January 2022

MARITIME REPORTER AND ENGINEERING NEWS

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ANCHORS AWEIGH

As maritime sets sail into uncharted decarbonization waters, Knut Ørbeck-Nilssen, CEO, DNV Maritime, seeks to provide a steady course.

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Number 1 Volume 84

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24
Austal is making a big investment in its repair business.
Source: Austal USA

On the Cover
Knut Ørbeck-Nilssen, CEO, DNV Maritime.
Source: DNV

Features

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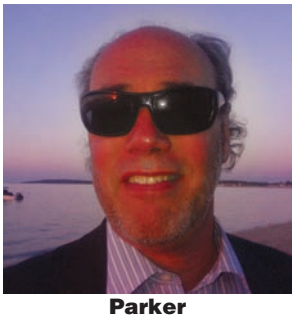
Contopoulos

Chen

Goldberg

Lundquist



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As we set sail on yet another year together – Maritime Reporter & Engineering News' 83rd year serving the global maritime industry and personally, unbelievably, my 30th year in this seat **–** I'm mindful of the advice **Charles O'Malley** gave to me during the interview process in 1992 when I admitted that I didn't have a maritime education and my knowledge of the industry, to that date, centered on personal boating. He said: *"Don't worry; this is a business … it's about money, people and technology."*

As we take the next step into the 2020's, there are an overabundance of technical changes finding their way into the maritime sector: technological challenges that will take a lot of people and a lot of money to solve. Here is where I really lean on my industry experts to help guide me – and you – on what promises to be an exciting, expensive and ever-changing trail.

We, like others in the maritime and mainstream media, talk incessantly and enthusiastically about the technical trends of the day, perhaps none more incessant or enthusiastic as DECARBONIZATION. While emission reduction and hybrid propulsion solutions garner more than their fair share of coverage, you know as well as I that the overwhelming majority of commercial boats and ships today – and for many, many more years – will continue to operate using diesel fuel. But while change has been understandably slow given the amount of money, time and R&D it will take to truly sail emission free, the change is undeniable and the pace is picking up speed.

Last month I had the chance to spend some time with **Knut Ørbeck-Nilssen**, CEO, DNV Maritime, as most of us 'spend time' today: on a Zoom call from the confine of our home offices. I've had the opportunity to interview Knut many times over the years, and I've always found him to be an even-keeled voice of reason on all matters maritime. Our discussion this time around was broad, but for this edition I've chosen to really focus in on the decarbonization efforts in maritime today as he sees them, as it is the multitude of research and investment today across the industry that will yield tangible technological advances and results for the generation to come. His insights from our discussion start on page 34.

Closer to home, and closer to the here-and-now for all of us is the spectacular logistics mess which has supply chains globally in a knot, impacting everything from the cars we drive to the food we eat to the energy we burn. While this is very far from a maritime-only problem, containershipping and the astronomical rise in shipping rates per box have been the poster-child for the debacle. **Patrick Berglund**, CEO of Xeneta, writes starting on page 20 regarding the short-, mid- and long-term impacts you can expect to see from the current situation and fall-out.

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Founder:
John J. O'Malley [1905 - 1980]
Charles P. O'Malley [1928 - 2000]
John E. O'Malley [1930 - 2019]

"A famous politician in Europe said that **we have to base our decisions on facts, logic and hope.** I think that resonates well with the situation that many ship owners are in these days: you have to know the facts; you have to make some logical assessment of what to do; and then you just hope that you made the right choice! **I think the biggest mistake though, is the one that chooses to do nothing at all.**"

Knut Ørbeck-Nilssen
CEO, DNV Maritime

"We're in the midst of the perfect storm, created by a combination of a worldwide driver shortage, equipment shortage, pandemic-related port congestion issues, container carriers' disregard for signed contracts and an influx of exports from Asia into the US. **And another storm cloud is that big carriers are buying up port facilities and freight forwarders, enabling them to have a firmer grip on rates and services.**"

Patrik Berglund
CEO & Co-Founder, Xeneta

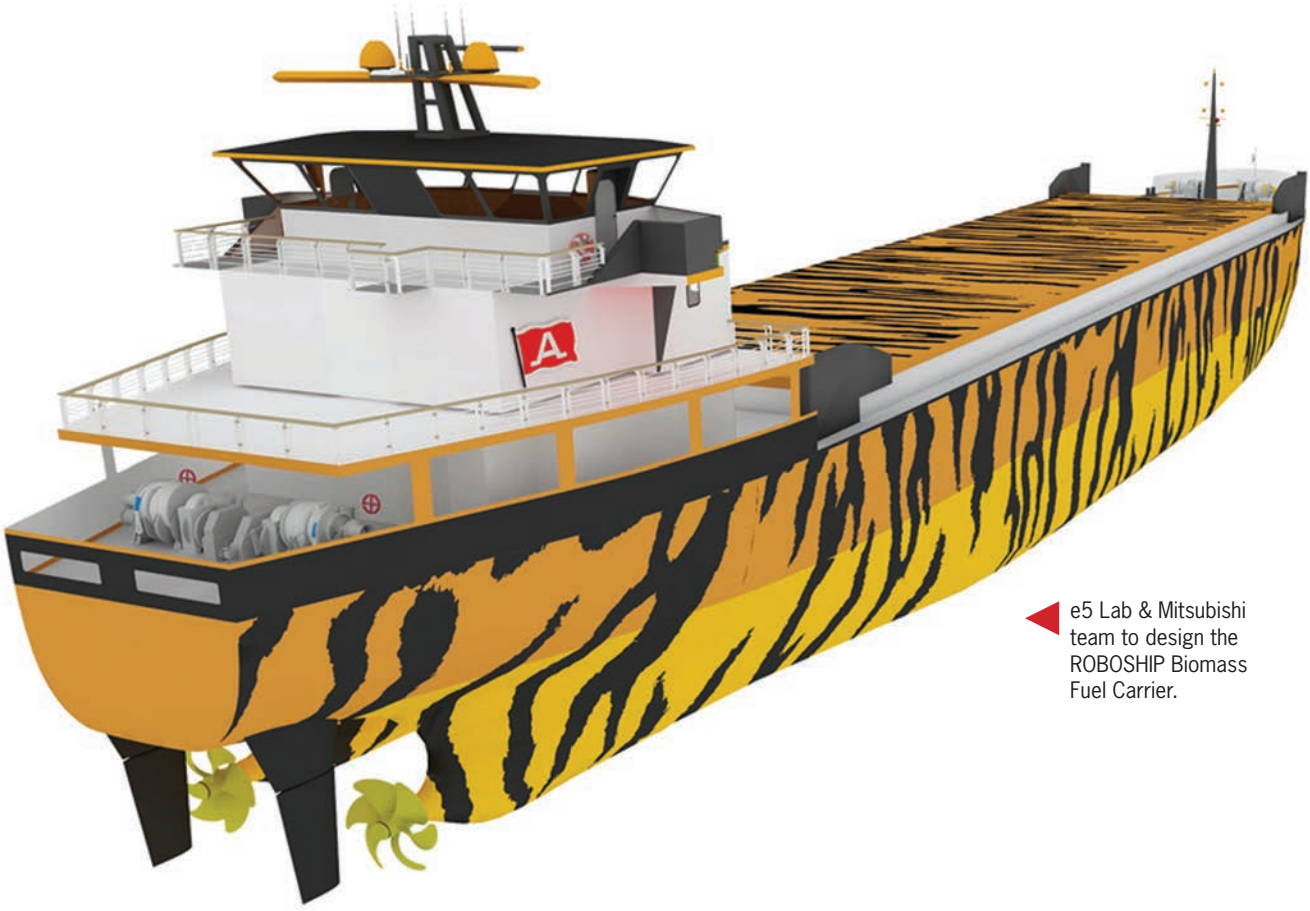
" I think everybody in this room knows what the current cost to build a U.S.-flag Jones Act-compliant SOV is, **and I don't think any project can support a rated return based around a $100m+ asset."**
Chad Verret, EVP, Harvey Gulf International Marine,

Speaking at ABS' Offshore Wind Conference last year in New Orleans.

EYE ON DESIGN

A look at new, innovative vessel designs and concepts

Northern Xplorer • ROBOSHIP Biomass Fuel Carrier • LPG/NH3 Gas Carrier • Electric Ferry



e5 Lab Inc. and Mitsubishi Shipbuilding Co., Ltd.

e5 Lab & Mitsubishi team to design the ROBOSHIP Biomass Fuel Carrier.

The pace of innovation in the global maritime sector continues as breakneck speed, driven by strict new emission mandates putting the commercial industry on the long, arduous road toward decarbonization. Watch this space for regular coverage of the most interesting ship and boat design concepts.

Japan's **e5 Lab Inc.** and **Mitsubishi Shipbuilding Co., Ltd.,** designed ROBOSHIP, a standard hybrid electric propulsion vessel to serve as a 499-ton biomass fuel carrier to be built by Honda Heavy Industries Co., Ltd. ROBOSHIP will be designed to use a standard system package comprising the hardware for electric propulsion, including propellers, motors, switchboards, storage batteries, and generators, together with the software to control this equipment; a system able to handle a cargo ship of up to around 749 tons. The ship foregoes conventional diesel engines in favor of a hybrid system of large-capacity storage batteries and generators to drive the propulsion motors. The adoption of Mitsubishi Shipbuilding's high-performance twin skeg ship design should lower propulsion horsepower by more than 20%, reducing CO2 emissions during cruising, and allowing the ship to navigate completely CO2-free during port operations The generators are capable of switching between fuels including liquefied natural gas (LNG), hydrogen, ammonia, biofuel, and synthetic fuel, allowing all operations, including navigation, to be CO2-free. After delivery in April 2023, the ship is expected to operate as a biomass carrier for Aioi Bioenergy Corporation.

Northern Xplorer AS (NX) announced its zero-emission, luxury cruise concept, designed to feature 'clean' technologies including fully electric propulsion, battery energy storage, hydrogen fuel cells and auxiliary renewable energy supply (wind and solar power). The concept is the brainchild of Rolf André Sandvik, founder and CEO, who previously founded travel company The Fjords, based in Flåm in western Norway, where as CEO he ushered in a new era of environmentally friendly sightseeing, commissioning the hybrid electric ves-

sels Vision of the Fjords (built 2016) and Future of the Fjords (built 2018). The plan today is for a series of 14 ships accommodating up to 300 passengers in 150 cabins supported by approximately 100 crew. The first are intended to be operational from 2024/2025. In addition to the clean propulsion technologies, the ships are designed with sophisticated HVAC systems to help safeguard against pathogen spread while extensive use of recyclable materials will promote circularity.

Current emission reduction and future flexibility is the hallmark of a pair of innovative ships that **NYK** ordered, its first two liquefied petroleum gas (LPG) dual-fuel very large LPG/ammonia (NH3) gas carriers (VLGCs) from Kawasaki Heavy Industries, Ltd., both to be built at the KHI Sakaide Works shipyard and set for delivery in 2024. Both ships, measuring 230 x 37.2m with an 11.65m draft with a 86,700 cu. m. tank capacity, will be equipped with separate cargo tanks designed to carry LPG and ammonia at the same time to flexibly respond to various trade patterns. In addition to the LPG dual-fuel engine, the ships will have a shaft generator that can generate electricity during the voyage by using the rotation of the shaft that connects the main engine to the propeller. Since the diesel generator can be stopped during normal seagoing transit, realizing full navigation with LPG fuel will be possible except for the use of a small amount of pilot fuel. The ships are designed with future flexibility in mind, expected to be given notations by ClassNK as VLGCs that have a preparatory design in accordance with the guidelines issued by ClassNK so that these ships may use ammonia fuel in the future.

Last, but certainly not least, **Incat Crowther** inked a deal to design an Incat Crowther 32 electric ferry for Fullers360 of Auckland, New Zealand, to be built by Q-West. Designed specifically for the Devonport route, the vessel will be designed to provide an efficient, low emission, quiet service between Auckland and Devonport. The drivetrain features the ability to employ a pair of range-extending generators that can be used in conjunction with the battery bank.

This technology supports the electrification transition while the charging network is expanded to allow all electric operation on longer trips. The design is also compatible to be refitted with hydrogen fuel for increased range as the fuel becomes more widely available in the future.

The vessel's drivetrain consists of four Danfoss EMPMI540-T4000 electric motors directly mounted to Hamilton HTX42 water jets, with a battery arsenal of 1944kWh to achieve maximum speeds over 28 knots. As well as the primary electric-only profile, the vessel can extend its range by a mode directly feeding the propulsion motors from the generators, a mode that charges the batteries from the generators, and a hybrid boost mode that combines both sources.

Start top left and move clockwise:

The LPG dual-fuel very large LPG / ammonia (NH3) gas carriers (VLGCs).

Artist illustration of Northern Xplorer zero-emission cruise ship.

Incat Crowther 32 electric ferry for Fullers360.

NYK

LPG/NH3 Gas Carrier

Incat Crowther

Electric Ferry

Northern Xplorer

Northern Xplorer AS

Tip #32

Are Mariners Knowledge Workers?

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What is the difference between knowledge and skills? Which should we focus more on in our training, and how does one influence the other?

When we think about the most important mariner quality, often the first thing that comes to mind is skill. Can the officer or crewmember safely perform the skills required of him or her? After all, if everyone performs their necessary skills correctly, what more is there?

There is, in fact, much more. Let's see what the experts have to say:

"A study by the U.S. Coast Guard found many areas where the industry can improve safety and performance ... the three largest problems were fatigue, inadequate communication ... and inadequate technical knowledge."

Human Error and Marine Safety - U.S. Coast Guard Research & Development Center

"Knowledge-based mistakes may occur when we have to think our way through a novel situation for which we do not have a procedure or "rule". ... Knowledge-based ... mistakes by crewmembers account for 13% [of maritime accidents]."

Searching for the Root Causes of Maritime Casualties - Maritime Research Centre, Warsash, Southampton, UK

It is interesting to note that the study from which the second quote was taken indicates that "skill-based" mistakes account for only 9% of accidents. Fewer than "knowledge-based" mistakes! So why is knowledge being identified as important - possibly even more important than skills?

The performance of any skill must accommodate and adapt to the context in which the skill is being performed. For example, weather conditions, proximity to hazards, lighting, noise, movement, and many other contextual factors may need to be accommodated when performing a skill. But since each mariner will face a vast array of novel situations while performing skills throughout their career, it is impossible to train them for every possible combination of factors.

Similarly, vessel-based technical systems are ever-increasing

in their complexity. If a vessel's system is influenced by an external contextual factor or does not respond as expected, how can we train our mariners to respond accordingly in such a complex, novel situation?

The answer is by ensuring that our mariners have the knowledge that underlies the skill, and the ability to reason and apply their knowledge to the novel situation being encountered. Today, this also means that mariners require at least a basic understanding of the complex systems they will be relying on when performing their skills. This need for knowledge is going to continually increase in scope, depth and importance as the role of the mariner and our vessel-based systems similarly increase in their complexity. To a degree, mariners must become knowledge workers, using their knowledge to continually adapt to novel situations. In a nutshell, skill is not sufficient, an increasing amount of knowledge is required as well. The deeper the knowledge, the more readily adaptable the person is to more widely fluctuating conditions.

Despite our best efforts, we cannot train and assess for every situation. Therefore, the next best thing we can do is to train and assess the knowledge which will help mariners do their job well, and provide them with the necessary tools to react intelligently when an unexpected situation arises. This is the age of the "knowledge worker" - and the maritime industry has entered this age. We need to prepare our knowledge workers for the job.

So - which is the more critical training focus - knowledge or skills? Clearly both are critical. Safety depends on it.

The Author

Goldberg

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U.S. Navy photo by Chief Mass Communication Specialist Shannon Renfroe

Course correction for DDG 1000

Navy will replace main battery for guided missile destroyer

By Edward Lundquist

The U.S. Navy's controversial USS Zumwalt (DDG 1000) class of guided missile destroyers raises the legitimate question of whether a ship is too transformational, or not transformational enough.

While the Navy Fact File states that DDG 1000 is the "largest and most technologically advanced surface combatant in the world," it's a program that has been in existence for many years. It began as the SC-21 (Surface Combatant for the 21st century) research and development program in 1994, which included the "arsenal ship" concept. From that effort came a 16,000-ton land attack destroyer, designed to support expeditionary forces coming ashore and moving inland, emerged with two long-range guns and 128 missile tubes, called DD-21 (Destroyer for the 21st century). That program evolved into the DD(X) or Zumwalt-class guided missile destroyer, with the characteristic tumblehome hull and stealth technology to operate in littoral waters against threats of the post-Cold War world. It was then designated as DDG 1000, with the intention of evolving that hull into an air defense cruiser called CG(X). In fact, at that time, the Navy was promoting the Surface Combatant Family of Ships, or SCFOS, which included the DD(X), CG(X), a new class of ships called LCS, and the Aegis cruisers and destroyers kept in the most upgraded configurations.

While many new and transformational technologies and concepts were developed and tested for DDG-1000—to include the Advanced Gun System (AGS) and Long-Range Land Attack Projectile (LRLAP)--the original program of 32 ships did not materialize (it was reduced to 24, then 12, then seven, and eventually three), and the CG(X) concept was cancelled. DDG 1000 was built around the main battery of two 155mm AGS guns that could fire the precision-guided, rocket assisted LRLAP rounds at targets 63 to 100 miles away with pinpoint accuracy. Using the multi-round simultaneous impact (MRSI), four rounds could be fired one after the other, each one on a separate flight path calculated to arrive pre-

Zumwalt-class guided-missile destroyer USS Michael Monsoor (DDG 1001) transits to San Francisco in support of San Francisco Fleet Week (SFFW) 2021.

U.S. Navy photo by Ensign Emily D'Italia/Released

cisely at the same time, such that the rounds could impact a different side of a structure at exactly the same time. The fact that the rounds cost as much as a Tomahawk missile doomed this projectile, and that doomed the gun, which together necessitated a new purpose for the ship.

Because the Zumwalts have considerable power margin, they were looked at as a platform for a new rail gun. But despite a significant development investment by the Navy, there is no current rail gun production program.

The ships remain lethal with 80 peripheral vertical launch system tubes that can launch Tomahawk and other missiles, with the size margin for even bigger missiles yet to enter service. But the AGS gun mounts and associated ammunition storage and handling system, which extends several decks below the guns, will be removed. And that creates an opportunity.

That opportunity is to the make DDG 1000 a hypersonic strike missile platform. The Navy's current plan is to replace the gun and associated equipment with the Advanced Payload Module (APM), the same one intended for the Block V Virginia-class submarines, to carry the hypersonic Conventional Prompt Strike (CPS) missile. That weapon reportedly has a 1,700-mile range and can travel at a speed greater than Mach 5.

According to the Navy, three CPS missiles can be carried in the Advanced Payload Module (APM) which will be installed in the Virginia Payload Module (VPM), this is analogous to the Multiple All-Up-Round Canisters (MACs) that normally carry seven subsonic Tomahawk land-attack cruise missiles, also installed in the VPM. Each Zumwalt-class destroyer would be capable of housing four APMs, and thus up to 12 CPS AURs could be carried in the space currently occupied by the forward AGS gun and its associated magazine equipment below decks. The option exists to do the same for the after AGS gun.

Today, USS Zumwalt (DDG 1000) and USS Michael Monsoor (DDG 1001) are in commission, while the third, the future USS Lyndon Baines Johnson (DDG 1002), is undergoing sea trials. Even though the program dates back to the 1990s, they are built on cutting-edge technology that is new to the Navy. They are assigned to Surface Development Squadron One (SURFDEVRON One), which is working with the Surface and Mine Warfare Development Center (SMWDC) on to find the best way to use the incredible capabilities possessed by these ships.

According to Capt. Jeff Heames, commander of SURFDEVRON One, DDG 1000 is an opportunity for the surface force. "We've been able to evolve, taking the best parts of the original design, while at the same time exploring new opportunities for the class. Installing the Conventional Prompt Strike weapon system on the Zumwalt class is one example. I believe the Zumwalt class has potential to inspire new warfighting capabilities and tactics, techniques, and procedures (TTP) for the fleet."

Photo courtesy Rik van Hemmen

Repair & Conversion Conundrums in Hybrid Propulsion

By Rik van Hemmen

I recently built a 35 ft. Solar Hybrid Electric Wheelchair Accessible Catamaran for my wife who became wheelchair bound a few years ago. (In typing this sentence, I just realized that this vessel can be referred to as a SHEWAC)

It is only a 35 foot recreational vessel, but it contains all the propulsion pieces that are found in any other modern hybrid propelled vessel.

I have operated the vessel for one summer and have learned a lot of things that I had not considered when I first conceived her.

Fortunately, most of the learning has been positive, with lessons in all aspects of the design, construction, operation and maintenance. Some of those lessons deal with repair and conversion implications and foreshadow issues that will become apparent to the ship repair and conversion industry as they encounter more and more non-standard vessels.

To be able to make the comparison, a description of a "standard" vessel is needed.

We have lived with standard vessels for almost 50 years (ignoring the residual steam vessels that were hanging on and the (re)emergence of diesel electric propulsion).

The vast majority of ships in the last 50 years were propelled by diesel engines through reduction gears with propellers. To make that work, a wide variety of auxiliary systems consisting of pumps, heaters, coolers, boilers, fuel treatment systems and intake and exhaust systems were needed.

While there are many variations on the theme, it was a rare day where a detailed explanation was needed to familiarize a repairer (or conversion contractor) with a looming repair job.

Either something had blown up, or one of the auxiliaries had died, or there was a mystery problem that required trouble shooting. In recent decades that approach was somewhat complicated and helped by electronic controls. Complicated, because the controls could malfunction, and helped, because the controls could help with trouble shooting of the system.

Regardless, the whole industry was helped by the fact that due to the extreme technical stability of ship propulsion concepts, the number of suppliers had become remarkably small due to consolidation. As such, in slow speed diesels, effectively, there were three worldwide suppliers; and while the number is somewhat larger for higher speed diesel engines and reduction gears, every yard had at least seen a few engines of each type and within its operating zone knew of manufacturers' reps or specialists who could deal with just about every propulsion component if they did not have in-house specialists. Moreover, the pace of technology improvements was manageable (barring recent engine add-ons to stave the demise of internal combustion).

While the number of components on a non-standard (hybrid) vessel may not increase, the number of possible different components that may be present on any vessel vastly increases. On the simplest levels, it may be solar panels, controllers, batteries, and chargers, but that stuff is only the tip of the iceberg.

On the far end, it may be kite controllers, hydrogen tanks, fuel cells, and fission reactors.

All of that might be manageable if we were not in the middle of a technological whirlwind, the likes of which have never seen in our industry. This means that a line of batteries may only be installed for a few years and will be superseded by the next generation of batteries and that there will be many manufacturers of batteries before the consolidation starts. And that will apply to every component in the propulsion system.

As such, every vessel that enters a yard in the next few decades or so will be likely to have unique propulsion systems and unique components, each of which needs to be individually figured out by a contractor who is offering to make repairs or offer conversions.

Because there will be such a rapid advance in technology, repairs may become relatively rare due to lack of knowledge in making repairs or lack of spares. This means that rather than making propulsion system repairs, conversions may be the order of the day.

That sounds really scary to ship owners who may see increased maintenance and repair costs in being unable to make repairs once they go hybrid. (It should be noted that many hybrid systems inherently have vastly lower maintenance costs due to fewer pumps, seals, heat exchangers, thru hulls and moving parts).

Strangely, this may not be as scary as it appears at first, since the march of technology comes to the rescue. The cost of hybrid components can be expected to go down quite rapidly, and the efficiency of these components can be expected to improve too, and then a conversion may actually be a life cycle cost saving.

As such, a component failure may actually be an opportunity, rather than a problem.

And component failures in well-designed hybrid systems are likely to be a much lower fraction of the overall vessel value than propulsion components in standard vessels.

Barring shipboard fires, which are extremely expensive to repair, the largest single damage cost aboard a vessel is an engine failure and a full engine failure can be a significant cost fraction of the entire propulsion system.

One of the first realizations I had in designing and building the SHEWAC was that the most expensive single propulsion component on the vessel was the standby generator at 3.4% of the total construction cost. Much lower than the cost of a propulsion engine. The full replacement of the generator unit would take about 6 hours in labor to remove and replace and can be replaced with any generator package of similar size. (Note: this strongly argues for high levels of standardization in interconnect features in hybrid systems.) If the vessel had been diesel propelled, the loss of a main engine would be a larger percentage, would incur higher labor costs for replacement,

Photo courtesy Rik van Hemmen

and even higher costs in additional component modifications and replacements if an identical engine cannot be procured.

While the electric components are not cheap, not one component comes close to the cost of an engine and can be replaced with a like (but not identical) component in the system.

Having said that, I did have a pause for thought when one of the electric outboards on the SHEWAC failed. The unit was still under warranty (these units are very reliable and I think it was a case of infant mortality). Initially, the manufacturer provided instructions and trickled various replacement components to the repair yard to see if it would fix the problem. This took time and I asked the manufacturer if they could just supply a replacement outboard. Instead, we were asked to ship the unit to a service center, which took more time to eventually have the unit fixed. I estimate the cost of all that troubleshooting, communication, shipping and labor came close to the cost of a new outboard ($8,000) and a new outboard would have resolved the issue over a month faster.

I have waited longer for a gasoline outboard to be fixed, so I have little to complain with regard to the delay; but, knowing that technology is changing fast, I wonder how much longer I can actually source a matched unit if there is another problem on this twin unit boat. Therefore, to have a spare on hand would not be a bad idea and that is just one ponderable in this expanding universe of repair and conversion issues.

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 Shake A leg Foundation. https://sailtoprevail.org/support/ They first made me maritime ADA aware and nothing is cooler than having the wind serve as your legs.

The Compelling Decarbonization Solution

By Nick Contopoulos, *COO, Anemoi*

Global supplier of wind propulsion, Anemoi Marine, believes Rotor Sails – which are unique, tall cylindrical sails that can be installed on the deck of commercial vessels – offer an immediate and compelling solution for shipowners working to reduce vessel emissions.

Anemoi estimates that a VLCC with six Rotor Sails would reduce fuel and emissions by approximately 14.9% (c.1,889 tons fuel and c.6,058 tons of carbon) per year, based on a Bonny-Ningbo round trip.

When considering fuel savings for bulk carriers, Anemoi's research suggests a VLOC fitted with six Rotor Sails could achieve an annual 15.5% fuel and emission reduction based on a Qingdao-Tubarao round trip. This equates to c.1,437 tons of fuel and c.4,607 tons of carbon per year.

The International Maritime Organization (IMO) wants considerable cuts in ship emissions as part of its 2030 and 2050 targets. The goal is to reduce Greenhouse Gas (GHG) emissions from vessels by at least 40% before the end of this decade and by at least 50% by 2050 (compared with 2008 baseline figures). The long-term target is full decarbonization, although this will likely require a range of solutions.

The Energy Efficiency Design Index (EEDI) is already in place and has been created to ensure newbuild vessels meet requisite levels of efficiency. The Energy Efficiency Existing Ship Index (EEXI) is due to come into force by January 2023. Carbon Intensity Indicators (CII) are also on the cards. These measures mean shipowners already have to carefully weigh up the options available to achieve compliance. Debate still surrounds the realistic timeline, availability and eco nature of alternative fuels.

As a result, many shipowners are ready to take the plunge and invest in future proof technologies. Installing wind technologies as retrofit or newbuild could be the ideal answer for the maritime community, particularly as using Rotor Sails would lower the consumption and cost of expensive clean fuels.

Simplicity in mind

Installing Anemoi technology can be a straightforward process because wholesale changes to the vessel structure, or dry docking, is not necessary. Rotor Sails and all associated equipment are delivered to the dockside, ready for installation. The Anemoi team then supervise the full equipment installation. Each Rotor is installed in a single crane lift and connected to the foundation on the ship's deck once the vessel integration work is complete.

Prior to this taking place, a feasibility study - which is unique to each vessel - will have been conducted to determine the optimal Rotor Sail positioning. This is to maximize performance within the vessel constraints and the required Deployment System for the vessel.

The vessel integration stage is crucial to the process and we constantly support clients at every stage, including the design and installation of the structural foundations and the electrical cabling from the vessel main switchboard to each Rotor Sail. The vessel integration can be completed during the construction phase of a newbuild vessel, or during a survey at a shipyard for a retrofit vessel. Once the Rotor Sails are installed and all cables are connected, we complete final commissioning of the system prior to handover. This crucial stage ensures safe operation and compliance with Class requirements through rigorous testing.

Ease of use and monitoring

The Anemoi Rotor Sail System is comprised of the Rotor Sail itself, the Foundation, Deployment System (if required), wind sensors and Electrical, Control, and Automation systems. The main components of our Rotor Sails are the "Rotor" (the cylindrical, rotating part), the support Tower, upper and lower bearings, and the electrical drive system.

The Rotor is built from advanced lightweight composite material and the Tower is a steel column structure. We use these materials to ensure maximum performance of our Rotor Sails and to withstand all weather conditions.

The Rotor Sails have a control station located on the bridge. This automatically controls the speed and direction of the Rotor Sails, as well as monitoring the performance and status of the system. Our control system is designed to maximize performance and minimize crew input with automated speed and direction setting, equipment monitoring, safety features and performance reporting to stakeholders using a ship to shore data transmission.

Technology reimagined

Rotor Sails were first fitted to a vessel more than 100 years ago. They make use of the aerodynamic phenomenon known as the 'Magnus Effect'. As the cylinder rotates within an airflow, a forward thrust force perpendicular to the apparent wind direction is created, which delivers additional thrust to the vessel. The thrust generated can either provide additional vessel speed or maintain vessel speed by reducing power from the main engine.

But with sustainability now a key focus for the entire maritime community, Anemoi has successfully reimagined the concept as a modern-day solution that can help facilitate the push towards industry-wide decarbonization.

Photos courtesy Anemoi

WTW Launches Forum to Mitigate Growing Port, Terminal Risk

By Ben Abraham, *CEO, Global Marine, Willis Towers Watson*

Ports and terminal operators are entering a new era where the operational threats they face – both old and new – will make a return to 'business as usual' increasingly unlikely, even once the pandemic finally subsides.

Transition to new technologies and digitally enabled systems, addressing the impact of climate change, defending against cyberattacks and shifting geopolitics will couple with traditional supply chain and operational risks to change the face of the sector.

According to Global Port Trends 2030, Deloitte's most recent report on the sector, the competitive position of port stakeholders and their ecosystems will be altered significantly from today's models.

As competition for prime land near consumer markets intensifies, the emphasis for operators is increasingly shifting from expansion to improving operational efficiency on the existing waterfront.

In one snapshot of how that will play out, global shipping consultancy Drewry recently forecast investment in container ports to slow in the post-COVID economy; it predicted that the pace of expansion will fall by at least 40% in the next five years.

According to Deloitte, with less suitable land available for expansion, container ports will transition to investment strategies that increase the productivity of existing spaces, support operational sustainability (in response to regulatory and social demand for lower carbon footprints) and increase collaboration between ports.

This implies an accelerated adoption of the kind of 'smart' technologies that help operators to better understand the operational impact of past events and better predict the impact of future ones.

The adoption of new 'smart' technology will be a primary facilitator of the transition to a more productive future, but these solutions will not come without adding risks: every device that connects to a port's digital community represents a new entry point for the ill-intentioned into mission-critical operating systems.

Recent reports seem to indicate that cybercriminals – particularly those using ransomware – have discovered what we

in the industry have always known: the maritime supply chain is both strategically and economically important to societies, big and small.

Simply put, the criminal element is increasingly recognizing that attacks against critical supply chain infrastructure such as ports and terminals are more likely to result in ransoms being paid, because those operations are vital to the health of global and local economies.

As port operators' connectivity expands in pursuit of better productivity, their stakeholders, including financiers, are going to insist on seeing evidence that cyber risks are added to the growing list of business threats that have been identified and are being addressed.

Securing capital to keep pace with technological change also will hinge on their strategies for handling ESG (environmental, social and governance) risks, particularly regarding climate change, and global threats arising from an increasingly unpredictable geopolitical arena, such as trade embargoes, tariffs and sanctions.

With the threat landscape destined to add several new layers of complexity for the next decade, operators will need additional resources and tools, especially relating to intelligence gathering and analyses of global risk trends and solutions.

In response, Willis Towers Watson, one of the world's leading insurance brokers to the maritime sector, has just launched a dedicated risk forum for ports and terminal operators.

Modelled after our highly successful Airport Risk Community (ARC), the forum acts as a members' network, designed to identify risks and the most effective responses in the market. It collaborates with the Centre for Risk Studies at the University of Cambridge's Judge Business School, a long-term Willis Research Network partner, to develop a continuously updated index of risks to the ports and terminals sector. The Index itself will be launched next year.

The forum provides an events-based networking group through which knowledge and expertise can be shared to create a stronger and more resilient industry. Our global experience as advisors, brokers and solution providers to industry has taught us that the harnessing of collective wisdom is an expedited path to finding effective solutions.

WILL THE CONTAINER CARRIER DEBACLE EVER END?

By Patrik Berglund, *CEO and Co-Founder of Xeneta*

When the global supply chain runs smoothly, it's like a well-choreographed dance. Everything comes together elegantly and effortlessly. But when someone misses a step, the show can quickly turn into a disaster. And that's what's currently unfolding before our eyes, headline after headline.

Those of us in the supply chain industry know it takes a Herculean effort to keep the wheels of commerce turning without so much as a squeak or rattle. And it's going to take just that to get what Reuters cleverly coined as "Containergeddon" back on track.

To help shed some light on what it will take to get supply chains back to full health, we must first examine the potential roadblocks ahead. The following market insights outline the factors that will impact efforts over the next 5-10 years.

Where we are today

Examining where things currently stand within the global supply chain makes clear that COVID-related disruptions combined with strong demand and other factors have resulted in port congestion, maxed-out capacity, and an overall imbalance in the shipping and receiving of goods. This has all resulted in some of the highest shipping rates on record.

Short-term market indices have documented a 900%+ rate increase over the past year alone. In November2021, the Xe-

neta Shipping Index (XSI) for the contract market revealed a monthly increase of 16.3% month-over-month. This represented the largest month-on-month jump since July and took the benchmark to 121.2% higher than the equivalent period of 2020 and the end of last year.

Shippers are willing to pay more to secure deliveries and get ahead of the key Christmas trading period with shortages of goods still looming. Others are finding more creative ways to battle the inflating costs, Maersk recently announced that it's rerouting services to multiple small ports, while other carriers are turning to more blanked sailing. Coca-Cola is shipping 60,000 MT of product in bulk tankers instead of containers.

In addition to consumers experiencing product shortages and higher prices, the supply chain's current state also has unintended consequences. A container ship was responsible for causing a recent oil spill that has polluted more than 24 miles of the California coastline. The more backlogged the ports become and the longer ships have to wait to dock, the greater the risk of error and adverse incident.

More than ever, shippers need to remedy the short, medium and long-term factors affecting the container market to create a healthier supply chain.

What to expect next: Short term outlook (2021-2025)

Unfortunately, there is little hope that container rates will drop back to pre-pandemic levels, and surcharges will continue as well. In addition, schedule reliability will only become more questionable as supply chain problems worsen. We'll also continue to see images of backlogged vessels waiting near port.

However, that's only half of the story; the truth is far more complex. We're in the midst of the perfect storm, created by a combination of a worldwide driver shortage, equipment shortage, pandemic-related port congestion issues, container carriers' disregard for signed contracts and an influx of exports from Asia into the US. And another storm cloud is that big carriers are buying up port facilities and freight forwarders, enabling them to have a firmer grip on rates and services.

Smaller carriers are moving cargo from China into the EU and US West Coast to circumvent some of this. However, they are running into the same port issues as the big carriers, so cargo isn't moving inland any quicker. And discussions of nearshoring show promise, but these are long-term decisions that take time to implement. As such, relocating to Mexico or Eastern Europe will not relieve the supply chain crisis any time soon.

Beyond the short term: Mid-term outlook (2025-2030)

Massive new build programs might launch in time, but the supply chain problems will remain. If anything, additional cargo sitting outside the US, Northern European, or main Chinese ports will only add to the paralysis, as budget and approval for port expansions get backlogged in government red tape. Driver and port worker shortages will only worsen as the populations in North America, the UK, and the EU continues to age out.

Consumer and retail pressure will also push carriers to take climate change seriously. The future fuel debate will likely be resolved (methanol and LNG), but the cost of such fuel and its effect on rates has yet to be determined.

As port congestion worsens and the big carriers increase their hold on rates and services, agile-minded companies will turn to multi-sourcing strategies to build more stability into their supply chains. Central and South America, Eastern Europe and Africa will be considered as alternative areas to source from. Nearshoring will also rise as another alternative for keeping the flow of cargo stable during challenging times.

Long term outlook (2030 and beyond)

The higher wages needed to continue attracting drivers and dock workers will cause shipping rates to climb. From a policy perspective, US lawmakers could target profitable carriers with fines and fees in response to public outrage to the never-ending supply chain debacle. It's not uncommon for the government to levy hefty fines on corporations the public deems as bad actors. One only needs to look at the penalties imposed on American tech giants for a recent example.

Under intense scrutiny from policymakers, retailers and consumers, pressure will mount for carriers to meet the International Maritime Organization (IMO) emission standards; via LNG, methanol, or both. But regardless of which fuel becomes the new standard, the new builds will still be forced to deliver into ports that lack sufficient workers, infrastructure and equipment. However, companies that have executed their multi-sourcing and nearshoring strategies might regain control of their supply chain by bypassing still-choked ports.

Although the above scenarios are based on the assumption that rates will continue to climb, proactive measures by carriers to help course-correct global supply chain woes will go a long way in preventing future blowback. Today, investments in remedies will help prevent the inevitable repercussions of shortsighted planning, including nearshoring, increased government regulations, and intense public scrutiny.

The Author

Berglund

Patrik Berglund is the CEO and Co-Founder of Oslo-based Xeneta, an ocean and air freight rate benchmarking and market analytics platform.

INTERVIEW TIM JANSSEN, CEO, SOFAR OCEAN TECHNOLOGIES

Inside Sofar Ocean's QUEST TO OPEN OCEAN DATA

By Greg Trauthwein

All images courtesy SOFAR

With the mission to create the 'nervous system for the oceans', Tim Janssen, CEO, Sofar Ocean Technologies, discusses this real-time ocean intelligence platform's quest to collect, network and distribute vast amounts of ocean information and insight.

What is unique about the Sofar approach?

"Ocean intelligence" is new, and as a result, it has to be inherently full stack. Data in itself is relevant for experts, but that data in itself is not that relevant for the everyday user. You need to be an expert to understand how that (data) changes forecasts. We create the insights from our sensors, and our sensor network is basically the central nervous system of our oceans. What we do is drive (data) into forecast models to translate it into better (weather and forecast) insights, (helping to) reduce the uncertainty around, for example, what waves and winds are going to be doing over the ocean. Specifically for maritime shipping, we deliver better options for routing their vessels for both safety, efficiency, and reducing emissions.

I think an important difference between what we do and what we have been doing in our oceans is that we are switching to a distributed paradigm. This is fundamentally not that different from what has been done in space over the last two decades, where you see a shift from single exquisite platforms that are incredibly expensive and mostly government-owned, to networks of lower cost nodes. Basically, we are taking that same idea and bringing it to the ocean, where we've been mostly pretty bad at doing that; stuck to building large platforms that require large operational support; needing a PhD in oceanography operate the instrument. As a result, (that type of network) does not scale.

Why is scale important?

Scale is fundamental to what we do. Everything has to be global scale, thousands of sensors, lots of data. The platform that we use is the Spotter platform, which is a solar powered, satellite connected, metocean buoy.

In addition, and this is really critical, we're building standardization to enable a rapid expansion of sensing in the ocean. (Traditionally) every sensor, every piece of hardware is different, with a different protocol, and a different connector. If you try to put them together, things get ugly quick, and everything turns into an engineering project. Engineering projects are great for engineers, they're bad for almost everybody else (because) they cost a lot of time and money. What we want to do is create large, heterogeneous networks of sensors that cover much more than we've ever been able to do before.

To be successful and at scale, tens of thousands of sensors,

Fact Box

Sofar Ocean Technologies	
HQ	San Francisco
Employees	50
Live Sensors	1,200
Data points daily	100,000

"Wayfinder, our maritime shipping route optimization capability, is driven and powered by the fact that we have all this additional and unique information across the ocean."

• • •

Tim Janssen, CEO,
Sofar Ocean Technologies

complete planetary coverage, we have to bring the cost down of the individual nodes radically. That's basically what we're working on in order to drive the scale. (So today we're) focusing on scale first, being disciplined around the hardware that we're building and trying to enable the community to drive the innovation needed to grow faster.

What's the biggest challenge to keeping this network functional and growing?

I think the most important thing about maintaining something like this is to show its value. Fundamentally what we're focusing on is in creating value out of this data, creating insights that haven't been available before. So there are two parts to this. One is broad application: driving innovation and standardization across the community, because with that, everything we build becomes more valuable. For example, communication standardization specifically designed for marine connectivity so the integration of components into platforms, (such as) our Spotter platform, helps the entire industry innovate faster and more efficiently.

The other part of it is focused insight. (An example of this is) Wayfinder, our maritime shipping route optimization capability, driven and powered by the fact that we have all this additional and unique information across the ocean.

Which technologies could be the most transformational to help gather and deliver better information faster and cheaper?

'Cheap' is a means to an end; it's really scale that matters. The capabilities that we have developed to date were enabled by advances across multiple technologies. The challenges that you have in collecting ocean data; one, it's the ocean, so it has salt water and storms and anything electronic generally doesn't like that very much. (But to answer your question): communications have traditionally been very expensive through monopolies in satellite communications, and that's changing rapidly. Power. Advances in battery technology and solar capture has made it possible for us to build a low cost completely autonomous system that can stay out in the ocean forever and provide useful information. More generally, advances in IOT technology, the ability to build something extremely low cost that is as capable as maybe your home computer was 20 years ago.

Other things like material sciences, are also obviously important. But the point being is that it's not a single innovation that makes it possible to do what we do today, and I don't expect it to be a single innovation that's going to basically, fundamentally change what we're going to be doing in the future. I see (radical standardization) as the single most important advancement in the industry.

Who's using your services today?

Basically we have three things that we sell and provide. One is hardware, to enable folks to collect data from the ocean, democratizing access to ocean data. One example is Aqualink, a philanthropy that's focused on monitoring in real time the health of coral reefs, and particularly looking at reef bleaching induced by heat waves in the ocean. The second part of what we deliver is large amounts of unique data. That's a very different type of customer, and you can think about large government agencies that run their own forecasting systems or intelligence agencies that would like to have unique information around what's going on in the ocean right now. And finally, insights.The shipping industry is our last customer layer, and an example there is Berge Bulk which has been using our system to improve the efficiency of their largest vessels.

Five Minutes with

Rusty Murdaugh, *President, Austal USA*

Austal USA has been investing mightily, more than $600 million to expand its repair and services business for both commercial and military customers; and in the opening of a state-of-the-art steel panel line in Mobile to complement its established aluminum shipbuilding operations. **Rusty Murdaugh** discusses the rationale behind the investment as Austal USA drives quickly toward a $500m services model.

By Greg Trauthwein

All photos courtesy Austal USA

"Maybe your readers will be a little surprised to hear this, but we want a half-billion dollar services model. And so incrementally, we're making greenfield organic and inorganic triggering events to get us there. Starting on the west coast and expanding was obvious. We are looking at other opportunities, both in the U.S. to build upon our presence in Mobile and the west coast, as well as expanding our presence overseas, where we currently have a good model in Singapore."

– Rusty Murdaugh,
President, Austal USA

Most of our readers know the Austal USA brand, but can you give a "by the numbers" look at Austal USA today?

Austal is about 3,200 people today, and there's about 573 direct and indirect suppliers in 41 states that we support. We've got 180 acres in Mobile, and we've added 15 acres with the opening of the facility in San Diego. We're investing about $110 million in our new state-of-the-art steel panel line; (and overall to date) the investments we've made are roughly $630 million. Finally, we're really proud to say that 21 safety awards in 12 years.

You've been with Austal USA since 2017, but your tenure in the leadership seat has been shorter than that. Coming into the president position, what were your immediate priorities?

The priorities remain very similar to what they were (when I was named interim president in February 2021), but on an accelerated path. That's to win new orders for ships, it's to expand and grow our services model, it's to get that steel line up and running and ensure it is a competitive advantage for us. But all of that can't work without focusing on great people and processes.

With the opening of Austal West Campus (AWC), the finalization of the deal to open the repair facility in San Diego and the ordering of the new drydock from Sedef Shipyard in Turkey, can you discuss the cumulative investment to date and the rationale behind adding this capability to the Austal USA brand?

Each component of our business model has a strategic element to it. At AWC it was to launch our own ships to get deep water and then to also grow our services business. That investment was about $12 million. This latest (addition) in San Diego is to expand upon the contracts that we've already been awarded.

Usually, you build a yard and then you go after contracts, but we were working these simultaneously. Expanding is critical in San Diego because we've recently won several contracts; and all are going to be hubbed out of this particular region's facility so that we can expand that waterfront and do top side work.

Not only do work on our own ships, but we also do work on other folks' ships. (With all of this) and the dry dock, in services we've invested $150 million over the last three years.

L to R: Christina Sashington (Austal's youngest employee), Rusty Murdaugh, Mike Bell (VP Operations) and Curtis Greenhouse (Austal's oldest employee). The picture is taken in front of the steel production line facility while under construction.

So when when you look at the existing Austal USA new build facilities and the personnel, how do they complement and augment all this new repair and service operation?

Well it goes back to those priorities, including people and processes. We focus in on the ships that we produce and the people that produce them. We're looking to leverage that experience and knowledge in the services model.

Do you have any plans to expand the repair and services operation further?

Yes, we do. Maybe your readers will be a little surprised to hear this, but we want a half-billion dollar services model. And so incrementally, we're making greenfield organic and inorganic triggering events to get us there. Starting on the west coast and expanding was obvious. We are looking at other opportunities, both in the U.S. to build upon our presence in Mobile and the west coast, as well as expanding our presence overseas, where we currently have a good model in Singapore. So without being too specific, the adjunct of all of that is to drive through a half a billion dollars of business in a rather quick fashion.

With the multitude of investment and changes, can you run us through the timeline when all will be online and functional?

(In regards to) our steel line, we're tracking on budget and on schedule to have that ready April 1, 2022. We're doing the same with the San Diego model. The full use of that dry docking model will be ready by August 2023. And that's why it was really important for us to make that release and order the dry dock now because we're accelerating and we found a really good supplier (Sedef Shipyard in Turkey) to be able to build not only what we need as far as size and capability, but

to build it in an expeditious manner. So in the short term, we'll be doing top side work and other type of work in this yard while getting ready for the dry dock to get up and running in the August 2023 model.

From a strategic perspective, the dry dock will be the right size, meaning we don't run a dry dock that's over the capacity of the yard and competing with some of the bigger ship repair yards in San Diego. We believe there's a big enough demand for LCSs and equivalent ships of size. So if you think about the middle market being frigates, LCSs, EPS, our dry dock will be able to accommodate that size ship, which are really not efficient to put on a bigger dry dock and too big to put on a smaller dry dock. So we're targeting the middle market, and specifically targeting LCSs.

In the context of the Austal USA business as a whole looking at 2022 and beyond, what do you consider to be your greatest challenges and where do you see the best opportunities?

Creating and winning profitable opportunities to grow the business is one of the biggest challenges any shipyard has. It's a contact sport. I can't do much about companies that are willing to underbid the work; that's just not Austal's model. So for me, weathering the storm from when people buy into work to fill their yards is the hardest part and the challenge. But growing a business is difficult on its own in this industry. I just want to make sure the things that we are chasing and creating and winning create profitable growth for my shareholders.

As for opportunities, servicing our own ships and leveraging our strengths is really key for us, but creating a state-of-the-art, new construction facility in steel, and having a competitive advantage by using the same proven methods and processes and people that we've done in building ships is really our best opportunity to shine. It doesn't matter to us, it's agnostic whether it's steel or aluminum. For us, the best opportunities are leverage our strengths with these new elements of what we call our defined total available market.

THE NEW DRYDOCK FOR SAN DIEGO

Shipyard	**Sedef Shipyard, Turkey**
Date to Enter Service	**August 2023**
Lifting capacity	**9,000 light tons**
Length	**531 ft. (162m)**
Width	**154 ft. (47m)**
Draft	**36 ft. (11m)**

Offshore Wind Could U.S. Repair & Conversio

WTIV under construction at Keppel AmFELS
Image courtesy Dominion Energy

d Drive
n Work

By Barry Parker

Shipbuilders and repair yards usually don't play center stage; yet their work is integral to the thriving U.S. maritime scene. During the past two years the decarbonization push across maritime and all industries has influenced the activities of shipyards closer to home. On land, the electrification trend in the power sector is now picking up velocity and longer-term climate goals for the U.S. have put offshore wind energy on the business radar for many U.S. yards. Building new assets for use on the U.S. Outer Continental Shelf is expensive, and one need look no further than the Keppel AmFELS yard, in Brownsville, Texas, which is building a Jones Act qualified Wind Turbine Installation Vessel (WTIV) for a price reported to be around $550 - $600 million. In regards to the burgeoning offshore wind market, like all other sectors finance is in the driver's seat. While general consensus from the start has been that, long-term, the fast-growing U.S. offshore wind sector will be best served by custom newbuilds,

"I think everybody in this room knows what the current cost to build a U.S. flag Jones Act compliant SOV is, **and I don't think any project can support a rated return based around a $100+ million asset.**"

Chad Verret, Executive Vice President, Harvey Gulf International Marine Inc., *speaking at ABS' Offshore Wind Conference last year in New Orleans.*

it is also widely acknowledged that there is a role for quality conversions to get and keep projects in motion.

For the Keppel AmFELS WTIV, which will be used to erect turbine structures for mid-Atlantic and New England wind projects, there is no existing asset to convert, but in many cases there are indeed choices. The electric power grid's ambitions to deploy 30 GW of offshore wind capacity by 2030 have implications for shipbuilding and repair yards. The question of building new versus converting existing assets was the subject of an insightful discussion at the ABS Offshore Wind Conference held November 30, 2021 in New Orleans, the panel *Accelerating the U.S. Market with Vessel Innovation* moderated by Greg Trauthwein. Turbines in coastal waters clearly give rise to demand for multiple vessel types; many existing vessels, mainly built for the offshore oil and gas trades, could be candidates. In European markets, vessels built for offshore oil fields have seen conversion into Service Operation Vessels (SOVs), with the addition of "walk to work" gangways and, sometimes, helipads. In the North American market, the discussions are fast and furious.

Brigitte Hagen-Peter, a panel member at the ABS conference in New Orleans, and Marine Asset Manager for turbine provider Siemens Gamesa, explained: "We are very happy to announce we will be working with Otto Candies. We signed the contract with them to work with one of their vessels. The Paul Candies [OSV, with a 250 mt crane, built 2018 at Candies yard in Houma, La] will be helping us with South Fork Wind. We're taking that existing asset – that really needed little to no modification – to have it fit right in with our operational requirements. So I think it's a perfect example of utilizing a U.S. existing asset, 100% U.S. owned company that we can just bring right on to service our wind farm." Paul Candies is powered by four Caterpillar 3516C engines (Tier 4 each 2,250 kW) tied to Schottel thrusters.

South Fork Wind, a partnership between Ørsted and U.S. electricity provider Eversource that will deploy a dozen Siemens Gamesa 11 MW turbines about 35 miles east of Montauk Point, gained Bureau of Ocean Energy Management (BOEM) approvals in the week prior to the ABS event. Hagen-Peter added: "We came with the approach, 'Here's our operational requirements, show us what you can provide, let's work together and see what we can do.'"

While she admits there was a wide spectrum of vessels that could have been fit for the job, the Inspection Maintenance Repair vessel from Otto Candies was "literally the perfect vessel for us."

Repurposing existing vessels may not always be the optimal choice, particularly as offshore wind moves into deeper waters. Crewboats that had served platform workers in the Gulf of Mexico may not be suitable for work as Crew Transfer Vessels (CTVs) along the U.S. East Coast, where the water may be deeper and the wave heights greater. Additionally, maneuverability issues on lengthier trips, including the ability to avoid Right Whales, is a requirement for work off the New England coastline.

The Blount Boats shipyard in Warren, R.I., built the first U.S. flag CTV, now serving the Block Island Wind project, At-

Photos courtesy Harvey Gulf International Marine Inc

Harvey Gulf is a leader in alternate fuel offshore vessels.

lantic Wind Transfers' (AWT) Atlantic Pioneer (built 2016), as well as Atlantic Endeavor (built 2021), serving offshore Virginia. The yard has recently received an order for four more CTVs from American Offshore Services (a joint venture between Northern Offshore, from Sweden, and a company tied to Galliano, La.-based Crosby Tugs).

The vessels, which will serve various windfarms offshore East Coast, are described as "hybrid-ready," providing future retrofit opportunities for a U.S. yard. Gladding Hearn, a south Massachusetts yard with expertise in building passenger ferries, recently announced that it will build a hybrid battery diesel electric CTV for Mayflower Wind (a windfarm in Atlantic waters 30 miles south of Nantucket Sound). The vessel, with an Incat Crowther catamaran design, would work out of Fall River, not far from Gladding Hearn's location in Somerset, Mass.

Show Me the Money

As expected, economics will influence most decisions. The ABS panel, in New Orleans, also included Harvey Gulf International Marine's Chad Verret, who has had experience with retrofitting PSVs (used in the offshore oil and gas sector) that were originally dual fueled (diesel and LNG), adding battery power. Harvey Gulf, like many offshore oil mainstays, has also been looking at the offshore wind sector. Verrett emphasized the impacts of inflation, with economy-wide price increases rivaling those not seen in decades. He asked rhetorically: "Look, newbuilds are always better, because you get to build exactly what you want. You get to arrange it the way you want. It's generally more functional and more efficient, but at what cost?" He offered some practicality, in the discussion, opining that: "Give me a list of things you want to do, and let me come up with a solution. I think everybody in this room knows what the current cost to build a U.S. flag Jones Act compliant SOV is, and I don't think any project can support a rated return based around a $100+ million asset."

Verret pointed out the mismatch between short term employment and long-term capital costs: "…it's hard for an owner to build an asset for short term, without understanding that over the duration of time, we're going to recoup all those costs and make money … " but also noted, "I don't think that shipyard pricing is going to stay the way it is. I don't think price of steel is going to be four times higher than it was two years ago. So maybe we just need to take a pause and let things work its way back to normality."

The WindServe Odyssey newbuild built by Senesco.

Photo courtesy WindServe Marine

The shipyard viewpoint came through in remarks from Darren Truelock – Vard US's Vice President, Houston Operations, opining that: "The east coast is obviously not the Gulf of Mexico. And so we've been working hard on whole form, station keeping, sea keeping, operational capability of the gangway, operational capability of a 3D crane, fitting in everybody in a single bunk, with huge warehouse spaces, too. We've been working to those requirements, and we've been working particularly hard to take those requirements and making them cheaper to build and trying to push it below that $100m threshold. We've won some and we've lost some, but it's extremely hard right now, especially with the steel prices."

It's Electric

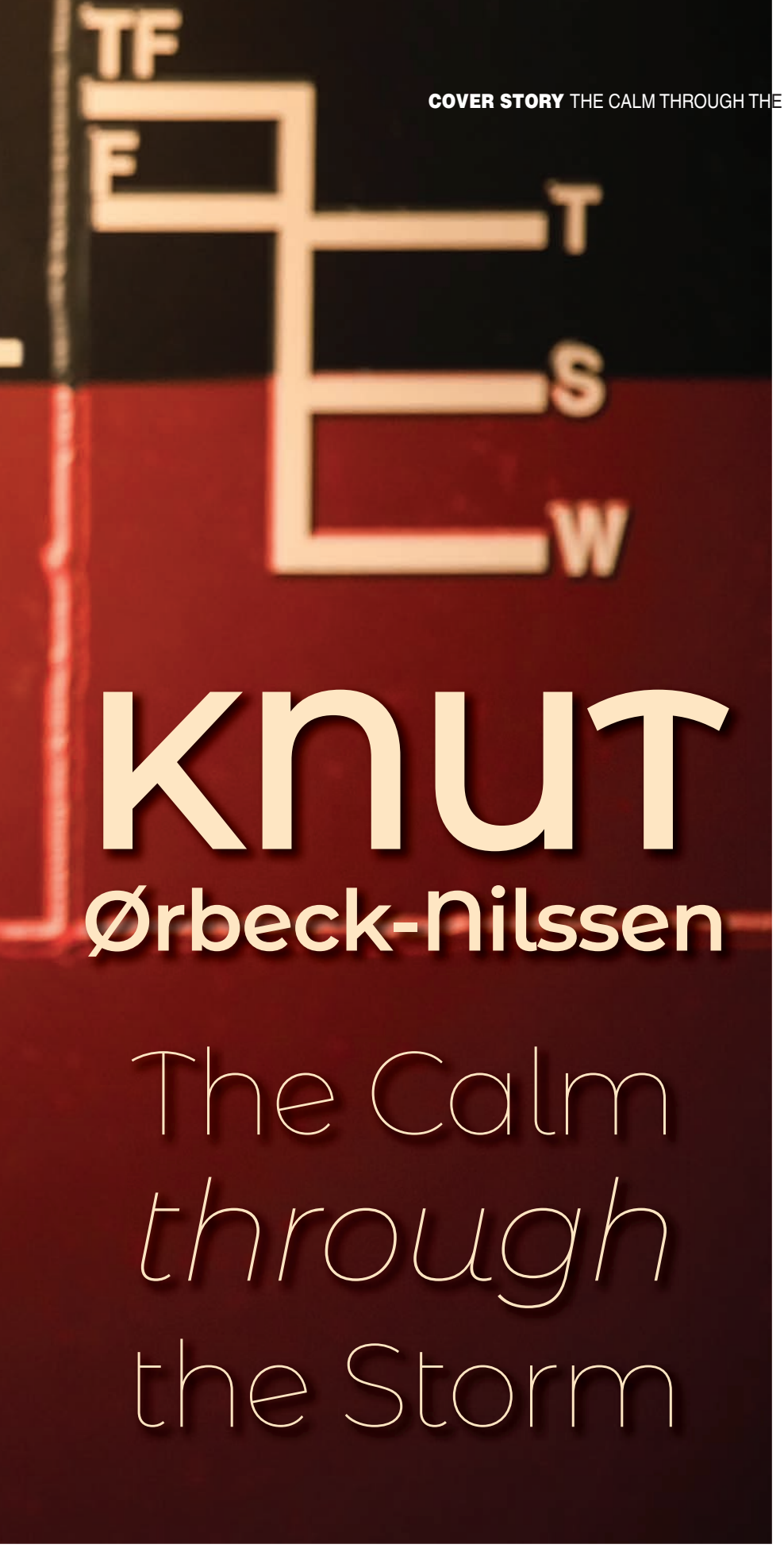
Electrification will lead to a new wave of conversions across many U.S. yards. Harvey Gulf has now pioneered the "tri-fuel" concept being implemented on four of its platform supply vessels (PSVs) at its owned yards. According to Verret, "Harvey Champion already has a battery pack aboard," with three sister vessels set to also see installations. In the future, he anticipates installation of batteries on additional PSVs (including three other 310-ft. class vessels in Harvey's fleet), as well as on larger construction vessels.

Edison Chouest Offshore (ECO), another stalwart from the oil and gas business, has attracted attention with its Jones Act qualified newbuild SOV under construction for Ørsted/Eversource. ECO has also been active in electrification. At the end of 2020, it had announced a contract with an oil major customer where a battery system would be installed about an ECO 312-ft. class PSV.

While the changes in the energy landscape are likely to bring about continued good news for retrofits, and for newbuilds (for example, Master Boat Builders working with Crowley on its eWolf- battery powered tug that will serve San Diego, to be delivered mid 2023), the negative impacts on the Covid 19 front are still evolving. The facility shutdowns in March and April of 2020, with rampant virus spread, saw temporary closures of yards, or production delays with sick-outs in facilities deemed "essential" early on, that remained open. Throughout 2021, shipyards, like many other skilled trades businesses, were bedeviled by staffing shortages. Two years on, as we move into 2022, the builders and ship- repair yards will all be watching variants, vaccine mandates, and grappling with factors that we can't easily predict.

COVER STORY KNUT ØRBECK-NILSSEN, CEO, DNV MARITIME

Photo courtesy DNV



Knut Ørbeck-Nilssen

The Calm *through* the Storm

From decarbonization *to* cyber security; port logistic snarls *to* digitalization; *the maritime industry is in a transcendent reformation. Through it all* **Knut Ørbeck-Nilssen, CEO, DNV Maritime** *& his team keep an even keel is guiding the of maritime stakeholders along the path of these tectonic shifts.*

By Greg Trauthwein

With the myriad of technical challenges facing shipowners in the coming three decades – led by decarbonization but closely followed by the tightly connected digitalization and cyber security – classification societies increasingly become a technical sounding board, a partner in bringing together disparate companies and entities both inside and outside of maritme to study, discuss and deliver solutions to solve some of maritime's most vexing problems. Through all of the noise, Knut Ørbeck-Nilssen serves as that calm port in the storm, focused on helping to solve not only the problems directly out his porthole, but keeping a vigilant eye for sqaulls on and beyond the horizon.

Choosing the Best Emissions Reduction Path

There is no greater challenge facing the maritime industry today than selecting the ship design, emission reduction kit and propulsion system for the next-generation of newbuilds. While the maritime industry is not known for broad collaboration in devising technical solutions, Ørbeck-Nilssen is heartened by what he has seen of late.

"I took part in the ICS event along of the COP26 event in Glasgow in November 2021," he said. "Taking in the sentiment from ship owners, charters, and financiers (among other stakeholders), it was amazing to see how many have come onboard to the decarbonization challenge just in the last year. There has been quite a shift in sentiment, and talk has now turned to 'how do we do it?'"

This, in part, has been driven by "an ESG revolution" where "everyone is being pushed by their stakeholders to be more transparent on both their environmental performance, as well as their social performance and governance."

To that, 'doing it' is happening now, as Ørbeck-Nilssen said that in 2021 about 200 ships were ordered with alternative fuels, most of those with LNG as a dual fuel set up. "That is amazing, because if you look to the past five years, it took us that long and maybe even longer to get to more than 500 in the fleet," said Ørbeck-Nilssen. The 200 orders placed this year has been driven by the container segment, but also includes some others, such as PCTCs. "So it is not just happening, as

There is no single technology, no single fuel, no single solution to t

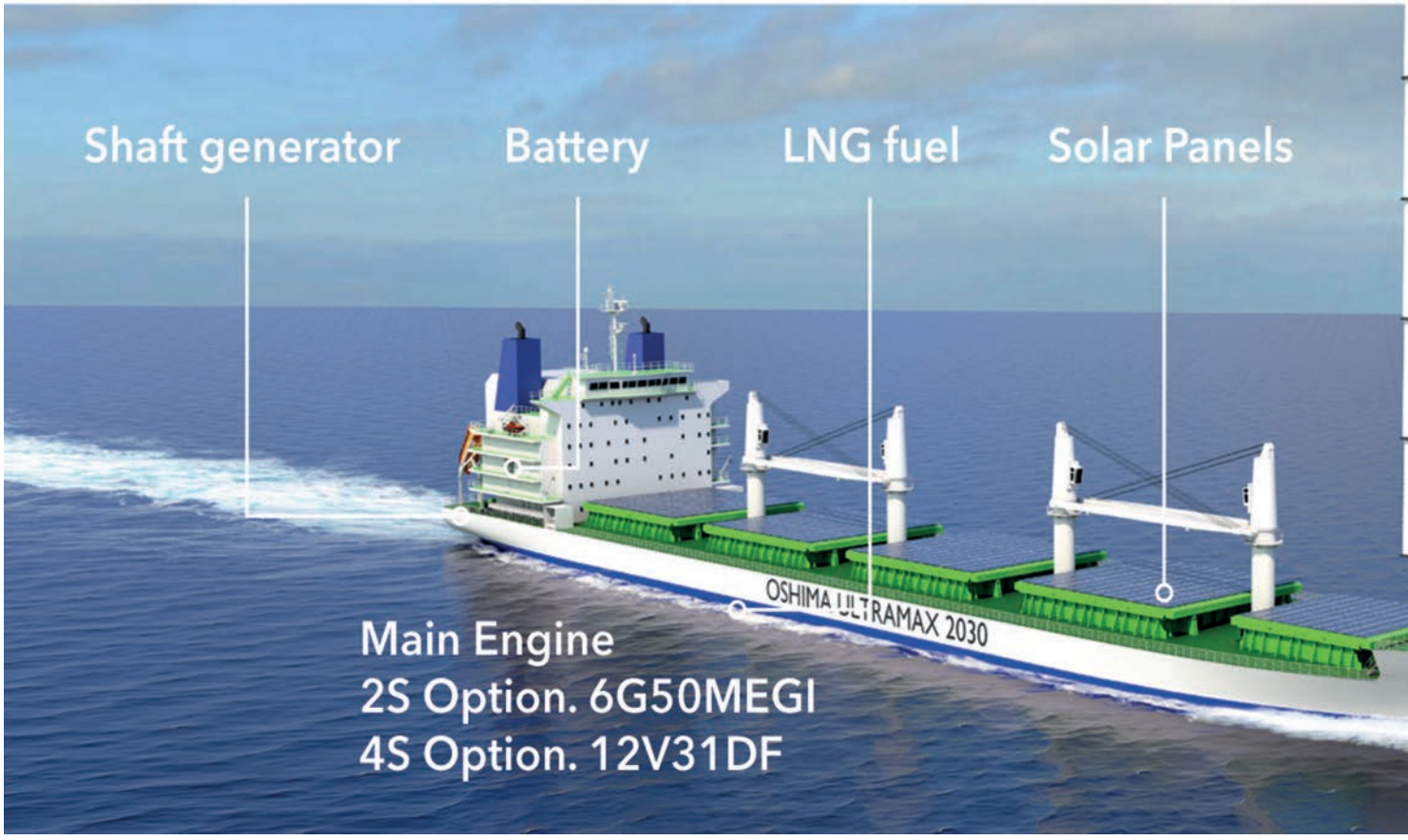


Photo courtesy DNV

it was before, with the ferry segment or the offshore PSV sectors. Now it's spreading into the deep sea and many of the different segments. If you look back to 2019, about 6% of the vessels ordered where with alternative fuels. Fast forward to 2021, that has doubled to about 12% of vessels ordered. By gross tonnage (it's even more impressive, at 20-25%).

While hybrid propulsion systems, as well as optimized designs and energy saving devices continue to penetrate new ships, Ørbeck-Nilssen insists that the transformation has not been fast enough, and in fact it's time for those sitting on the fence to pick a direction. "I'm preoccupied with the fact that we need to do what we can do now, rather than wait another 10 years to find a better solution, because that will be 10 years wasted. As I've said before, we shouldn't make good the enemy of perfect."

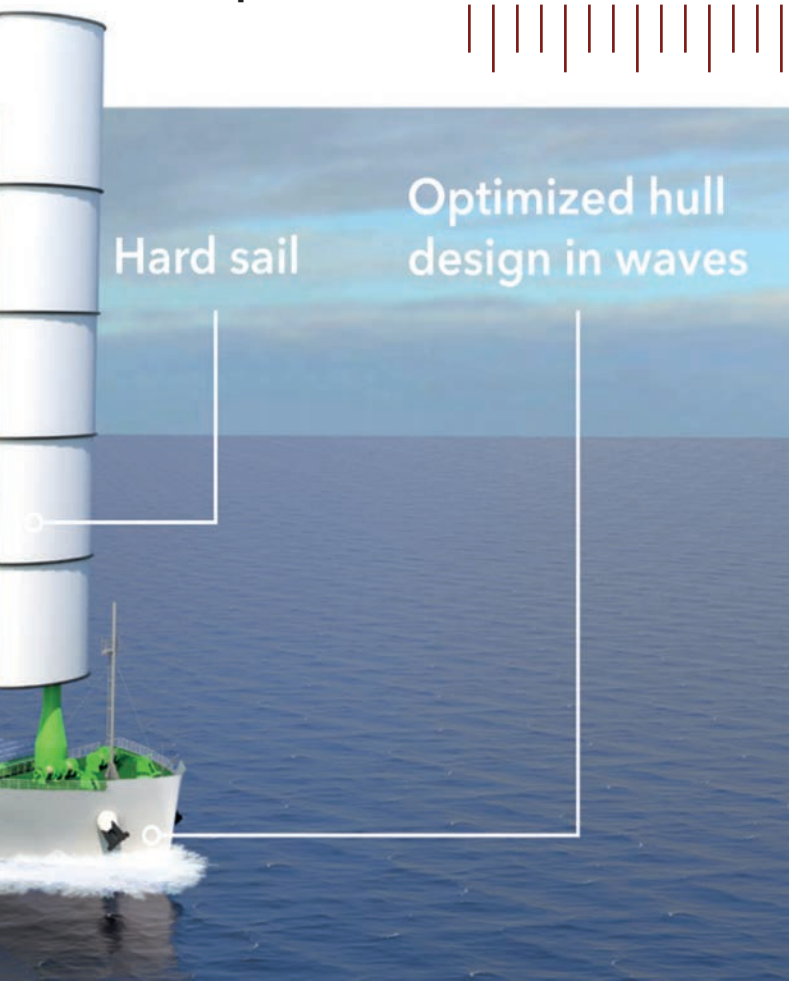
Small, incremental steps in emission reduction, from slow steaming to optimized route planning, from propulsion assist devises to better coating application and maintenance, are available today for all.

'Perfect' in this decarbonization drive sense appears to be the wide adoption and use of 'green fuels' – maritime fuels generated by renewable sources, but there are myriad showstoppers today, namely the quantity of fuels themselves plus the infrastructure, the distribution network and the facilities in the ports that still needs to be developed.

As with any industry in any country, many decisions boil down to cost, and while Ørbeck-Nilssen maintains it is not possible to give an exact answer (premised on the diversity of vessel types, types of energy saving devices or fuel systems, plus where it is built) of an exact generalized cost impact, owners can generally plan a CapEx hit of 10 to 30% in designing, building and outfitting a vessel optimized for emission reduction. "(But it's really a case-by-case basis) for example if you go with methanol instead of LNG on a dual fuel system, methanol is less cost-intensive because the systems are somewhat simpler."

"Whether it's an air-lubrication system, a hybrid propulsion solution or a battery package; you can simply say that the more equipment and systems you put in, the more you pay," said Ørbeck-Nilssen. "But I would say that everything that saves energy makes sense. Because whatever the fuel choice will be, fuel is getting more expensive, and it will be even more expensive in the future. So whatever you can do to bring down the energy consumption onboard makes a lot of sense."

he decarb puzzle ... There is no SILVER BULLET



But he also said the bigger financial consideration lies in lifetime of the asset, particularly when you factor in the increasing speed of new regulations and more strict emission reduction mandates. "These are assets you will have for 20 to 25 years, maybe longer. So if you have a stranded asset (that is unable to be used because of regulation or upgraded) that would be very bad."

The maritime renaissance

As technology evolves, classification naturally evolves in step, and the past two years have seen a seeming avalanche of Approvals in Principle (AIPs) from all class societies. "As we've talked about before, I really believe that this is the decade where we are entering into this maritime renaissance," said Ørbeck-Nilssen. "We have to look at things with new eyes and challenge a lot of existing truths. Engine manufacturers, vessel designers, yards and owners are all trying to harvest these new ideas and to make things better. I think it's a really good thing, innovation is at the core and naturally class has a big role to play in making sure that some of these concepts are being looked at, they are being matured; that they are checked against safety and practicalities. And that's where I think that class can really play an important role. Naturally we spend quite a bit of time on this, but it's also in our interest to use these innovative projects to help develop our rules."

Photo courtesy DNV

"A famous politician in Europe said that **we have to base our decisions on facts, logic and hope.** I think that resonates well with the situation that many ship owners are in these days: you have to know the facts; you have to make some logical assessment of what to do; and then you just hope that you made the right choice!"

He cites the evolution of LNG as a maritime fuel as a great example. "We've been talking about since the early 2000s, and that was based on a lot of these AIPs and other initiatives. Then batteries came along, and now we're looking methanol, ammonia and other alternative fuels."

But the sheer size of the challenges facing maritime today mandate that it is best not to 'go it alone,' and Ørbeck-Nilssen believes that the role of partnerships across maritime, across countries and increasingly across other industries are the key to success. "What I find is that many ship owners are indeed naturally very competitive, as are shipyards and engine manufacturers (and class!). But I think when it comes to some of these challenges around decarbonization, the willingness to collaborate is much bigger than we've seen before. I think many realize that we will not compete on having the best fuel. That is not really a competitive edge and therefore the whole basis of collaborating makes more sense to them," said Ørbeck-Nilssen. He cites the Maritime Technologies Forum that DNV helped to create earlier this year (together with three other classification societies and three flag states), as well as interest in decarbonization centers such as the Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping and the Global Center for Maritime Decarbonization (GCMD) in Singapore "are all about trying to leverage research activity, especially around decarbonization. That the old perception of working in silos may be changing, especially for those that would like to be on the leading edge," said Ørbeck-Nilssen.

The maritime industry itself, too, continues to evolve, with the really large companies growing larger, affording the scale to invest in some of the big and expensive changes ahead, not to mention the increasing presence and sway of the Amazon's on the world that want more control over the supply chain.

"The whole industry is becoming more complex, the markets are very dynamic and changing faster than we've seen in the past," said Ørbeck-Nilssen. "Regulations are becoming quite challenging just to keep pace. And as we just discussed, choosing the right technology and how to move ahead with the digitalization effort. These are the tectonic shifts that I've been talking about for some time. And I've said often that in a more complex shipping world, it would be either you have to be big, or you need to be a niche player where you are really focusing on something specific."

He sees consolidation continuing, but not at the pace where in a decade that "we can say that shipping is not a fragmented industry. We will still have a number of different (sized) ship owners and players."

There will be consolidations, but there's still room for niche players, particularly as markets get more specialized, and regulations become stricter for certain areas. "But if you want to be a ship owner and have five ships, it's going to be increasingly difficult unless you can find your own niche."

Prudent decision making ... choose wisely

With the technical and business storms spinning around him, Ørbeck-Nilssen takes a breath to discuss how shipowners can turn uncertainty into decision.

"Today we see a big demand (from owners) to establish where their fleet is in comparison to the upcoming regulations. What is the impact of these regulations? And then second, how can they deal with the fleet that they have to make it last longer, or (make the best decision) when it should be phased out. After that comes the questions on fleet renewal, and mak-

Photo courtesy DNV

ing the best choices going forward? And I think small, medium or big, it is basically the same issues: it's around getting more longer lifespan out the vessels we have in the water, and what do we need to do to make sure that the new vessels we are getting are not going to be stranded assets."

The advice (DNV delivers) varies from owner to own owner, segment to segment, fleet age group to age group; but to start, Ørbeck-Nilssen advises that it's really important to first know where you are. "I remember a famous politician in Europe said that we have to base our decisions on facts, logic and hope. I thought that resonates very well with the situation that many ship owners are in these days: you have to know the facts; you have to make some logical assessment of what to do; and then you just hope that you made the right choice! I think the biggest mistake though, is the one that chooses to do nothing at all."

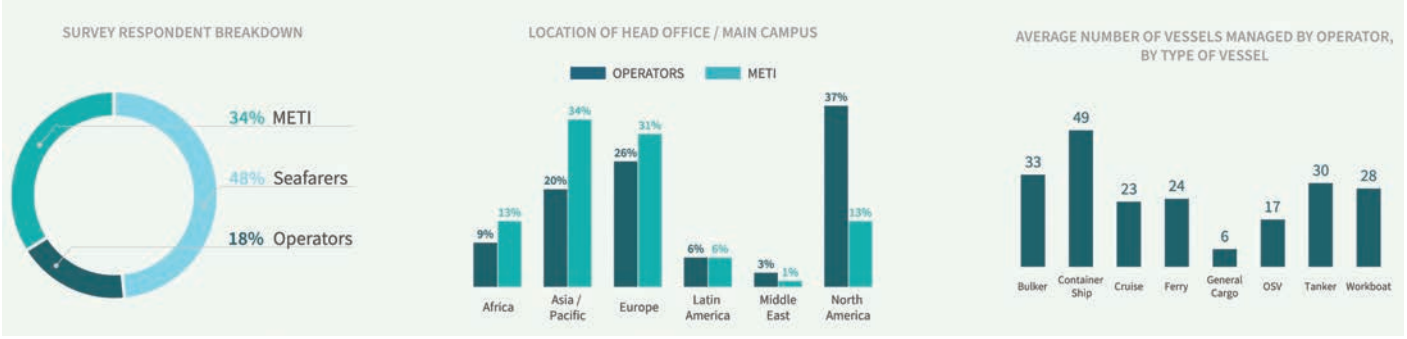
Cyber Security in Perspective

"It may be a bad way to say it, but **(cyber hacking) is one of the fastest growing industries.** I recently heard that a smart houses in Norway was hacked and the poor family couldn't even turn on the lights. The problem is growing and the hackers are beating the protection measures. There was around a **400% increase in attempts in the maritime industry from February to June 2020 alone**. We see cyber security as one of the biggest needs across our entire group."

MarTID 2021

As we enter the second full year of COVID effectively defining our lives, personal and professional, seafarers remain at the literal eye of the storm, and the pandemic and its long tendrils continue to impact this group of nearly 1.9 million professionals operating on nearly 74,000 ships globally. Both mentally and physically, the pandemic has taken a heavy toll on seafarers, both here and now as well as potentially in the long term, as it remains unclear how the events of 2020/21 will dictate individual decisions on seafarer career direction and length.

All charts and graphs courtesy MarTID: 2021 Maritime Traning Practices Report



While there remain many unknowns in the world of maritime training practices, there are increasingly a number of 'known knowns' courtesy of industry surveys such as the MarTID maritime training practices report, the fourth annual installment released late in 2021. This year's survey again takes in responses from vessel owners, maritime training and education institutions (METIs) and seafarers, an effort designed to get a full, updated and accurate overview of maritime training practices.

As the pandemic effectively has fast-tracked a number of 'digitalization' initiatives across all industries, John Allen, Director Maritime Professional Development, Carnival Corporation & plc, wrote "There is little doubt, however, that online learning's improved access, reduced environmental footprint, and lower cost have been well noted by training administrators and trainees alike." He also asks:

- Does the increased approach and use of online learning remain the weapon of choice?
- Will older, established approaches to training and education become the norm again, or will we see a more coherent and blended approach mixing online and face-to-face learning?

Follow this link to discover some of the significant findings in the MarTID 2021 report. **www.MarTID.org**

► TRAINING BUDGETS

Budgets decreased for Operators, Increased for METIs

While past surveys saw a consistent trend of growth in training budgets for vessel operators, nearly 30% saw a decrease in this year's training budget, and an additional 50% saw no increase in their budgets, with most, naturally, citing COVID-19 as the reason.

According to survey responses, METIs were not affected the same way, as 45% of training institutions reported increasing their training budget over the previous year and nearly 60% indicated that they expected their budgets to increase for the upcoming year, an increase that is likely related to the need to acquire new training infrastructure, particularly for delivery of training.

► TRAINING METHODS

As face-to-face classroom training declines, eLearning grows

Despite the difficulty in maintaining in-person training due to the pandemic, face-to-face classroom training was still cited as the most commonly used training method, with 85% of operators using it to a high or medium degree. But even with its continued high use, face-to-face training experienced the largest decrease in usage, with 60% of respondents reporting a decrease from the previous year, with 25% expecting to use it less in the coming year.

On the other hand, eLearning using internet-based sources, was reported to be in high and medium usage by 76% of respondents, and 80% of operators saw an increase in internet-based e-learning usage, with nearly 75% of respondents anticipating a further increase of internet-based e-learning in the coming year.

► WHO PAYS FOR TRAINING?

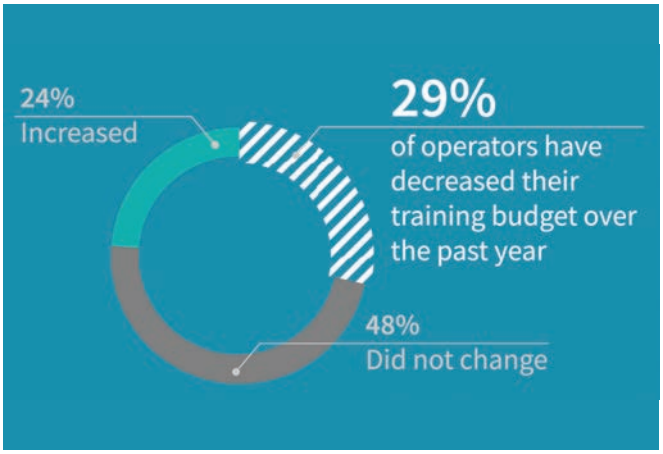
Increasingly, seafarers pay

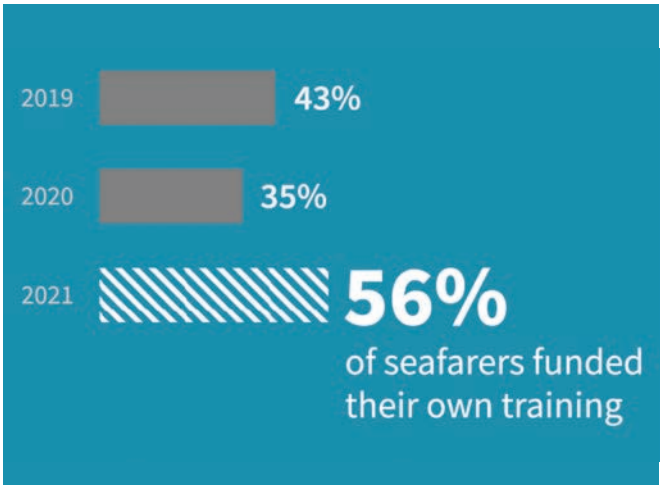
In 2021 there was a notable increase in the percentage of seafarers who indicated that they funded their own training, with more than half self-funded their training. For those who reported a mix of self- and company-funded training, seafarers indicated they were, on average, responsible for around half of their training with the remaining half provided by their employer.

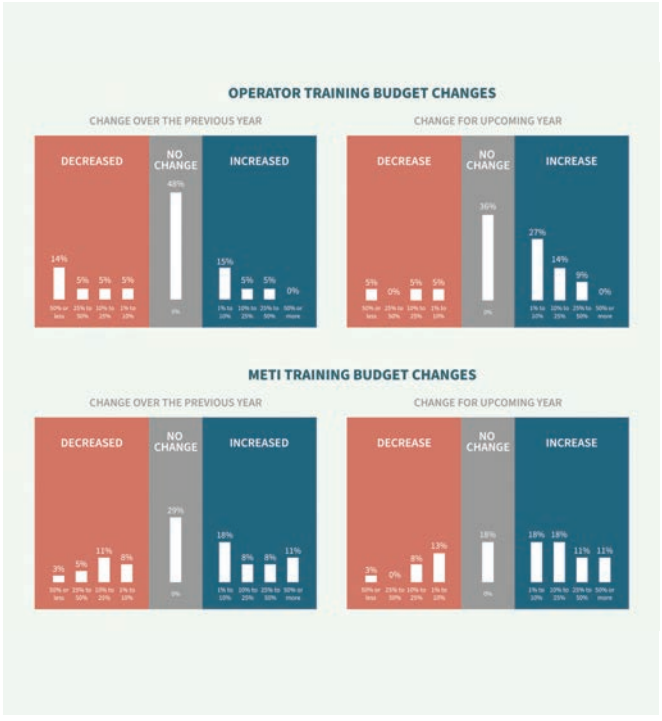
► THE SEAFARER OF TOMORROW

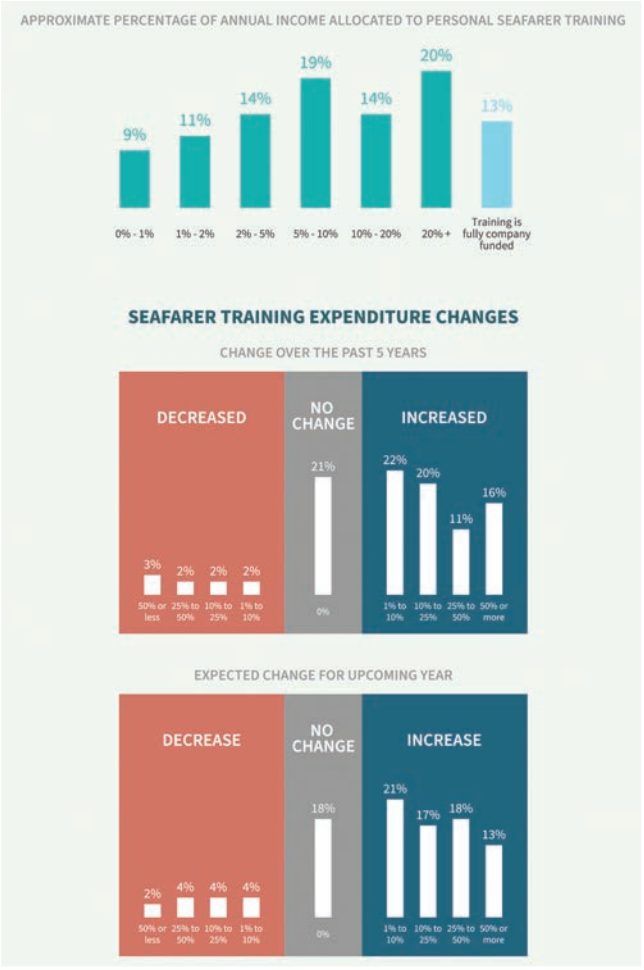
The pandemic has left many seafarers questioning their career path

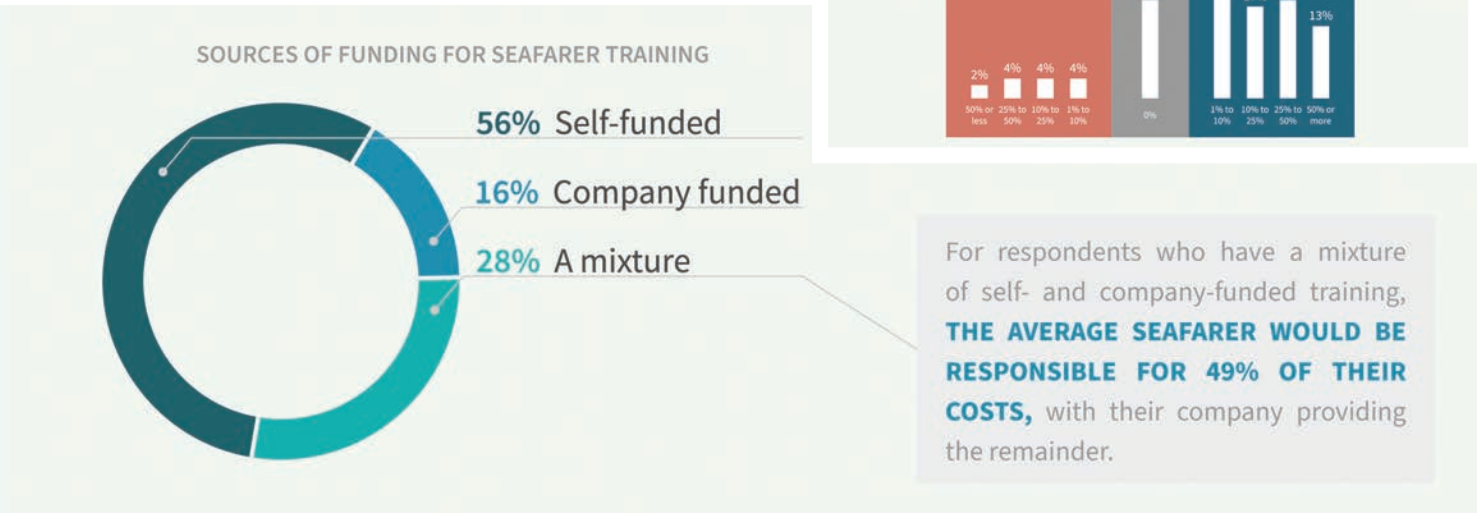
Around 89% of operators and 80% of training institutions report that their ability to deliver training has been affected by travel restrictions and other impediments caused by COVID-19. More than 60% of responding operators expect that this training slowdown has created a backlog which will have to be cleared as the effects of the pandemic ease. The pandemic apparently – and somewhat expectedly – has caused seafarers to change their opinion on their career. One-third of seafarers responding to the survey indicate that they are more likely to remain in the seafaring career despite the negative effects of the pandemic. However, one-third of responding seafarers also report that they are less likely to remain in their current career due to COVID-19.











► OPERATORS & METIs

Despite the challenges presented by COVID-19, training remains a core mission for both operators and METIs. However, the budgets for and the delivery of that training continue to change. In 2021, the survey found that training spending slowed for operators, but looking ahead training budgets are projected to increase for both operators and METIs.

While the pandemic has impacted nearly every corner of the maritime world, one thing that has not changed are the drivers for training: reducing accidents and complying with external regulations.

► SEAFARERS

While the past 24 months have seen volumes of impassioned writings and pleas for seafarers to be treated equitably, uniformly and humanely globally, those pleas have largely fallen on deaf ears, as the seafaring community is largely nameless and faceless the general public, despite the fact that they are essential cogs in ensuring the timely movement and delivery of nearly 90% of the world's goods and energy. In past MarTID reports it was written that "Seafarers today are in the spotlight more than ever," but that spotlight seemingly does not extend beyond the industry itself. The MarTID re-

port, from its inception, has sought to give seafarers a voice in regards to their training. Here's what they say.

For the first time, more than half of seafarer respondents report funding their own training, and a majority – nearly 70% – have seen their personal expenditures rise 1% to 10% over the past five years with roughly the same number expecting to spend more in the future.

Seafarers see their employers prioritizing both safety and regulatory compliance, in line with what both Operators and METIs report. But, with future projections of seafarer shortage, perhaps more ominous is the most oft-mentioned on the seafarer training 'wish list': training to transfer skills and knowledge to a shore-side career.

► COVID-19

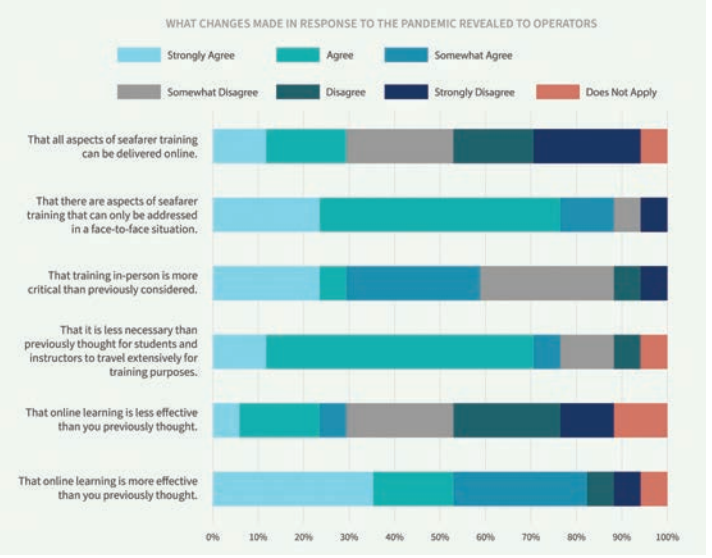
The COVID-19 pandemic and the responses of different nations and players have affected many education and training regimes adversely. Predictably, COVID has significantly impacted the ability to deliver seafarer training, premised on the fact that hundreds of thousands of seafarers found themselves stuck on ship far past their contract with the inability to effectively enact crew changes, and simply the inability to move globally, freely plus restrictions on gathering in groups.

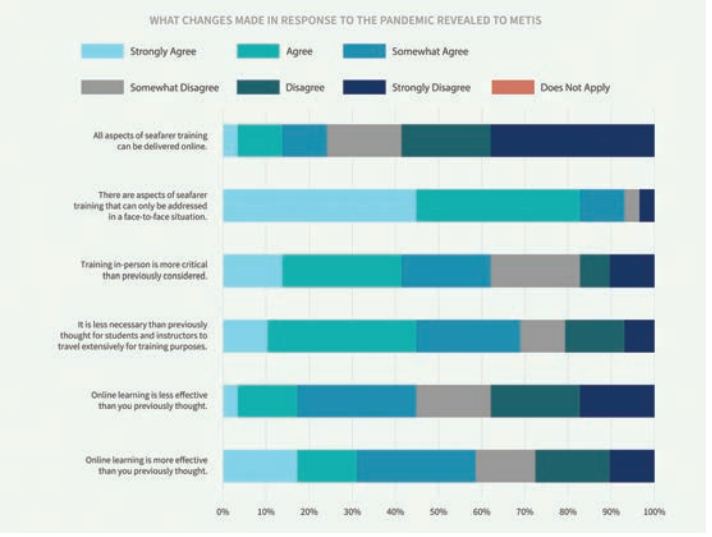
Training schedules have been disrupted and investments have had to be made to allow for online interventions where possible and when practical.

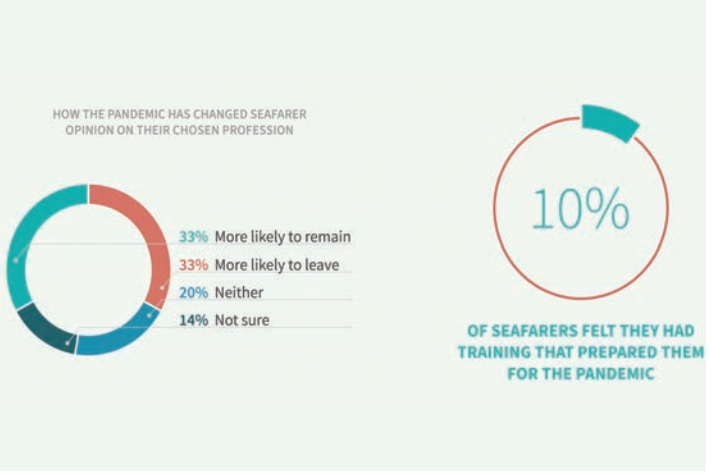
It is expected that this will have a medium to long-term effect on the availability of competent seafarers even when discounting the potential increase of attrition rates related to seafaring as a career. The report confirms that the pandemic has, overall, had a negative effect on training with training levels having reduced for both operators and METI.

The report shows an increase in the adoption of remote, online training tools. This increase is expected to persist, even as operations return to normal. A pre-COVID trend towards online technology-mediated learning in the industry has been catalyzed by the pandemic and caused training providers to invest more in online training interventions. On the other hand, and not surprisingly given the hands-on nature of maritime training, face-to-face (non-virtual) encounters remain a critical component of training and will continue to play an important role in the development of maritime competence. It is interesting to note that while none of the respondents for the previous MarTID surveys mentioned "cloud simulation", this year's surveys had many of the respondents indicating their use of cloud simulation, either as a new in-place tool for training or as a planned intervention for the delivery of training.

READ THE FULL MARTID 2021 REPORT @ www.MarTid.org







Is Baltic Sea Special Area for Passenger Ships *Really Special?*

By Dr. Wei Chen, *Wartsila Water Systems Ltd, UK*

The persistent eutrophication (being too rich in nutrients) of the Baltic Sea prompted the IMO's Baltic Member States to tackle shipping's < 0.1% contribution by designating the Baltic Sea as the first Special Area under Annex IV of IMO's MARPOL Convention [1]. Passenger ships must give sewage to wastewater treatment works (WWTWs) ashore via the port reception facilities (PRFs) or operate a nutrient removal sewage treatment plant (STP) on board prior to discharge. It has been perceived as a positive move. But how special is the Special Area?

Rules at sea vs. rules on land – where do they meet, and clash

The coastal waters and the PRFs are where the local rules on land and the international rules at sea meet. As the IMO does not have jurisdictions over the local rules, the IMO's Baltic Member States can, and should, reflect and integrate their local rules when creating the Special Area. BUT…

12 vs. 10,000. Total nitrogen (TN) removal is required for 12 or more passengers at sea, and for 10,000 or more population equivalents (p.e.) on land (see table). Low capacity TN removal applications are known to have their limitations and diminishing benefits [2, 3] on land. Such significant discrepancy in population threshold for TN removal leads maritime industry into uncharted waters. Are STPs for 12 passengers available and viable?

Availability and viability of small STPs. Ship sewage can be over 10 times more concentrated than urban wastewater [4] and has 500~1,000 mg N/l of ammonia [5,6] when collected by vacuum. Ships also have space and logistic constraints, they pitch and roll, and they lack the relevant skills and resources. These challenges are not reflected by the IMO's approval regimes. Nutrient removal STPs have been tested and approved [7], and unfortunately, along with certified "magic boxes" [8,9]. These magic boxes give 'availability' a different meaning and become nutrient leakage for the Special Area. So, the lack of enforcement under MARPOL Annex IV, which has resulted in poor STP performance status over the decades, has now eroded the Special Area too. Furthermore, an available technology may not be viable when it entails excess costs, natural resources, and adverse impacts that outweigh its benefit. However, STP availability and viability cannot be assessed without proper enforcement. Fundamentally, the declared availability and viability for 12 passengers is at odds with the 10,000 p.e. threshold on land [2]. They cannot both be correct when the Baltic eutrophication issue is at stake.

Open-ended percentage removal targets – a disservice. The EU Urban Wastewater Treatment Directive (UWWTD) caps the percentage TN removal target of WWTWs on land with a maximum concentration ceiling [2]. But such a ceiling is absent for ships [1]. As such, the EU TN standard can be exceeded by 8-15 times under the Special Area rules. The ammonia toxicity limits imbedded in the national regulations can be exceeded by 10~70 times, considering the typical ammonia discharge permit of around 4 to 30 mg N/l [10 -12]. Furthermore, the percentage removal targets are almost impossible to verify onboard.

Discharge bans in ports. Many ports have banned STP discharges in port waters, including the discharges from the so-called advanced wastewater treatment (AWT) systems with proven performance far more superior than that of equivalent coastal WWTWs. The ban contradicts with the intention of the IMO rules that allow STPs to discharge without restrictions. The creation of Special Area further promotes reliance on PRFs. For major PRFs that are served by mega-scale state-of-the-art municipal WWTWs with spare treatment capacities, it makes sense.

Adequacy of PRFs. Many major ports have invested in newer and better reception facilities. However, PRF adequacy is influenced by advanced planning of ship itineraries, PRF utilisations, connections at each relevant berth, the

	WWTW TN standard		STP TN standard
p.e.	EU UWWTD [2]	BSAP [2]	MEPC.227(64)
10,001 - 100,000 (1 p.e.=60 gBOD/day)	15 mg/l, or a 70-80% reduction capped by a maximum daily average < 20 mg/l	15 mg/l or 70-80%	20mg/l or 70% (1 passenger equates to 3~4 p.e. when grey water is included)
2,001 - 10,000	N/A	30%	
301 - 2,000		35 mg/l or 30%	
< 300		N/A	

Source: Wartsila Water Systems Ltd.

inclusion of grey water, and the fee systems, etc. The emerging aspirations to receive sewage from cargo ships [20] may spread the uncertainty of PRF adequacy to smaller and more remote ports that are served by smaller WWTWs. But PRF adequacy is not all.

Maximum permissible sewage concentrations. Wastewater entering local sewers can be restricted by maximum permissible concentration limits to protect the local infrastructures from corrosion, odour, toxicity, health&safety risks, and to safeguard the compliant performance of local WWTWs. Ship sewage readily exceeds these limits by a long way (see table), not to mention sewage sludge. The situation can be alleviated when ship grey water is one day regulated together with sewage – a necessity for having an effective MARPOL Annex IV [20].

Not all WWTWs remove nutrients. Those WWTWs serving <10,000 p.e. are not required to remove TN. They become a nutrient leakage when receiving ship sewage. Larger WWTWs can be overloaded by ship sewage during peak loading conditions especially in the absence of storage tanks in PRFs [5]. Crucially, the timing, quantity, or quality of ship sewage are not visible to the receiving WWTWs. The disposal route of road tankers and barges may not be traceable. This lack of transparancy undermines the extended producer responsibilities (EPR) and risks potential nutrient leakages from facilities ashore.

Should a passenger ship rely on PRF or STP? Many ship owners choose to install STPs to gain flexibility and green

	TSS mg/l	BOD mg/l	TN mg/l	TP mg/l	Chloride mg/l	Sulphate mg/l
Finland [13]	500		50		2,500	400
Germany [14]			100	50		500
UK [15]			750	20	5,000	1,000
Australia [16]	400	400	60	30	200	
China [17]	400	350	45	8	800	600
Singapore [18]	400	400			1,000	1,000
Spain [19]	1,000	1,000	50	20	600	350
Ship sewage [5]	3,700	3,500 - 3,700	620-850	78-160	Sea water	Sea water

Source: Wartsila Water Systems Ltd.

credentials. But not many people have realised that treating sewage on some days and giving it to PRFs on other days will risk STP performance. This is simply because a proven biological TN removal process relies on daily sewage influent to perform – a point to be noted when MARPOL Annex IV is effectively implemented.

There is more…

Animal carriers. Animal carriers are not passenger ships, but animal sewage contains nutrients. A carrier with 22,500 cattle produces the same amount of phosphorus as a ship of 375,000 passengers [22]. It can be a significant nutrient leakage for the Baltic Sea [23] as well as other waters of eutrophication concerns.

Diseases. The IMO introduced the most stringent Coliform standard for sewage discharges in order to minimise the spread of waterborne diseases by international shipping. But there is a loophole: untreated sewage received by the PRFs can carry international diseases into the local environment unchecked, because not all countries require their coastal WWTWS to disinfect the effluent, including those in the Europe. [24].

Summary

Comparing to Alaskan water, whereby the local laws have successfully regulated grey water and introduced compliance program to large passenger ships for 2 decades, the Baltic Sea Special Area has inherited the weaknesses of MARPOL Annex IV. This is evident by the certified magic boxes and a lack of visibility to STP discharge performances. On land, there is a lack of transparency to ship sewage disposal routes and the capabilities of the receiving WWTWs. Importantly, issues such as the conflicting TN removal population thresholds (12 vs. 10,000), the open-ended percentage TN target, the exceedances against the local permissible concentrations, and the nutrient contribution of animal carriers can have long-lasting implications.

The IMO needs to showcase effective implementation of its environmental rules. This well ringfenced Special Area can be a candidate. To address the <0.1% nutrient contribution from ships, money and natural resources are being invested twice, once in the PRFs, and once in the STPs. Industry is committed. The Baltic member states will no doubt be equally committed to showcase the effectiveness and the benefits of this Special Area. Time will tell if the Baltic Sea Special Area is really special.

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Ship Repair

Recent projects and upgrades from ship repair and conversion

Kongsberg Maritime Updates Aker BP's Alvheim FPSO

A Kongsberg Maritime project team carried out an upgrade of the Safety and Automation Systems on an Aker BP Floating Production Storage and Offloading (FPSO). The FPSO was converted into an FPSO in 2008 and renamed Alvheim after the oil field in which it operates in the North Sea. At the time its hull system was not upgraded, and in 2020 it was reaching the end of its working life. Kongsberg Maritime's team organized the full-scale replacement of 19 SAS controllers as an EPCI (Engineering, Procurement, Construction and Installation) project. KM's scope of supply encompassed everything from engineering, procurement, fabrication and documentation to testing, offshore installation and commissioning of the hull SAS cabinets. The project proceeded with a procurement order from Aker BP in February 2020 and culminated in October 2021 with the successful live field test on the last controller offshore. "This complex and challenging project for Aker BP really tested our limits, and

Photo courtesy Kongsberg Maritime

I'm very proud of everyone who contributed to our success," says Nicola Barbati, Project Manager, Oil & Gas at Kongsberg Maritime. "Around 30 determined people from across our global organization played a crucial role in delivering this high-quality project to a very satisfied customer."

Profile: Alabama Shipyard

Alabama Shipyard, Mobile Ala., has a long history of providing ship repair services on the Gulf Coast. With one of the largest, commercially used floating dry-docks on the East and Gulf Coasts, and more than 5,000 ft. of wet berth space available, Alabama Shipyard can service most vessels in operation today. Since its establishment in 2018, the company has invested more than $17 million completing significant upgrades to the facility; including a complete overhaul and upgrade to one of the existing piers and plans to invest another $20 million on other capital improvements in the future. The company recently named Lee Stokes as COO and Tim DeLong as CFO.

During the pandemic Alabama Shipyard remained fully operational with minimal impact to daily operations while keeping its employees and customers safe and healthy.

During the second half of 2021, Alabama Shipyard successfully completed several long-term dry-dockings and top-side availabilities for a range of customers including, Military Sealift Command (MSC) and the Maritime Administration (MARAD). Alabama Shipyard seasoned workforce continues to exceed customer expectations and provide quality service.

Photo courtesy Alabama Shipyard

Alabama Shipyard's shipbreaking division successfully dismantled three jack-up rigs in the last six months and will support APTIM with dismantling the SSSB that was awarded in 2020 and is focused on growing the shipbreaking sector to include Government assets as well. Alabama Shipyard recently secured a nearly $26 million contract for the regular overhaul and dry-docking of Military Sealift Command's (MSC) hospital ship USNS Comfort (T-AH 20), the U.S. Department of Defense announced. Work is scheduled to begin March 1 and is expected to be completed by July 28, 2022.

Ship Repair

Recent projects and upgrades from ship repair and conversion

Astican Gives *Africa Mercy* 15+ Years of New Life

There are thousands of ship repair and refurbishment projects annually, but when the project involves Mercy Ships, the global charity that operates floating hospitals to provide critical surgeries in the ports of some of the world's poorest nations, the gravity of the project is elevated far above and beyond the notion of getting a ship back in service to preserve it's revenue making.

For Astican Shipyard and Rainmaker LLC, Astican's North American Commercial Office, Africa Mercy has been one of the most important projects this year.

The hospital ship in the world from Mercy Ships, measuring 152 x 23.7m, and 16,572 tons, exited Astican recently following an extensive work scope designed to add 15 years to her service life.

The major scope of work included the replacement of more than 70 tons of steel, covering the hull and bulkheads plates, the frames, all structural members, plus the replacement of 350m ofinternal piping, as well as hull treatment, steel works, tank coating (blasting and painting) among others.

80 hulls had to be opened to accommodate the blasting equipment and tanks works to ensure safety during the work. A lot of work was also exterior, such as the deck cranes and her chimney, which was structurally renovated. 120 windows were replaced and up to 49 tons of paint were used to make it as good as new again.

Photos courtesy Astican

Africa Mercy Life Extension
By the Numbers

Shipyard	Astican
+70	tons Steel replaced
+80	hull openings for tank works
+49	Tons of pain used
120	Windows replaced
14,983 sqm	Tanks blasted and painted
1336 tons	Grit used to blast tanks
350	Meters of piping replaced
450	Shipyard people from the yard working on the project

Ship Repair

Recent projects and upgrades from ship repair and conversion

BWMS

Ecochlor's EcoOne BWMS has been tested to ensure that it works as a single-step treatment, without a filter, under all operating conditions in brackish and marine waters in accordance with the USCG, Standards for Living organisms in Ship's Ballast Discharged Waters, Final Rule (Final Rule). The IMO Type Approval Certificate was awarded in September 2021.

bit.ly/3F9KwRO

Digital

Kongsberg Digital (KDI) signed a contract with Singapore-based transshipment company Rocktree to provide its Vessel Insight technology for the Supramax size Bulk carrier modified to an Offshore Floating Terminal (OFT) RT LEO. While in dry dock, the integration of Vessel Insight with KM's K-Chief 500 were installed.

bit.ly/3qX94rP

Canadian Ferry Refit to All-electric, Zero-emission

Photo courtesy CANAL

A newly retrofitted electric ferry is the first in Canada to enter service powered by a zero-emissions, lithium-ion power and propulsion system containing no diesel fuel components.

Ports Toronto's 96-ft. Marilyn Bell I, used for transporting passengers, vehicles and supplies the short distance to and from Billy Bishop Toronto City Airport on Toronto Island, returned to operations last week following a 20-week conversion, and is now sailing 100% emissions free.

St. Catharines-based marine electrical engineering firm Canal Marine & Industrial Inc. (CANAL) delivered the complete electrification retrofit of the formerly diesel ferry, from conception to installation.

The project's naval architect is Quebec-based Concept Naval, and Ports Toronto also engaged Nova Scotia-based E.Y.E marine consultants to assist with the implementation of the project.

In operation since 2010, Marilyn Bell I was previously upgraded to run on biodiesel fuel in 2018 before its diesel generators and engines were removed in 2021 to make way for a new electric power and propulsion system and a suite of lithium-ion batteries. Now fueled by 100% Bullfrog Power renewable sourced energy, the ferry emits zero greenhouse gas (GHG) emissions, reducing the airport's direct GHG emissions by 530 tons per year, according to Ports Toronto.

The project involved the complete transition of the Marilyn Bell I to CANAL's ZEROe Power and Propulsion Solution, which includes the CANAL Automatic Shore Charging System (ASCS), said to be the first automatic charging solution for an electric vessel in North America. Charging of the batteries automatically initiates when connected to the ramp on the mainland side and takes only five minutes during loading to top up the charge, CANAL said.

Drawing from the retrofitted 226 kWh Corvus Orca Energy ESS, the new power and propulsion system supports the ferry's existing operations, carrying up to 15 regular-sized vehicles and 200 passengers at a time seven days a week, 19 hours a day, and four round trips (122 meters each way) every hour.

In total, the ferry conversion cost approximately $3.8 million, paid in full by Ports Toronto through the Airport Improvement Fee.

Ship Repair

Recent projects and upgrades from ship repair and conversion

Overview: The Shipbreaking Market

Sub-continent ship recycling markets (including Turkey) remained in a precarious position at the end of 2021, with the recent decline in steel plate prices mixed in with the crushing depreciation of currencies that has led to a serious dearth in the global demand for tonnage.

As a result, there have still not been any noteworthy sales at these new lower levels to justify some of the alarming news emanating from sub-continent markets, and it does seem that much of what we are hearing is far more dramatic than current realities on the ground.

Steel plate prices in India have collapsed by over $60/LDT in recent weeks. Yet, sales of stainless-steel units (in particular) continue at ever impressive numbers to Alang Recyclers. This is likely because the non-ferrous market is comparatively more specialized and is somewhat insulated from the wider steel markets.

On the currencies front, the Turkish Lira and the Pakistani Rupee have both depreciated to their (respective) highest ever levels against the U.S. Dollar – continuing an ongoing theme with the depreciations that we have seen for much of this year.

Notwithstanding, the markets still saw several units reportedly sold to Gadani Recyclers from existing Cash Buyer inventories and at solid numbers to boot - those not too far from where Bangladesh currently is.

Chattogram has seen a number of vessels arrive and beach over recent tides – including several larger LDT units /VLCCs/ FSUs – and so it is perhaps understandable to see a weakening Bangladeshi demand as most Recyclers seek to monitor competing markets and re-adjust/lower their numbers accordingly, hoping to acquire a bargain or two.

Overall, the overriding feeling is that fundamentals have not declined so dramatically in most of the sub-continent markets that justify some of the opportunistic and lower levels currently on show, and given a period of festivities/Christmas respite, we may see markets come roaring back as the industry heads into the New Year.

Rank	Location	Sentiment	Dry Bulk $/LDT	Tankers $/LDT	Containers $/LDT
1	Bangladesh	Declining	590 / LDT	600 / LDT	610 / LDT
2	Pakistan	Declining	580 / LDT	590 / LDT	600 / LDT
3	India	Declining	550 / LDT	560 / LDT	570 / LDT
4	Turkey	Declining	325 / LDT	335 / LDT	345 / LDT

Profile: Verret Shipyard, Inc.

Verret Shipyard, Inc., is a full service shipyard, located on the Port Allen route, just south of Port Allen lock. Verret specializes in five year dry dockings as well as repowers, but can cater to any need, from steel and aluminum fabricating to carpenter work, machine shop, blasting and painting, fuel tank cleaning, electrical, etc. Verret Shipyard is also capable of making onboard emergency repairs within a reasonable travel distance.

Photo courtesy Verret Shipyard

Over the course of 70 years in operation, the shipyard has been at the forefront of building and maintaining vessels and the Verret shipyard crew have developed efficiencies that has led this industry in good marine practices. Verret can dry dock vessels up to 700 tons with its railway and floating drydock. The shipyard has recently completed work on two newbuild vessels for Chem Carriers, Capt. Frank W. Banta and Ben Hays, a pair of 1600 hp, 76 x 32 ft. sister vessels.

Propspeed targets Commercial Maritime for Growth

MARITIME REPORTER TV Watch the full Propspeed interview @ bit.ly/3zxoS8N

All images courtesy Propspeed

Propspeed launched a new kit packaged specifically for commercial marine, as **Rusty Morgan (above), VP of Sales & Operations, Americas,** *discussed with Maritime Reporter TV.*

New Zealand-based Propspeed, a maker of underwater foul-release coatings for 21 years, has entered full-force into the commercial maritime space with the launch of its first coatings kit packaged specifically for the commercial marine trade professional. The Propspeed Commercial Kit includes all that is needed to coat two propellers 65-80 in. (165-203cm) in size, or a total surface coverage of 153 sq. ft. (14.2 sq. m.).

According to Morgan, Propspeed has had a hand in the commercial market since its start. "We've been working on some ferries in New Zealand and Australia, but we really haven't made a concerted effort to get out there in front of the commercial customers." But a recent expansion has increased the company's capability, and now with warehouses in North America, Europe and New Zealand, plus distribution partners in 30 countries, it is positioned to "service the whole Americas, EMEA, and the Asian markets," he said.

Propspeed's expansion was not conducted in a vacuum, and Morgan said that the bevy of environmental and, by association, vessel performance issues have made the commercial market that much more interesting for the company.

"The world has changed a lot in 21 years, especially in terms of commercial operators," said Morgan. "Tiered engine regulations, greenhouse gases, aquatic invasive species, corrosion protection, and maintenance," are just a few of the concerns for vessel owners. "Let's just look at it in terms of fuel savings," said Morgan, noting that in the past, operators chartering ships were not as concerned about fuel cost, "because they'll pass that along to the charterer." Today that is changing, with the people chartering vessels starting to look more closely at the big picture regarding fuel burn and cost, maintenance, and of course, coatings. "Now we see a lot of companies reaching out directly to us to say, 'Hey, we are looking for a solution. Do you have something that would help us become more profitable, or become more environmentally friendly?'"

In The Kit

The Propspeed commercial kit is priced at $1,999 in the U.S., and inside it includes Propspeed's etching primer, a clear coat, adequate solvent for cleaning surfaces, as well as an acid prepping primer. It is designed to provide 153-sq. ft. of coverage, propellers between 65-80 inches. Precise measurements eliminates waste.

bit.ly/3HJ0yUh

Tech Files

The month's best technical innovations

Schottel for eWolf

Crowley's new 25-m eWolf, the first all-electric tug to be built and operated in the U.S., will be equipped with Schottel systems, including a pair of RudderPropellers type SRP 430 featuring the LE-Drive (Embedded L-Drive) and adata IoT Gateway and monitoring solution. Designed by Crowley Engineering Services and to be built at Master Boat Builders shipyard in Coden, Alabama, the innovative workboat is scheduled to enter operations by mid-2023.

bit.ly/3qXdb7l

Schottel

Mitsubishi Shipbuilding

FGSS for High-Pres Engine

Mitsubishi Shipbuilding has taken its first order for LNG (Liquefied Natural Gas) fuel supply systems (FGSS) for high-pressure dual-fuel marine engines, for installation on six LNG-fueled car carriers to be built by a group company of Imabari Shipbuilding Co., Ltd.

The core components of the newly ordered FGSS are LNG fuel tanks, LNG fuel gas supply units and a control unit, and the package is designed with space-saving in mind.

bit.ly/3f1jQb8

© Wärtsilä Corporation

Wärtsilä thrusters for WTIV

Wärtsilä will supply the seven thrusters required for a new Wind Turbine Installation Vessel (WTIV) being built at the Daewoo Shipbuilding & Marine yard in South Korea for Eneti Inc. The scope includes six Wärtsilä WST-32 thrusters **(pictured)** fitted with a modern electric steering system, and one Wärtsilä WTT-36 thruster All seven comply with applicable environmental regulations with the use of Environmentally Acceptable Lubricants (EAL).

bit.ly/3zyusYy

MOL

MOL: A new World Record

Mitsui O.S.K. Lines (MOL) said its Propeller Boss Cap Fins (PBCF) was certified as the "Best-selling Energy-Saving Ship Appendage Brand (Cumulative)", by Guinness World Records, and received the official certificate on December 23, 2021.

This award is based on the cumulative 3,748 PBCFs sold (the sales record with 3,516 vessels including twin-screw vessels equipped with PBCF) as of the end of December 2020.

bit.ly/3q0qaGa

RIX Hydrogen-on-Demand

RIX Industries offers on-vessel hydrogen-on-demand as the key to building momentum in decarbonization for the maritime industry. Eliminating the complexities of high-pressure gas or cryogenic liquid hydrogen storage, hydrogen-on-demand transforms methanol to feed fuel cells as needed in a self-contained, small footprint system. Hydrogen-on-demand is enabled by RIX's M2H2 Series systems, integrating technology licensed from Element 1.

bit.ly/31B6Rd3

RIX Industries

HamiltonJet

HamiltonJet JETSense

HamiltonJet unveiled JETSense in collaboration with Sea Machines' Autonomous Technology. JETSense is a 3-in-1 system featuring navigation, multi-sensor fusion and computer vision. It uses Artificial Intelligence (AI) and advanced autonomy to perceive the domain and maintain precise control of steering and speed during a voyage and re-route to avoid traffic and obstacles, while enabling a new level of streaming data to improve on-water operations.

bit.ly/3G7OpYu

Hempel announces new Exec Group

Hempel

Maine Maritime

Paul to the Helm @ Maine Maritime

Royal IHC

Royal IHC appoints Klaver CEO

Hempel announces new Exec Group
Hempel announces a new Executive Group Management to lead its growth journey to double Hempel by 2025. Hempel's commercial activities are now organized into key segments: Marine, led by Executive Vice President, Alexander Enström; Energy & Infrastructure, led by Executive Vice President, Michael Hansen; and Decorative, led by Executive Vice President, Joe Devitt. Chief Operations Officer and Executive Vice President, Katarina Lindström, now heads up Technology & Operations; Chief Financial Officer and Executive Vice President, Lars Dollerup now oversees Finance & Digital; and Chief People & Culture Officer and Executive Vice President, Pernille Fritz Vilhelmsen is at the helm of People & Culture. Strategy & Transformation is also joining the EGM, headed up by Vice President, René Overgaard Jensen.

Paul to the Helm @ Maine Maritime
Jerald S. "Jerry" Paul has been named as Maine Maritime Academy's 15th President. Paul, current President of Capitol Access and a 1989 graduate of the institution, will take office the spring of 2022. Paul succeed President William J. Brennan, who steps down from the position at the end of April following 12 years of leadership at MMA.

Royal IHC appoints Klaver CEO
Jan Pieter Klaver started as CEO of Royal IHC on January 1, 2022, taking over from Gerben Eggink, who fulfilled the role of CEO on an interim basis for more than a year and a half. After his training as a civil engineer at the Technical University of Delft, Klaver started at Heerema. During his more than 25-year career at Heerema, he fulfilled various (management) roles, including manager of the Heerema shipyard in Vlissingen. After being

HII

HII appoints Mulherin

Britannia P&I

Pizzaro Joins Britannia P&I

CEO of Heerema Fabrication Group for a number of years, he became CEO of Heerema Marine Contractors in 2009. In 2017, he made the move to Kenz Figee, where until recently he was CEO.

HII appoints Mulherin

Huntington Ingalls Industries (HII) announced that Matt Mulherin Jr. has been promoted to vice president of contracts at its Newport News Shipbuilding division. Mulherin succeeds Christie Thomas, who has been appointed corporate vice president, investor relations. Mulherin, who joined Newport News in 2004, will have overall responsibility for contracts, pricing, and export/import licensing and compliance for Newport News. He will report to Don Godwin, Newport News vice president of business management and chief financial officer.

Pizzaro Joins Britannia P&I

Britannia P&I and its Exclusive Correspondent in the US, B Americas P&I, announce the recruitment of Marcela Pizzaro. She worked for many years at one of the major international container lines, where she was Director of Corporate Insurance Risk Management with oversight and responsibility for the company's risk, insurance and claims in North America. B Americas, led by Director, Mike Unger, is based in New York and opened on 30 March 2020. It provides support to all Britannia Members requiring assistance with claims and other matters in the USA, as well as focusing on the specific needs of the Club's North American Members.

BIMCO appoints Rasmussen

BIMCO has appointed Niels Rasmussen as its Chief Shipping Analyst effective January 2022. Most recently Rasmussen was Global Head of Research at Maersk Broker, a role he held for six years focusing on the main shipping segments; dry bulk, tanker, and container.

Paramount Appoints Connolly CEO

Paramount Group appointed Lee Connolly as CEO of Paramount Maritime Holdings, its naval and maritime shipbuilding subsidiary, based in Cape Town, Africa.

Connolly held the position of CEO of Paramount Advanced Technologies, a Paramount Group company, until recently. Paramount Maritime Holdings, comprising ship builders Nautic Africa and Veecraft Marine, reported ongoing customer demands in the security vessel sector due to the myriad of maritime threats which today challenge the trajectory of Africa's blue economies.

Sun Feng Takes the Helm at CCS

Sun Feng formerly a CCS vice president, was named Chairman and President, taking over from Mo Jianhui, who retired. Sun, aged 56, worked in the Dalian Branch of CCS from 1987 to December 2005. He served as general manager of the Classed Ship in Service Department since December 2005 based at CCS headquarters and worked as vice president of CCS from December 2008 till December 2021. He has been in charge of almost all business areas of CCS including classification survey services for ships, offshore installations and related industrial products, science and technology, R&D, IT and international affairs.

BIMCO

BIMCO appoints Rasmussen

Paramount Group

Paramount Appoints Connolly CEO

Maersk Training appoints new CEO
Maersk Training has appointed David Skov as its new CEO as the company targets further growth in the global offshore energy and maritime markets. Skov was previously Regional Head of Terminals, Africa & Middle East at APM Terminals, part of A.P. Moller – Maersk. He replaces Johan Uggla, who served as Maersk Training's CEO for four years.

HDR Promotes LaFata
HDR's Cathy LaFata has taken on a new role as the company's transportation equity director, where she will apply more than 27 years of environmental justice expertise to help clients incorporate equity into projects at every level. In her new role, LaFata will help multidisciplinary teams deliver HDR's full breadth of advisory and technical services through an equity lens.

Gupta joins BMT
BMT Appoints Hittesh Gupta as Head of Casualty Investigation, Asia. With more than 23-years of experience in the shipping industry, Gupta has a deep understanding of marine surveying having served on product and crude oil tankers and offshore oil & gas production units. He has worked extensively for underwriters and leading P&I Clubs undertaking casualty investigations.

"Mr. ECDIS" *Tor Svanes Chronicled in New Book*

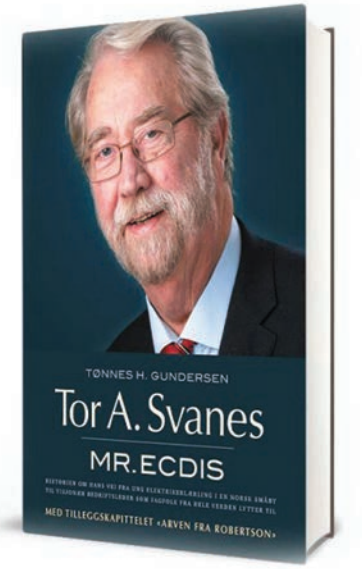
NAVTOR CEO Tor Svanes is "Mr. ECDIS", at least that's the title he's been given in a new book charting his life story as well as his role in the development of maritime e-Navigation. Author Tønnes H. Gundersen details the voyage that took Svanes from electrician's apprentice in the small town of Egersund, Southern Norway, to a globally renowned figure in this key smart shipping niche. And, Svanes is keen to add, the journey isn't over yet. Gundersen spent more than two years researching, interviewing and writing the 300-page opus, which was launched today in both English and Norwegian versions. The author says the publication operates as a biography, but also as a history book, interweaving Svanes' personal development with the evolution of technology that is now essential to unlocking safer, smarter, simpler and more sustainable shipping and business operations.

"From humble beginnings in a working-class family he's shown incredible ambition, inspiration and dedication – even when forced out of high-profile industry positions – to commit himself to a cause that has delivered huge benefits for the maritime industry. At the end of the day his legacy won't be the products and services he's developed, but the lives they've saved, the efficiencies they've unlocked, and the environment they've protected. The book may be finished, but I'm looking forward to the next chapter!"

Svanes led C-Map Norway as CEO, building the company into the world's leading supplier of digital charts before a disagreement with Boeing-owned Jeppesen Marine (which acquired the business in 2007) forced him out in 2011. From that point he followed his own vision, founding NAVTOR and pushing the envelope of e-Navigation development.

The company quickly launched the first type-approved, cloud-based Pay As You Sail digital chart service, before going on to develop an entire eco-system of world first innovations centered on seamlessly sharing data between ship and shore, accelerating shipping into the digital age.

Today, NAVTOR has products and services on over 7000 vessels worldwide and has made the move into performance monitoring and optimization, as well as digital logbooks. The business has regional offices in Norway, Singapore, Japan, Sweden, Germany, Russia, Poland, the United States, and the United Kingdom, with customers in more than 60 countries.



"I may have been given the title 'Mr. ECDIS,' but for me it's about the story of digital development and how innovation can make life simpler, safer and smarter at sea, rather than any one personality," said Svanes. "It's also important to underline that none of this could ever be achieved individually. It's always about the team effort, so I'd really like to thank all our customers, employees, backers and supporters over the years. This is a voyage we've made together… and we're not at our destination just yet. There's plenty more developments, and benefits, to come."

Let's Get the Plastic Out of Our Lives (& Waterways)

By Thomas N. Thompson, Maritime Environmental and Energy Technical Adviser, MARAD (retired)

A confession. I'm part of a very big problem that's easy to ignore. Last year, I contributed the U.S. average-per-person 300 pounds of plastic garbage to wherever it went after convenient curbside pickup. So out of sight, out of mind, right? Not really, but does it matter? Yes, it does.

In a fascinating recent report, the National Academy of Sciences, Engineering, and Medicine politely told us that we're choking ourselves to death on manufactured plastic waste and that 80% of the harmful plastic in the ocean comes from land-based sources.

It's the micro-plastics, smaller than 5 mm (the size of a sesame seed) and nano-plastics, which are smaller, that are the problem. Because we have consumed much of it in the food chain, we're eating it, and not in the way we like to think of "recycling."

Plastics are not biodegradable. They break down into tinier and tinier pieces. So human health is especially at risk, with everybody's food safety and quality in jeopardy. The human body cannot digest plastics.

Plastic pollution also contributes to climate change. Plastics are synthetic polymers manufactured at petrochemical plants where Greenhouse Gases (GHG) are produced.

Most micro-plastics are dyed or painted, which causes them to absorb sunlight, thus increasing global temperatures. But more urgent research is needed to know the exact radiative effects of plastics.

The deluge of plastic waste in the world's oceans, with the attendant generation of GHGs, needs to be reduced. Higher ocean water temperatures increase the breakdown of plastics. And it's well documented that phytoplankton, which produce fifty percent of the earth's oxygen, are ingesting micro-plastics, reducing the typical amount of carbon dioxide that they consume.

The National Academy tells us they estimate that 8 million tons of plastics

end up in the ocean each year, and that under the current trajectory the number could climb to 53 million by the end of the decade. That's a big number!

I've wondered why it's only the Great Pacific Plastic Patch that gets all of the headlines. Maybe because it seems far away? It's a gigantic floating collection of marine debris in the North Pacific Ocean that's larger than Texas, and fast beginning to resemble the size of Australia. But it's out in the open sea, so, conveniently, nobody will take responsibility for it. Oceanographers and ecologists have discovered that about 70% of marine debris actually sinks to the bottom of the ocean. So, in fact, we have no idea how large the Patch really is, or even how much plastic is in the oceans or inland waterways anywhere.

All of us in the world like data, so here we go: We do have plastic production figures. 300 million tons of plastic are produced every year. Plastic is everywhere in our lives. Packaging, building and construction, household and sports equipment, vehicles, electronics and agriculture. Half of that 300 million tons is used to create single-use items such as shopping bags, cups and straws. There's no end in sight to ramping up both production consumption.

According to the National Academy report, the U.S. produced a total of 42 million tons of all categories of plastic waste in 2016, twice as much as China. Just in U.S. households, 35 million tons of plastic are thrown away yearly. Only a small fraction, maybe 10%, of that material is recycled. Most of it goes to landfills, where it can escape into our oceans. The report notes that U.S. recycling systems are "grossly insufficient."

We can't take much comfort in the world's plastic waste from the COVID-19 pandemic, about 25,000 tons, the equivalent to more than 2,000 buses, dumped into the ocean. All of those masks and gloves have to go somewhere, much of it on a beach or in the seabed.

The distant, alarming, and now forgotten, headlines of COP 26 included mostly hot-air pledges of career politicians to address their citizens' production of GHGs. There were inspirational speeches, but no mention of plastics. Maybe some of us took some comfort from the false promise of the vague buzzwords of the summit: "raised consciousness."

Maybe our world leaders could be more than conscious about that 8 million tons of plastic waste that enter the world's oceans each year. The details matter. We're depositing the equivalent of a garbage truck of plastic waste into the ocean every minute.

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January 2022

The Ship Repair & Conversion Edition

- Hull, Deck and Tank Coatings
- Engine Conversion & Repower
- Fuels and Lubricants
- Emission Scrubbers
- Waste Water Treatment Systems

February 2022

Government Shipbuilding

- Autonomous Ship Systems
- Bridge Technology: Satellite Communications, Navigation & Controls
- Seafarer Training & Education
- Health, Safety & Sanitization

Event Distribution:
Sea, Air, Space: April 4-6, National Harbor, MD

March 2022 E-Magazine Edition

Dredging

April 2022

Offshore Energy

- Wind Turbine Installation Vessel Technology
- Cruise & Ferries
- Marine Gears & Transmissions
- Fluid Handling Pumps and Filtration
- Heavy Lifters: Deck Machinery & Cranes

Event Distribution:
OTC: May 2-5, Houston, TX
IPF: April 26-28, Atlantic City, NJ
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May 2022

Green Ship Technologies

- LNG / Hybrid Propulsion: Marine Batteries & Fuel Cells
- Classification Societies
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Event Distribution:
Posidonia: June 6 - 10, Athens, Greece
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June 2022

USCG Fleet Modernization Annual

- Fast Attack and Patrol Craft Builders
- Ride Stabilization: Pitch and Roll Control Solutions
- Water Jets, Thrusters & Propellers
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MACC: Jul 2022, National Arbor, MD

July 2022 E-Magazine Edition

Navy & Coast Guard Shipbuilding

August 2022

The Shipyard Annual

- Bearings, Seals and Couplings
- Pipes, Pumps & Valves
- Ballast Water Management
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Event Distribution:
SMM: September 6-9 Hamburg, Germany

September 2022

The Marine Design Edition

- Naval Architecture/Marine Engineering
- Dredging: Port Expansion and Deepening
- Material Handling Equipment
- Performance Coatings
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CMA Shipping: October, Stamford, CT
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October 2022 E-Magazine Edition

Offshore Wind

November 2022

Workboat Edition

- Autonomous Workboats
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Event Distribution:
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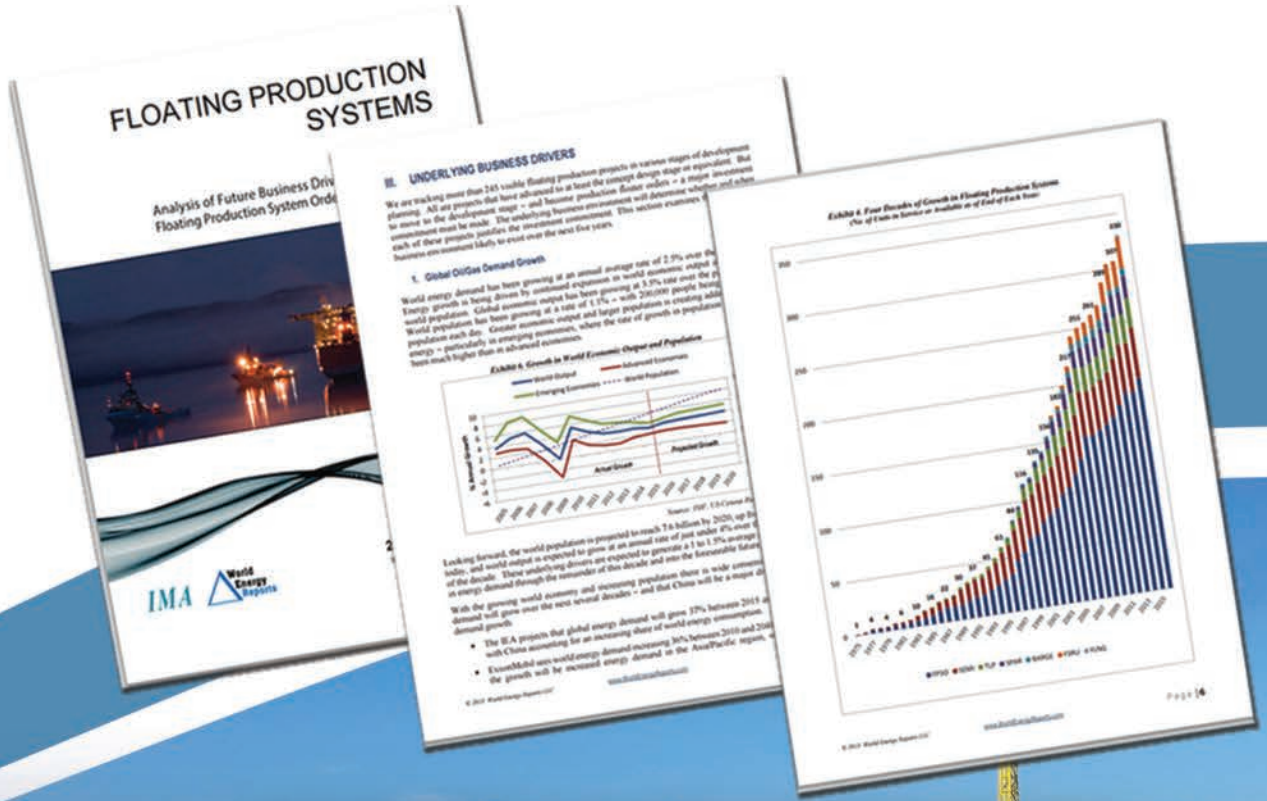

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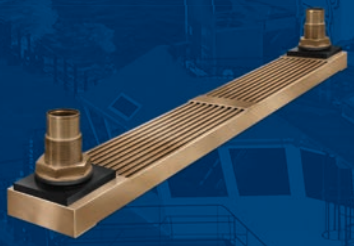

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