general cargo ships. "I was the first in, and I'd be the last out." There was no compromise on his enclosed space entry protocol.

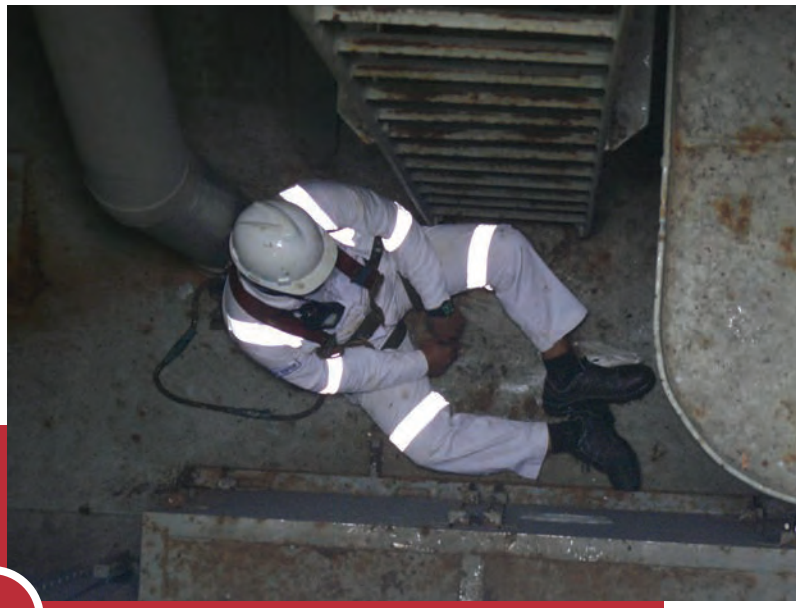
Reflecting on his tanker experience, he says: "You're at the bottom of a 100-step ladder. It can feel claustrophobic and fearful when inside 30,000 cubic meters of a VLCC, ballast tank, or forepeak tank. What reassures you is your trained crew working as a unit with everyone looking out for each other."

Before filling in the enclosed space entry permits and the risk assessment form, Watkins would go into the tank with his breathing apparatus, backup supply, personal O2 meter and multi-gas detector, torch and spare torch. The tanks had been forced-ventilated for days until final testing took place. "Only when we had tested the space remotely, the tank valves isolated with the crew observing, would I proceed with testing the tank locally, including inspecting the tanks for safe physical access."

The crew needed to see leadership in action and procedures followed to the letter. No shortcuts. Discipline continued in the tank. If anyone's alarm was triggered, work stopped, and the tank was tested and reventilated before the entry process was restarted.

Enclosed space tank work demands high alertness and stamina, so the crew should be adequately rested and fit. Tank work must never be rushed, and there should be no pressure and no overconfidence. These are the human factors that lead people to take shortcuts. "When tank inspections are carried out, your sole focus is just this job, nothing else. No conflicting work activities are taking place; the sole focus should be

Images on this page: OneLearn Global



Enclosed space entry drills provide an opportunity to enhance competence.

on the men and women working in the tank."

Equally important for reassuring the crew is the support provided by the deck team in case of emergencies. "You need an experienced spotter with good communication skills who can quickly activate an emergency response if something goes wrong. Regular exercises were practiced until we became confident in our ability to carry out a rescue from any enclosed space."

Responding to a casualty in an enclosed space requires specific knowledge, training, and equipment, including the use of gas detectors, respirators, and safety harnesses. Enclosed space entry drills provide an opportunity to further enhance competence, and Captain Sundeep R Sequeira, Area Sales Director for training provider OneLearn Global, highlights the importance of responding not reacting.

"If a seafarer reacts impulsively and endangers themselves or others, it could create fear and mistrust among the crew. On the other hand, a well-planned and executed response can inspire confidence, trust among the crew, and reinforce the importance of safety protocols."

Of equal importance, is a high level of familiarity with the procedures for notifying the emergency response team and following established communication protocols, says Sequeira.

It is important to look at enclosed space issues through the dimension of human behavior, says Raal Harris, Chief Creative Officer at Ocean Technologies Group. "As human beings we have a blind spot for dangers that we cannot see, touch or hear. This is particularly true if we see a space that we have entered without consequence many times in the past." He says it is instinctive to go to the aid of another when no visible danger is present.

Exploring case studies, play-through scenarios and gaming techniques can all be effective in testing the application of

Widely used IMO Resolution A1050/27 and Code of Safe Working Practices are very confusing.

Captain Kuba Szymanski, Secretary General, Intermanager

"As human beings we have a blind spot for dangers that we cannot see, touch or hear."

Raal Harris, CCO, Ocean Technologies Group

knowledge, he says. Can the person make the right decision at the crucial moment? Can they do it under pressure? "Immersive techniques can help to simulate the conditions that people may face and prepare them."

It's a multi-dimensional issue, and training is not able to influence all the factors, he says. "There are many procedural, hardware and ship design factors which are beyond the seafarer's control, and we support initiatives such as those by InterManager to attempt to address these so that we minimize risks wherever possible."

InterManager data shows that 347 people lost their lives between 1999 and 2023. The problem may be even greater as there is a lack of consistent recording and reporting within the industry, particularly by Flag States.

InterManager's research also shows that widely used IMO Resolution A1050/27 and Code of Safe Working Practices are very confusing, says Intermanager Secretary General, Captain Kuba Szymanski. These two documents are, however, the backbone for almost all company-prepared onboard safety management systems.

Late last year, the IMO committed to review guidance governing safe working in enclosed spaces, and plans are expected to be confirmed at MSC107 in June 2023.

InterManager has partnered on a submission that draws attention to industry-led investigations into enclosed space accidents. This has resulted in several distinct themes that require attention: design and construction, gas evolution, movement and entrapment within the ship structure, and the human element prevalent in many enclosed space incidents, such as the rush to rescue a single casualty resulting in the death of many, the disregard of procedures and local adaptation of unsafe practices.

Szymanski says: "We are keen to ensure the debate looks beyond any initial mistakes made by those who died."

He would like to see table top exercises for office staff to familiarize them with how to cope in the event of an accident. Everyone involved in the command chain needs to have a better understanding of the dangers of working in enclosed spaces and the procedures needed to ensure safe working. "And I do mean everyone."

ENERGY TRANSITION:

WHAT IS AN OFFSHORE VESSEL OPERATOR TO DO?

The energy transition is moving ahead amid recovery in offshore oil & gas and growth in offshore wind, leaving vessel owners that serve these markets with big questions about energy carrier and energy converter selection for their newbuilds.

By Philip Lewis, Director of Research, Intelatus Global Partners

What is driving the change?

The foundations of energy transition in the offshore and marine segment can be found at global, regional, national and local levels:

1) At a global level, International Maritime Organization (IMO) measures cover vessel energy efficiency (for vessels over 400 gross tonnes) and carbon intensity (for vessels over 5,000 gross tonnes) but do not necessarily impact offshore support vessels (OSV). However, the IMO strategy on emissions is expected to be revised at MEPC 80 in July of this year. Full decarbonization of the maritime sector by 2050 is expected to be discussed but unlikely to be agreed. Measures such as greenhouse gas fuel standards on a well-to-wake basis and some form of carbon pricing are expected to be discussed for implementation through this decade. What we have then is a bit of a moving target.

2) Currently, vessel movements related to the installation of wind turbines in Europe are not subject to the Monitoring, Reporting and Verification (MRV) reporting requirements. However, as our table summarizes, some key numbers for the revised EU MRV and Emissions Trading System (ETS) schemes.

3) At a national level, and of importance to floating wind, we note for example Norway's support of partial or full electrification of vessels or the use of hydrogen and ammonia as energy carriers.

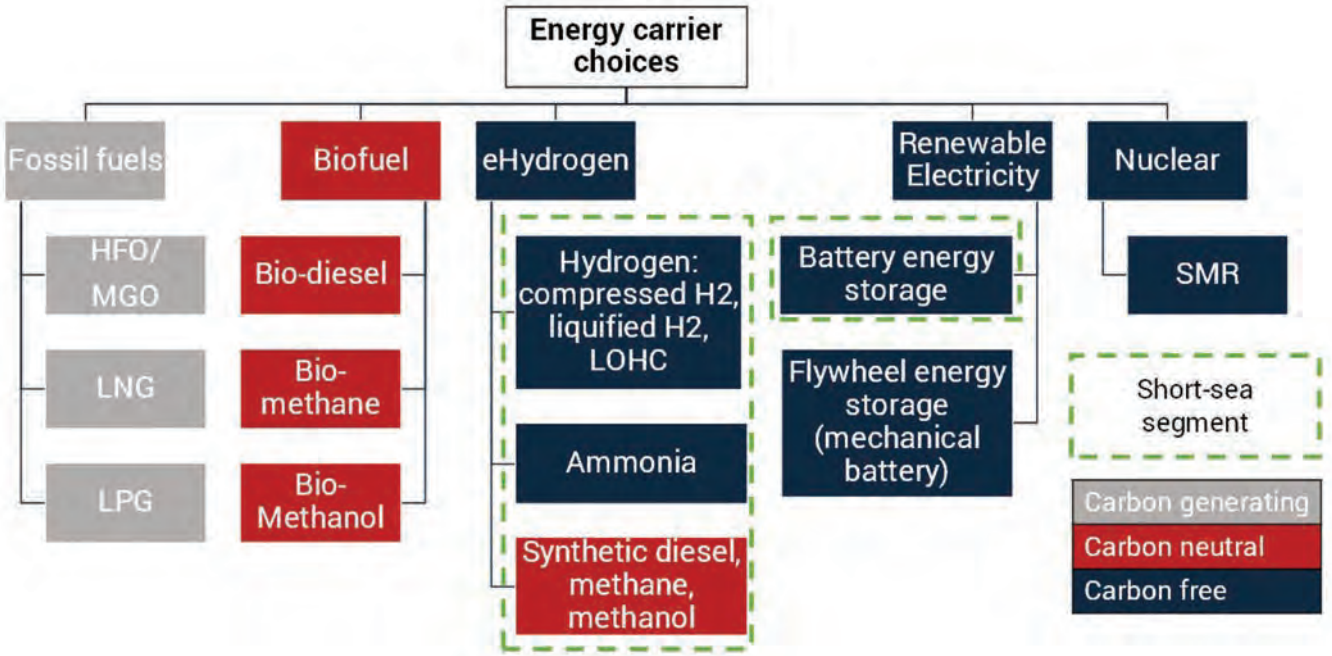
4) Now let's take a local level look within a country. The California Air Resources Board's (CARB) Commercial Harbor Craft regulation defines emissions standards for vessels calling into state waters and stricter amendments are currently under review. These will likely impact the anchor handlers involved in California offshore wind projects.

In addition to these regulatory conditions, we find several other main drivers for choosing low or zero emissions fuels, including:

1) Vessel charterers are seeking more and more to manage their Scope 1, 2 and 3 emissions, including emissions associated with their own or chartered-in vessel operations.

2) Shareholders in listed companies may demand that vessel operations impact less on the environment.

Included	GT	EU MRV	EU ETS
Offshore	400-5,000	2025	To be evaluated
Offshore	>5,000	2025	2027
CO2		In force	2024
CH4 & N20		2024	2026
Voyages and port-calls within EU/EEA		100% by 2026	100% by 2026
Voyages into and out of the EU/EEA		100% by 2026	50% by 2026



3) Finance and insurance providers in certain markets have become more interested in incentivizing investments that have less of an environmental impact.

4) A younger workforce who are increasingly less motivated to choose careers in industries associated with hydrocarbon related emissions, such as oil & gas and marine operations.

What are the choices?

As per the chart below, there are many choices of lower carbon, carbon neutral and carbon free energy carriers, some of which (ringfenced by the green dotted line) can be seen as more suited to shorter sea voyages typical of most of the offshore oil & gas and offshore wind fleet.

Depending on the trade and fuel supply, we see an increase in the number of hybrid energy systems, combining an internal combustion engine (dual fuel for flexibility) or a fuel cell with battery energy storage and shore power connections.

And what about the challenges?

The first challenge is to choose the energy carrier(s) and the energy converter for a vessel. This will often be dictated by trade patterns, vessel size, local factors and the availability of internal combustion engine, fuel cell and/or battery energy storage system options.

Securing a supply of fuel is the next challenge. At present, most low and zero emissions fuels are in very limited supply. Further, the scale of most offshore vessel operating companies and trading patterns does not allow most owners to replicate what liner companies like Maersk have done, which is secure 1.4 to 2 million tonnes per year methanol supply from nine supplier partnerships in Asia and the Americas, and continue to review a further 30 partnerships in regions including Eu-

© AdobeStock/David Maddock

rope, Africa and the Middle East.

If you can get the fuel, the next challenge is the cost of the fuel. Carbon pricing, in markets like Europe, will help this situation, but at a fundamental level, green hydrogen, e-methanol and e-ammonia cost more than marine diesel and gas oil.

As many people know, certifying bunker quality is a major challenge today. But the challenge will only become more daunting. Taking methanol as an example, methanol can be produced from coal (brown), natural gas (grey), from carbon capture from another combustion process (blue), renewable sources (green) or nuclear (pink). The final product is always CH3OH. The question is how to ensure that the methanol in the tank is green.

And finally, there are a range of technical and operational barriers ranging from toxicity of certain fuels, lack of sufficient bunkering infrastructure, the impact on onboard storage based on the large volumes required to store hydrogen, ammonia and methanol, available of internal combustion engines, availability of fuels cells and battery energy storage systems and crew capabilities.

What else can we consider?

On top of the energy carrier/converter choice, there remain several other tools for lowering emissions intensity available to owners to consider, depending on the size of vessel. These include:

- Ship design and hydrodynamics: Hull-form, ship size, propulsion improving devices, propellers, rudders & material optimization, air lubrication, hull coating/ cleaning and propeller cleaning.
- Energy assistance from wind or solar sources.
- Logistics and digitalization: Speed reduction, weather routing, trim, draft, and ballast optimization, autopilot software, engine de-rating and vessel size.
- Waste heat and/or kinetic energy recovery.
- After treatment measures such as carbon capture and storage.

Alll photos courtesy Ardmore Shipping

ARDMORE SHIPPING B

Garry Noonan, Director, Innovation, Ardmore Shipping is candid in discussing emerging technologies and their impact on ship fuel and emissions reductions. With a fleet of product and chemical tankers under his guise, Noonan gives insights on technologies that he has seen work, as well as his thoughts on the fuel transition, which he believes won't become mainstream until we're well into the 2030s.

By Greg Trauthwein

UILDS A BETTER FLEET

While Cork, Ireland-based Ardmore Shipping, founded in 2010, is relatively new in shipping circles, it is hardly a neophyte, sporting a management team that is long on experience with a modern product and chemical tanker fleet at its disposal. "Ardmore Shipping is predominantly a product tanker company," said Noonan. "We have a couple of smaller chemical tankers, but overall, we have 22 owned vessels, just shy of 30 operated."

Altogether it has a team of 50 employees in the company, plus 15 more in a joint venture with Anglo Eastern, which is Anglo Ardmore, with another 15 people permanently employed in Hong Kong, and a pool of around 900 seafarers.

According to Noonan, gross revenue last year was around the $450 million, "so things are going well right now, the markets are hot, life is good."

Innovators Innovate

Noonan joined Ardmore from BP Shipping in October 2014, where he had been sailing as a Marine Engineer for 11 years in various positions, most recently as Second Engineer. In his sea going career he has worked on VLCC's, product tankers, LPG and LNG vessels and as a result has extensive experience with various steam, motor and dual fuel diesel electric propulsion systems, particularly relevant for his role of Director, Innovation at Ardmore.

"My main role is looking for ways to make our vessels more efficient, make our processes more efficient, looking towards the energy transition in the future," said Noonan. "There are two of us on the innovation team, but we operate within the wider energy transition plan team. So we have a team of 10 people, one from every department within the corporation, to

"Even when I look at liner trades and at green corridors, a lot of those projects are not going to go 'live' anytime soon. We are in a capital-intensive business and making the wrong [alternative fuels] decision could be fatal."

Garry Noonan, Director, Innovation, Ardmore Shipping

ensure that we're getting a depth of research across all different fields and not just the technical field."

While the remit of Noonan's position is broad, he admits that "formulating and executing our energy transition plan" is a primary focus.

"At the end of the day, we are a shipping company, so efficient ships are paramount to our business [success and profitability]," said Noonan, noting that innovation doesn't stop on the ship, with the company expending all efforts to optimize efficiency across the system.

While Ardmore has enjoyed a very strong financial run, Noonan said that "having a strong balance sheet doesn't really change my job all that much. It makes it easier to ask for money, but our philosophy has always been, 'If it's good for business, it's good for business whether you're in an up cycle or a down cycle.' In fact, in a bad market, the energy efficiency increases mean even more."

Inside Ardmore, each technology, each project must stand on its own, and while the technology palette at his disposal is broad, he sees the company joint venture with e1 Marine, which is a methanol to hydrogen reformation company, as a key enabler to fuel cells in deep sea and inland water. "We think that fuel cells have a great place in our industry."

Putting Tech to the Test

When it comes to narrowing down the technologies that he and Ardmore have found most beneficial to cut fuel and emissions, Noonan was pressed to select the one or two that truly stand out.

"I suppose one of my favorites is simply variable speed drives. Vessels are designed for worst case scenario, fully laden, full speed, under challenging environmental conditions. We rarely see one of them, never mind three of them all together. The whole engineering plant is designed to run at 100%. By employing variable speed drives on the main [energy] consumers, we've seen drastic reductions in our fuel consumption … almost a third of our daily hotel load has been reduced."

Proving to be both technically and financially successful, he notes that when they looked at the variable speed drive tech, they estimated a payback period of 18 months, when in reality its been a ROI in nine months.

Noonan also sees great value also in micro boilers. "We have waste heat units, or economizers, on the main engines – that's general practice – but not on the generators. "[By using them on the generators] we've been able to reduce a sizeable amount of our boiler consumption while in port. [It may not sound like much, but] depending on the environmental conditions, it could be upwards of a ton [of fuel] a day, which not too long ago was $800-$900. And one thing's for sure, future fuels are not going to get any cheaper, so efficiencies mean even more in the future than they will today."

Noonan admits that Ardmore has more work to do on the software and soft skills side, noting that this often involves culture change, which is a bit more arduous. But he said that here, too, Ardmore is seeking to engage the crew – including a WhatsApp group with the energy transition team and the ship engineers – effectively empowering them to not only suggest changes, but to see the monetary impact of the change.

"We don't have to tell you whether a [new technology] works or not; you just have to look at whether we've bought one of them or 22 of them."

Garry Noonan,
Director, Innovation,
Ardmore Shipping

"It's making a difference, and we can see them picking up the mantle and coming up with ideas," said Noonan, telling them "there's no point in telling me what you could have done yesterday, tell me what you can do tomorrow. You're trying to get across to the seafarers that they're not there to support us, we're there to support them. At the end of the day, it's a shipping company. Without ships, without seafarers, none of us would have a job. If you have 900 people looking for a problem, you'll see a lot more avenues for generating savings then you will if it was just 10-12 people in the office."

Whether it's hardware or software, Noonan stresses that each technology in and of itself must pass muster regarding Return on Investment to make it on the Ardmore fleet. "Every project has to stand on its own two feet," said Noonan. "One of the things you can be sure with Ardmore is, if it works on one vessel, it'll be on all of them. So we don't have to tell you whether a [technology] works or not; you just have to look at whether we've bought one of them or bought 22 of them."

Future Tech Fuel Savers

When looking at the myriad of new technologies available, from wind sails to air lubrication and everything in between, Noonan is pragmatic, noting that for its vessel size, the ROI on some of the newer technologies can run seven to eight years, not particularly attractive given the Ardmore fleet generally works with the oil majors, meaning Ardmore's ships generally have a 15-year life-cycle with the company.

"our ships have a life cycle of 15 years; so having a five-year timeline on a seven-year payback doesn't make economic

"I suppose one of my favorite [fuel reduction technologies] is simply variable speed drives. The whole engineering plant is designed to run at 100%. By employing variable speed drives on the main [energy] consumers, we've seen drastic reductions in our fuel consumption ... almost a third of our daily hotel load has been reduced."

Garry Noonan,
Director, Innovation, Ardmore Shipping

sense."

While he and his team aim to squeeze as much savings out of existing hulls and technologies, he believes that the truly monumental step changes would require an equally dramatic seismic shift in the industry in terms of true collaboration, true risk and reward sharing. But here he sees the very nature of the industry working against itself.

"You read some of the papers out there where there's a potential for 30% savings on CO2 emissions just purely based on the way we operate a vessel; to me, that would be the holy grail, long before we ever talk about future fuels. We're all well-aware that our industry is quite fragmented, but if we could get everyone on board, there's a lot we could do with what we have now."

As talk turns to energy transition, Noonan is cautiously optimistic. The first, and greatest challenge, is the fact that Ardmore operates on the spot market, making it difficult first and foremost to ensure its ships are positioned to get its fuel.

"For us in the spot market, without mass adoption, we simply can't make that decision," said Noonan. "Personally, and obviously Ardmore believes in methanol, in the near future we don't see a pathway to putting methanol propelled vessels on the spot market."

"Even when I look at liner trades and at green corridors, a lot of those projects are not going to go live anytime soon. We are in a capital-intensive business and making the wrong decision could be fatal," said Noonan.

When Noonan joined Ardmore, he envisioned being in the middle of the next great fuel wave in maritime.

But now – with the broad availability of future fuels at quantities required and the infrastructure to support them still more than a decade away – he earnestly believes that he won't see a substantial, industry wide adoption of alternative fuels in his career.

"I thought I was going to be in the middle of this massive transition, but if I'm frankly honest, I'm worried it's going to pass me, I won't be around for it."

A particular sticking point in the fuel transition will be the cost of the fuel itself.

"I understand people's skepticism [of future fuels] because if you're paying twice, maybe even four times the price for your fuel, if someone else is does not have to pay that, then they have a massive competitive advantage over you, which means you may not be commercially viable."

"I think in the grand scheme of things, unless we have price parity across the different types of fuels, you're not going to

get mass adoption."

Despite the obstacles, Noonan and his team work daily toward traversing the sizeable hurdles, and although he sees 'collaboration' as a grossly over-used buzzword, he admits that cooperation and shared risk taking could help to clear the energy transition path.

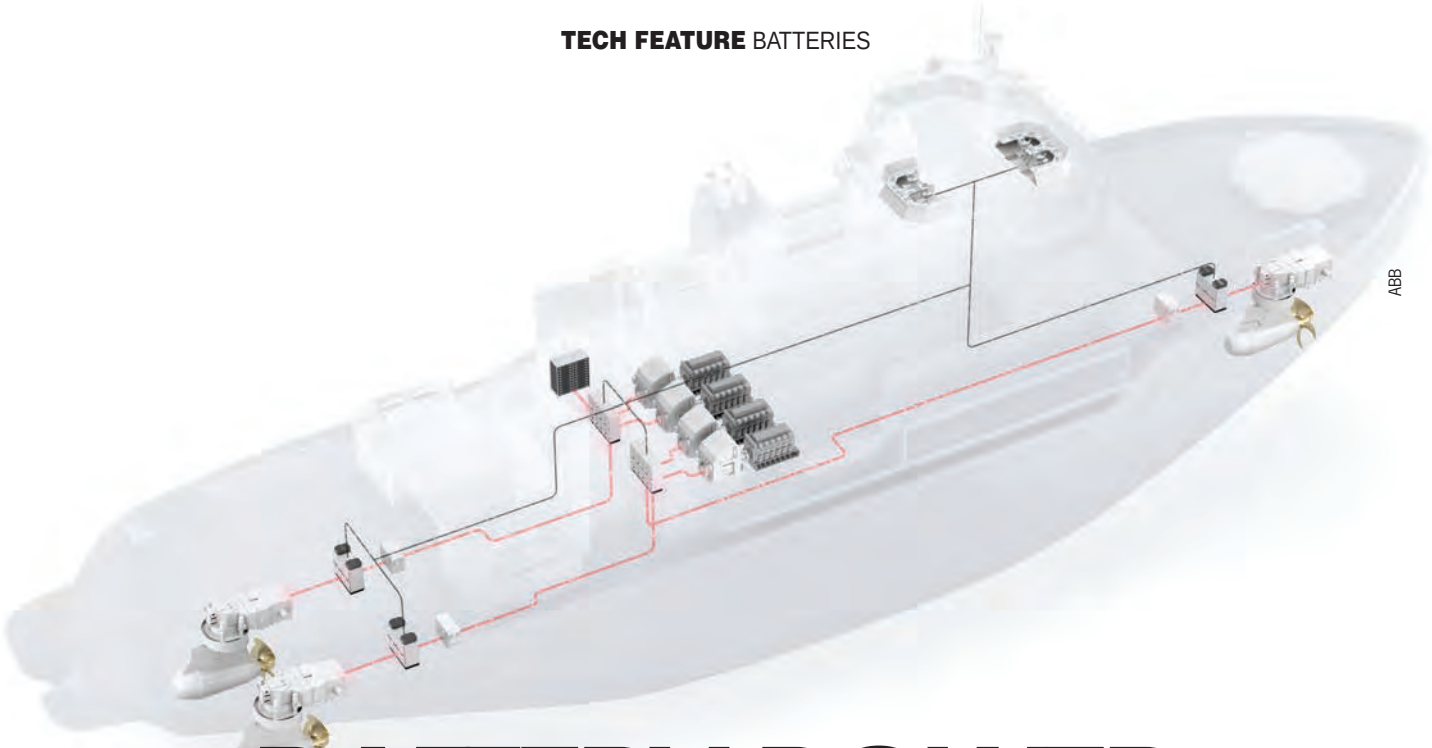
"One of our energy transition business streams is energy transition projects, which would be working with our customers to help them to overcome their decarbonization issues, using our expertise in helping them to build vessels specific for a trade and then putting them on long-term time charter where we could split that risk," said Noonan. "We can build ships, we can take the risk of the capital upfront, as long as we have contracts in place to share that risk."

For the moment, building new ships is not an option for Ardmore, but it maintains course in evaluating the technologies it will feature onboard when the time to buy invariably presents itself. "To buy new vessels right now would be massively expensive," said Noonan. "When it comes to new build vessels, right now the price is sky-high and no one's building for a reason. We're building up a fund so that when the prices do come back down, we can expand and hit our aspirations to be a bigger company, a bigger fleet."

A Unique Test of Marine Coatings

According to Garry Noonan, Director, Innovation, Ardmore Shipping, an essential fuel and emissions reduction tool is coatings. "When we look at hull coatings, paint is expensive; but when you compare it to the life cycle of the paint, it's relatively cheap," said Noonan. With that, Ardmore opts for the highest performing coating that it can, and historically it has used International Paint and Jotun, though it is trialing one vessel now using Hempel's X7. Evaluating a coating's real value in saving fuel and emissions numerically is a bit more unclear, as no two ship or ship routes are the same.

With that, Ardmore has put International Paint and Jotun to the test in a fairly unique way: "I'm not sure if it's an industry first, but it's certainly not very popular. We managed to convince both International and Jotun to paint one side of a ship each. The proof is in the pudding; we can see it. This, to us, was a way of actually cutting out that [paint manufacturer product claim] noise and saying: 'put your best product on this ship and we'll see whose is better.'" Noonan said they are in the middle of the test cycle, with results to come at a later date.



ABB

BATTERY POWER BREAKTHROUGH IN ICE

An ABB study based on three years of operational ship data mounts a case for integrating battery power onboard modern icebreakers, writes **Samuli Hänninen**, *who specializes in icebreaking vessels at ABB Marine & Ports.*

The maritime industry is still at the formative stage of realizing the gains available from batteries, but the ability to scale up to megawatt-hour levels is not the only attraction for the zero-emission technology. Evidence newly disclosed by ABB suggests that the improvements made to power efficiency and responsiveness can make a decisive difference for the performance of icebreakers operating in extreme conditions.

Demanding high installed power, icebreakers should also be efficient across a wide variation in power needs, especially given that they operate in areas where emissions face particular scrutiny. However, conventionally the need for high dynamic loads is met by oversizing generators running on fossil fuel – a solution which is highly inefficient when engine loads are low.

Slow load ramping is also a common problem for diesel engines, while new generation LNG engines are even less responsive. At the propulsion controls, icebreaker operators are often ready to respond but left waiting for engines to ramp up. Time lags like this can encourage what some call a conservative approach to operations, and others call out as inefficient: if an engine takes 10 minutes to warm up to 100 percent power, crew operating at loads in the margin between two and three engines will prefer to run continu-

ously on three.

Battery power integration by ferry and cruise ship owners offers strong guidance on the way instantly available stored energy can improve the performance of other ship power sources by assisting peak shaving or spinning reserve, as well as providing a zero-emission power alternative. Understandably, newbuilds account for the vast majority of battery installations to date, but the number of cruise, ferry and cargo ship retrofit projects is growing.

Cold Hard Evaluation

As a driver of sea-going battery power, ABB has evaluated the impact of installing an energy storage system (ESS) onboard icebreaker Polaris. Delivered in 2016 but still one of the most advanced icebreakers in the world, Polaris was the first ship in its class to run on liquefied natural gas (LNG), driving four Low Pressure Dual Fuel (LPDF) engine driven gensets. The vessel is owned and operated by the Finnish state-owned company and has combined electrical power plant output of 22.5 MW.

Like many icebreakers before it, Polaris features an Azipod propulsion system from ABB – in this case two 6.5 MW stern units and one 6 MW bow unit from the Azipod VI product family ranging from 6-17 MW, developed and tailored for icebreaking vessels. The high torque induction motors in the propulsors come with a simple and durable construction and can deliver up to 180 percent of over torque, ensuring that the propeller rotates even during the heaviest ice interactions.

Plug-in Simulation

Using data drawn from three full winter seasons operating in the Bay of Bothnia, ABB's Polaris study sets a new precedent in evaluating the impact of ESS technology on a new ship type.

With an overall objective of simulating a battery system that could absorb large load variations, to improve fuel efficiency and ramping capability, ABB uploaded powerplant load profile data from real operations in ice to a MATLAB file. The model evaluated the impact of an ESS Installation on total greenhouse gas emissions, primarily CH_4, in addition to reducing fuel consumption and improving the dynamic performance of the system.

The model worked using a hybrid power system that was simplified in comparison to real operations onboard Polaris, to consist of four main generators (auxiliary generator was excluded), one 4.5MWh and one main system load, with the battery to be charged from the generators. The dual-fuel engines were simulated to operate in gas mode or in diesel mode, with experience-based assumptions made on reduced engine efficiency at lower loads. A linear correlation between load fluctuations, fuel efficiency and CH_4 emissions was also assumed.

Based on a profile that saw Polaris at sea for four consecutive weeks, around 4,000 hours of operations were modelled over a 28-month period.

In the anecdotal example given, a conventionally powered ship working in ice-infested waters and operating at loads at the margins between two and three engines was maintained on three engines, based on the precautionary principle. However, the instant availability of additional power from a 4.5MWh ESS implies room for manoeuvre. The ESS will provide immediate propulsion power to cover the time it takes for additional main engines to come online, for example.

In the scenario given, safe operations should be possible for more of the time with two engines online supplemented by peak load battery power. From the Polaris simulation, ABB suggests that the immediate availability of power as needed would reduce main engine usage hours by up to a very substantial 46 percent of online time, with consequent fuel and emissions savings, and other knock-on benefits for maintenance and through-life cost.

Icebreaker Moves Ahead

Together, the operating profile and expectations on environmental footprint make the vessel type the ideal candidate to exploit the peak loading, spinning reserve and zero-emission power capabilities available through integrating batteries into propulsion. For LNG, ABB's simulation suggests that including the ESS onboard Polaris would result in a 38 percent CH_4 reduction, 16 percent less fuel consumption (based on 46 percent reduction in engine hours); for diesel, the result is a 10 percent reduction in fuel consumption, 36 percent reduction of engine hours.

By being more responsive to power load needs, the addition of the ESS will also improve the icebreaker's overall safety margin: an icebreaker engine working to overcome an ice ridge can be exposed to sudden over torque condition, for example; the power ramp with an onboard ESS-equipped vessel is no more than 10-12 seconds.

Despite the limitations of the model, ABB concludes that it is evident from the simulations that installing a battery can play a positive role in the power system of ships like Polaris. As well as reducing the number of engine running hours, the specific example highlights that the use of batteries would also lead to a reduction in the methane slip.

In addition, integrating battery power may be a route to broadening the safety envelope of icebreaking in a way that could allow for reduced installed power/number of main engines. It may be argued that, if most situations requiring full ahead power are relatively short in duration, it would be feasible to increase the capacity of the ESS and do away with one main engine. In some applications, ABB believes this is worthy of further study.

New Products

Innovative products, technologies and concepts

ABB's Whale Tail-inspired Propulsion Concept

ABB introduced what it said was a concept representing "revolutionary propulsion system breaking new ground for efficiency in the marine industry, inspired by the dynamic motions of a whale's tail." The innovative concept is called ABB Dynafin.

The new propulsion concept features a main electric motor that powers a large wheel rotating at a moderate 30-80 rounds per minute. Vertical blades, each controlled by an individual motor and control system, extend from the wheel. The combined motion of the wheel and blades generates propulsion and steering forces simultaneously, enabling ground-breaking operational efficiency and precision for ships, accordnig to ABB.

©ABB

The concept follows ABB's "proven design philosophy in marine propulsion of gearless power transmission," the company said.

According to ABB, an independent study of ABB Dynafin from OSK-ShipTech A/S of a passenger vessel design equipped with different propulsion solutions has verified savings in propulsion energy consumption of up to 22 percent compared to conventional shaftline configuration.

This can deliver significant savings in fuel consumption and help to avoid emissions. As part of an electric propulsion power system, the concept is also fully compatible with zero-emission battery and fuel cell technologies, ABB said.

Volvo Penta Debuts All-new IPS Professional Platform

Volvo Penta debuts the all-new Inboard Performance System (IPS) professional platform. Targeted for 2025 and building upon the efficiency of Volvo Penta IPS, this new platform promises a powerful and flexible solution for professional vessels and superyachts from 25 to 55+ meters with top speed from 12-40 knots. Designed to be larger and more versatile, it will be prepared for a range of energy sources, while also featuring a new level of premium support and features.

The Volvo Penta IPS will feature the largest and most powerful platform in the Volvo Penta IPS range – including a new, larger marine drive, Volvo Penta IPS 40. The new drive is designed with a dual power input concept, which manages the power to the water in the most efficient way, but also acts an important enabler to utilize different combinations of energy sources. Starting series production in 2025, the new Volvo Penta IPS 40 drive will be powered by two Volvo Penta D13 engines, paired with a compact after treatment system to comply with the latest IMO Tier III standards.

© Volvo Penta

But, the platform is already prepared for a mix of power sources; from combustion engines running on renewable fuels to fully electric or hybrid solutions. The platform is installed as twin, triple or quad, meaning each vessel will have from 4 to 8 power sources.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Mitsubishi, Nihon to Design, Build LCO2 Carrier

Mitsubishi Shipbuilding and Nihon Shipyard—a Tokyo-based joint venture for ship design and sales between Imabari Shipbuilding and Japan Marine United Corporation—have started a joint study for the development of an oceangoing liquified CO2 (LCO2) carrier. Nihon Shipyard is pursuing this project with the aim of completing construction of the vessel from 2027 onward. Demand for LCO2 carriers is expected to grow in the future as a means to transport large volumes of CO2 safely for CCS (carbon dioxide capture and storage) projects, in which captured CO2 is stably stored underground. Following the lead of the EU region, it is expected that CCS projects in Asia will be accelerated by the promotion of national governments, it will be essential to establish a shipbuilding framework in Japan to meet the demand for LCO2 carriers. This project will take advantage of the knowledge and advanced gas handling technology that Mitsubishi Shipbuilding has acquired in designing and constructing liquified gas carriers (liquified petroleum gas (LPG) and liquified natural gas (LNG) carriers), as well as the wealth of shipbuilding experience for various type of vessels and advanced technology capabilities that Nihon Shipyard has accumulated over the years, as strengths that can be mutually supplemented.

Image courtesy Mitsubishi, Nihon

SHI European 'Road Show' Showcases New Ship Designs

Samsung Heavy Industries (SHI) held a Technology Road Show in Europe as an official debut of its new ship designs. SHI held its "Samsung Technical Seminar in Athens" at the Marriott Hotel in Athens, Greece, and announcing details on a pair of new designs: an LNG carrier and a containership.

SHI reports the event attracted 70 people from 35 companies, including shipowners such as Minerva, GasLog, Shell and Total. "The technology road show is SHI's active marketing method for new design and innovative technologies and is the most effective way to increase contact with customers," said Jang Hae-ki, vice president at SHI, "cosidering favorable responses from ship owners, it can be a barometer to predict future orders."

SHI said the '3 Cargo Tank LNGC' is designed to have increased efficiency, sporting three cargo tanks rather than the usual four. In addition, SHI said the boil-off rate has improved by more than 5% as an area where LNG touches the cargo tank is reduced, and maintenance costs are also greatly reduced thanks to a decrease in the number of equipment and parts for each cargo tank.

The design was jointly developed with GTT, the French company specialized in membrane cargo tanks, and has received an AIP from Lloyd's Register.

The 'Eco Container Ship' secured additional space to load 8% more containers by separating a ship's operating part and cabin area. In addition, it was designed to use methanol and ammonia as a fuel in the future.

In addition to the new ship designs, SHI promoted its eco-friendly ship technologies such as carbon capture storage, fuel cells, ammonia and hydrogen.

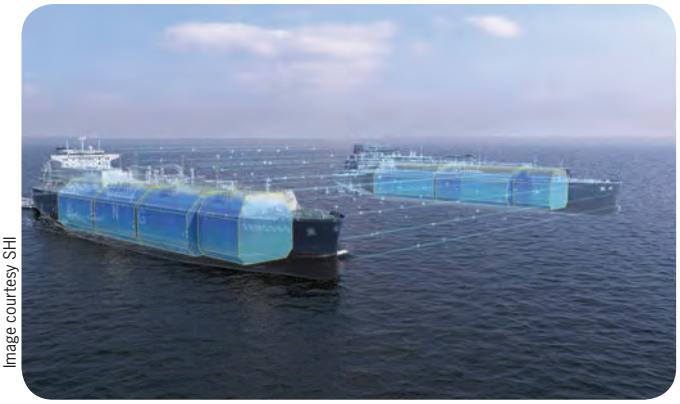

Image courtesy SHI

Eco Container Ship' which SHI first unveiled at the Road Show.

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A major fleet owner-operator wanted to improve margins by analyzing fleet performance and optimizing vessel voyages while increasing compliance. With so many specialized maritime software options to choose from, maritime professionals can be easily overwhelmed.

ABS Wavesight's My Digital Fleet™ provides a one-stop solution. My Digital Fleet software (including the My Dashboard, Daily Fuel Monitor, Vessel Performance Monitor and Environmental Monitor modules), combined with Sofar Ocean's Wayfinder™ voyage guidance, delivers comprehensive meaningful insights.

In this real-world example, the client was provided with dynamic RPM and voyage routing guidance and now has access to real-time analytics into key vessel performance metrics such as power, speed, resistance, fouling summaries, daily fuel consumption and CII monitoring. To see the full results, **scan the QR code below**.

ABS WAVESIGHT™