MARITIME REPORTER AND ENGINEERING NEWS

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May 2024

Arsenio Domínguez

The man and his mission as IMO's new Secretary-General

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THE EVOLUTION OF PROPELLER SHAFT LINES

THE ELIMINATION OF THE STERN TUBE

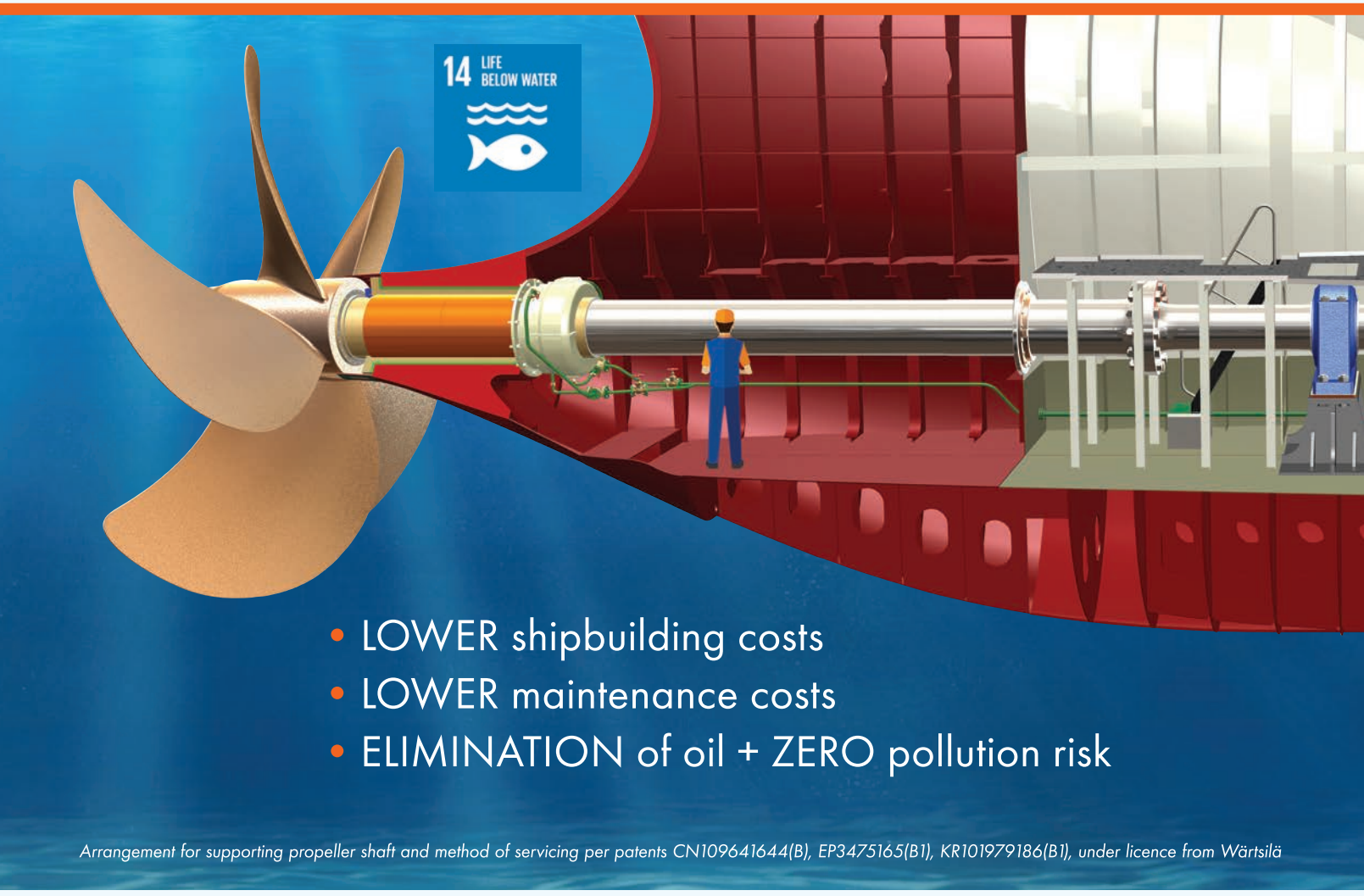

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Photo Justin Zurre

This edition is touted as the 'green marine' edition, but to be perfectly fair, nearly any edition, any industry, any month could be touted 'green', as decarbonization and all that it entails is all around us ... and it's not going anywhere. More accurately, this edition could be tagged as the 'Green Marine Leadership' edition, as in the past two months we have traveled around the world and were given the opportunity to sit with a trio of maritime leaders, starting with our cover interview with **Arsenio Domínguez, the 10th Secretary-General of the International Maritime Organization (IMO)** who just started in this post in January 2024.

I was afforded the opportunity to interview Domínguez while in London in early March for the subsea technology exhibition Oceanology International, and given the IMO's central role in laying down the international mandate for maritime regulation, it's useful to have the 'view from the top.' He is on a mission to help transform both the IMO and the industry it serves for the coming generation, using clear, two-way communication as his tool of choice, while leaning on two salient bits of advice learned early in his career: [1] Learn the business side of maritime, and [2] Always be humble. From my first one-on-one encounter with him, Panamanian native seems a grounded, well-rounded leader who is eager to dig in, engage industry and help work toward solutions to some very difficult problems lying on his desk. His story, "Mission Possible," starts on page 28.

While the IMO is a driver on delivering new marine regulation, classification is a critical hinge partner with all stakeholders – from government to vessel owners to shipyards and equipment suppliers – to ensure that the tech and procedure is able to withstand the rigors of a life at sea. Our class coverage is voluminous and pervasive throughout this edition, starting with my one-on-one with **Hiroaki Sakashita, President & CEO, ClassNK** in his office in Tokyo, and continuing with Wendy Laursen's broad overview of how class is playing a critical role in paving the maritime industry's new fuel path.

Tying this altogether was our interview with **Caroline Yang, CEO of Hong Lam Marine and President of the Singapore Shipping Association.** I met with Yang briefly on the sidelines of Sea Japan in Tokyo – the interview had already been conducted a month prior – and she is a dynamic and busy maritime leader. Here insights are particularly welcome in this edition, as Hong Lam Marine is a big logistics player in the world's largest bunker fuel market, and its 33 ships – all owned, operated and managed in house – supply fuel to fleets operating in and around Southeast Asia.

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AI to Maritime Trainers: *"Watch Your Back"*

By Murray Goldberg, CEO, Marine Learning Systems

Last week's headline in the *Financial Times* was startling to me: **"Andreessen Horowitz raises $7.2bn and sets sights on AI start-ups."** Oh boy. Andreessen Horowitz is one of Silicon Valley's most prominent venture capital firms with an eye for investing in the next generation of tech companies that will change our lives. Their new fund tells us that the people who know the science of AI now believe it is poised to make an outsized global impact. AI is no longer a "tomorrow" thing. It is a "today" thing. And it may not be long until we start to find out who is correct - those who fear it, or those who welcome it.

Clearly the impacts, both good and bad, will touch every part of our lives. But since we are a community of maritime trainers, let's explore one very narrow but interesting question about the possible impact of AI.

Will AI replace us as maritime trainers? Or will it just help to make us more effective and more efficient?

Well, it is a good question and there are some fairly credible arguments on both sides of the debate. While the topic is enormous and we can only touch on a sliver of it here, let's dive right in to the heart of the argument.

"AI will replace trainers"

Central to the "AI will replace trainers" argument is that AI can process and analyze vast amounts of data much faster than we humans do, and in many ways, it is already doing so with more insight than we can. This could help to produce better and more consistent training outcomes. AI-driven programs can run 24/7 without the need for breaks or downtime, providing training opportunities that are not limited by human constraints.

Consider an AI-driven virtual training module that is designed to teach navigational skills. Trainees log into a cloud-based training system that operates 24/7. The system presents interactive scenarios based on real-world data, such as navigating through busy shipping lanes or poor weather conditions. The AI assesses each trainee's decision in real time and provides immediate, detailed feedback. If mistakes are made, the AI system automatically generates additional relevant scenarios until the trainee demonstrates proficiency, ensuring a consistent level of competency across all trainees. All, by the way, in the native language of the trainee.

This highlights a point that speaks to the heart of the potential for AI to replace trainers. AI technologies, particularly machine learning algorithms, can continuously adapt the training they deliver based on real-time performance data from the trainee - whether that data is gathered during training or on the job. This level of training customization for each individual will easily exceed what is feasible in human-led sessions where trainers might struggle to provide personalized attention to each member of a group. Essentially, every trainee would now have available to him or her a fully dedicated, 24/7, expert trainer who is deeply aware of their trainee's ca-

pabilities, knowledge, and experience, and who exists for no purpose other than to maximize the skills and knowledge of that individual trainee.

As an example, consider an AI system that is used for training the skill of engine troubleshooting. Each trainee starts with a diagnostic test that the AI uses to identify their current knowledge level and learning pace. The AI then customizes the curriculum separately for each individual, focusing on areas where the trainee is weakest. If a trainee struggles with fuel injection systems (for example), the AI provides a series of interactive, step-by-step tutorials and simulations specific to fuel injection problems. As the trainee improves, the AI increases the difficulty and complexity of the problems, ensuring the trainee is continuously challenged and engaged.

And meanwhile, as the trainee is learning, so is the AI! It is learning lessons about which techniques work best with various trainees and will incorporate those lessons into its future work with these and other trainees. In this way the AI itself is continuously improving.

In each of these examples above, the training experience is fully automated and personalized - no human trainer required. And conceivably, it will be better at it than we are. However, the question remains whether an AI is capable of a nuanced understanding of the trainee's needs, the ability to adapt to completely unforeseen circumstances, and the personal mentorship that human trainers excel at. Will human trainers still have anything to offer that AIs don't offer now and might never be capable of? If so, perhaps AIs will be a powerful tool of, rather than a replacement for we human trainers. We simply don't know yet.

In the next edition of *Training Tips for Ships*, we will look instead at the potential for a collaborative working relationship between trainers and AIs to bring the best of both worlds to the training mix.

Until then, thank you for reading and sail safely!

The Author

Goldberg

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Hybrid Blood, Sweat, and Tears.

By Rik van Hemmen

In earlier columns, I have discussed various approaches and issues with Hybrid Propulsion. I have now had the pleasure of a number of years of experience with the design, operation, upgrade, modification, and maintenance of ship (and car) hybrid propulsion systems and may be able to make a claim of gradually becoming a little less confused.

It is still not easy, but at the same time, I am starting to see a few shortcuts that make it less likely that a beautiful vision of marine efficiency ends up being beached somewhere.

In essence, they are variants of the KISS (Keep It Simple Stupid) principle. KISS in marine design was never easy, but when KISS needs to be integrated with sustainable design it become even more complicated.

In particular I have become very cagey of IC/battery electric hybrid systems. These are the systems that are basically diesel-driven, but use a battery setup in the same way that the original Toyota Prius used a battery for boost. In running the numbers in certain applications (like docking tugs), it becomes apparent that this can result in decent CO2 emission reductions.

A number of such systems have been installed, and some work. However, when they don't work for any one reason, these systems are very difficult to fix because they tend to be heavily integrated systems. If any one component acts up, the whole system shuts down. Ashore, that means the car gets taken to a dealer, spare parts are sourced, installed in a dedicated facility, and the car is put back on the road.

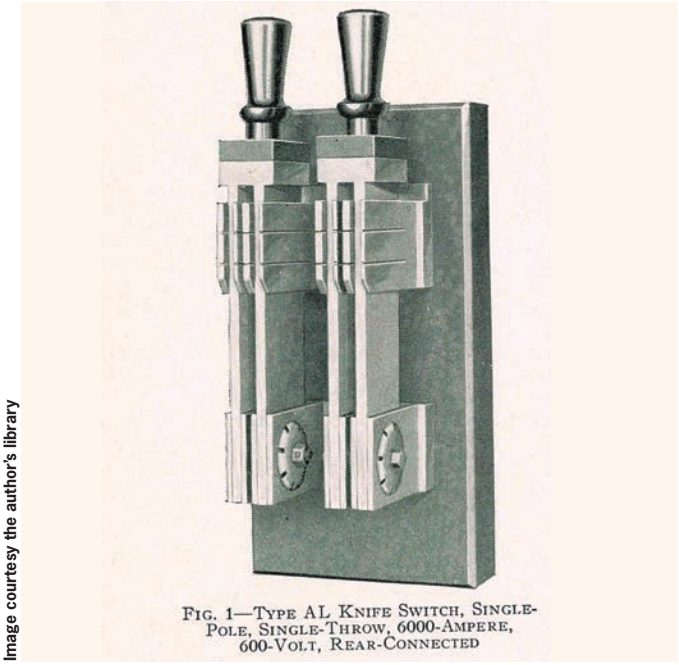


Image courtesy the author's library

FIG. 1—TYPE AL KNIFE SWITCH, SINGLE-POLE, SINGLE-THROW, 6000-AMPERE, 600-VOLT, REAR-CONNECTED

In maritime, that does not work out so easily. There can be any number of obstacles in getting the vessel back onto the water. The parts may not be readily available. The service technicians may not be readily available. There may be auxiliary system bugs or spikes that result in intermittent failures, and most frustrating of all, the OEM may tell the ship owner that they no longer support the equipment/software, or repair technicians.

In the worst possible case, the owner is looking at a pile of components with very little prospect of getting the vessel to run again. In the best possible case, the vessel can run as a conventional (inefficient) diesel powered vessel if the engines are geared to the shafts, possibly for the rest of its life.

It appears to me that ship hybrid system designers have tried to give the ship's crew the same experience as a hybrid car owner; somewhat reduced emissions by fitting more magical stuff. However, a ship's crew is not a hybrid car owner. A ship's crew is actively engaged in the planning of the use of its available and required power. A car operator does not ponder whether they need to run one or two auxiliary generators, but a ship operator does.

A marine hybrid system should not make decisions for the operator; it should allow the operator to make decisions. Therefore, a system that automatically brings in battery boost is not of great use. A ship operator will know when she needs boost, and can then look at her batteries to see how much boost is available and decide to bring it online.

So, instead of sophisticated software and controllers, we need to think in terms of the modern equivalent of big knife edge switches that can engage and disengage power suppliers as needed by the crew.

Don't for a second think the crew is not smart enough to do that. This is what crews do; they anticipate their needs, whether it is food, sleep, maintenance. or power. And if your crew does not do that, it is probably time to get another crew, because your ship has become an accident waiting to happen.

So, what does KISS mandate then for hybrid systems?

From my side of the problem (vessel designer and operator), it looks like we need to design for CO2 reduction, redundancy, and economic upgrades.

As far as I have been able to figure, that can only be achieved one way, and that is by electric drive. Every new vessel needs to be built with electric motors driving the shafts that can take electric power from any one, or a combination of electric power generators. (And should be as isolated as possible from the auxiliary electric bus to prevent voltage spikes and other gremlins.)

The actual propulsion controls (the throttles) are integrated into the electric drive system, but the electric power producers are only very lightly integrated into the propulsion controls, and the operator can manually select whatever power input it has available. If there is battery capacity and the trip is short, she may choose to just run on batteries. If it is a long run and another power supplier is a methanol fueled generator, she may choose to bring that unit online when needed. If they can be designed to run simultaneously, that is fine, but it should always be possible to move a big knife switch and force the system to work on just batteries or just the methanol-fueled generator. That seems clunky, but this is the feature that allows ship operators to make decisions about getting home, rather than getting stuck with complex troubleshooting somewhere far away from help with a system that has decided to shut down.

When the vessel propulsion core is electric drive, the possibilities to achieve zero carbon become available as technology advances, and that can be more economically achieved than with complex hybrid system upgrades.

Initially (but hopefully not), the vessel may be diesel electric drive. That is not a great solution, but it would not be economically prohibitive at some stage to toss the diesel and go to batteries, or to add batteries and use the diesel less, or to convert the diesel to methanol. In other words, the system should be designed for progressive upgrades and avoid any controls that may become obsolete or may suffer from programming bugs, voltage spike gremlins, or loss of OEM support.

Since hybrid systems tend to be designed for specific trades, what is even more fun is that the "electric drive first" approach allows more economical modifications of a vessel when it changes trades. For example, a ferry may originally be designed for a relatively large range with an LNG powered electrical generator, but partway into its economic life, it may become a candidate for a shorter or slower run, and with emerging battery technologies and shore charging, she may be an attractive candidate for a true zero carbon configuration of batteries alone. Since the vessel is inherently electric drive, the upgrade will be no more that battery installation and removal of the LNG IC system and that is a good thing, because scrapping useless vessels for new ones also emits CO_2.

For each column I write, **MREN** has agreed to make a small donation to an organization of my choice. For this column I nominate the **Virginia Maitland Sachs Foundation, *https://www.virginiamaitlandsachsfoundation.org/about***. This organization introduces young people to maritime careers as their path to the middle class, and complex but satisfying careers.

Building the Next-Gen Maritime

Prepositioning Ship & Auxiliary Crane Ship

By Jerit VanAuker, Taluga Group, Military Sealift Command

M/V Ocean Jazz can be configured to carry containers, vehicles and even aircraft, including this Apache helicopter being loaded in Hawaii.

Military Surface Deployment and Distribution Command photo by Donna Klapakis

The Military Sealift Command's Maritime Prepositioning Ships (MPS) and Auxiliary Crane Ships (ACS) were built 50 years ago to pre-position vehicles and supplies in forward locations and load or unload them in undeveloped or damaged port facilities.

I serve with MSC's Taluga Group, charged with finding innovative solutions to pressing problems. One of those challenges is meeting the MPS and ACS mission as the current ships continue to serve past their expected service lines.

To support distributed maritime operations (DMO) means we still need prepositioned material on vessels and the ability to handle their cargos, and we must anticipate the need to do so in a contested logistics environment.

Many of the MPF and ACS vessels employed today by the Navy provide Roll-On/Roll-Off (Ro/Ro) and/or Lift-On/Lift-Off (Lo/Lo) capabilities and have functioned very well. However, these vessels lack a Float-On/Float-Off (Flo/Flo) capability that could be used to support Expeditionary Advanced Base Operations (EABO) and Advance Naval Base (ANB) replenishment, heavy lift requirements, maintenance and repair vessel, transport barges or act as a mother ship for unmanned vessels. Moreover, these ships are old.

For example, the first of the five USNS 2nd Lt. John P. Bobo (T-AK 3008) class of roll-on/roll-off ships was completed in 1985, and chartered by MSC until 2007, when it was acquired by MSC. The 683-foot, 40,846-ton 2nd Lt. John P. Bobo is currently part of the U.S. effort to provide pier facilities to deliver humanitarian supplies to Gaza, but suffered an engine room fire while enroute to the Mediterranean, which may be indicative of the fragility of gaining sealift assets.

The ACS vessels are more than 50 years old and were converted to their current roles. The first, the 668-foot, 31,500-

ton SS Keystone State (T-ACS 1) started life as a commercial breakbulk ship in 1965, and acquired by MSC in 1984 and converted to its current role.

As we recapitalize the prepositioning fleet, I propose the next generation of MPS and ACS vessels could not only be similar, but potentially even be the same vessel.

MSC has contracted for the use of J-Class "Open Hull" vessels to support Department of Defense missions in the past. They are heavy cargo, semi-submersible Flo/Flo, Ro/Ro and container-fitted Lo/Lo vessels. These ships might be more broadly described as maritime support vessels or multi-mission capable vessels, because they have great potential for a spectrum of military support missions.

The existing well deck could be modified to add vertical watertight bulkheads, tween deck, and hatch covers. It should be fitted for dangerous cargo as defined by International Maritime Organization (IMO) Safety of Life at Sea (SOLAS), and smoke detectors, CO2 system and a sprinkler system should be installed. The stern ramp would permit vehicles access to the well deck, and additional ramps can provide access to the tween deck and the maindeck.

Flo/Flo capabilities would allow transporting of numerous military related items, such as Navy or Coast Guard patrol boats, landing craft or the Improved Navy Lighterage System (INLS). Additionally, we would require a vessel with a few large cranes that can conduct a 350-ton lift; with the ability to support container handling from other container ships.

By adding a dynamic positioning system (DP2), compensating cranes, berthing modules, tween decks and Flo/Flo capability would allow her to maintain station without having to anchor in most sea states; safely discharge cargo to other vessels while her load remains relatively stable; load and discharge the INLS, and serve as a crane ship and floating pier in austere ports. Both DP2 and compensating cranes are commonly used in the oil platform and wind farm industry; this technology already exists and would enhance the Navy and Marines' capabilities.

The current MPS and ACS fleet are larger vessels that what we envision here. By comparison with MSC's T-AKRs and T-AKs, the vessels on the commercial market today are smaller but bring additional capabilities. To obtain this capability quickly, existing commercial ships can be converted. Eventually, the Navy should look at a newer version built in U.S. shipyards for the sealift fleet. U.S. yards are up to the task, and building these types of ships would be a boost to the U.S. ship construction industry.

A class of "Open Hull" heavy cargo, semi-submersible Flo/Flo, Ro/Ro and container-fitted Lo/Lo vessels would provide the Navy and Marine Corps a range of versatility that permits different configurations, and would be suitable replacements for the MPS ships in our Naval inventory.

2024 Decarbonizing Shipping

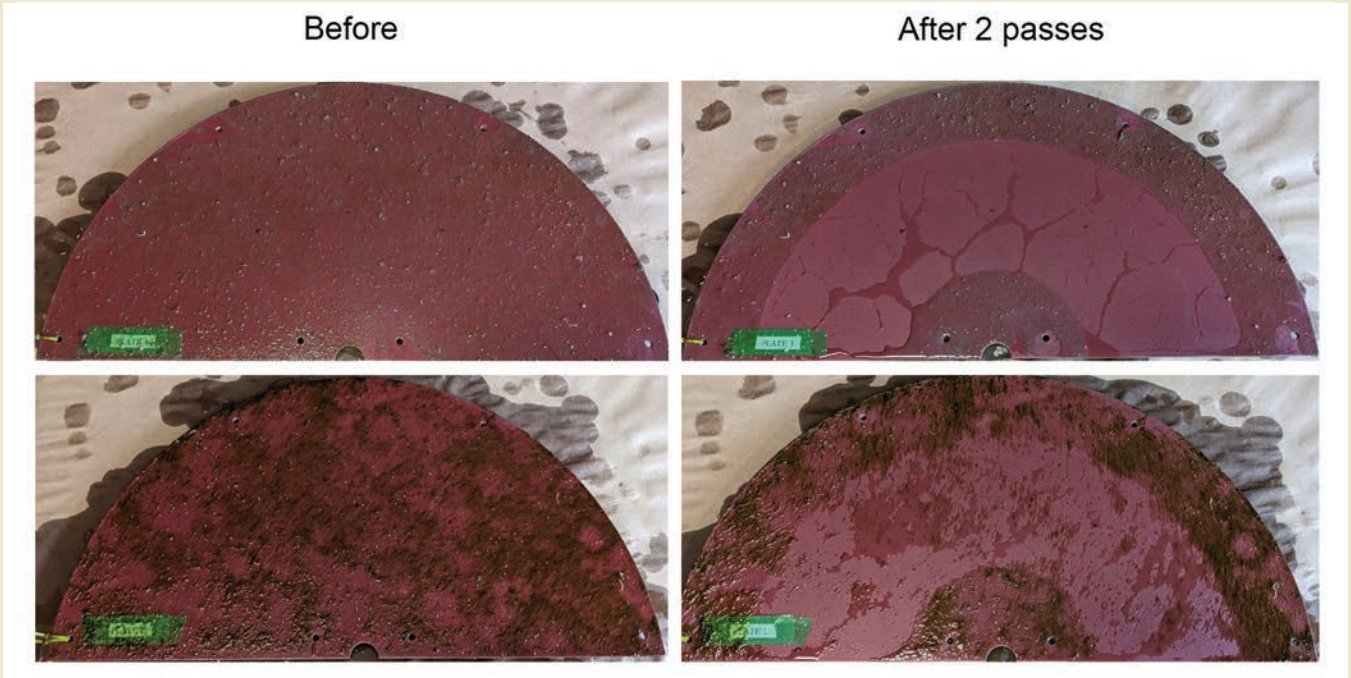
The maritime industry is well aware of a long-standing and challenging problem: biofouling. Biofouling is the accumulation of microorganisms, plants, algae, or small animals on surfaces submerged in water. When present on the surface of ship hulls, this growth can create drag, which increases fuel consumption and carbon emissions. According to the IMO, even a thin layer of slime, about 0.5 mm thick, covering only half the hull can increase emissions by 20% to 25%. If our industry hopes to radically reduce the amount of emissions, we simply have no choice but to address hull fouling differently than how we do today.

Biofouling is, of course, not a new problem. Humans have been contending with the effects of biofouling for as long as ships have been in the water, before written records. As far as we know, we have used materials such as coal tar, animal hair, tallow, wax, lead, and copper sheathing to make hulls slicker and more resistant to fouling accumulation. Today, we have advanced coatings applied to hulls to help reduce the growth and presence of fouling on hulls, but we know that even the most advanced coatings cannot keep a hull fouling-free forever, and when coatings fail, most vessels are cleaned by abrasive in water cleaning methods administered by divers.

However, in recent years, a new wave of proactive solutions using robotics has been introduced to the market, which provide vessel owners and managers with new options for improving their vessel's performance, reducing fuel consumption, and helping move our industry towards a greener future. EverClean, a service of Greensea IQ, one of the first of these solutions to market, challenges the current paradigm of hull cleaning by supplying regular, in-water maintenance by advanced subsea robots that have proven safe for many coatings. By regularly maintaining vessel hulls, EverClean can keep the hulls always clean, allowing vessel owners and managers to achieve not only a better-performing hull but also reduce fuel consumption for the entire lifetime of their coating.

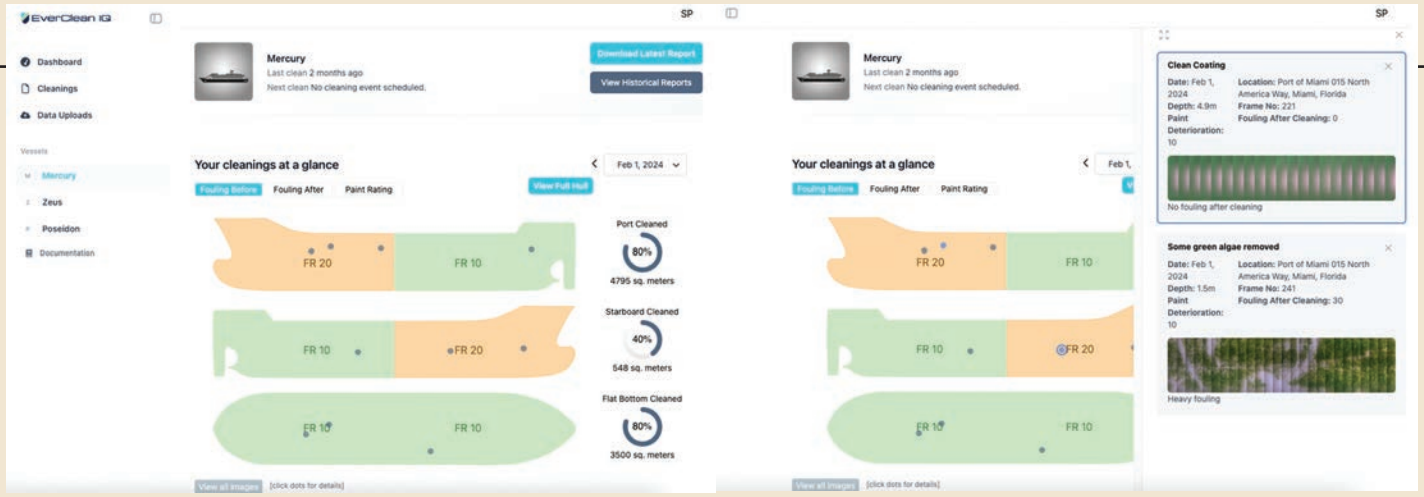
Coating Thickness Levels Maintained

In Greensea IQ's Advanced Coating Test Facility, EverClean



All images courtesy of Greensea IQ

Above are test plates from Greensea IQ's Advanced Coating Test Facility



A typical EverClean IQ post clean report is shown above with coating report inset.

can ensure that coating thickness levels are unchanged while running several passes of our proprietary nylon brushes. This ensures that coatings are not degraded during regular cleaning events and continue to perform at optimal levels. Greensea IQ understands the investment made in coating a ship and sets out to provide ship owners and operators a solution that works on all coatings. EverClean is the only currently fielded solution that has partnered with several coating manufacturers to demonstrate the effectiveness of the EverClean solution on some of the most common coatings on the market today. This ensures that as the proactive in-water maintenance solution EverClean gains adoption commercially, coating companies can maintain compatibility with the EverClean approach to biofouling management.

In addition to developing and deploying robots to address biofouling and reduce carbon emissions, EverClean is modernizing vessel cleaning in other ways. Diver-based cleanings are typically followed with a written report on the condition of the hull with some limited images of any issues identified. However, these reports are limited in scope and can draw scrutiny from vessel owners and managers who may not trust the data presented. Because of the cleaning conditions, it's often difficult for divers to know where they are precisely on a vessel, and they may not be able to see or capture all hull conditions. Due to EverClean's advanced autonomy and navigation, the EverClean robot is not only able to locate its position but, due to a variety of sensors and cameras installed on the robot, see what divers cannot – the entire surface of the hull to ensure that vessel owners and operators have a complete understanding of their hull's condition and performance.

With the launch of EverClean IQ, EverClean's reporting and data platform, users can now login to a web interface to view the latest data collected from their hull, including maps of where the robot was able to clean and images on its path. Due to the completeness of the cleaning provided, EverClean IQ can showcase an image from the same location from cleaning to cleaning, allowing vessel owners insight into not just where fouling is accumulating, but how quickly.

Data Consultation and Performance Improvements

Of course, none of these advancements in robotic cleaning and report digitization matter to the industry or our efforts to decarbonize if the EverClean solution doesn't deliver on performance improvements, cost savings, and carbon emissions. The industry is working hard to precisely measure and quantify performance in the hope of isolating performance degradation due to biofouling. As a result, EverClean is again the first to offer one-on-one data consultation with our customers to ensure that this novel approach to performance improvement is indeed delivering to users the performance improvements that they require to reach their environmental goals. In a recent analysis utilizing the ISO 19030 standard of one of our largest customer's vessels, EverClean achieved a **20% fuel savings in** the **8 months** the vessel was regularly serviced, equating to roughly **320 tonnes of fuel**. Through this approach, EverClean believes it can save most vessels between 5% - 20% of fuel with regular servicing, amounting to a significant reduction in carbon emissions for vessels on the water today, ensuring vessel owners can start to realize these savings now.

To meet the ambitious decarbonization targets of the industry, prioritizing biofouling control is essential, given its potential for significant cost savings. Innovations such as advanced robotic hull cleaning, enhanced coating research, digital reporting, and precise performance metrics are simplifying the transition for vessel owners and operators toward a sustainable, modern maritime future.

The Author

Glowacky

Paige Glowacky serves as the Senior Product Manager for EverClean at Greensea IQ. Before her tenure at Greensea IQ and entry into the maritime sector, she held Product Manager positions at various late-stage startups within the technology and financial industries.

Momentum Builds for Ammonia as Technology Solutions Mature

Strong demand is driving development but emissions issues remain, writes René Sejer Laursen, ABS Director – Fuels & Technology, Global Sustainability

The interest in ammonia stems both from its zero emissions when used as fuel and because its production isn't dependent on biogenic carbon sources.

To realize large-scale production of green ammonia to serve new markets, its production capacity, along with that of renewable electricity and green hydrogen, will need to grow tremendously.

Current projections for the growth in global production indicate there will be enough renewable electricity to produce the volumes of green ammonia needed for the maritime fleet alone by 2040. However, because shipping will also be competing with many other industries for both the renewable electricity and green hydrogen necessary to produce ammonia, as well as with other sectors that depend on the consumption of green ammonia such as agriculture and coal fired power plants, supply is expected to be constrained.

Propulsion Technology

First tests have been performed using ammonia as fuel in combustion engines by several of the main engine manufacturers.

Though the amount of pilot fuel and levels of NOx, NH3 slip and N2O emissions have yet to be quantified for the commercial marine engines, marine engine makers generally agree that the Diesel cycle is best suited for combustion of ammonia.

Research is ongoing for both diesel and otto cycle combustion concepts. Optimising emissions reductions is foreseen as a challenge and control of N2O and ammonia slip requires high temperature combustion which also generates high NOx levels.

Tests on two-stroke engines have shown that NOx is less of a problem using the Diesel cycle combustion principle when burning ammonia. When ammonia is injected into the combustion chamber, it expands and generates a cooling effect that removes the high peak temperatures in the combustions zones that generated the high NOx.

Pilot fuel is necessary to ignite ammonia and it is also needed to keep combustion stable. For smaller four-stroke engines, 10% pilot fuel is required once engine optimisation has been completed and after the engine is in service. For large two-stroke engines using Diesel cycles, just 5% pilot fuel is required, and some engine makers expect that this amount can be further reduced.

Assessing Emissions

The actual amount of NH3 and N2O emissions is still to be accurately assessed, however, emissions are expected to be low, particularly for the Diesel combustion cycle. Even so, with N2O having a 20-year global warming potential (GWP) of 264 and a 100-year GWP of 265 according to IPCC 2013-ARS, the emitted levels may negate much of the CO2 benefit of using ammonia as a fuel. This remains a significant potential barrier to adoption.

Two-stroke marine engine designers have, however, found in their tests that N2O level are low - in the same range as we see for other fuels including marine diesel, LNG and methanol. Overall it seems that the Diesel combustion principle is ideal for use of ammonia since the temperature in combustion chamber hits a 'sweet spot' where the NOX, N2O and ammonia slip levels are recorded at a very low level. It is therefore expected that those engines will be able to operate to IMO NOx Tier II standards without any need for an abatement system.

As of Q1 2024, the main marine engine makers have the following development plans and lead times for ammonia-fueled engines:

- Two-stroke ammonia dual fuel engines covering power ranges from 5 MW to 31 MW. These engines will be available for delivery starting from Q4 2024/Q1 2025.
- Four-stroke ammonia engines as dual fuel gensets engines are also becoming available. Two engine manufacturers will launch this type of engine at the end of 2024 or beginning of 2025.

Safety and exhaust treatment

Most engine designers expect that exhaust gas after-treatment will be needed to comply with the IMO NOx Tier III standard, and all of them expect to specify Selective Catalytic Reduction (SCR) as the preferred means of cleaning the exhaust gas after it has left the combustion chamber, rather than exhaust gas recirculation (EGR) which changes the combustion conditions thereby limiting NOX formation. The EGR is reducing

the amount of oxygen in the intake air, and the fear is that this will have a very negative impact on the performance of ammonia combustion, but this is still to be investigated.

In addition to main engines and gensets operating on ammonia, designs are also emerging for auxiliary engines required to complete the transition to vessels running on ammonia. Boilermakers are preparing dual fuel boilers for use with ammonia as fuel to be able to generate steam and heat from burning ammonia.

Working with ammonia onboard on a day-to-day basis requires a solution to collect ammonia vapor in a safe manner. Different solutions for vapor handling are under development from several manufacturers, including water scrubber designs that can remove ammonia vapor from the purge air. In this solution, ammonia vapor is stored in dedicated tanks as a water-ammonia solution. However, this approach would require dedicated infrastructure at the port to receive and store it.

Ammonia Value Chain

Illustration Courtesy ABS

The Author

Laursen

René Laursen serves as a Director of Sustainability for ABS, leading the ABS Copenhagen Sustainability Center. In his current role, he supports shipowners in selecting the best technologies and fuel mixes for their fleet.

Source: AI generated in ChatGPT by the Author

THE MISSING LINK IN DEEP SEA MINING SUPPLY CHAIN

By Phillip Gales

As companies approach the exploitation phase of Deep Sea Mining, one critical factor is the transportation of mineral ores from the mine site location to onshore refineries

While this may appear to be a relatively simple step, involving conventional bulk ore carriers and standard procedures, the nuances and practical limits of operating in the deep ocean mean that this step becomes increasingly complex and challenging. This article will explore the STARS concept, the likely regulatory requirements, and the complexities of this new vessel type.

Unfortunately, many stakeholders have overlooked the importance of this link in the production process, and challenges around shipyard availability and lead times mean that the timing of delivery of STARS vessels is critical to the success of projects.

STARS Concept

Most proposals for deep sea mining involve using a large Production Support Vessel (PSV) to operate the mining equipment (including Harvester, RALS, surface separators etc) that stays on the mine site location. This necessitates a shuttle type of transporter to transfer harvested nodules to the designated offloading site. These operations would be superficially analogous the use of shuttle (oil) tankers offloading FPSOs in the oil and gas industry.

While it might seem feasible to simply modify a standard bulk carrier for this purpose, this type of shuttle transporter requires significant thought on the part of designers and operators around efficiency and regulatory compliance. These additional requirements mean that the industry regards them as a distinctly different type of vessel, and they have acquired the acronym STARS (Shuttle Transport And Resupply Ship)

STARS Considerations

In general, a STARS vessel will likely be expected to fulfill four key tasks:

- Transfer of nodules from the PSV
- Transport of those nodules to the processing facility
- Transport of equipment, fuel and provisions to the PSV
- Transfer of personnel to and from the PSV per crew rotas

Of these four tasks, the receipt of nodules, transport of fuel, and the transfer of personnel raise several challenges, particularly around Standards and Regulations. These impact the ability to ensure the vessels and operations, and consequently impact financing of the project or company.

The nuances and complexities of these tasks are outlined below.

Ship-to-Ship Transfers

There are several options for transferring nodules from the hold of the PSV to the STARS, including wet or dry transfer, via hose or conveyor, and with the vessels alongside or astern of each other. Each of these options has a several advantages and disadvantages:

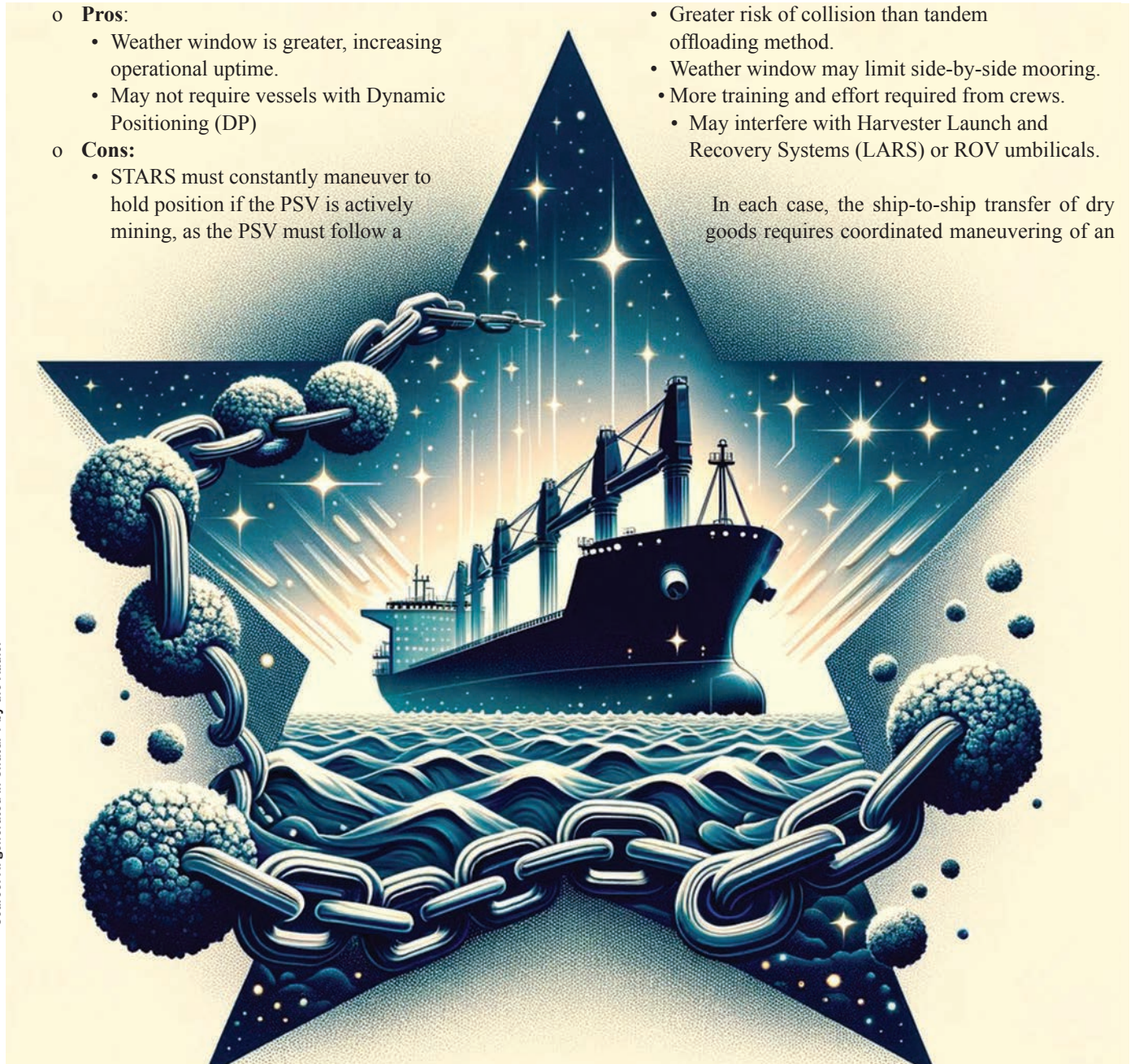
■ **Tandem (Line Astern) Offloading:** STARS maneuvers to hold position astern of the PSV, and nodule transfer is made from the stern of the PSV to the bow of the STARS.

- o **Pros**:
  - Weather window is greater, increasing operational uptime.
  - May not require vessels with Dynamic Positioning (DP)
- o **Cons:**
  - STARS must constantly maneuver to hold position if the PSV is actively mining, as the PSV must follow a pre-determined mining pattern and cannot "weather-vane".
  - Likely necessitates the use of slurry transfer via hose, with significant issues (see below).
  - STARS must still come alongside for refueling and replenishment.

■ **Side-by-Side (Alongside) Offloading:** STARS maneuvers alongside the PSV, lines go across, STARS is secured alongside the PSV on Yokohama type fenders. Nodule transfer is made from the side of one vessel to the other.

- o **Pros:**
  - Allows for simultaneous cargo loading, replenishment, refueling and crew-change.
  - Greater range of nodule transfer options, including dry/conveyor.
  - PSV may continue mining while offloading.
- o **Cons:**
  - Greater risk of collision than tandem offloading method.
  - Weather window may limit side-by-side mooring.
  - More training and effort required from crews.
  - May interfere with Harvester Launch and Recovery Systems (LARS) or ROV umbilicals.

In each case, the ship-to-ship transfer of dry goods requires coordinated maneuvering of an



Source: AI generated in ChatGPT by the Author

approximately 100,000t PSV (typically following a pre-determined track at a speed of around 0.5 knots ground speed) with a 25,000-100,000t bulk ore carrier. This is relatively unprecedented in maritime operations.

Furthermore, while OCIMF/SIGTTO has published the *"Ship to Ship transfer Guide for Petroleum, Chemicals and Liquefied Gases"* (to advise Masters, Mariners and others in ship-to-ship transfer), as of now, no organization has guidance for dry cargo transfer at sea. It is hoped that the new International Subsea Minerals Academy (ISMA) based at the Texas Laboratory for Ocean Engineering might take on developing this new and needed standard.

Nodule Transfer Methods

Further to these maneuvering requirements, two broad categories of nodule transfer have been proposed, each of which brings challenges and limitations:

- **Wet Transfer:** Nodule slurry is pumped via hose from the PSV to the STARS.

  Pros:
  - Hose has longer length and greater flexibility.
  - Can be used with either Tandem or Side-by-Side offloading.

  Cons:
  - Requires dewatering equipment to be installed on the STARS.
  - Water must then be returned to the PSV for reinjection at depth, requiring significant extra equipment, handling, and connections between the two vessels.

- **Dry Transfer:** Nodules are transferred via cargo conveyor.

  Pros:
  - Simpler, as dewatering occurs on the PSV and extra handling equipment is not required on the STARS.

  Cons:
  - Transfer distances are shorter and equipment is less tolerant to errors.
  - More appropriate for use in Side-by-Side offloading and costs increase significantly as offset distances increase.

Although these options both present several challenges and issues, the wet transfer method is generally seen as unacceptable and operators are aligning on using dry transfer. Significant volumes of water are lifted to surface with nodules from the seabed. This water is very different in temperature and chemical composition to water at the surface, and environmental studies indicate that it should not be discharged at surface. Consequently the separated water is returned to depth via return line on the PSV.

Transport of Equipment, Fuel, Provisions and Personnel

Polymetallic Nodule are mostly found on the vast, deep abyssal plains of the global ocean. In most instances, nodule fields are located at great distances from land; ranging from around 100-150nm from land in the Penrhyn Basin of the Cook Islands EEZ, to thousands of miles from land in some parts of the Clarion-Clipperton Zone of the Northern Pacific. Consequently, transport distances, times and practicalities are of major consideration

If a deep sea mining mine site is within practical helicopter flight or sailing distance, then equipment, provisions and crew transfers may be best accomplished from the shore base by conventional helicopter and/or platform supply vessel transfers.

However, many of the International Areas are impractical for a platform supply vessel and impossible to helicopters to reach. Therefore the most economical way to resupply the PSV would be to adapt the STARS as a cargo transport vessel to also accomplish these auxiliary missions.

The STARS role would thus expand to include:

- Transport of solid cargo, provisions and equipment.
- Transport and transfer of fuel.
- Transport and accommodation of personnel (likely between 10 and 30 per transfer, depending upon rotas, crew requirements and frequency of resupply).

These additional requirements in turn add further complexities and challenges, such as the need to use a “Billy Pugh” or other personnel transfer methods, along with regulatory requirements for increased stability and survivability for fuel-carrying vessels, and safety and accommodation requirements for personnel. These are outlined below:

Source: AI generated in ChatGPT by the Author

Regulatory Issues Around Industrial Personnel

In November of 2022 the Maritime Safety Committee (MSC 106) adopted a new mandatory safety code for ships carrying “industrial personnel”.

The new Chapter XV of the International Convention for the Safety of Life at Sea (SOLAS) and the associated new International Code of Safety for Ships Carrying Industrial Personnel (IP Code) aim to provide minimum safety standards for ships carrying industrial personnel (as well as for the personnel themselves) and address specific risks of maritime operations within the offshore and energy sectors, such as personnel transfer operations.

The amendments and code are expected to enter into force on July 1st 2024, and will require ships of > 500 gross tonnage to have an Industrial Personnel Safety Certificate (IP Certificate) if they carry more than 12 Industrial Personnel. These criteria will likely be exceeded by a STARS vessel, and the requirements will likely not be met by existing bulk ore carriers

Regulatory Issues Around Refueling

If STARS vessels are to be used to refuel the PSV, then certain aspects of the International Convention for the Prevention of Pollution from Ships (MARPOL) will also apply to STARS. These requirements include specifics around cargo oil

tank construction, subdivision, piping and oil/water separation arrangements. Conventional bulk ore carriers would not meet these requirements as they do not refuel other vessels. Furthermore, their design optimizes for bulk carriage, rather than the sub-division and flooding protection that MARPOL typically requires. Consequently, significant retrofitting would be required of conventional bulk carriers.

Options - New Construction or Major Refit

As with any other engineering design calculation, cost and scheduling constraints will be major considerations. On the cost side, an existing handy or handymax bulk carrier can be readily purchased on the second-hand market. However, extensive hull and machinery modifications would be required in order to meet the minimum requirements of Dynamic Positioning, IP code and MARPOL tanker.

Conclusion

Shipment of bulk polymetallic nodules from a deep sea mining mine site appears at first glance to be a relatively simple issue, requiring the use of standard bulk ore carriers with minor modifications. However, the combination of remote mine-sites, long distances and complex supply-chains means that the STARS vessels are expected to do far more work than a typical bulk ore carrier.

Operating complexities, including combinations of pre-determined sub-optimal courses, large unhandy vessels, and tight offloading criteria, mean that the process of offloading bulk nodules is complex. These operations likely necessitate the retrofitting of thruster pods and DP2 capabilities to existing ore carriers, whilst the operations themselves are unprecedented and currently lack regulations.

Further logistical optimizations, such as the use of the STARS to transport food, fuel, equipment, and personnel, further complicate the operations. These trigger provisions in SOLAS and MARPOL which require significant design modifications for regulatory adherence.

The result is that retrofitting existing bulk ore carriers into STARS is likely to be prohibitively complex and expensive, and it seems likely that a new purpose-built type of vessel will be needed to meet these needs. However, design and construction lead times (particularly availability of shipyard space) mean that these vessels are increasingly becoming the limiting factor for successful deep sea mining operations.

As with the PSV, the American Bureau of Shipping has done a great deal of groundwork on the regulatory compliance aspect of the STARS vessels. The publishing of the "Requirements for Subsea Mining" was the first and until now, the only Classification Society Rules for this industry. It is expected that in the future a new vessel designation such Supply Transport and Resupply Vessel will be accepted by Flag States and by the DSM regulatory bodies (ISA, Cook Is SBMA etal.) much as Subsea Mining Vessel was accepted for the Alllseas Hidden Gem.

In order to be successful, DSM stakeholders need to carefully consider this "missing link" in their supply chain.

The Author

Gales

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FUEL FOR THOUGHT

CAROLINE YANG,

CEO, HONG LAM MARINE & PRESIDENT, SINGAPORE SHIPPING ASSOCIATION [SSA]

By Greg Trauthwein

***Caroline Yang**, by anyone's standard, is a busy woman. She is the CEO of Hong Lam Marine, a Singapore ship owner, which owns, operates and manages its own fleet of 33 vessels. She also is the president of the Singapore Shipping Association [SSA], a national trade association in one of the world's most important and dynamic maritime hubs. We recently met with her in Tokyo on the side lines at Sea Japan, and here she shares insight on her dual positions and the many challenges facing shipowners today.*

"You need all hands on deck to support this: the owners, charterers, bankers and even the governments: **all need to have a skin in this decarbonization journey.**"

– Caroline Yang
CEO, Hong Lam Marine & President,
Singapore Shipping Association [SSA]

Hong Lam Marine started in 1981 with two steel tankers and today it owns about 33 vessels, with a fleet operating within Singapore and Tanjong Pelepas (Malaysia), supplying bunkers to ships calling into Singapore port and Tanjong Pelepas.

"We have another fleet that operates mainly in South East Asia. We own, operate and manage our own tankers," said Yang. "We do not, however take positions in the bunkers, and therefore are mainly a logistics provider. We have about 150 people on shore and about 750 crew on the ships."

The energy transition will most assuredly impact Hong Lam Marine, as Singapore has been the top bunkering port in the world since 1988, with the port of Singapore supplying more than 50 million tons of fuels in 2023 alone. As with most owners eyeing a diverse fuel future, it is a classic 'chicken and egg' conundrum, balancing the availability of alternative fuel technology with the ready availability of 'green' fuels.

"We are at a strategic geographical location for ships to refuel, and the bunkering eco-system is entrenched with a strong infrastructure (terminals, traders, suppliers, brokers, etc.)," said Yang. "So if there is a change in the type of fuels to be delivered, we will have to be part of this equation and be ready for the change ... [but] the main question is timing." Timing in the maritime space is unique given the relatively long gestation to design and build a ship, not to mention its long lifespan.

"Build too early and you [run the] risk of a stranded asset, the new builds are expensive," said Yang. "You need all hands on deck to support this: the owners, charterers, bankers and even the governments all need to have a skin in this decarbonization journey." In her view, the bunkering sector has "a delayed effect," in the sense that as you service the ship owners, you keep your eye firmly on the trending of the types of new fueled ships that are being built, the pricing on the different types of fuels and the availability of supply of the fuels. "The next challenge is the safety and competency of the seafarers to handle safely the operations of these new fuels," said Yang. "We already have a shortage of seafarers, and this will be a challenge that requires the unions, government and industry to work together."

Investing in the Future

"We will have to invest in new ships and invest in the up-skilling and re-skilling of the crew," said Yang, as she eyes the multitude of big changes circulating through the industry. "We are constantly in discussions with our charterers to hopefully build the right ships at the right time. We are involved with many studies and consortiums to study the operations of methanol bunkering and ammonia bunkering. For example: in July 2023, Hong Lam Marine, together with Maersk and Maritime and Port Authority of Singapore, conducted the first in the world ship to containership methanol bunkering of 300

All photos courtesy Hong Lam Marine Pte Ltd.

tons of green methanol." Hong Lam Marine also completed a study on the building of an ammonia bunker tanker, together with Pax Ocean and BV.

Part of the investment in the future transcends technology and includes attracting and retaining qualified crews. "The whole world is facing this challenge, as seafaring requires sacrifices: a long time away from home with patchy internet access at times and hard work," said Yang. Added to the stress is less shore leave premised on security concerns and commercial pressure for quick port turnarounds. But Yang is an optimist, and she believes finding and keeping the talent you need comes down to the basics. "Treating our seafarers fairly in terms of wages; making sure that the rotation is certain for the crew, meaning no overstay on board the ship (without good reason); providing clarity of the various career paths, because there are amazing career paths from ship to shore for many positions. Most importantly, making sure that your ship is properly built, well-maintained and you have safety systems to protect the life and limb of each and every seafarer – underpinned by value of care for people."

CAROLINE YANG: THE SSA PRESIDENT

Singapore Shipping Association (SSA) is a national trade association formed in 1985, today with a membership of 500 organizations, representing a broad array of shipping companies and other businesses allied to the shipping industry, including technology start-ups, to promote the maritime industry's digitalization push. Like most in the maritime space, SSA and its membership are focused on the evolving industry, driven by environmental concerns. "Our top three priorities this year are decarbonization, digitalization and workforce development and training," said Yang.

• SSA & Decarbonization

The need to reduce carbon emissions, improve energy efficiency, and adopt cleaner fuels are the current hurdles for the shipping industry, as the IMO goals for ships evolve toward to have net zero GHG emissions by 2050. "Operating in a future fuel ready Port of Singapore will play a vital role in our industry's transition to low to zero emission fuels and SSA works closely with our port authorities and other related maritime organizations to relay our members' concerns, participate in trials and lend our expertise in workgroup discussions on new safety standards," said Yang. SSA also organizes forums to support members' efforts to comply with environmental regulations and adopt sustainable practices. For example, SSA rolled out the *"Operating a sustainable shipping business"* workshop for members to better understand ESG reporting in the maritime context. The newly inaugurated Decarbonization Committee was set up to help the Singapore harbor craft industry pivot towards sustainable practices, in order for all new harbor craft operating in the port from 2030 onwards to be fully electric, capable of using B100 biofuel or be compatible with net zero fuels.

"Shipowners and operators are grappling with the adoption of decarbonization technologies such as alternative fuels, emission reduction technologies, and exploring alternative propulsion systems (e.g., wind-assisted propulsion, electric propulsion)," said Yang. "The technical feasibility, scalability,

All photos courtesy Hong Lam Marine Pte Ltd.

and economic viability of these technologies pose significant challenges for implementation."

• SSA & Digitalization and Connectivity

SSA and its membership are working to leverage digitalization and all that it has to offer in the name of efficiency, while keeping guard up on the potential pitfalls, namely cyber hacks. "The digitalization of maritime operations is transforming the industry, with a growing emphasis on data-driven decision-making, automation, and connectivity," said Yang. "Shipowners and operators are investing in digital technologies such as Internet of Things (IoT) devices, sensors, and onboard systems to optimize vessel performance, enhance safety, and improve operational efficiency."

On the cyber security front, SSA is "devoting resources to address cybersecurity challenges within the maritime industry," Yang said, "because as shipboard systems become increasingly digitalized, maritime enterprises will be more vulnerable to cyber risks. By offering self-assessment tools and benchmarking data, the SSA enables its members to evaluate their cybersecurity readiness and identify areas for improvement. By Q2 2024, our members will be able use SSA's cybersecurity maturity scorecard, tailor made for ship owners and operators to access industry-wide benchmarking data and self-assess their cyber maturity."

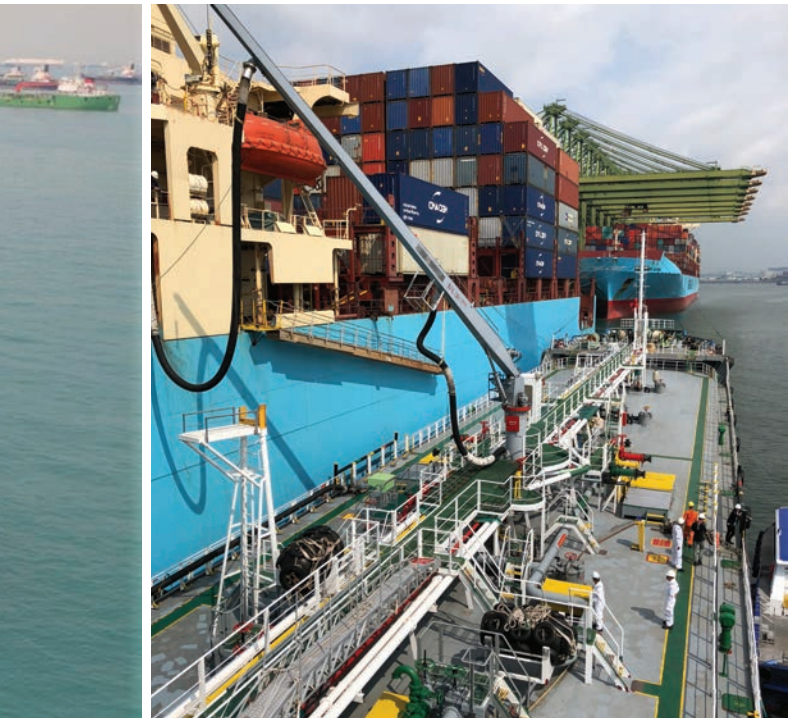
• Freedom of Navigation

"Shipowners are concerned about the safety and security of their crew members and vessels navigating through geopolitical hotspots and areas prone to security threats," said Yang, noting that recent activities have inspired an uptick in piracy concerns in the waters off of Somalia.

"The indiscriminate firing of drones and rockets toward commercial ships, as seen in the Red Sea, raises concerns about the potential for direct attacks on vessels and the safety of crew members onboard."

As traditional trade routes have been disrupted, shipowners have seen costs and delays soar, from being forced to take longer routes around Africa, to the delays in ports and shortages of bunker fuel in West African ports due to the unplanned ship and cargo movement, to increased insurance premiums for vessels operating in the area.

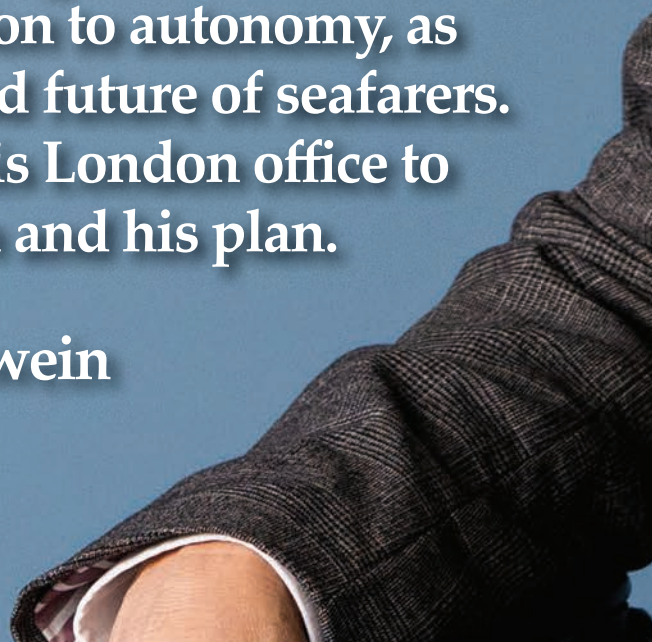
Through it all, SSA stands ready to support its membership base. "Organizing training programs, workshops, and seminars on maritime security and crisis management can help enhance the preparedness of shipowners and their crews to respond effectively to security threats and emergencies," said Yang. "SSA collaborates with maritime security experts, government agencies, and industry partners to develop comprehensive training modules tailored to the needs of commercial shipping, such as SSA's organization of a webinar entitled *"Navigating the Red Sea: A Comprehensive Analysis of Maritime Security."*



Mission Possible

As Arsenio Domínguez took the top spot as the tenth Secretary-General of the IMO in January 2024, drones and rockets had just started flying at commercial ships traversing the Red Sea. This assault on the freedom of navigation is just the latest in a series of transcendent challenges facing maritime; from decarbonization to digitalization to autonomy, as well as the health, well-being and future of seafarers. We met with Domínguez in his London office to learn more about the man and his plan.

By Greg Trauthwein



ARSENIO DOMÍNGUEZ, SECRETARY-GENERAL, INTERNATIONAL MARITIME ORGANIZATION (IMO)

Image courtesy IMO

Looking back when and why did you realize that yours was going to be a career in maritime?

My family doesn't have a maritime background, but growing up in Panama, it's easy to understand when you see the ships in the Panama Canal. That connection with the Panama Canal is when it started to become attractive for me, and gave me the opportunity to study something different: naval architecture. At the time I couldn't study it in Panama, so I needed to move abroad, and that, also, was important for me to grow personally and professionally. I fell in love with the industry, and from the moment I went into a shipyard, it became part of me.

Can you point to mentors that helped to shape your vision about the maritime industry?

The first were my parents, as they encouraged me to move into something that was different, that was going to help me contribute to a sector that was quite important for the country. Little did they know that I was going to move away from Panama! When I was graduating from Veracruzana University in Mexico, I had to do a professional practices before graduating, and this was with the Department of Naval Architecture and Inspection with an oil tanker fleet. [One of my managers] graduated from the same university; she was very good, very strict. Two things she told me [that have remained with me]:

- *You're going to gain all of the technical experience and expertise here, but* **you need to learn the business part** *of it to understand the sector better.*
- **Always be humble.** *Engage with people, understand the different silos, learn from people; that's going to help you personally and professionally to open the doors*.

In addition, there have been several [IMO] delegates that I learned a lot from, and it is difficult to name names because there were many, four or five that took me under their wings when I came here in 1998. An important lesson learned was that when there's a proposal on the table, if you don't agree, don't just disagree, but put forward an idea, explain the reasons why you cannot agree and then put forward another option. Even if it's not accepted, you're contributing to the debate.

Coming into the Secretary-General seat, you have a very full plate. What are the top three agenda items facing maritime today?

The first one is **seafarers** from the aspects of security and education. When it comes to security, you take into account what is happening in the Red Sea. But the other side of security is our move into new technologies, new fuels. We need to look into the safety aspects and then connect that also with the education because one depends on the other.

The second one will be **decarbonization**. It would've been easier to say 'the environment' [in addition to decarbonization, we have] noise pollution, biofouling, ballast water, protection of sensitive sea areas, you name it. But it's the decision that the organization took last year in decarbonizing by around 2050 that makes it a top priority.

The third one is **implementation**. We all want a level playing field, but it doesn't exist. We want to assist on the implementation of our regulations for everyone to enhance safety, security, protection of the environment, etc. One of the key priorities is using best the results of the member states or this that we carry out to the countries. The projects that give us information of where we are going and what's the effectiveness of the different activities and the regulations. And from them, then tailor technical cooperation and capacity building in particular to developing states, so we can raise the maritime domain in all countries, because that also improves their national economy. But it's now focused having a more targeted, more planned and measurable approach when it comes to implementation. For me, those three are key for our success.

What do you think is the key to getting that implementation?

Well, that's the beauty of the nature of the United Nations; that's how we were born and that's what we do. And it is one of those challenges that I truly enjoy and it is from my experience as a delegate, chairing meetings, because I used to chair the **Marine Environment Protection Committee**. It's how sometimes we are seen as very divided, but we're not. We share the objectives. It's how we get there, different approaches, different routes; but bringing the parties together is what we do best here. We did it last year when there was very little expectations about whether we were going to be successful in revising our GHG strategy; and we demonstrated that we can do it. So it's sitting down, having those difficult conversations, explaining, understanding the concerns and then addressing those concerns. And again, connecting it back to implementation, that's what I want to change within the organization.

It sounds like it's one brick at a time.

It is but it's continuous, it is non-stop. Every time that we make a decision here, there will be concerns because we're a consensus organization.

The Red Sea is obviously topical, with the drone and missile attacks on commercial ships. What should IMO be doing to help?

The first thing is the safety of the seafarers is paramount. From there you have the safety of the ships, too, and the environment. Right now, our main focus is working with all the other UN agencies to provide any additional assistance and information that we can in relation to the effect that this is having on shipping, on the global economy, to continue to find solutions. The root causes are beyond IMO, but because there's a negative effect in shipping, we have a responsibility to also act and to be part of the solution. When it comes to

ships [rerouting to sail down the coast and around the tip of Africa], there's a constant exchange of information with the member states in the region on how they can better prepare. Sharing information, with the countries and the shipping industry in the region, is key so they can make decisions. They, in turn, will bring their experience back to the organization for us to update our guidance. For example, we have guidance for anti-piracy and robbery, but those scenarios are different now. We need that feedback to further improve the guidance that we provide.

I've been having conversations [with several] countries in West Africa looking at the negative impact of additional trade flow in the region, because we need to share information in relation to, for example, shortages in supply, including bunkering, because they were not prepared for this. [Also important is] working with seafarers organizations to gauge the negative effect [to seafarers] of additional time on board. This is an ongoing, non-stop cooperation, a constant exchange and dialogue between the parties involved, even when we have to have difficult conversations. I'm ready for that.

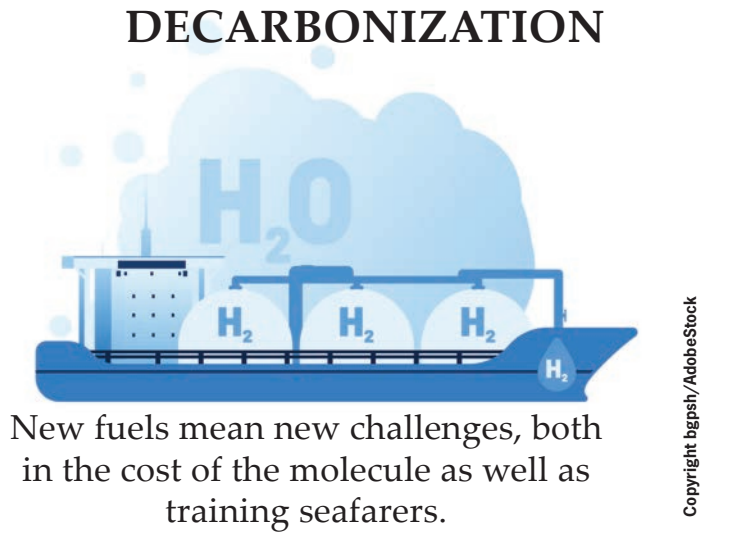
Outside of the Red Sea, what do you see as the biggest potential threat to the premise of freedom of navigation and maritime trade?

We need to uphold the principle of freedom of navigation, and I continue to reiterate that in my call that this is a global industry that requires global regulations. The moment we go to the national or regional level, that will have a negative impact on shipping as a whole. From the beginning, we need to play a part, though some of the root causes are beyond the organization. It's not the remit of IMO to enter into [some of] those conversations, but if it has a negative effect on shipping, we need to raise our voice, explain the challenges and be a part of seeking solutions.

For us, it is to be proactive, to start thinking ahead. One example: we know the situation on the Red Sea may increase piracy in all the regions, so it's about taking that first step, having the conversations with the countries in the region, raising the awareness, even though it's not happening yet.

What is your plan for IMO under your tenure to help clarify this path towards decarbonization

I'll use one word that you utilized at the beginning: this is a transition. This is going to take time and it's going to have a cost. From the moment we adopted the Paris Agreement back in 2015, there was a realization that we needed to take a stand on this. We provided the clarity that was required last year into where are we going and the dates for decarbonization targets. So we had targets for 2030, we had targets for 2040 and of course decarbonization by around 2050. We are now carrying out the analysis of the impact assessments of the measures that we will put in place; the technical measures and the economic measures, because the pricing mechanisms will support this transition including developing states and particularly smaller developing states in least developed countries in order to be part of the process. At the same time, you have several ship owners that are early movers, they are taking that stand.



"[For successful energy transition] the tools are there, the technology is being developed, decisions can start to be made. **Ship owners need to be early movers and exchange information among themselves;** *information and experiences need to be shared."*

– Arsenio Domínguez
Arsenio Domínguez, Secretary-General, International Maritime Organization (IMO)

There's a lot of research and development, and projections on when [different] fuels will be ready. Right now, we also are considering the safety aspects of [new] fuels in regards to seafarer training. Also, there's a projection by early to mid-2030 the [alternative] fuels will be there, but also consider that we are not the only sector that will require those fuels. We work with countries to [ensure] maritime is high on the priority list.

[For successful energy transition] the tools are there, the technology is being developed, decisions can start to be made. Ship owners need to be early movers and exchange information among themselves; information and experiences need to be shared. There are economic aspects [that dissuade shipowners from sharing information], but there's a lot that can be shared that will help others. Shared information is really useful for IMO too, [to help] in the way that we then develop the technical and economic measures.

So there's a lot more research and experience that we will gain, and it's going to pave the way for the regulations. By 2025 we will adopt the technical and economic measures and that will provide even more clarity.

IMO has its supporters, IMO has its detractors ...

Everyone has a right to their opinion!

... that's true, but is there something that you've heard consistently that you believe is patently incorrect regarding the work that IMO does?

That we're very slow, that we're not effective, that we're not transparent and we're not inclusive.

This is where we have to work on explaining how we work, and that's why I'm engaging more with the media. We need to put IMO and shipping on the map. During COVID, everybody knew what shipping was all about – even though it was detrimental to seafarers – because we were the only mode of transport that kept delivering essential goods globally. Now, with the situation in the Red Sea, we continue to find ways to operate even though it's detrimental to the seafarers and to the safety to the ships. But I continue to hear that IMO is very slow. We are 176 member states right now. In 2015, the UN comes together and agreed to the Paris Agreement. In 2018, we were the first sector that had a strategy for decarbonization with a timeframe. And we decided then that in five years, by 2023, we would revise and strengthen those goals. And we did. With all the challenges through COVID, we delivered last year. Sometimes we need to also take into account the legal aspects of international law. After a decision is made, you go into the legal aspects circulating them; to adopt an amendment you give the member states 18 months for them to enter into force, because countries have to prepare. [Companies have to prepare], you have to train people, you have to invest in infrastructure, you have to expand and communicate to your clients ... it's not done overnight. One of the things that I'm doing is being more out there, being more open: speaking to the members, speaking to the stakeholders, speaking to the media, listening to the media. And when constructive criticism is valid, we take it on board to improve ourselves.

How do you envision raising the public perception of the maritime industry, to give it clout?

It's being out there. During COVID, we were [front and center] but COVID [is forgotten now]; it's a cold. The moment you forget COVID, you forget about shipping. We need to make the industry more diverse, more attractive to the young generation and to women, to be open to change as well.

We can't take a passive approach [as we did in the past]. [For example, today] everyone's dependent on shopping online and expecting their goods the following day. This is the opportunity to tell them that [the goods], 90% of the time comes by ship. But we need to change the language. We can't

speak in the same way to the general public. You can't use acronyms or formulas or regulations. That's not attractive. But if you highlight how [shipping] impacts their daily life, you start making connections. We need to learn; I need to learn how we evolve in communicating. We always talk about cooperation and communication. For me it's how do communicate and cooperate effectively? So it's about being more proactive, out there and understanding that as good as we are – and we are good in shipping, just look how we keep trade flowing – we can always be better.

If you could offer one bit of advice to shipowners regarding making their operations more efficient, more effective, what would it be?

Be an early mover; take the first step and be ready to change. We can't continue to operate the same way that we've been operating for centuries. We can use that experience, but we need to move to the next step.

What do you hope to achieve during your tenure?

I want to leave an organization that is progressive, that is in touch with modernization, that is inclusive, that is transparent. But not just by statement. If I cannot achieve it within my tenure, than at least the tools, the mechanisms and the processes are there. [It's about raising the stature of IMO and the stature of the maritime industry], and for me it's about learning from others. I want an IMO that is more engaged with all the sectors, with all the UN agencies. For example, on decarbonization we need the energy sector; so we are including the energy sector in our technical capacity cooperation as well as in the conversations. They learn from us, we learn from them, we need each other.

When I say [I want IMO to be more] forward-looking, it is about being more transparent, more diverse, more inclusive, and being ready for change, [and last but not least] it's about attracting the younger generation.

• This recorded interview was edited for brevity and clarity

Meet Arsenio Domínguez

Domínguez assumes his role as tenth IMO Secretary-General, bringing with him more than three decades of experience serving the global maritime sector, across a spectrum of leadership roles of increasing scope and responsibility.

Initially representing his native Panama, first within the Panama Maritime Authority and in his lattermost appointment as Ambassador of Panama to IMO, his affinity for building consensus saw him elected by his peers as Chair of several flagship IMO intergovernmental meetings, including: the Marine Environment Protection Committee (MEPC), the Technical Committee of the 29th Assembly, and the Maritime Security, Piracy and Armed Robbery Group, as well as a number of Vice-Chair and Board member roles.

A naval architect at heart and by training, Mr. Dominguez gained his first degree at Veracruzana University, Mexico, and later went on to pursue a Master of Business Administration (MBA) at the University of Hull, as well as an executive qualification in International Law and European Politics at Birkbeck University, both in the UK.

His initial term as IMO Secretary-General, approved at the 33rd Assembly in December 2023, will be for a period of four years from 2024 to 2027.

Image courtesy ClassNK

CHARTING THE FUTURE

HIROAKI SAKASHITA

PRESIDENT & CEO, CLASSNK

ClassNK is one of the world's leading maritime classification societies with more than 9,200 ships totaling more than 273 million gross tons under class at the end of 2023, and a global service network of more than 120 survey offices. Last month while in Tokyo we had the opportunity to sit with Hiroaki Sakashita, President & CEO, ClassNK, a marine industry veteran for his insights on the trends driving ship classification today and in the future.

BY GREG TRAUTHWEIN

> **Decarbonization** *will [most dramatically] change the structure of seaborne trade, ships' specification and design, ships' operation, and the economic mechanism of maritime transportation.*
>
> **– Hiroaki Sakashita**
> President & CEO, ClassNK

Hiroaki Sakashita took the helm at ClassNK at one of the most historically significant times in history, March 18, 2020, just as the COVID-19 pandemic was starting to shut the world down.

"During the pandemic, I had two basic principles: first, keep ClassNK colleagues safe and healthy and second, maintain class services to support global seaborn trade as stable as we can," said Sakashita, two objectives that were accomplished as "there was no fatality in our employees, and we were able to provide our class services stably." But even without the pandemic and all the challenges it generated, Sakashita took the helm of one of the world's premier classification societies just as the industry was starting to digest several monumental technological challenges in regards to decarbonization, digitalization and automation/autonomy that stand ready to impact impacting ship design, construction and operation for the coming generation.

Decarbonization + Energy Transition

"Decarbonization will [most dramatically] change the structure of seaborne trade, ships' specification and design, ships' operation, and the economic mechanism of maritime transportation," said Sakashita. "It will profoundly affect all stakeholders involved in the shipping business."

Big changes often are accompanied by confusion in industry, particularly in regards to the energy transition and accurately predicting and selecting the 'fuel of the future,' as a misstep in this regard could leave a shipowner with a significant competitive disadvantage. In this regard, and in regard to the additional challenges posed by digitalization, for example, class societies have become a tech resource to provide information and insight. "Today maritime businesses are facing transformation under the tide of decarbonization and digitalization," said Sakashita. "ClassNK has started to support maritime business transformation by providing advanced certification. As a classification society, we set standards, offer certifications, supporting shipowners through the complexities of maritime challenges. Initiatives like the formation of a safe operation support team and planning services that incorporate new technologies and crew training reflect our dedication to enhancing maritime safety and operations."

While much focus is paid to fuel choice, in fact there are multiple ship design and ship outfitting techniques and technologies that are working hand-in-glove to help vessel owners incrementally improve fuel efficiency. Regardless of the fuel or the tech, Sakashita is particularly hopeful that the industry as a whole will follow guidance as laid out by the IMO.

"A global regulatory framework will regulate the course of transition to decarbonization in international shipping. Establishment of that framework is essential and indispensable," said Sakashita. "I hope that member states of IMO will agree to the framework as soon as possible."

By ClassNK's analysis on the revised IMO GHG reduction strategy published in the autumn of 2023, development of supply capacity of carbon-free fuels is the most crucial issue. "Huge investment will be made in this sector, however for the time being, we cannot expect sufficient supply of carbon-free fuel," said Sakashita. "I assume that we have to use every possible measure to reduce GHG emission for next decade, measures that may include use of bio-fuels, energy saving devices and carbon capture and storage." To assist, ClassNK started to provide a menu of comprehensive transition support services.

The Digital Path

Decarbonization and digitalization often walk hand-in-hand, as the effective use of real-time information, from condition based monitoring of machinery to ensure it is running optimally, to weather routing, is increasingly deployed to enact time and cost efficiencies across the board. But as with any new or emerging technology, it can be a double edge sword of promise and peril.

"Digitalization and AI have brought maritime communications closer to shore-based standards with utilization of data, enabling a broader scope of navigational support, ship management and whole logistic management," said Sakashita. "They also provide improvement of productivity in shipbuilding and machinery manufacturing. They would be one of potential solutions for workforce issues in shipping and shipbuilding sector." Central to efficient use of data is Artificial Intelligence. "As we manage increasing volumes of data, AI plays a criti-

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CHARTING THE FUTURE

"ClassNK is now tackling to expand its services beyond conventional class services with the slogan **'Charting the Future'.***"*

– Hiroaki Sakashita
President & CEO, ClassNK

Image courtesy ClassNK

cal role in processing and decision-making, driving the industry toward eliminating inefficiencies and enhancing safety," said Sakashita. "At the same time, the challenge lies in ensuring these technologies are implemented securely and effectively."

In this regard, ClassNK established ShipDC in 2015 and initiated collaboration with maritime industry to accelerate data utilization in maritime businesses at the IoS-OP consortium.

"Charting the Future"

While these megatrends impact the shipping industry, they impact class, too, opening up many possibilities for ClassNK to deploy its services and surveyors in a more efficient and meaningful way. "With regard to Class surveys, ClassNK has introduced advanced technologies," said Sakashita. "To implement remote surveys using Information and Communication Technology (ICT), ClassNK has published "Guidelines for Remote Surveys" to ensure reliability equivalent to traditional in-person surveys and to provide transparent criteria for applying ICT. Amid the pandemic, more than 400 remote surveys are conducted monthly to prevent delays in maritime transportation. Another example is a survey framework incorporating Condition-Based Maintenance (CBM). Now 43 vessels are utilizing this framework." In fact, it is this evolution of class that Sakashita counts as one of his biggest challenges in the coming years. "I expect that the role of classification societies will expand along with business transformation in maritime sector," said Sakashita. "ClassNK is now tackling to expand its services beyond conventional class services with the slogan "Charting the Future". Charting the future together with partners is my biggest challenge.

Image courtesy CCS

BUILDING THE NEW FUELS PATHWAY

Long-term initiatives led by classification societies are building the foundation for future fuels uptake.

By Wendy Laursen

Image above: CCS issued the first AIP certificate for the marine liquid hydrogen fuel supply system which is developed by Weishi Energy Technology Hebei Co., Ltd.

"When you look at where we are and the steepness of the curve ahead, the biggest risk is the unintended safety consequences of change."

– Chris Wiernicki, CEO, ABS

Image courtesy ABS

About this time last year, ABS CEO Chris Wiernicki said: "When you look at where we are and the steepness of the curve ahead, the biggest risk is the unintended safety consequences of change." Class, he says, is built for the intersection between technology, safety and regulations and must be prepared.

Work is underway. China Classification Society (CCS), for example, has released 87 green-ship-related guidelines and provided classification services for over 30 methanol or ammonia fueled vessels.

Korean Register (KR) is currently developing a 4-stroke ammonia-fueled engine with HD KSOE and STX Engine, with a dual focus on engine performance and crew safety. At the research facility, the risks are being comprehensively addressed. A double barrier is installed in the laboratory where the engine is being tested, with the inter-barrier space maintained at negative pressure, and any leaked ammonia is reduced below the standard level through after-treatment. Additionally, the engine is remotely controlled from a separate, secure space to prevent researchers from direct exposure to ammonia leaks. KR's research is informing its own guidance as well as that of IACS and the IMO.

Dr. Song Kanghyun, Head / Senior Vice President of KR's Decarbonization, says: "Ultimately, fuel conversion is essential, as it is the sole solution to achieve decarbonization." That doesn't just mean fuel for combustion engines, and KR is also involved in a project aimed at increasing the capacity of fuel cells and one to develop a 2,000cbm liquefied hydrogen carrier.

Pathways available to reach long-term decarbonization goals are diverse, says Panos Koutsourakis, ABS Vice President, Global Sustainability, and it can be challenging to choose a pathway today, especially for existing ships. ABS is working closely with its clients to explore multi-step approaches towards a long-term net zero future.

Digitalization is a core part of the green maritime ecosystem,

"Ultimately, fuel conversion is essential, as it is the sole solution to achieve decarbonization."

– Dr. Song Kanghyun, Head / SVP of KR's Decarbonization

Image courtesy KR

says Koutsourakis, and ABS has developed a Carbon Diligence Platform (CDP) to digitalize carbon emissions monitoring, reporting and statutory compliance. In the short-term, the CDP program provides an interface between vessels and operators to improve carbon emission performance. In the long-term, it provides a platform for incorporating all environmental-related datasets. This will help the industry digitalize the task of complex data analysis, planning and project execution, says Koutsourakis.

For now, shipowners face the challenge of a price gap between fossil and alternative fuels, and the "chicken and egg" conundrum of securing green fuels where they need them. Green corridors are considered an important solution, and here, again, class is at work. ABS provides a model-based approach to simulate the operation of alternative-fueled vessels on specific corridors.

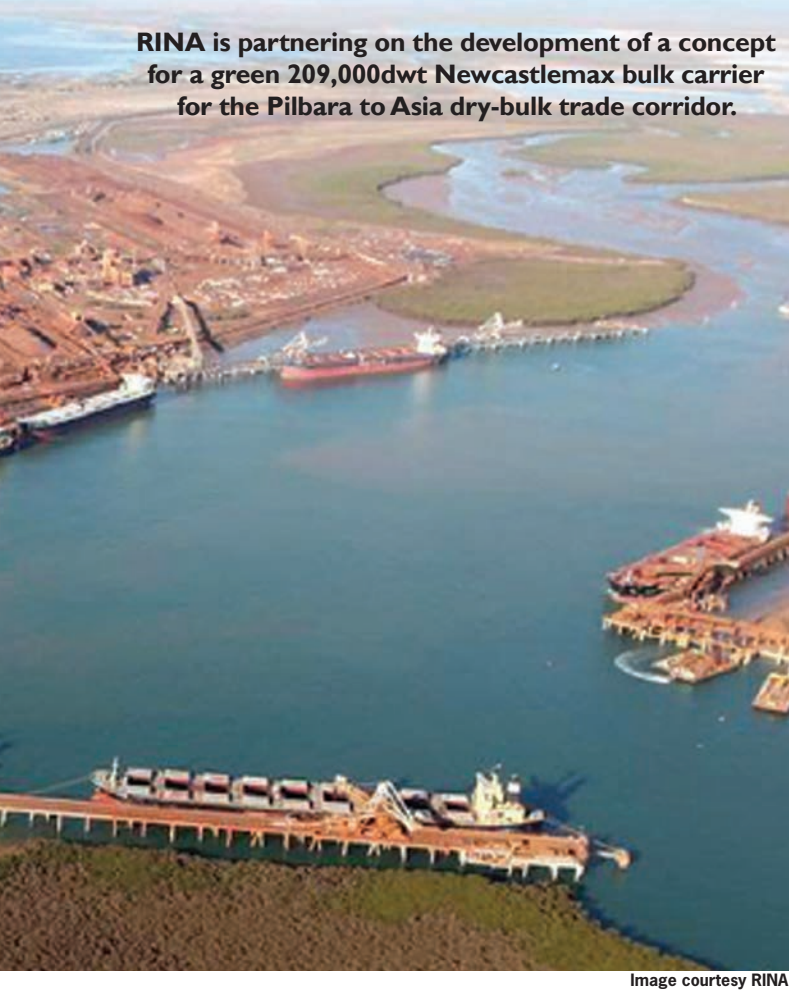
CCS is a partner in the development of a green corridor for the container shipping route between the Ports of Los Angeles, Long Beach and Shanghai. Carrier partners include CMA CGM, COSCO Shipping Lines, Maersk, and ONE, and they will begin deploying reduced or zero lifecycle carbon capable ships on the corridor by 2025.

RINA is partnering on the development of a concept for a 209,000dwt Newcastlemax bulk carrier with an LNG fuel system involving pre-combustion carbon removal and hydrogen production. The design includes the capture, onboard storage and offloading of liquefied CO2 or solid carbon and is destined for the Pilbara to Asia dry-bulk trade corridor. RINA says the concept provides a credible line-of-sight pathway to zero emissions for the application of LNG as a marine fuel.

"Digitalization is a core part of the green maritime ecosystem."

– Panos Koutsourakis,
ABS Vice President, Global Sustainability

Image courtesy ABS



RINA is partnering on the development of a concept for a green 209,000dwt Newcastlemax bulk carrier for the Pilbara to Asia dry-bulk trade corridor.

Image courtesy RINA

"As a testing, inspection and certification body, we can play a key role in helping build trust between stakeholders across supply chains."

– Benjamin Lechaptois, Future Shipping Team Head, Bureau Veritas

Image courtesy BV

Launch of the Joint Innovation Studio established by DNV and SDST.

Image courtesy of DNV

LR has established a Maritime Decarbonization Hub with shipowners in Athens.

Image courtesy of LR

"The industry is very invested in making sure that there is confidence in the safety levels of alternative fuels."

– Jason Stefanatos, Global Decarbonization Director at DNV

Image courtesy DNV

Carbon capture faces similar barriers to commercialization as new fuels. Lloyd's Register (LR) collaborated on a report which identified that while the technologies required for offloading onboard captured CO2 exist, a limited number of ports possess the infrastructure. They primarily handle food-grade CO2, and the higher purity standards required for that limit their interoperability to handle onboard captured CO2.

Class-led collaborations are tackling the practical issues that are hindering change. LR, for example, has established a Maritime Decarbonization Hub with shipowners in Athens which aims to remove technical, investment and community barriers to the uptake of solutions for the existing fleet, and ClassNK provides transition support services to help clients reduce GHG emissions. This includes proposing optimal strategies, providing the latest information on alternative fuels, cost estimations including regulatory compliance, fuel supply forecasts and ordering status for alternative fuel ships.

DNV and Shandong Shipping Tanker Company have launched a Joint Innovation Studio to promote digital and sustainability projects. DNV is also leading long-term projects such as the Green Shipping Program and the Maritime Battery Forum. The Maritime Technologies Forum also includes ABS, LR and ClassNK. There are different levels of cooperation at work, says Jason Stefanatos, Global Decarbonization Director at DNV.

"In terms of setting the competitive instincts aside, I think this is clearly seen in the mission of class as it relates to safety," says Stefanatos. "Fuels are a big lever for decarbonization, and the industry is very invested in making sure that there is confidence in the safety levels of alternative fuels that is at least the equivalent to conventional fuels today."

Bureau Veritas has created a Future Shipping Team (FST) which brings together over 250 experts from across the group. The team's efforts are designed to expand shipping's sustainability journey to encompass the broader supply chain dynamics that will be instrumental in making any green fuel, energy or technology available at the scale needed, says FST head, Benjamin Lechaptois.

"Furthermore, as a testing, inspection and certification body, we can play a key role in helping build trust between stakeholders across supply chains. This ranges from fuel certification which validates the product's sustainability credentials and safety to use on board to verifying emissions reduction claims."

DNV Principal Consultant and safety task leader of the Nordic Roadmap project, Linda Sigrid Hammer, identifies what's at stake: "We cannot go green without doing it safely. Any accident involving a new ship fuel would, in addition to the risk to persons directly involved, be a serious setback for the use of this fuel for the whole industry."

CLASSIFICATION

The Maritime Cyber Priority: Staying Secure and Seizing New Connectivity Opportunities

By Svante Einarsson, *Head of Maritime Cyber Security Advisory, DNV*

Recent decades have seen the global maritime industry give considerable focus to enhancing the security of its information technology (IT) systems. In addition to managing the evolving risks onboard vessels, the industry also needs to manage significant security risks as it digitally connects its operational technology (OT) – the systems that manage, monitor, control and automate physical assets such as sensors, switches, valves, and safety and navigation systems. OT generally lags IT security in maturity by around 15 years. Many OT systems were developed without cyber security in mind, but they are now being connected to IT systems and the internet.

As the maritime ecosystem becomes increasingly interconnected with the outside world, cyberattacks on maritime OT are a matter of 'when', not 'if'. As the urgency of the risk grows at pace, the sector has important work to do to expand its focus and ensure it is prepared for such attacks.

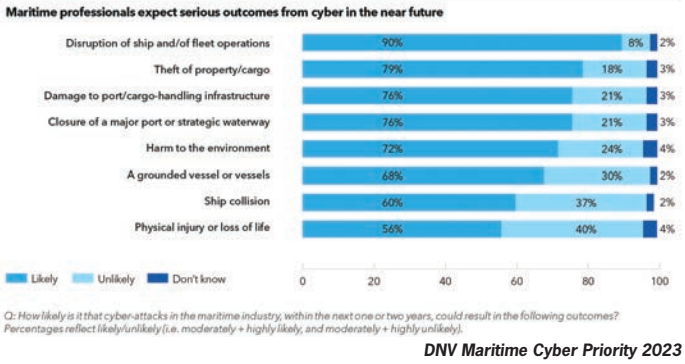
SHARPENING FOCUS ON OT

Research by DNV, The Maritime Cyber Priority: Staying secure in an era of connectivity, surveyed 800 maritime industry professionals worldwide and revealed an almost universal expectation among the industry that cyberattacks will disrupt ship operations in the coming years.

Three-quarters (76%) believe a cyber incident is likely to force the closure of a strategic waterway in the next one to two years, with potentially similar consequences as the 2021 Suez Canal blockage, holding up some $10bn worth of cargo daily.

Positively, three quarters (75%) of those surveyed believe OT security is now a much higher priority for their organization than it was just two years ago; on the other hand, just 40% believe their organization has invested enough money in their OT cyber defences to date, and only a third (33%) are confident their organization's current OT cyber security is as strong as its IT security.

Given the industry expects serious outcomes from maritime-targeted cyber-attacks in the near future, the sector must sharpen its focus on OT security.



DNV Maritime Cyber Priority 2023

UNLOCKING NEW POSSIBILITIES

While this new era of connectivity is undoubtedly giving rise to new vulnerabilities, it also has huge potential to unlock new possibilities and is already doing so. Indeed, 87% of the maritime professionals surveyed say the industry's very future relies on a continued increase in connected networks, and 85% say connected technologies are helping the industry reduce its greenhouse gas emissions through fleet and route optimization.

More than half (51%) of maritime professionals say digital technology has already been a key enabler of their existing decarbonization plans. This rises to 61% among freight transportation firms, with this likely connected to growing scrutiny in recent years over their use of high-carbon bunker fuel.

Digital technologies improve sustainability performance and allow operators to automate and streamline complex processes, increasing efficiency and helping to enhance safety at ports and at sea.

TIGHTER CYBER SECURITY REGULATION

Tighter regulation is on the horizon also in the maritime sector as industry bodies seek to encourage the sector to improve its security posture. The IMO published its Guidelines on Maritime Cyber Risk Management, practically making it mandatory for ship owners and managers to apply cyber risk management on ships from 2021 onwards.

The reality is that ship managers and owners have handled these requirements differently. Some do the bare minimum, including only a few references to cyber security in their safety management system (SMS) and undertake limited crew training. Others have updated their SMS to comprehensive, integrated management systems and sought certification against standards like ISO 27001 and DNV's cyber secure class notation.

NEW IACS REQUIREMENTS

The International Association of Classification Societies (IACS) has adopted new universal requirements for cyber security. The requirements will make verification of cyber security aligned to recognised IEC standards part of the

mandatory verification scope for new vessels contracted from July 2024. As a classification society, DNV already has more than 250 projects ongoing or finalized with its corresponding cyber secure class notation and type approval aligned with the IACS rules.

IACS will increase the focus of vendors, yards, owners, and ship classification societies on cyber security. It will ensure that technical cyber security by design is built into important onboard systems and a vessel's overall network, for example, addressing the integration of IT and OT and the systemic integrity of third-party suppliers. It will also lead to follow-up on cyber security with surveyors visiting vessels in operation.

WHAT NEXT?

Maritime organizations should take the following actions to address their cyber security:

- Treat cyber security as an enabler. The maritime sector has set itself clear strategic priorities around digital transformation to enable both commercial advantage and decarbonization. Cyber security leaders must be part of these wider strategic conversations from day one; consider investment in cyber security as not just a cost of business but an investment in confidence, competitiveness, compliance, and innovation.

- Treat cyber risks like safety risks. Maritime leaders have long asserted that work is never so important it cannot be carried out safely; for decades, employees have been encouraged to stop work and blow the whistle if they believe safety protocols are being neglected. A similar mantra should be adopted for cyber security. If security procedures and systems are not set up according to standards and requirements, they could be potentially vulnerable and, in turn, expose physical systems to being targeted and breached. This can lead to severe damage to equipment, people, or the environment – or, worst case scenario, to all three.

- Clarify responsibilities. To professionalize their approach, maritime businesses should seek to clarify cyber roles and responsibilities across the enterprise while enabling system owners to manage the risk from a multidisciplinary team.

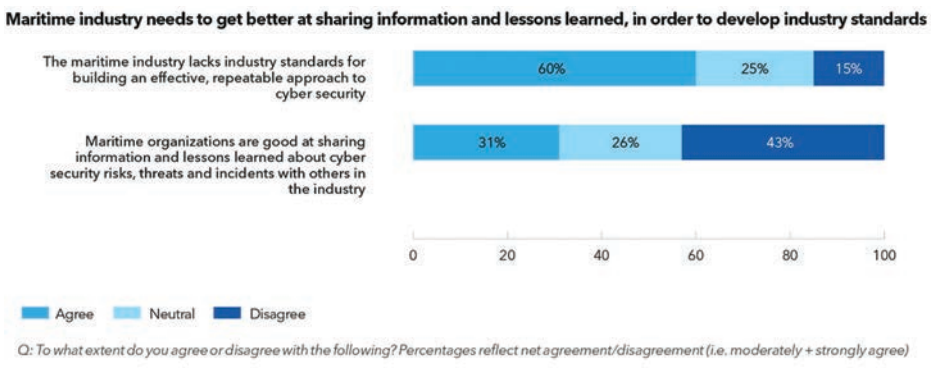
- Champion insight-sharing across the industry. Sharing cyber security experiences – the good, the bad and the ugly – with peers and the regulator will be key to improving cyber security. In an increasingly connected industry, where an attack on one organization or asset gives rise to contagion risk, this is in everyone's interest: only through collaboration will the industry create standards and best practices around cyber security.

- Reframe regulation as the baseline instead of the goal. Meeting the minimum requirements set out by industry regulations, such as the IMO and IACS, doesn't guarantee security; after all, regulations tend to come into being at a much slower pace than the hacking methods used by cybercriminals. Rather than treating them as the end goal, the maritime industry should use regulations as a foundation on which to further improve and adapt to the changing threat landscape.

- Rethink how to manage supply chain vulnerabilities. Including cyber security in the procurement and development processes for new technologies is much more efficient than carrying out risk assessments at a later stage. Suppliers may also be able to help address maritime organizations' limitations in technical cyber knowledge, turning supply chain risk into an advantage.

- Resource a strategy for more effective training. Most maritime organizations lack critical cyber security awareness and knowledge across their workforce. Despite the practical challenges of training and education – especially around industry-specific challenges, such as ship crews operating in remote and inaccessible settings – organizations must remedy this.

Although cyber security is a growing safety risk to the maritime industry – perhaps even the risk for the coming decade – crucially, it is also an enabler of innovation and decarbonization. As we pursue greener, safer, and more efficient global shipping, the sector's digital transformation is deeply dependent on securing these interconnected assets. This makes it imperative that the sector works collaboratively to strengthen its collective cyber security.



MSC @ 75

For 75 years, Military Sealift Command (MSC) crews and ships have sailed worldwide supporting the fleet and DoD

By Edward Lundquist

U.S. Navy's Military Sealift Command (MSC) USS Hershel "Woody" Williams (ESB 4) hosted a visit from Capt. Kenneth Pickard, Military Sealift Command Europe and Africa (MSCEURAF) commodore/Task Force 63 commander, while the ship was in drydock at the Palumbo Malta Shipyard

Photo by Christina Johnson

This year marks Military Sealift Command's 75th anniversary of service to the Navy and Defense Department. MSC's celebration recognizes the unique service of the crews and ships that have sailed in every ocean

While the Navy had specialized ships for logistics before and during World War II, it wasn't until 1949, when the Department of Defense established the Military Sea Transportation Service (MSTS) to be DoD's single managing agency for ocean transportation needs. DoD transferred a number of Army ships to the Navy and MSTS assumed responsibility for providing sealift and ocean transportation for all military services as well as for other government agencies.

In 1970 its name was changed to Military Sealift Command, and in 1987 came under the newly establish U.S. Transportation Command, joining Military Airlift Command (replaced by Air Mobility Command in 1992), Military Sealift Command, and Military Traffic Management Command (renamed Military Surface Deployment and Distribution Command in 2004). Today, MSC is aligned under Commander Fleet Forces Command, which sees MSC as an integral part of fleet operations.

MSTS, and later MSC, were vital to the delivery of material and fuel for the war efforts in Korea and Vietnam. More recently, MSC led a massive sealift effort for Operations Desert Shield and Desert Storm.

A report from the Center for Naval Analyses stated that the sealift operation in Desert Shield/Storm was a massive undertaking. "All elements of the Navy's sealift assets were involved, in addition to a large number of chartered ships, both domestic and foreign."

According to a U.S. Transportation Command report on the war, "At the height of the sealift, on 31 December 1990, 217 ships--l32 enroute, 57 returning, and 28 loading or unloading--formed a virtual "steel bridge" across the Atlantic Ocean. This equated to approximately one ship every 50 miles from Savannah, Georgia, to the Persian Gulf. By the end of the war, 459 shiploads had moved 945,000 pieces of unit equipment totaling nearly 32.7 million square feet--enough tanks, trucks, ammunition, and foodstuffs to cover every square foot of 681 football fields. Unit equipment sealifted to the United States Central Command (USCENTCOM) area of responsibility (AOR) totaled nearly 2.43 million tons."

Today, the MSC fleet covers a wide spectrum of capability, and the command's contracting authority facilitates bringing additional or unique vessels when required. The Combat Logistics Fleet consists of 32 ships that can deliver fuel, food, supplies and ammunition wherever needed, while ships are underway. The CLF includes oilers, fast combat support ships, and dry stores and ammunition ships. And all of them can deliver while connected alongside or using helicopters. MSC's strategic sealift fleet of 24 prepositioning ships supports the Navy and Marine Corps, Army, and Air Force with vehicles, equipment, weapons and ammunition warfighters will need in the event a conflict erupts. Another 22 "special mission" ships do everything from tracking missiles

U.S. Navy photo by Mass Communication Specialist 2nd Class Daniel Barker/Released

1949 — **Military Sea Transportation Service established** to combine the Navy's Fleet Support Services, the Naval Transportation Service, the Army Transport Service, and the U.S. Maritime Commission's War Shipping Administration.

1950 — When the U.S. forces land at Inchon in September 1950, 13 USNS cargo ships, 26 chartered American, and 34 Japanese-manned merchant ships, under the operational control of MSTS, participate in the invasion. A few months later, MSTS helps evacuate 105,000 U.N. troops; 91,000 refugees; 350,000 tons of cargo; and 17,500 vehicles--193 ship loads--from encirclement by Communist forces around the ports of Hungnam and Wonsan, and delivers them to the port of Pusan.

1970 — MSTS renamed **Military Sealift Command.**

1972 — A Navy study concluded that it would be more cost effective to fleet auxiliaries such as oilers, stores ships and ammunition ships to MSC to operate with civil service mariners (CIVMARs) instead of active-duty Sailors. The fleet oiler USS Taluga (AO 62) is transferred to MSC as USNS Taluga (T-AO 62) and begins providing replenishment-at-sea services to the fleet.

1984 — **USNS Zeus (T-ARC 7)**, the first cable repair ship designed and built by the U.S. Navy from the keel up joins the fleet.

in the exo-atmosphere to charting the bottom of the ocean; and 14 "service support" ships serve as hospital ships, salvage ships, ocean-going tugs, command-and-control flagships, submarine tenders and other fleet support roles. MSC also has 16 high-speed "expeditionary fast transports" to move people, vehicles and cargo quickly around a theater of operations.

Looking back, MSC has operated a wide variety of vessels to meet its many demanding mission requirements. Here are just a few examples:

USNS Taluga (T-AO 62) was the first Navy oiler converted to operate under MSC with a civil service mariner crew. She exemplifies the spirit of support and dedication exhibited by CIVMAR crews over the decade, on deck in all weather, day or night, handling the rigs that refuel the Navy's warships.

USNS Vanguard started life as a tanker built for the U.S. Maritime Commission during World War II to deliver fuel in the Pacific theater of operations. After the war she was acquired by the Navy and commissioned as USS Mission San Fernando (AO 122). She was placed into service with the Naval Transportation Service in 1947, which then became part of MSTS. After being laid up at the Maritime Reserve Fleet at James River, Virginia, she came back into naval service and was lengthened and converted missile-range instrumentation ship to support space flight tracking, including the Apollo and Skylab programs. She briefly carried the name Muscle Shoals (T-AGM-19) before becoming USNS Vanguard (T-AGM-19). In 1966. In 1980 she changed missions to become a test ship for submarine navigation systems, serving in this role for two decades.

Tugboat Jane McAllister pulls alongside MV Roy Benavidez (T-AKR 306) to the ship safely pull away from the pier March 15, 2024.

U.S. Navy photo by Ryan Carter

USNS Observation Island has a similar pedigree. She started life in 1954 as a merchant ship, the SS Empire State Mariner, and was transferred to the Navy in 1956. She was converted into a ballistic missile tracking ship and classified as a miscellaneous auxiliary as EAG 154 and later as AG 154. She supported both the Polaris and Poseidon missile programs. After a period of inactivity, she returned to service with MSC in 1979, becoming the range instrumentation ship USNS Observation Island (T-AGM 23). She supported the U.S. Air Force missile tracking operations until decommissioning in 2014, a role now performed by USNS Howard O. Lorenzen (T-AGM 25).

The 894-foot, 70,000-ton USNS Comfort (T-AH 19) and USNS Mercy (T-AH 20) were built as tankers in the mid-seventies and converted to hospital ships a decade later. Today, the Military Sealift Command operates the two hospital ships with a CIVMAR crew and a Navy medical team. The ships are maintained in a reserve status and can be activated in five days to respond to contingencies. When active they have a civilian crew of 71 and a medical of up to 1,200, and have 1,000 patient beds.

MSC's hospital ships played a big role in humanitarian assistance and disaster response contingencies, such as the 2004 Indonesian earthquake that precipitated the one of the most destructive tsunamis in recorded history, the 2010 Haitian earthquake, and Hurricane Maria in Puerto Rico in 2017. Both hospital ships were mobilized and staged to Los Angeles and New York City to provide medical services during the Coronavirus pandemic. Hospital ships and expeditionary fast transports have

1986

The 1,000-bed float hospital ship **USNS Mercy (T-AH 19)** joins the MSC fleet. Mercy and sister ships USNS Comfort (T-AH 20) have CIVMAR crews and an active duty and reservist medical staff.

1990

MSC provides sealift for **Operations Desert Shield/ Desert Storm**. On just one day (Dec. 31, 1990), 217 ship were in support--132 enroute, 57 returning, and 28 loading or unloading.

1993

During fiscal year 1993, a total 561,000 tons of cargo, including 8,757 vehicles and 2.4 million square feet of other equipment, were deployed to Somalia aboard MSC ships, in support of **Operation Restore Hope.**

1995

Capt. Emigdia "Amy" Esqueda assumes duties as master of USNS Effective (T-AGOS 21), becoming **MSC's first female master**. She serves until her retirement in 2018. U.S. Transportation Command established. MSC becomes a component command of TRANSCOM.

2004

During fiscal year 2004, the MSC team delivered more than **6 billion gallons of fuel** for U.S. ground and air forces in Iraq and Afghanistan. During the same period, the MSC team delivered more than **3 million short tons of cargo** to the ground forces in Iraq and Afghanistan.

also participated regularly in support of Southern Partnership and Pacific Partnership theater security cooperation exercises.

The Navy's expeditionary sea bases (ESBs) provide a sea-going platform from which logistics, special operations and mine countermeasures can be conducted, and operate with a hybrid Navy-CIVMAR crew.

The T-AGS oceanographic survey ships and T-AGOS ocean surveillance ships provide critical environmental data to help warfighters maintain the competitive edge.

Some ships work in pairs. The 349-foot, 6,500-ton USNS Vice Adm. K. R. Wheeler (T-AG 5001) transfers fuel from tankers to forces ashore to support boat, vehicle and aviation operations. It works in tandem with the 155-foot, 367-ton M/V Fast Tempo, which helps position the fuel transfer hoses. And at the Navy's bases at Bangor and Kings Bay respectively, a pair of T-AGSE ships support the movement of submarines in coordination with the U.S. Coast Guard.

MSC ships have often had to venture into distant and dangerous waters. During the early 1950s, a number of WW II-era MSTS cargo ships carried the material need to build the Thule air base in Greenland to support long-range bombers. Likewise, a number of MSTS ships supported construction of the Distant Early Warning radar stations across the northern approaches to Alaska and Canada.

One of the Navy's dock landing ships was built with a strengthened hull and operated by MSC to support Arctic operations. The 10,000-ton, 456-foot USNS Point Barrow (T-AKD 1) was later modified to support NASA's manned space flight program. The ship was later converted to support deep submergence operations and renamed USS Point Loma (AGDS 2) in 1974.

Military Sealift Command has wide-reaching contracting authority to obtain sealift services for special missions. Among the interesting assignments given to those MSC-contracted ships are the annual resupply missions to the Thule base in Greenland and McMurdo base in Antarctica, which requires ice-strengthened cargo ships capable of unloading cargo and taking on retrograde materials.

MSC-chartered MV Ocean Giant performed the Operation Pacer Goose mission to Pituffik Space Base — which is the new name for Thule Air Force Base — in Greenland last August. MSC chartered the cargo ship MV Ocean Gladiator and tanker MT Acadia Trader to conduct the resupply to the National Science Foundation's base at McMurdo Sound on Antarctica. Although these missions are conducted in the summer, icebreakers are usually required to open a channel for the resupply ships.

The most distinctive silhouette of any MSC ship has to be the Sea-Based X-Band Radar, which is a 32,600-ton semi-submersible, self-propelled platform with a large white radome on top that provides ballistic missile-tracking information for the Missile Defense Agency.

Today, as it has for 75 years, MSC ships across the world's oceans are supporting the fleet and DoD with high-skilled and dedicated mariners sailing aboard unique and specialized vessels with blue and gold stripes on the stacks.

The Cutter Mustang escorts U.S. Naval Ship Henry J. Kaiser into Seward, Alaska, a standard procedure for a Military Sealift Vessel visiting the state.

US Coast Guard Art Program 2008 Collection, Ob ID # 200802, "Escort Duty" Nina Buxton, oil, 24 x 36

2005 — U.S. Sixth Fleet flagship USS Mount Whitney (LCC 20) converted to a **hybrid crew** of CIVMARs and active Navy personnel.

2007 — First of fourteen 45,000-ton, **689-foot Lewis and Clark class** of dry cargo and ammunition ships joins the fleet.

2012 — First **Spearhead class** of expeditionary fast transports joins the fleet. The EPFs are capable of 40-plus knots.

2014 — MSC announces that its headquarters function in Washington, D.C. and Norfolk, Va., will be consolidated in Norfolk.

2022 — MSC's newest fleet oiler, **USNS John Lewis** (T-AO 205) is delivered to the Navy.

2024 — Civil Service Mariner (CIVMAR) **Eliza Pingree** becomes MSC's **first female chief engineer**.

EFFICIENCY GAINS FROM ELIMINATING THE HUB VORTEX

All images courtesy EcoMarine Innovations

There is hydrodynamic solution that delivers multiple benefits for ship owners facing increasingly tough regulatory requirements and rising operational costs, writes ***Dr. Batuhan Aktas.***

One area of ship operations that has attracted much attention in recent years due to the possibilities it represents for emissions reduction is that of cavitation. During ship operations, cavitation occurs because of vortices that build up and cause bubbles to collapse under the ship's propeller. The results of this process include increased noise, vibration and energy usage. The latter is of particular concern for ships looking to streamline their energy profile.

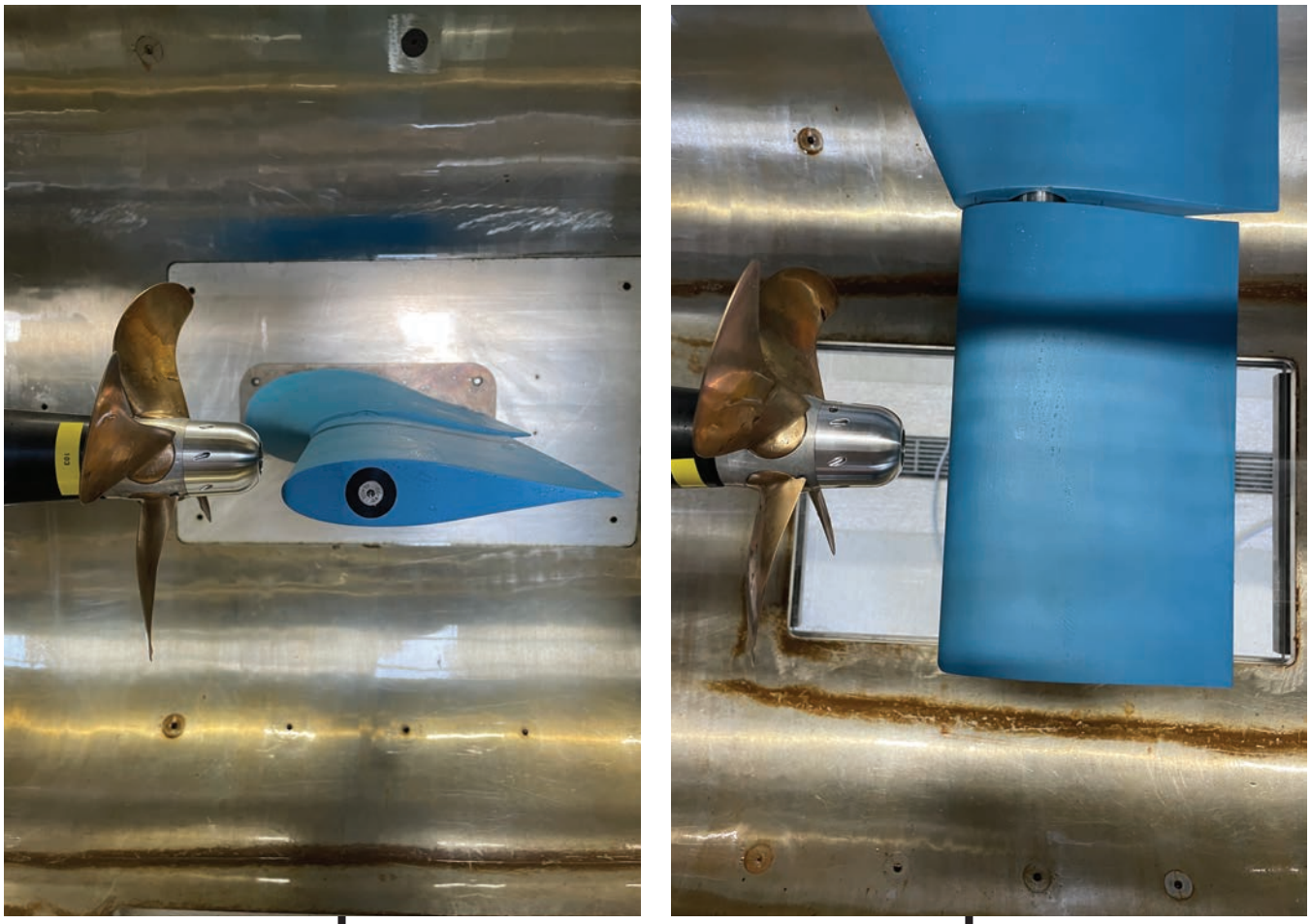
Existing energy saving designs for propeller hub caps or boss caps incorporate fins that act to improve vessel efficiency by reducing cavitation while ships are at sea. However, the finned design generates turbulence and is linked to cavitation as bubbles form underwater.

At EcoMarine Innovations, a start-up supported by the University of Strathclyde, we set ourselves the goal of addressing these issues while we were working on a project with a major European propeller manufacturer. During this collaboration, we learned that cavitation is a major cause of inefficient ship operations, accounting for 3-8% of lost propulsive efficiency.

Convinced that it must be possible to develop a better way of addressing this efficiency cost and the related environmental impacts, we studied the design of boss caps commonly used on ships. In the course of this research, we began exploring the idea of designing a boss cap that uses holes instead of any structure that can cause turbulence or operational risk. The result is the Holy Boss Cap (HBC).

Testing the Tech

The development of the HBC demonstrates the importance of research support of the kind we have at Strathclyde University. The product, which was launched in February 2024, eliminates propeller hub vortex cavitation, the main source of rudder erosion, and reduces associated propeller efficiency



Holy Boss Cap undergoing trials

losses. However, an early version of the innovative 'holy' design failed to gain traction as it was not hydrodynamically efficient, as the holes reduced the efficiency of the propeller.

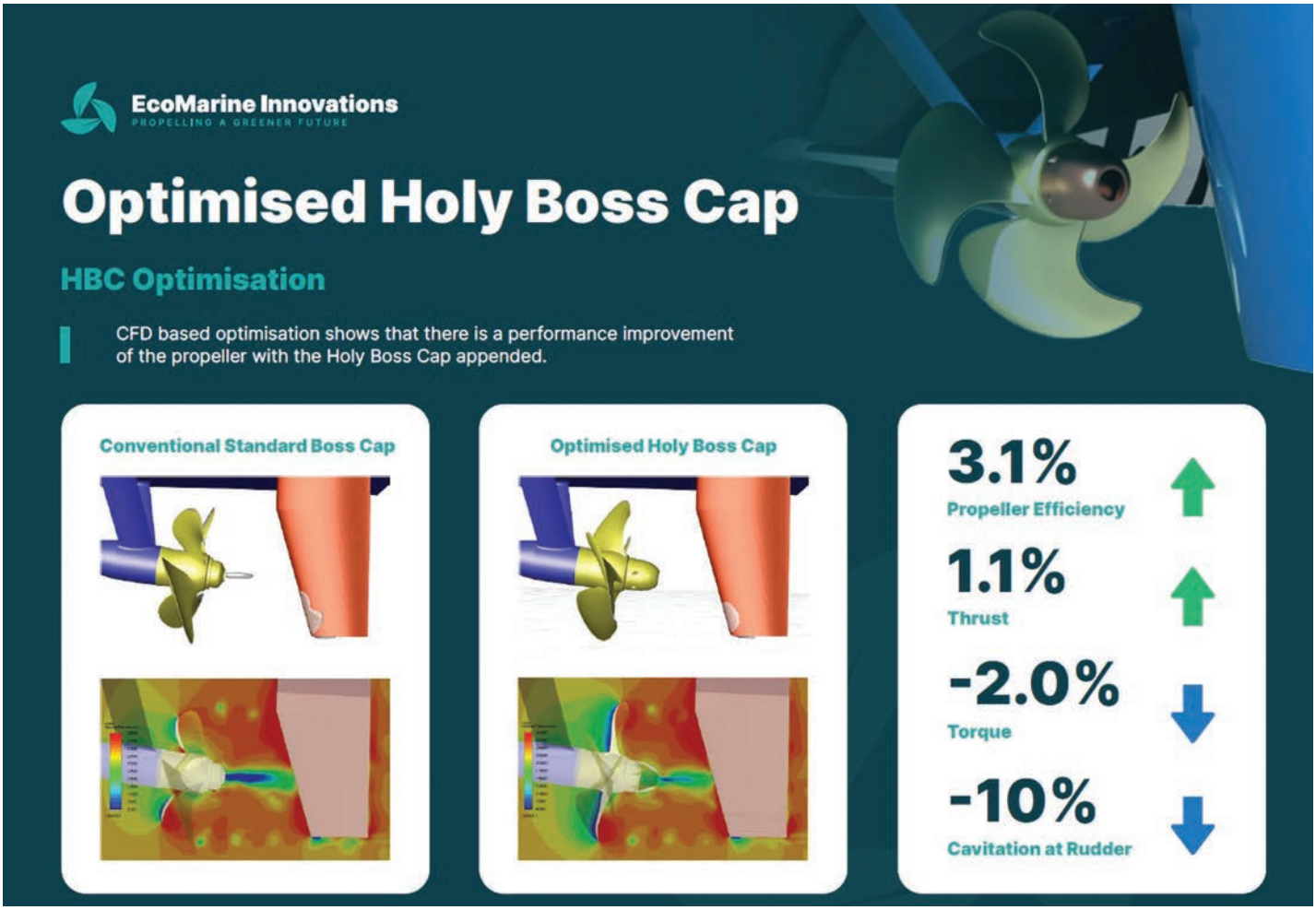
The revised design of the HBC, which we implemented following extensive studies in partnership with the University, addressed these problems with carefully placed and angled holes bored into a conically shaped hub. The holes channelled into the hub affect the high pressure in the hub vortex by redirecting the flow downstream. The resulting low-pressure swirl flows in the opposite direction to conventional hubs, behind the propeller blades, reducing propulsive drag, fuel consumption and maintenance costs.

To assess the effectiveness of the new design, we carried out computational fluid dynamic (CFD) tests on a typical twin-screw vessel with V-brackets and a 90m coastal general cargo ship. Using local workstations running parametric optimization software combined with CFD software, we studied the effects of variables such as chamber volume and profile, number of holes, and angle of the holes.

When we compared the HBC with more advanced energy-efficient boss caps currently in operation, we found that it to be at least 3% more efficient. Overall, compared to standard propeller boss caps, the HBC improved propeller efficiency by 3.1% and thrust by 1.1%, while reducing torque by 2%, rudder cavitation by 10%, and propeller induced noise by 1-3dB. We expect the HBC to be capable of delivering increases in propulsion efficiency of up to 5%, compared to conventional propeller boss caps.

These potential savings were further confirmed by a European cavitation tunnel testing facility, where savings more than 2.1% were found despite challenging scale effects.

Given the pressing emissions-reduction challenges that the shipping sector faces, we believe it is not enough to develop a solution without ensuring that it can be scaled in a meaning-



ful way. Having successfully completed validation tests at a hydrodynamic research centre in Sweden, the HBC is undergoing ship model basin trials to verify the efficiency gains on larger commercial and naval vessels. Meanwhile, the patent for the HBC is pending, with the support of Strathclyde University in the patent application process.

A Simpler Solution

It has become clear to us while developing the HBC that traditional methods of addressing ships' energy wastage have failed to keep pace with the industry's needs, or to consider the wider impacts of underwater noise and vibration. Zero propeller hub vortex cavitation can help towards ESG, EEXI and CII goals, improve efficiency and reduce the costs associated with cavitation induced rudder erosion. Driven by research, the HBC is meeting this need in the market and is contributing to more sustainable ship operations.

Underpinning our efforts in bringing this product to market is the drive to find the simplest way to address what is actually a very simple problem. We have achieved this by several metrics: installation of the HBC takes just five to six hours, and the product can easily be retrofitted or installed on new vessels. Once fitted, the product can be maintained during routine drydock visits. In addition, the HBC offers reduced CAPEX compared to existing devices. Thanks to the ease of casting and the lower amount of material required, it costs significantly less to manufacture than current conventional propeller hubs.

The business case for shipowners is compelling. Taking the example of a 250m vessel and a fuel consumption of about 35 tonnes per day, operating for approximately 240 days a year, and assuming a 3% saving return on investment is around five months.

We have already received significant interest from ship owners and propeller manufacturers and are engaging with potential partners to take the concept to market.

CLASS MOVE SIGNALS INDUSTRY DRIVE TOWARDS OIL-FREE PROPULSION

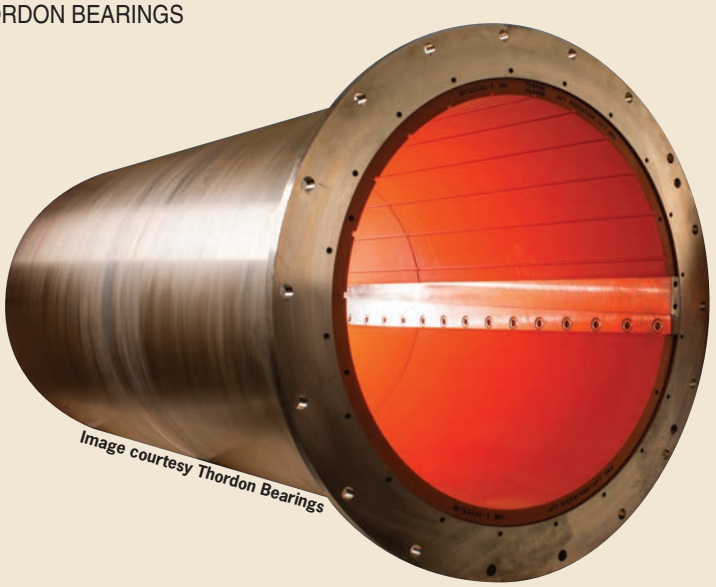


Image courtesy Thordon Bearings

Along with cost savings and greater operational efficiency, the seawater-based lubrication of propeller shaft bearings offers significant environmental benefits as oil pollution is eliminated. However, operators of these systems have, until recently, had to comply with more demanding propeller shaft withdrawal and inspection regimes than their oil-based counterparts.

Now, following a decade during which individual class societies gradually updated their rules to reflect the reality of seawater-lubricated bearing materials and systems, all the major societies have revised their rules and notations to make seawater-lubrication technically equivalent to that of oil. Previously, seawater-based systems had to comply with costly five-yearly shaft withdrawal requirements, but they are now subject to the same extended 15 to 18-year shaft withdrawal inspection periods as those using oil-lubrication, subject to monitoring criteria.

The societies that have amended their rules relating to the inspection of seawater-lubricated propeller shaft systems include the American Bureau of Shipping (ABS), Bureau Veritas (BV), the China Classification Society (CCS), Det Norske Veritas (DNV), Lloyds Register (LR), and Nippon Kaiji Kyokai (ClassNK).

Early adopters of revised rules include Lloyd's Register, which noted in its January 2013 Periodical Survey Regulations – Screwshafts, Tube Shafts and Propellers: "For water-lubricated bearings, the screwshaft is to be withdrawn for examination…when the ship reaches 18 years from the date of build or the third Special Survey, whichever comes first."

Bureau Veritas followed and amended its MON-SHAFT notation to cover seawater-lubricated tailshafts in January 2014. The update required ships to undergo a modified tailshaft survey after five years and full survey every 10 years.

CCS then amended its guidelines for screwshaft condition monitoring systems (SCMs) in its Rules for Classification of Sea-Going Steel Ships in 2015, stating: "If they are found satisfactory at a survey of the items…the interval of drawing the shaft for examination as specified…for the normal survey may be extended to a maximum period not exceeding 15 years."

DNV (then DNV GL) followed in 2016 when it introduced its voluntary TMON notation for open loop seawater-lubricated propeller shafts. This revision also removed the need for five-yearly inspections, providing that equipment passes sensor-driven condition monitoring to check bearing wear, along with checks of the tailshaft and lubricant systems.

Then in January 2020, ABS published guidance that "TCM-W (Tailshaft Condition Monitoring – Water Lubricated) may be assigned to a vessel with tailshafts specifically arranged with closed or opened type seawater-lubricated sterntube bearings."

Drivers of these changes include the development of real-time data capture techniques that reduce the need for inspections, along with advances in materials and technology. The most recent class society update, in June 2023, was from Class NK, which stated in its amendments to the Rules and Guidance for the Survey and Construction of Steel Ships: "In recent years, the development of mechanical type sealing devices, and bearings with lower wear properties as well as improvements in corrosion prevention technology, have led to fewer wear and corrosion defects in both shafts and bearings."

All the societies have included conditions in their changes to rules affecting seawater-based bearing systems, covering aspects such as monitoring devices and alarms, resistance to corrosion, methods of monitoring wear, seawater flow rate and pump efficiency in such systems.

Thordon Bearings, a pioneer of seawater-based systems, has long called for industry-wide standardization of extended shaft withdrawals for seawater-based lubrication solutions.

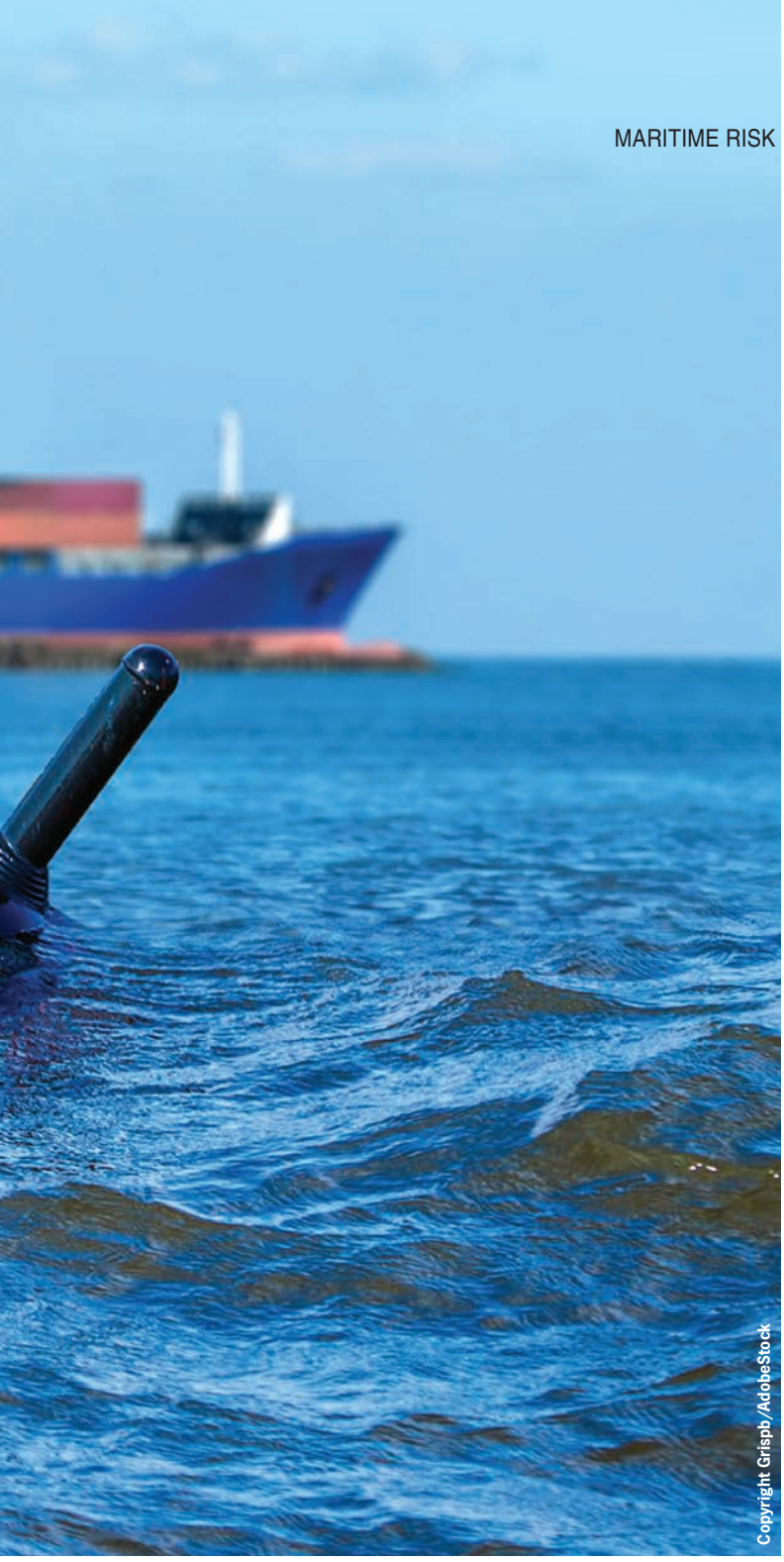
"The implications for the shipping sector of these rule changes are significant. Ship owners can now benefit from ongoing improvements in material technologies by installing seawater-based lubrication systems – without being held to onerous rules that oil-based systems do not have to follow," says Craig Carter, Vice President Business Development, Thordon Bearings.

MARITIME RISK SYMPOSIUM 2024: Great Power Competition and Gray Zone Engagement

By Dr. Joe DiRenzo and Dr. Don Brutzman

For 15 years the Maritime Risk Symposium (MRS), an annual three-day event, has brought together government and maritime industry leaders, port representatives, international and domestic researchers and solution providers to examine current and emerging threats to maritime security. World events highlight that maritime security is increasingly at risk during the current period of great-power competition and ongoing conflicts. The active competition between nations who are not at war but also not fully at peace is called the "gray zone." Hostile gray-zone actions of international adversaries present growing dangers to freedom of navigation, the maritime global commons, and world trade.

In 2024, gray zone activities against the maritime industry and the Marine Transportation System became front page news with drone attacks, ship sinkings, mining of grain-shipment corridors, cutting of subsea cables, and more. Due to adversarial actions, the industry itself is now at the center of attention for the U.S. Coast Guard, U.S. Navy, U.S. Marine Corps, U.S. Merchant Marine, inter-agency partners, state and local governments, and international stakeholders. Vessels have been harassed and



rammed, message traffic has been blocked, and continuing cyber attacks have all interrupted maritime trade. Panel presentations at MRS2024 bring together many government and industry experts sharing their knowledge on how to manage future risk in the maritime global commons, in littoral waters, and the seabed.

This year's MRS is being held 11-13 June 2024, hosted by the Naval Postgraduate School in Monterey California as an in-person event. There is no cost for registration. A series of keynote addresses and panels led by leading national experts are focused on cooperative efforts among the services, maritime domain awareness, policy imperatives, maritime cyber, assessing risks during great change, and Arctic collaborations. As in previous years, a Coast Guard Evergreen facilitated session for strategic-concept generation is being help immediately afterward.

The MRS 2024 program aims to increase awareness and better understand the coercive aspects of maritime gray zone operations. The discussions will also look to explore ways to establish unity-of-purpose in order to build unity-of-effort for countering the disruptive actions of malign actors. This year's symposium has been organized within the broad context of the current U.S. Tri-Service Maritime Strategy, published in late 2020, and signed by the Secretary of the Navy, the Chief of Naval Operations, the Commandant of the Marine Corps, and the Commandant of the Coast Guard. Given excellent guidelines provided by this cooperative framework, MRS2024 contributors are examining how all of the nation's maritime services and other critical partners can continue to support maritime security during an increasingly contested "gray zone" period. This year's agenda has six major panels:

PANEL 1 – FUTURE OF MULTI-SERVICE MARITIME STRATEGY: HOW TO MOVE FORWARD ON URGENT FUTURE NEEDS?

Flag and general officers from each maritime service will provide insights for achieving an enduring national strategy amid growing threats to U.S. maritime industry. Can we build on solid concepts in the 2021 Tri-Service Maritime Strategy (TSMS) to get to the next level: considering an all-services focus on mutual cooperation during times of steadily rising maritime risk, military hazards, and gray-zone international conflict.

PANEL 2 – MARITIME DOMAIN AWARENESS AND TRI-SERVICE COLLABORATION

Focus: Global maritime security and prosperity is accomplished through the effective understanding of the maritime domain and by improving our ability to appropriately share maritime information, including intelligence, law enforcement information and all-source data from private sectors. The panel will consider pressing issues in this space, including: How can we improve access to maritime information for all those with requisite needs/appropriate permissions among the Global Maritime Community of Interest (GMCOI)? What are some key barriers to our ability to create enterprise-level access to data and transition away from current organization-centric data architecture? What steps can we take today to break down these barriers and enhance collaboration between GMCOI members?

PANEL 3 – MARINE BOARD: MARITIME POLICY VIS A VIS THE NATIONAL MARITIME STRATEGY

Focus: Since 2014 Congress has tasked the administrations to develop a national maritime strategy to ensure the nation has sufficient U.S. flagged vessels, mariners and shipbuilding capacity to meet future military sealift requirements, which is critical to

our national security. To date, the efforts have not produced the directed strategy. This panel will discuss the latest attempt to develop the strategy as mandated by the Fiscal Year 2023 National Defense Authorization Act. After providing a historical review of previous efforts, panelists will provide the status of the ongoing study, aimed at providing foundational input to the strategy. This will be followed by perspectives from the administration, U.S. shipbuilding/repair industry, U.S.-flag shipping and maritime labor regarding what the strategy needs to address.

PANEL 4 – MARITIME CYBER AND MULTI-STAKEHOLDER COLLABORATION

Focus: Gray zone threats in the maritime domain, characterized by subtle cyberattacks aimed at disrupting operations and gaining strategic advantage, pose a complex challenge to traditional cybersecurity approaches. These threats often fall below the threshold of conventional conflict, making attribution and response difficult. Artificial intelligence (AI) offers promising solutions to enhance the detection, analysis and mitigation of gray zone cyber threats in the maritime sector. This panel will explore the potential of AI to counter tactics like GPS spoofing, Automatic Identification System manipulation and attacks against port infrastructure. It will examine how machine learning-based systems can identify anomalies in network behavior, detect subtle patterns associated with gray zone activities and automate threat intelligence analysis. The panel will also address the challenges of applying AI in this context, including the need for specialized datasets, then explain the ability of AI decisions and ensuring the trustworthiness of AI systems in high-stakes environments.

PANEL 5 – UNDERSTANDING MARITIME RISK AMIDST GRAY ZONE CONFLICT

Focus: Identification of gray zone activities and understanding of their risk and impact. It can be difficult to identify gray zone activities, since they are already in an undefined space. Consequently, understanding the total impact of gray zone activities, or more broadly, the total risk of potential activities in the gray zone, is a significant challenge. The panel will work through questions like: What types of risk do gray zone activities pose to the economy, international relationships, security v and global balance of power? What types of risks do gray zone activities bring to operational activities in different regions? What are the key concerns of each of the services and industry? What are each of the services doing to address these concerns? How are the services coordinating with international partners, government agencies and non-governmental organizations to combat gray zone activities?

PANEL 6 – MULTI-SERVICE AND MARITIME INDUSTRY COLLABORATION IN THE ARCTIC

Focus: As maritime activity in the Arctic region increases, how do the sea services (the U.S. Navy, U.S. Marine Corps, the U.S. Coast Guard, Merchant Marine and National Oceanic and Atmospheric Administration) and maritime industry best collaborate to mitigate the risks of conducting operations in the harsh Arctic region? While domestic and United States Indo-Pacific Command maritime gray zone activities are receiving national press coverage, such activities also extend to the polar regions, and specifically the Arctic. This panel will explore the risk and impact of such activities.

EVERGREEN

MRS 2024 will include a Coast Guard Evergreen event that will also focus on the gray zone. The Evergreen Program is the Coast Guard's strategic foresight initiative, tasked with looking over the horizon to inform current planning and better prepare the U.S. Coast Guard for an uncertain and unpredictable future. Using scenario-based exercises and workshops involving a diverse group of stakeholders, common strategic needs or key success factors can be identified across multiple plausible scenarios to better inform long-term strategic planning efforts.

Evergreen is a joint venture that combines strategy and foresight with the greater maritime community of seasoned industry professionals, academic centers and national labs, maritime students and government/non-governmental organization regulatory bodies. Typically, participants examine possible future scenarios and identify tomorrow's maritime infrastructure vulnerabilities and their implications to prosperity and security. The teams are a balance of diversity of experience, combining students and professionals in an interactive workshop designed to drive multi-disciplinary perspectives and strategic thinking. This will be the fifth year the Commandant's Emerging Policy staff has run an MRS-focused Evergreen.

Who should attend MRS2024? Maritime military members, Marine Transportation System industry representatives and members of academic institutions.

For more information and to register for the Maritime Risk Symposium 2024 use this link:

https://www.maritimerisksymposium.org

The Author

Brutzman

Dr. Don Brutzman is a co-chair of the 2024 Maritime Risk Symposium. A computer scientist and associate professor of applied science, Brutzman works in the Modeling Virtual Environments Simulation (MOVES) Institute, Undersea Warfare Academic Group and Information Sciences Department at the Naval Postgraduate School in Monterey, California. He is a retired naval submarine officer.

The Author

DiRenzo

Dr. Joe DiRenzo is a co-chair of 2024 Maritime Risk Symposium and the U.S. Coast Guard's director of research partnerships for the Research and Development Center. A frequent contributor to Maritime Reporter, he founded MRS in 2009 and has co-chaired every event since.

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Bibby Orders Zero Emission eCSOV

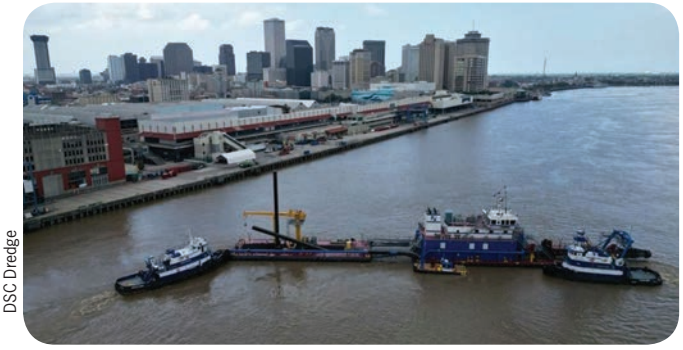
Bibby Marine

Bibby Marine signed a shipbuilding contract to build the world's first zero-emission, electric Commissioning Service Operation Vessel (eCSOV). It will be built in Gondan's Asturias shipyard in Spain and is scheduled to be delivered in 2026.

The eCSOV, which has been designed in collaboration with UK-based ship designers Longitude, will feature a battery system, complemented by dual-fuel methanol engines for emissions-free operations. It will be equipped with mission equipment, a spacious insulated warehouse and climate controlled electrical store. Ensuring comfort for crew members, the vessel will provide top-tier accommodation with generous communal areas and comfortable cabins. To facilitate zero-emission operations, the eCSOV will feature high-voltage offshore charging facilities for rapid recharging. With the capability to operate solely on battery power for over 16 hours between charging cycles, the vessel is primed for efficient field operations.

This project is part of the Zero Emission Vessels and Infrastructure (ZEVI) scheme, funded by the UK Department for Transport (DfT) and delivered by Innovate UK. ZEVI is part of the Department's UK Shipping Office for Reducing Emissions (UK SHORE) programme, a £206m initiative focused on developing the technology necessary to decarbonize the UK domestic maritime sector.

Marlin Class Dredge Delivered



DSC Dredge

On April 19, 2024, Muddy Water Dredging, LP, held the christening ceremony of its Marlin Class dredge at the Port of New Orleans.

"We are happy to unveil the Vaneta Marie dredge. After many hours of collaboration between Muddy Water and DSC what we have before us is a dredge that was crafted with precision and ingenuity," said Michael Kerns, President, and CEO of Muddy Water.

William (Bill) Wetta, Senior Vice President, and Chief Technology Officer of DSC Dredge, said, "This dredge represents the future of dredging technology."

The fully customized Marlin Class dredge speaks to DSC Dredge's reputation for innovation and engineering abilities. It measures 371 ft. long, boasting the capability to dredge a 400-ft wide cut with an 80° swing arc, it sets a new standard for operational efficiency, enhancing productivity by 5.9%. Furthermore, its customizable design features a detachable carriage barge, enabling seamless adaptation to various working environments.

DSC's Director of Domestic Dredge Sales, Charlie Johnson added, "this dredge is like no other, apart from it being the only one in its class equipped with state-of-the-art technology, including DSC's survey-grade DSC VISION package and Dredge Rx remote monitoring system, the dredge ensures unparalleled precision and performance. The dredge boasts US-built WABTEC generators meeting EPA Tier 4 Final emissions standards without the use of urea. Additionally, all dredge machinery is mounted on or above the main deck, eliminating the risk of flooding by dredge pump leaks or failures. Active monitoring of hull tank voids ensures early detection of water intrusion, further enhancing safety and reliability". He further added, "the dredge is equipped with powered lay-down spuds for quick bridge transits and the ability to remove and replace spuds for maintenance without additional support equipment. The selection and design of the dredge pump are based on USACE Engineering and Design Manual standards, ensuring optimal performance and efficiency. Additionally, its dual diesel-electric design, delivering 9,621 hp of total installed horsepower, underscoring its commitment to sustainability and environmental stewardship."

In the Shipyard

Green Ship Designs & Deliveries

MISC

MISC Makes a Move Toward Ammonia

MISC entered into Time Charter Party Contracts (TCP) with PETCO Trading Labuan Company Ltd (PTLCL) via its petroleum arm, AET for the world's first two ammonia dual-fuel Aframaxes. Through these vessels, PTLCL will be able to transport its products to customers around the world while contributing to the industry decarbonization by using ammonia as the cleaner alternative to conventional fuel.

AET also signed the Shipbuilding Contracts (SBC) for these two vessels with Dalian Shipbuilding Industry Co., Ltd (DSIC), a subsidiary of China State Shipbuilding Corporation (CSSC).

The TCP was signed by Mr. Zahid Osman, President & CEO of AET and Mr. Shamsul Bahari Salleh, CEO of PTLCL; and witnessed by Captain Rajalingam Subramaniam, President and Group CEO of MISC, and Mr. Ahmad Adly Alias, Chairman of PTLCL.

Sanmar Shipyards

Sanmar Delivers Camperdown to Targe Towing

Sanmar Shipyards is delivering a new tug for Targe Towing in Scotland. Known as BIGAÇAY Xl while under construction, the tug was renamed Camperdown by its new owners, and was on its way to its new home port of Aberdeen.

Camperdown is based on the exclusive-to-Sanmar RAstar 2900SX from Robert Allan Ltd., primarily intended for demanding escort operations in exposed areas.

Measuring 29.4 x 13.3m with a 5.5m molded depth and 5.75m design draft, the tug can achieve a minimum of 85 tonnes of bollard pull ahead and astern. Its escort towing and seakeeping performance is significantly enhanced by its unique sponsored hull form.

Camperdown, which has FiFi 1 fire-fighting capability, can achieve a free running speed of 13 knots, has both a forward and aft winch and accommodation for a crew of eight. In addition, the tug is equipped with dispersant and spraying system.

First in "Prima Plus Class", Norwegian Aqua Launched

The uniquely painted Norwegian Aqua was launched at the Fincantieri Marghera (Venice) shipyard, the first vessel in the Prima Plus class for Norwegian Cruise Line's (NCL). With external work now complete, the yard and its partners will focus on completing the ship for its scheduled April 2025 delivery.

Photo courtesy Fincantieri

"We are thrilled to celebrate another milestone together with our partners at Fincantieri, who are an integral part of the Prima class ships' journey and support us in evolving the extraordinary experience we design and deliver to our guests," said David J Herrera, President of Norwegian Cruise Line. "The 10% increase in space, based on preferences indicated by guests on ships of this class, gives us greater flexibility in expanding the offerings and evocative settings on board, through which passengers can relax and explore Norwegian Aqua."

The ship is big: 322m long and 156,300 gt and a length of approximately 322 meters, the new ship is 10% larger than the first two Prima class ships, also built by Fincantieri. In addition to more space the ship will have unique offerings including the **Aqua Slidecoaster, the world's first hybrid roller coaster and water slide**, the Glow Court, a new digital sports complex with an interactive LED floor, and Ocean Boulevard, the largest 360-degree outdoor promenade ever made by NCL.

Brunvoll Propulsion for Hydrogen Ferries

The Norwegian Ship Design Company

Brunvoll has been contracted to deliver the propulsion, maneuvering and autonomy systems for two hydrogen powered ferries for Torghatten Nord AS. The ferries will operate the harsh route to and from Lofoten in Norway, more specifically the Bodø-Verøy-Røst-Moskenes route. The ferries are of a new and innovative ship design with hydrogen fuel cells in mind, and the designer is The Norwegian Ship Design Company AS. Both ferries included in the contract will be delivered from Myklebust Yard in 2026.

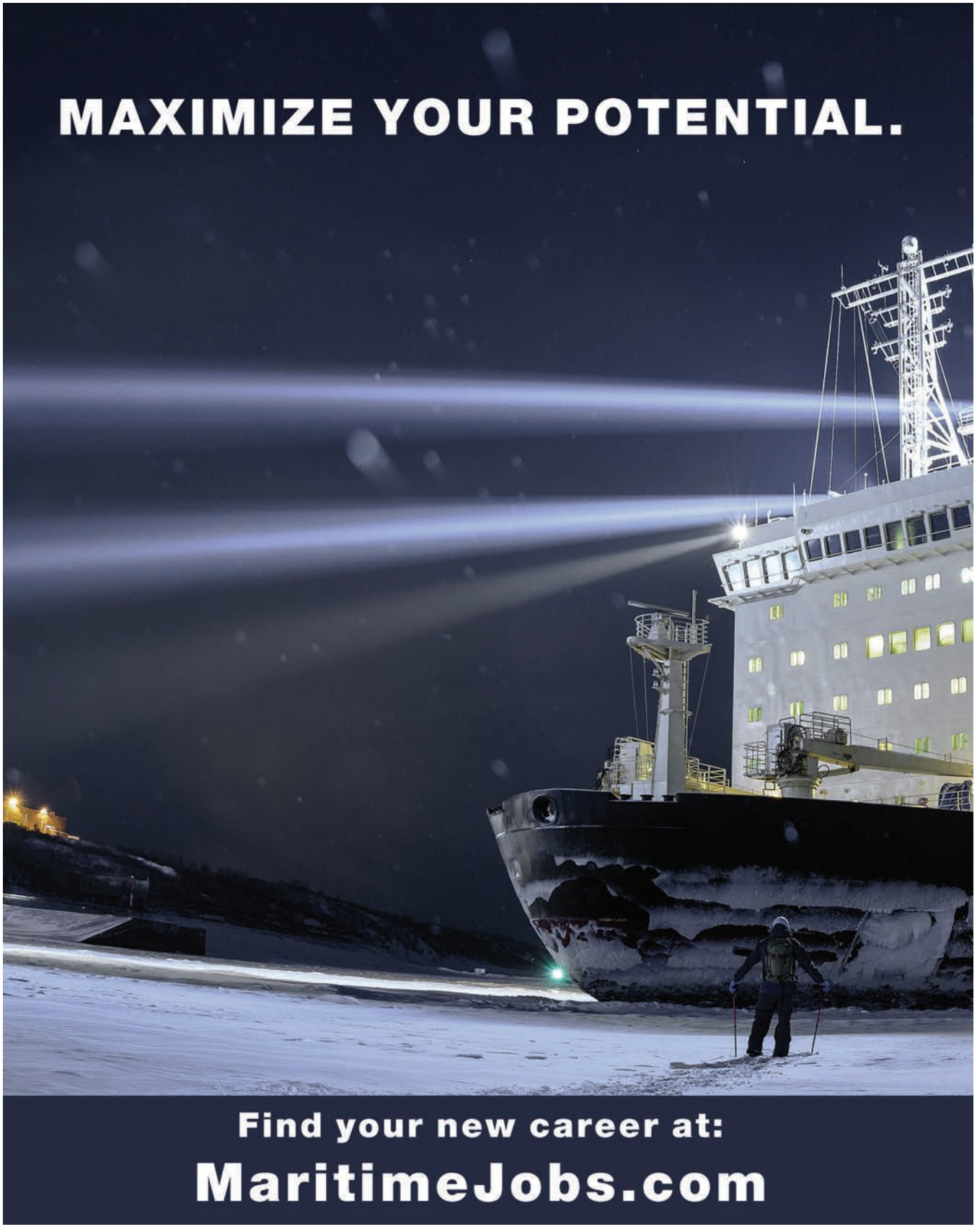
The Brunvoll contract includes two azimuth propulsion thrusters, BruCon Propulsion & Thruster Control System, BruCon Auto-Crossing system, and BruCon Condition Monitoring System. The pulling azimuth propulsion thrusters are of the largest size that Brunvoll delivers today. The installation of high propulsion power is one of the design considerations which make the vessels ready for the rough sea conditions experienced in this area which is open towards the North Sea.

The BruCon Condition Monitoring System will allow for remote monitoring and operational optimization throughout the vessel lifetime. Replacing the older ferries with hydrogen powered newbuilds will lead to an estimated CO2 emission saving of 26.500 metric tons. The routes are part of Norways national road network, and the Norwegian Public Roads Administration has set clear goals for emissions reduction for all new public ferry tenders. The contract for these routes came with a specified requirement for hydrogen powered vessels, and the Norwegian maritime industry has stepped up for the challenge.

Brunvoll

Employment

www.MaritimeJobs.com



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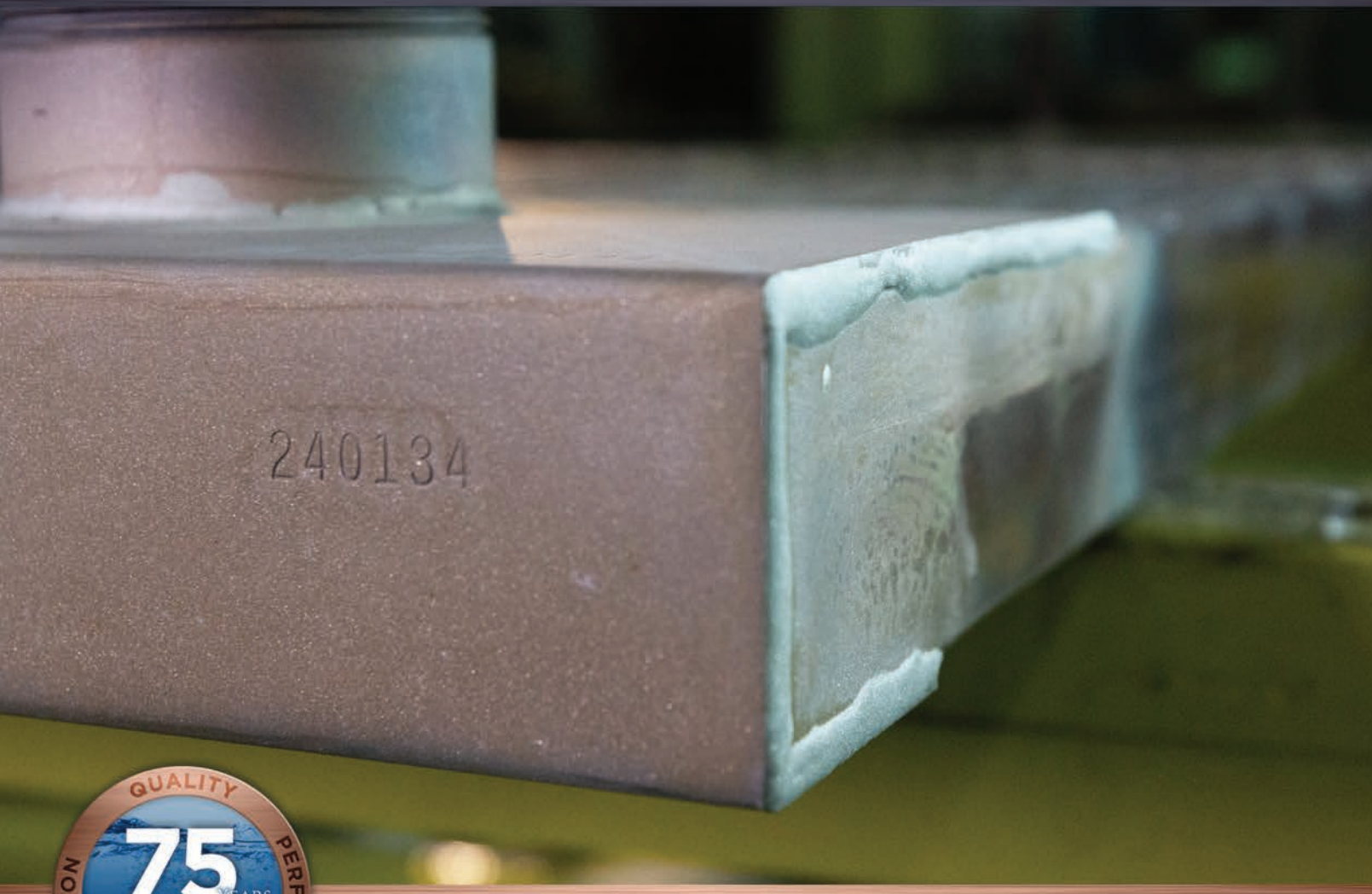

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