August 2023

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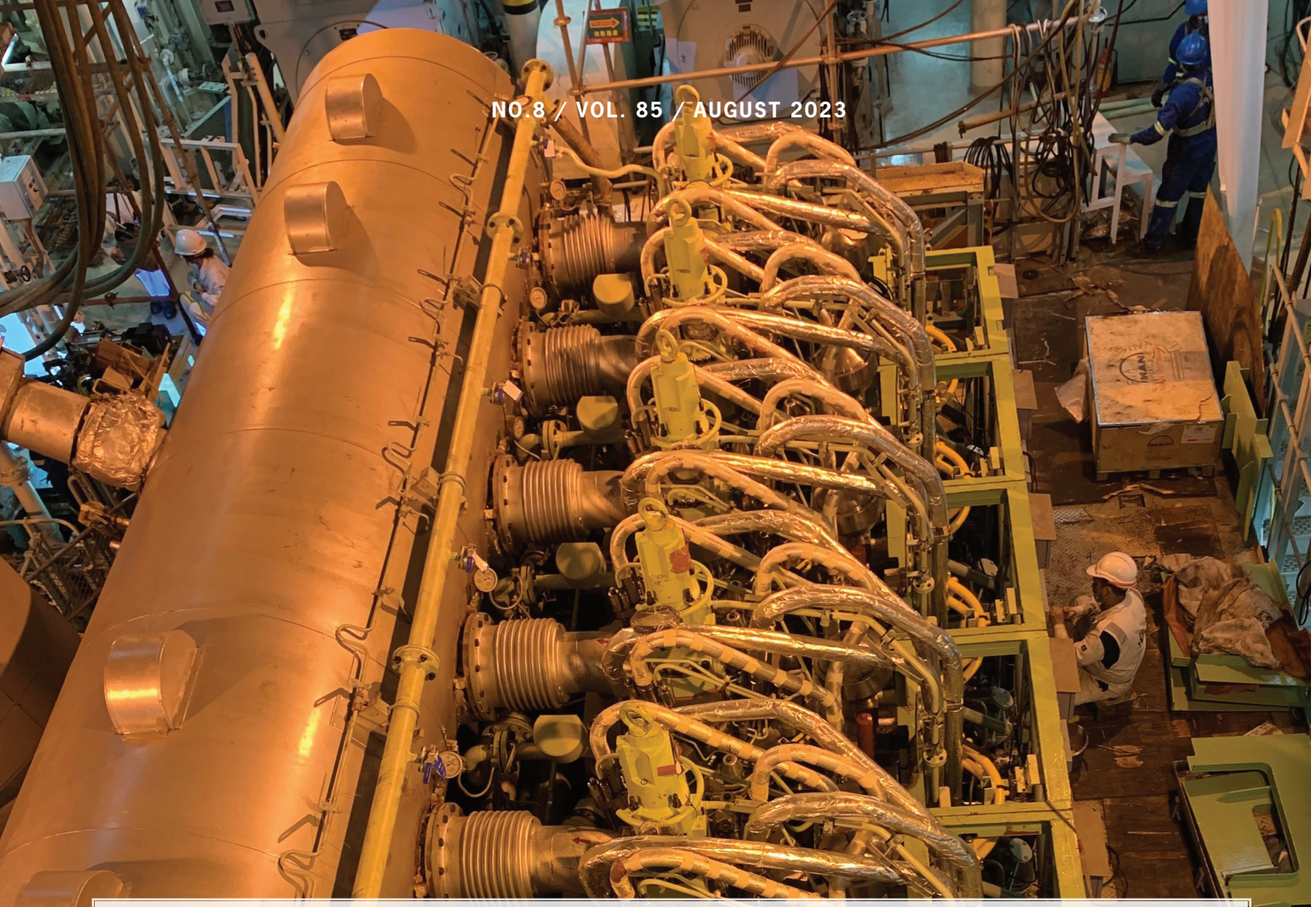

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Decarbonization, Emission Reduction, The Path to Zero … whatever you call it, however you feel about it, the future of maritime is increasingly defined by mandates from authorities which determine the types and amounts of emissions from commercial ships and boats.

Last month news from the IMO came out regarding the adoption of a revised strategy to reduce GHG emissions from ships, the *2023 IMO Strategy on Reduction of GHG Emissions from Ships.* Whether you think this was a step too far or that the measure was not taken far enough is irrelevant. The important takeaway here is that the course toward emission reduction is set, and the restrictions are going to only get more onerous and costly to ship and boat owners globally. That said, the immediate future from the operational side is business as usual, as the technology and the infrastructure for the vast majority of future fuels is still a generation away. But taking a blind eye now as to how your fleet is going to look and operate in the future is not advised.

August is our traditional look inside shipbuilding, and to that end the decarbonization discussion tendrils reach deep inside the ship design and construction business. Energy transition in its cumulative form is happening right now, globally, with the rapid expansion of offshore wind as a power source. The whole offshore wind phenomena will entail an offshore construction and maintenance program on a scale never before seen, not even in the offshore oil and gas sector. To put it simply, there will be a ton of 'stuff' going in to the water, and the need to have the vessels, the personnel, the logistics infrastructure to install and maintain it will be off the charts.

In this edition we have a pair of features addressing this topic directly, the first from **Paul Bartlett** starting on page 22 which examines how shipyard capacity (or lack thereof) could effectively pump the brakes on decarbonization. Immediately following on page 26 is a feature from **Phil Lewis**, Director of Research, Intelatus, which takes a look a bit further down the road in analyzing the inevitable impact of offshore floating wind and its demand for new anchor handling tug construction.

While I am loathe to pick favorites, I must admit that my nod for the 'must read' of this edition is our interview with **Hydrocomp's Don MacPherson** (and no, not because I wrote it). I've known Don and Hydrocomp founder **Jill Aaron** for most of my 30+ years in this seat, and my interview with Don earlier this year on the topic of the business of measuring ship emissions covers a lot of ground, including both GHG and radiated noise emissions. Don offers some fairly candid insights on the good and bad of the rules to monitor and measure emissions, as well as some excellent insights on the business of designing and building clean and quiet ships in our feature *The KISS Principle & Managing, Measuring Ship Emissions*, starting on page 34.

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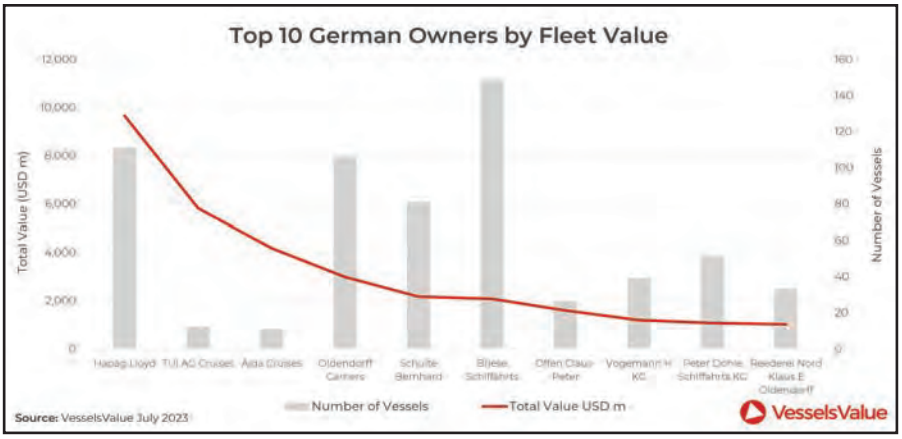
German Shipowners

This month VesselsValue offer insights and a breakdown of a traditional maritime (& container shipping) powerhouse, German ship owners.

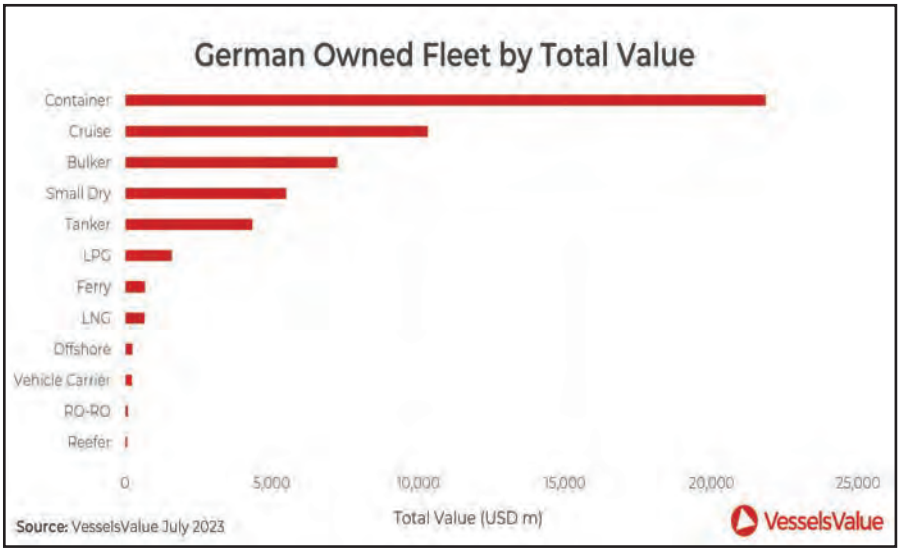
Top 10 German Owners by Fleet Value

Type	# of Vessels	Value ($)
Hapag Lloyd	100	6,838
TUI AG Cruises	9	3,411
Aida Cruises	11	4,167
Oldendorff Carriers	90	2,362
Schulte Bernhard	81	2,157
Briese Schiffahrts	117	1,357
Offen Claus-Peter	26	1,581
Vogemann H KG	11	290
Peter Dohle Schiffahrts KG	51	1,056
Reederei Nord Klaus E Oldendorff	33	1,006



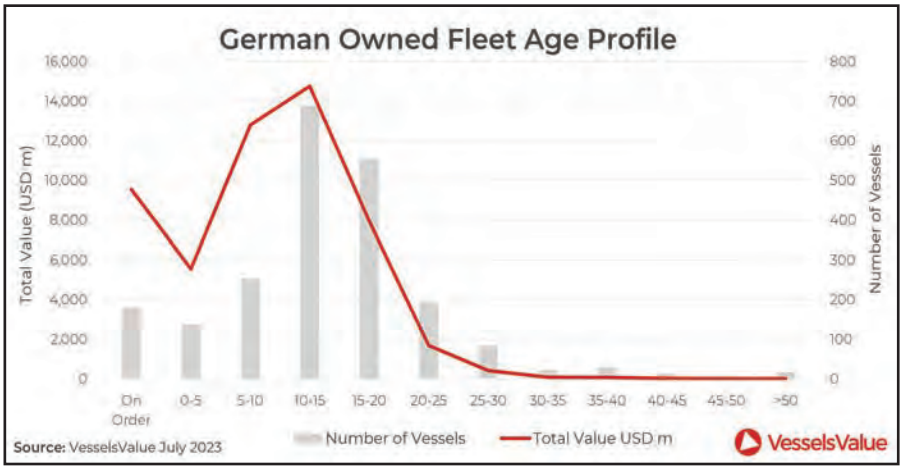
German Owned Fleet Vessel Types

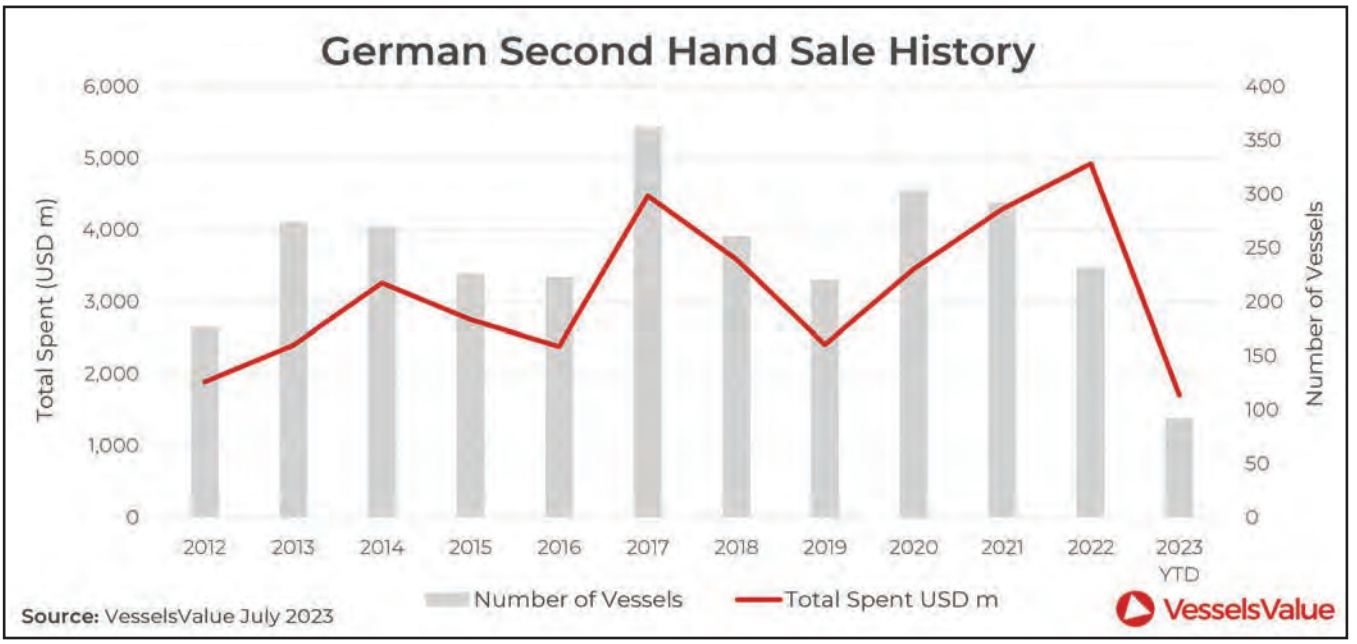
Type	# of Vessels	Value ($)
Container	620	18,095
Cruise	26	7,928
Bulker	267	5,627
Small Dry	555	4,447
Tanker	380	4,198
LPG	47	1,177
Ferry	14	680
LNG	4	544
Offshore	57	232
Vehicle Carrier	4	233
RO-RO	10	100
Reefer	14	68
Grand Total	**1,998**	**43,328**



German Owned Fleet Age Profile

Age Group	# Vessels	Total Value ($)
On Order	180	9,535
0-5	137	5,548
5-10	253	12,799
10-15	689	14,757
15-20	554	7,944
20-25	194	1,684
25-30	84	417
30-35	22	80
35-40	29	67
40-45	12	19
45-50	7	4
>50	17	8





Tip #50

ChatGPT & Maritime Training: Steps to Harness the Power

By now we have all heard about ChatGPT, an example of a "Large Language Model" technology which is remarkable in its ability to generate human-like responses to questions we ask of it. But is ChatGPT primarily a novelty, or can it provide real value in terms of its ability to create content? In my personal experience with ChatGPT, the answer is far closer to the latter than the former - but with some caveats. In this edition of Training Tips for Ships, we'll explore the steps required to harness the power of ChatGPT to generate engaging and effective maritime training materials. It is easy to try this for yourself by following some basic guidelines which I present here.

As a first step, it is important to understand that the quality and relevance of the output from ChatGPT is enormously influenced by the clarity and specificity of the questions you pose. So as a prerequisite to content creation, it's essential to have a clear idea of the specific skills or knowledge you want your trainees to acquire from this content, and to outline the key topics that your training materials should cover. Having a clear goal in mind will help you provide more focused input to ChatGPT, resulting in better-quality output.

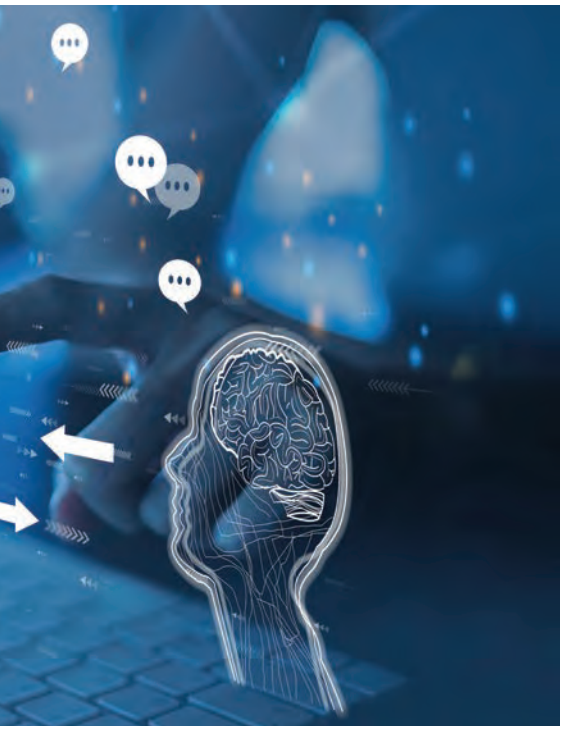
With your clearly considered goal in mind, the next step is to sign up for an account with OpenAI at https://chat.openai.com/. Once your account is set up, you are presented with a simple box into which you can type or paste your request.

Now it is time to try it out.

Using the requirements you formulated above, create a request which describes the needed content, any required guidance, and the specific output desired. For example, you might ask ChatGPT the following: "New maritime trainees often have trouble learning collision regulations due to their complexity. Create 10 clear, scenario-based, short-answer quiz questions on collision avoidance at sea which will help them understand the nuance of different situations''. Or "Write a training module of 500 words maximum for beginners on the basic safety precautions which need to be taken to safely enter and work in a confined space. Be sure to emphasize the risks present and how the likelihood and consequences of each of those risks can be reduced." The more specific your question is and the better the guidance you provide, the better the outcome will be.

What is interesting and not immediately obvious to new users is that ChatGPT considers your requests as part of a conversation. So, this gives you the ability, for example, to follow up it's answers with further guidance to get closer and closer to the output you are hoping to achieve. For example, after it provides a response, you might say "can you try that again, but this time elaborate further on the preparatory steps before first entering the confined space." This iterative process will help you guide ChatGPT to produce the results you need.

Now comes the part that you, as a knowledgeable expert, are required for. ChatGPT is a powerful tool, but it's crucial to remember that it will rarely generate perfect content. After receiving the AI-generated text, carefully review it for accuracy, relevance, and clarity. You may find inaccuracies, omissions or conflicting information that you are able to correct, but it



cannot. This underscores the specific value of ChatGPT. In its present form, it cannot be thought of as an expert author. Instead, consider it more along the lines of a junior assistant - one who is eager and highly productive, but whose work always needs to be vetted and edited by an expert (you) before it sees the light of day.

As a junior assistant to you, it will save you a tremendous amount of time and help you to be far more productive, so long as you learn how to give it clear direction. Being able to do so with ChatGPT, just as with a junior assistant, it a skill that develops over time.

Incorporating ChatGPT into your maritime training content development process can be a game-changer. By following the steps outlined above and embracing an iterative approach, it will improve your productivity and help you create engaging and effective training materials that meet the unique needs of the maritime industry.

Thanks for reading this edition of Training Tips for Ships, and until next time, sail safely!

The Author

Goldberg

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The Internet is Not As Useful as We May Think

By Rik van Hemmen

I was discussing torsional stiffness in ship's hulls with one of our intern engineers and pointed out a torsional stiffness problem with a certain hull design section since it could not inscribe a decent sized circle. (See figure above). I expected it to be a comment that would be confusing to a young engineer and proceeded to explain that torsional stiffness is related to gyradius which is powerfully related to radius and radius is related to circles. Inherently the stiffest shape in torsion is a circle and the closer to a circle the better.

A square tube of a certain circumference is much stiffer in torsion than a rectangular tube of the same circumference and that can be confirmed by noting that the inscribed circle in the square tube is bigger than the inscribed circle in the rectangular tube.

This was explained to me when I was a young engineer and it has stood me in very good stead in quickly assessing torsional issues. While I was explaining this to the intern, he started googling inscribed circles and torsional stiffness and came up with … nothing. We did find lots of equations for torsional stiffness of thin-walled tubes, and the online version of "Roark's Formulas for Stress and Strain" even made a marginal reference to inscribed circles in a few of its torsional equations, but I could find absolutely nothing that made mention of my very useful engineering rule of thumb.

This made me wonder how many other neat engineering tricks will disappear in our world of CAD, FEA and AI.

I have mentioned **"Beam is Cheap"** in a prior column, but even this well-known axiom is not readily found on the internet. As a matter of fact, the only way I could find a reference to "Beam is Cheap" in the context of ship design was to google *"Rik van Hemmen Beam is Cheap"*.

Another rule that I find extremely useful is that 44 ft. is the maximum length that is needed for a seaworthy oceangoing sailboat. Smaller is possible, but once you hit 44 feet you are adding luxury instead of seaworthiness. I googled: "Smallest reasonable size for an ocean crossing sailboat" and there were a lot of articles that discussed sailboat size. They often came up with smaller sizes, but interestingly nobody advocated anything longer than 45 feet, a subtle confirmation of that truth.

In the spirit of service to the engineering profession I will provide two more engineering truths.

The first one relates to mast placement on sloops. As a young designer I was working for Johan Valentijn and was laying out a new sailboat design and asked him if he had any good references on mast placement. Johan said: "Don't bother. Put it on station four."

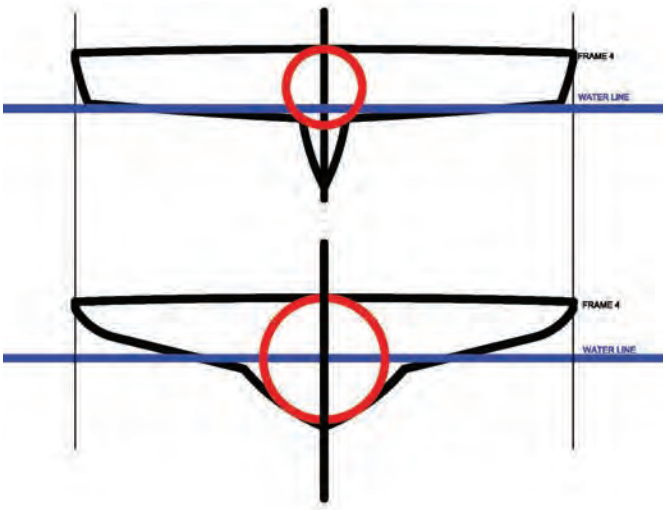


Image courtesy Martin & Ottaway

At Valentijn Inc., all boat stations were 10% of the bow to rudder stock, so it ends up at 40% waterline. As a young pinhead engineer that confused me because he had barely seen the design. "Uh, how do you know Johan?"

"Because all boats that I design have good balance with the mast at station four." He then explained that when he worked at Sparkman & Stephens, they always struggled with helm balance on boats (Yes, even S&S designs were not always perfect out of the box) and he simply took all S&S designs and plotted mast station against weatherhelm and only boats with the mast at station 4 had perfect helm.

Johan said it made no difference if the boat was a cutter or fractional rig boat, and even claimed that it worked for Bermuda rigged yawls. I have never designed a yawl (quite frankly, who would anymore?) so cannot answer for that, but even today when I look at very modern sailboats, I keep seeing station 4. When I google "mast location for a sloop" I do get a reference to station 4 for masthead sloops but not for fractional rigs where they advocate station 3, which, to me, looks very far forward and may work for a dinghy (where body placement can control the boat), but I would have no

confidence in it for a keelboat.

Then there is the hull speed equation for slender hulls. The standard equation for hull speed in knots is familiar to just about every naval architect:

Hull speed = 1.34 x Square Root (L)

Where L is the waterline length in feet.

However, for slender hulls I have seen hull speed defined as:

Slender Hull speed = L/3B x Square Root (L)

Where B is the waterline beam in feet.

It basically says that if the Length to Beam ratio is greater than 4, hull speed will go up.

I copied the equation from a really nice book on multihull design (of which I do not remember the title and author name) and then somebody "borrowed" the book. It was never returned, and all I had was the equation which I happened to copy into a presentation on Zen and Naval Architecture that survives. I have often searched for the origin of this equation, and even sent intern engineers on searches, but this equation is not referenced anywhere and even marine designers older than me do not recognize it. Nevertheless, it is very helpful, and in my experience, provides very useful results when playing with slender hull designs.

These hull speed equations basically show the point where a hull hits the classic Froude number wall with sharply increasing wave drag. To go faster the hull has to transition to planing mode, but since planing is not terribly efficient for slender hulls, it shows at what speed there is a trade off point between planing hulls and slender hulls.

It does not provide hard numbers, but it is excellent for comparisons and trade offs and to prevent a designer from becoming confused about interlocking design issues.

Just putting these four concepts together will provide a designer with a quick frame of reference:

"Let me design an ocean crossing sailboat that is 44 feet long and skinny to get better non-planing speed, but I have to put the mast at station 4 and make sure I keep sufficient torsional stiffness in that small cross section."

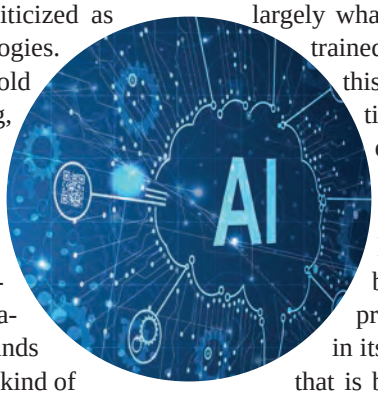
These are just four variables in the hundreds of variables that come into play with boat design, but reducing variables simplifies the overall equation and will result in better solutions.

Most of all, these tricks are extremely helpful in eliminating incorrect solutions and therefore should not be forgotten or we will be doomed to repeat the mistakes made by our predecessors. I just wish there were a way to transfer that engineering knowledge more efficiently. It appears the internet, despite its many engineering benefits is not well suited for it.

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 Herreshoff Museum. *www.herreshoff.org* In my mind one of the best places to preserve engineering realities.

An Honest Discussion About AI

By Kyle E. Marlantes



The maritime industry is often criticized as being slow to adopt new technologies. While ship building is an age-old industry, it is also varied: fishing, commercial, inland, marine construction, energy, passenger, recreation, defense, and the list goes on. Each sector serves a different purpose, and bespoke vessels fulfill different missions, operate in different environments, and are subject to different regulatory profiles. As a result, our industry abounds with unique solutions, but often it is not the kind of innovation that fits in your pocket.

Perhaps the criticism comes from the fact that ship building, and the industry it serves, is a highly competitive and dynamic market, and this may reward strategic and measured investment. Our industry is not averse to technology, but perhaps we are pragmatic in our choices. Unlike some consumer products, if the industrial adoption of technology is not for the sake of novelty, a strong value proposition is a prerequisite for wide acceptance.

This sort of pragmatism seems to fly in the face of the social-media-fueled juggernaut that is Artificial Intelligence (AI). Have you heard? The promises are grand and the premonitions ominous. Sadly, dialogue of this type misses the mark when it comes to exploring the possible value of AI from an industrial perspective. Yet this does not diminish the importance of the question: what value does AI offer the maritime industry?

To answer this question, it helps to know a little about the digital machinery that makes AI possible. Let's look at what goes on under the hood: machine learning (ML). Machine learning models are configurable computer algorithms which can learn complex relationships within data. The models have tens, hundreds, thousands, or even millions of tunable parameters, and they learn by optimizing the parameters to conform to a data set in a high-dimensional, nonlinear, and sometimes eerily intelligent way. There are many different types of models, but the details and differences between each are not important in this discussion. The most important concept to remember is that ML models are trained to map inputs to outputs—even if the relationship between them is not obvious.

The adaptable and configurable nature of ML models is largely what contributes to their appeal: a model can be trained to fit virtually any type of data. Sometimes this property is referred to as universal approximation, but this doesn't mean the model can predict every possible outcome. In fact, a well-trained model can only make reliable predictions within the confines of its training dataset. In colloquial terms, the resulting AI thinks inside the box. If only one fact should be understood by prospective industrial users of AI, it is that AI—in its current form—cannot synthesize information that is beyond its original training dataset. There are some who will surely challenge this statement, but for the time being, true synthesis remains a distinctly human ability.

When it comes to deploying AI, data is paramount. Because the capability of AI is limited by the data to which it has access, this means two things:

1) to derive value from AI, you need a robust data set, and

2) if the relationships within the data are complex, you will likely need a lot of data.

These two facts make applications where data is plentiful, and patterns identifiable, yet conventional modeling is difficult, easy candidates to derive value from AI. Most of the applications of AI which we see in our news and social feeds tackle problems in this category.

In the maritime industry, there are similar data-rich use cases which can benefit from AI. This includes equipment monitoring, health, and failure detection, operational and voyage planning, fuel, and energy monitoring—areas already seeing successful commercial deployment of the technology. Shipyard operations also create a lot of data related to workflow, material moving, and inventory, and if the data were accessible, AI could help identify and leverage unseen patterns and relationships. AI is extremely valuable when it can expose relationships within available data that we didn't know existed, or were unable to model in other ways, and many of the current industrial applications of AI leverage this fact as part of their value proposition.

However, there are many problems in the maritime industry which are not data rich. This is often due to the nature of the problem, for example, improbable events are difficult to learn due to their infrequent occurrence. But it may be that the necessary data are simply too difficult—or expensive—to

measure. Furthermore, even if adequate training data are attainable, if efforts to obtain the data address the original problem directly, then a resulting AI is rendered unnecessary. When considering AI for an application, it is very important to consider the data requirements for a successful deployment, the feasibility and cost of acquiring the data, and if acquiring the data will provide the necessary insight without AI.

The availability of data remains the greatest barrier to utilizing AI in more applications within the maritime industry. Designing methods which reduce training data requirements, leverage small amounts of data to make predictions, and derive deeper insight from less information are front and center in the current academic and industrial research world. One significant example of this is using AI in engineering applications, specifically in ship design and analysis. When designing a ship, data is often not plentiful, but if a small initial data set could be leveraged, then significant insight could be gained earlier in the design process, faster, and cheaper. Researchers are working on this very problem, with some recent work showing promise, but the methods take considerable domain knowledge to be successful. However, as these efforts continue to gain traction, it is possible that AI will considerably benefit ship designers and engineers within this decade.

As the conversation around AI continues to unfold, it is more important than ever to keep a pragmatic mindset. When evaluating the technology for a proposed application, we must keep the limitations of data—in terms of quality, quantity, and availability—front and center. AI can yield insight from data in ways that were previously impossible, but strategic deployment is critical to deriving real value. For the maritime industry, with a long history of unique challenges and solutions, AI should be yet another tool in the toolbox, to be adopted when the question—and the data—are well-suited to the technology.

The Author

Marlantes

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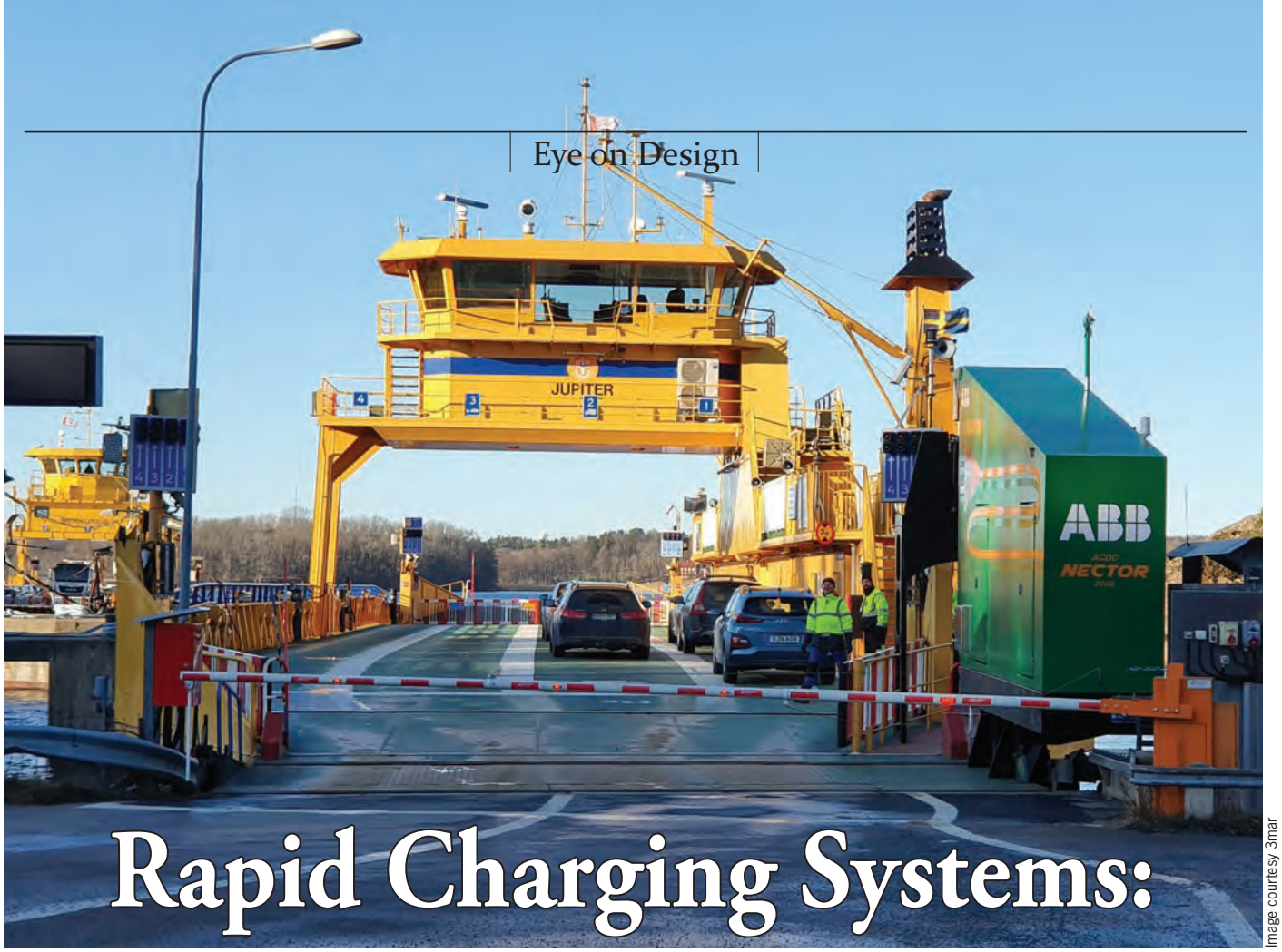


Image courtesy 3mar

Rapid Charging Systems: Current Technology for the Future of Ferries

By Maggie Stagner, Electrical Engineer, Elliott Bay Design Group

As the devotion to more sustainable shipping expands and regulations become more stringent, the demand for lower emissions operations continues to increase. As a result, the marine industry is confronted with the challenge of large-scale electrification as an alternative energy solution.

For electric ferries, one developing technology is Rapid Charging Systems (RCS), which transfer electrical power from the shore to a vessel at a high rate. These charging systems establish a ship-to-shore connection quickly, providing a power transfer solution for vessels with short docking periods.

As the United States maritime industry continues to adapt to more sustainable powering and propulsion technologies and begins to incorporate energy storage on a larger scale, there are existing active RCS options to consider. Notably, Scandinavia has a significant quantity of plug-in ferries in service that operate with RCS.

The most significant challenge associated with introducing RCS is the ship's motions relative to the pier. The system must span a gap to the vessel and maintain a safe electrical connection without interfering with vessel operations. Subsequently, most existing systems utilize positive restraint to minimize vessel motions. Developing such systems often requires substantial installations or modifications of shore-side infrastructure. Some plug-in ferries in Scandinavia have actually gone into service before their corresponding final charging systems could be installed. A temporary mechanical testing stage can prove out system functionality, which delays electrical infrastructure costs until the

planned solution is verified for a final installation.

Elliott Bay Design Group (EBDG) is working on the development of plug-in vessels with several clients, including Casco Bay Lines, Washington State Ferries, and Water Emergency Transportation Authority. These ferries will be some of the first plug-in vessels in North America, supporting a more sustainable future for shipping. With a wide array of continuously developing technologies, it's important for EBDG to provide unbiased engineering analysis that accurately characterizes the available options for vessel owners and operators.

Some of the key factors that drive the varying system designs are vessel and dock configurations, automation, power requirements, schedule, and route. The types of RCS can be loosely categorized as follows:

- Mounted on Auxiliary Side Dock vs Loading Ramp
- Vertical (Hook) vs Horizontal (Extension) vs Davit (Crane)
- Automated vs Manual

Making a safe and secure connection between vessel and shoreside components is of primary importance. However, a fast connection is often desired in order to maximize charging duration without affecting the vessel schedule. Vessel motion, including tidal fluctuation, is one challenge to consider that impacts the safety and speed of connection.

Most existing RCS utilize positive restraint mooring, typically an automated mooring device, to minimize vessel motions while at the dock. While automated mooring combined with RCS can make secure connections quickly, such systems that connect to the side of a vessel are not well suited to an end-docking configuration and could require extensive modifications to infrastructure.

Bow charging, an alternative system configuration, can either be mounted on a stationary structure or on the vehicle ramp. These RCS may not require positive restraint and could reduce the magnitude of necessary infrastructure modifications.

Another possible solution is a davit RCS. The davit offers a large range of connection points through a rotating arm that can adjust vertical and horizontal position, potentially simplifying mooring arrangements. Although a manual davit may reduce the duration of charge by increasing the connection time, this comparatively simple solution could provide sufficient power to a vessel with low power requirements.

Several active and developing RCS technologies are outlined below.

Cavotec offers a variety of manual or automatic charging technologies. The horizontal automated plug-in system (APS) is an autonomous solution for bow charging, which has installations across Norway. Another system with existing active installations is the APS tower, a semi-autonomous vertical

Image courtesy Will Ayers, EBDG

(hook) solution with vessel infrastructure installed near midship. The APS can establish quick connections, particularly when paired with the Cavotec automated mooring system, MoorMaster.

The CharIN Megawatt Charging System (MCS) is a plug-in solution still under development, which has a charging capacity up to 3 MW. The plug was designed as a charging solution for the trucking industry with marine applications. By charging with multiple plugs, a CharIN MCS system could provide higher levels of power.

3mar (Mobimar) offers a ramp-mounted autonomous bow charging system, NECTOR, that can establish a rapid connection to the vessel, easily activated via push button from the bridge. An active NECTOR installation serves the all-electric ferry ELLEN in Denmark.

Shore-Link has developed an autonomous ramp-mounted charging system with a charging capacity up to 5 MW. The CONNECTOR for E-ferry establishes quick connections and automatically compensates for vessel motions through the horizontally extending arm on a vertically traveling platform.

Stemmann-Technik offers autonomous horizontal charging arms, which have active installations across Norway. Another system, the FerryCHARGER, is an autonomous bow charging davit that can be mounted alongside a vehicle loading ramp.

Zinus offers a manual or autonomous system, consisting of vertical plugs hanging from an extendible overhead arm.

The existing and transforming charging technology reinforces the growing commitment to a more sustainable shipping future. Although vessel electrification includes challenging elements, it also offers an opportunity to contribute to the evolution of ship powering and propulsion.

The Author

Stagner

Maggie Stagner joined Elliott Bay Design Group in 2022. Her combined naval architecture and electrical engineering experience allow Maggie to support multiple tasks on varied projects providing accurate engineering results on all phases of vessel design and modifications.

ABS Introduces Guide for Certifying Smart Shipyard Technologies

By Gareth Burton

The adoption of smart technologies is accelerating in the shipbuilding industry. From virtual/augmented reality (AR/VR) and wearables to data analytics and artificial intelligence (AI), shipyards across the globe are increasingly turning to digitalization as a means to increase efficiency, lower costs, enhance safety, and optimize their operations.

In response to this transition, ABS has published its "Guide for Smart Technologies for Shipyards". The guide introduces the certification framework for a shipyard to integrate innovative smart technologies into their operational processes and demonstrate their commitment to digital transformation.

Upon compliance with the requirements in the guide, participating shipyards are eligible for class recognition in the ABS Type Approval database.

What is a "Smart Technology"?

Smart Technologies are technologies which utilize digital, and data driven innovation in three key areas: Hyperconnectivity, Advanced Automation, and/or Data-driven Intelligence, to support decision-making capabilities and improve operations and work processes.

ABS classifies smart technologies into three categories:

1. Hyper-Connectivity – Hyper-connectivity is a key enabler for the implementation of digital technologies. It encompasses human-to-machine and machine-to-machine communication in networked organizations. Characteristics of technologies with hyper-connectivity features include:

i. Provides communications among humans, devices, and information systems (e.g., Internet of Things). This connectivity may be integrated through an organization-wide network.

ii. Provides real-time data transfer/information sharing on operational processes.

iii. Complies with suitable and relevant industrial standards, data communication protocols for connectivity.

iv. Includes cyber-physical security network architectures if necessary.

2. Advanced Automation – This category includes production/operation activities that are performed by the automation equipment or computers to substitute all or part of a human task. The response to maintenance or failure of yard equipment is either managed by a human or performed autonomously. Characteristics of advanced automation technologies include:

i. They can be implemented through automatic monitoring, control, and execution through mechanical or electric devices under predefined conditions to substitute part of human tasks using automated equipment. For example, the production activities are performed by mechanized devices (blasting, cutting, grinding processing, coating/painting procedure, welding of subassembly, etc.). But the start and end of work and management activities for abnormal conditions are performed by humans.

ii. For certain technologies, the production and management activities are operated by machines and computers without human intervention. The production activities and maintenance to production stoppage, such as failures, are performed autonomously through embedded prognostic health management.

3. Data-driven Intelligence – Data-driven Intelligence refers to information generation through analysis/inference by engineering algorithms or human-level computer intelligence (i.e., AI). Characteristics of these technologies include:

i. The collected data is controlled centrally (e.g., cloud computing or wireless infrastructure).

ii. Provides data processing and conducts data analytics via machine learning (ML) or AI

iii. Definition of input and output and preparation of input data are performed by humans, and the input data are processed/analyzed/inferred by engineering algorithms implemented in a computer to generate information used for decision-making.

iv. For certain technologies, the AI algorithms are at the same level of human thinking or even superior to humans, enabling them to support decision-making.

Certification Framework

The Shipyard Smart Technology Certification Framework consists of two phases: Technology Identification and Technology Verification and Validation Phase.

The objective of the Technology Identification phase is to review and identify the smart technology and determine its features. Once these have been identified, a screening process is performed to determine if the technology is new or existing. Technologies categorized as "new" are to undergo Technology Qualification. Those categorized as "existing" can proceed directly to validation and issuance of a Product Design Assessment (PDA) certificate.

The objective of the Technology Verification and Validation Phase is to verify the smart technology and validate its implementation into the shipyard's processes. This phase is aligned with the ABS Type Approval Program. The "Confirmation of Type Approval" represents that the technology, including its software, related hardware, and quality assurance and control system have been reviewed for compliance with one or more ABS Rules or Guides, statutory, industrial or manufacturer's standards, or other criteria acceptable to ABS.

What are the Benefits of Type Approval?

Receiving Type Approval for a shipyard technology is advantageous for several reasons:

- Industry acceptance of the digital technology in shipyards or ABS-classed units
- Demonstrates compliance with international/recognized standards and/or ABS Rules
- Increased market visibility
- Vendors can avoid repeated evaluation of identical designs
- Searchable in the ABS Type Approval Database

Ultimately, by completing the certification framework, shipyards can demonstrate to customers and regulators that their smart technology possesses a level of feasibility and maturity. Doing so also signals to these parties that potential hazards associated with its implementation have been systematically reviewed in accordance with the ABS guide. While this is important for technology adoption in any industry or sector, it is especially so in shipbuilding, where even minor disruptions to normal shipyard activities can have a significant impact on development costs, delivery timelines, and overall safety.

The Author

Burton

Gareth Burton is Vice President, Technology, ABS, joining ABS in 2001. In his current role, he is responsible for the development and execution of the ABS research program.

Image courtesy HOS

SHIPYARD CAPACITY: A BRAKE ON DECARBONIZATION?

The IMO's latest crunch meeting in early July may not have aligned global shipping with mid-century targets established in the 2015 Paris Agreement. However, its 2023 Strategy indicates a clear direction of travel. Energy supplies by sea are essential for many countries and therefore ships have a key role in supporting the world's energy transition – not only on their own account, but at a global level.

By Paul Bartlett

As world shipping accounts for about 3% of greenhouse gas emissions, its environmental importance attracts wide attention. And plenty of criticism. However, since a large volume of the world's energy supplies are transported by sea, the shipping sector will also play a central role as a key enabler in the global energy transition. Ultimately, it will provide transport and support for some of the new low-carbon and carbon-neutral energy sources that will be developed in the decades ahead.

Two types of ships, in particular, will play a central role in supporting global decarbonisation over the next three decades. They are offshore wind vessels of various types; and LNG carriers.

Ambitious targets for offshore wind are being established in many parts of the world. In the US, the Bureau of Ocean Energy Management is working towards the Government's targets of 30GW of offshore wind by 2030; 15GW of floating wind by 2035, and a mid-century target of 100GW.

According to analysis by Philip Lewis, Director of Research at energy consultancy Intelatus Global Partners, US states have announced plans for around 39GW of short- and mid-term offshore wind capacity so far. But they have identified 60GW of potential capacity over the longer term. Lewis estimates that final investment decisions for over 22GW of offshore wind capacity could be taken over the next three years (see table below).

Delays are evident, however, Lewis warns, for various reasons. He predicts that the first commercial offshore wind farms will rely significantly on foreign flag vessels for foundation and turbine installation. Other support vessels, such as service operation vessels (SOVs) and crew transfer vessels (CTVs) will have to be built in the US to meet Jones Act requirements.

The outlook is not bright, however. Lewis says it is already clear that ships being built in US yards for Jones Act deployment are running late and are substantially more expensive – more so than expected – compared with those contracted by other owners elsewhere. US-built SOVs, for example, are between 1.5 and 2.5 times as costly as those built in Europe

U.S. OFFSHORE WIND FORECAST OPPORTUNITY BY FID TIMING

	Projects	GW	Turbines	CAPEX ($ bn)
FID taken	2	0.9	74	4.6
0-18 months	15	14.5	952	62.1
18-36 months	11	7.5	505	27.4
36-60 months	6	8.4	588	31.2
60 months	37	45.3	3,022	124.0
Total	**71**	**76.6**	**5,141**	**249.3**

Source: Intelatus Global Partners

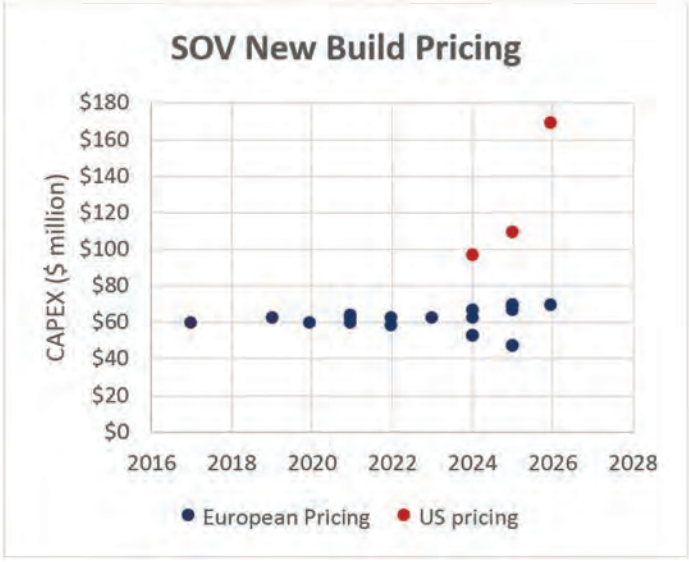
Panagiotis Mitrou,
Lloyd's Register

Philip Lewis,
Intelatus Global Partners

(see chart below). But the demand will still be there for US-built SOVs and CTVs.

Intelatus' monthly US offshore wind report identifies a short-to-medium term requirement for 6-13 SOVs and a longer-term requirement for between 40-80 units. So far, only three SOVs are being built in US yards. Meanwhile, Intelatus' long-range forecast for CTV requirements indicates that 70-145 vessels are likely to be needed.

Even with project clustering, therefore, the supply chain could prove a limiting factor in the supply of Jones Act vessels. However, one recent project indicates that there could be some scope for upgrades and conversions. In mid-July, Hornbeck Offshore revealed a deal with Florida-based Eastern Shipbuilding Group Inc to convert a recently delivered Jones Act-compliant offshore supply vessel into a SOV.



Source: Intelatus Global Partners

The 279-foot vessel will undergo a series of modifications and upgrades prior to a scheduled redelivery in spring 2025. The project, conducted jointly with the ship's original designer, VARD, will enable the HOSSOVTM 300E to support both wind farm construction as well as operations and maintenance.

Earlier this year, Bernard Schulte Offshore took delivery of the modified Windea Leibniz, following an upgrade at the ship's original Norwegian builder, Ulstein. The vessel was converted from a SOV to a Commissioning SOV, with extra accommodation and a new height-adjustable pedestal for the motion-compensated gangway enabling operation in a range between 57 feet and 75 feet above the waterline.

LNG Carrier Logjam

Meanwhile, in the LNG sector, supplies of pipelined gas from Russia had to be replaced in a hurry last year during the months following the country's invasion of Ukraine. LNG imports to Europe, much of the gas coming from the US, drove record LNG carrier contracting.

The relatively small number of yards capable of building these sophisticated vessels are full in practical terms until at least the middle of 2027. Chevron's likely order of up to six ships at Samsung Heavy Industries will see the first deliveries in 2028. New ship prices have risen by close to 40% over the last two years.

Yet Panagiotis Mitrou, Gas Segment Director at Lloyd's Register, believes we need hundreds more LNG ships to support the energy transition. He pointed out recently that the world consumed more than eight billion tons of coal in 2002 for the first time ever. Coal is not only the dirtiest form of hydrocarbon energy, it is also only about half of the calorific value of LNG per unit of mass.

Writing in the classification society's magazine, Horizons, Mitrou said that when more gas came to Europe, a number of developing countries shifted back to coal for pricing reasons, boosting both consumption and production in countries including China, India, and Indonesia. So, he argued, the inelastic supply of LNG vessels because builders are full could well become a constraint on the world's energy transition.

Mitrou also pointed out that a significant percentage of today's LNG fleet is likely to face challenges with the IMO's carbon intensity rating systems. For example, there are about 240 steam turbine-powered vessels with poor fuel consumption which use conventional marine fuels and do not have boil-off management systems. When these factors are taken into account, the ships' carbon intensity indicator ratings are likely to fall into the two lowest categories, requiring remedial action on the part of their owners.

"Even if there were a way in which a thousand new LNG carriers could suddenly be built," Mitrou wrote, "which, of course, there is not, my view is that these steamers should not be decommissioned because they are needed to transport greener energy sources than coal. Unless traded LNG gets replaced by renewable energy, the net climate result of decommissioning LNG carriers will likely be significantly negative."

Even taking into account methane emissions, Mitrou said that each cargo shipped by one LNG carrier saves about 50% of the carbon generated by using coal to supply the same amount of energy. He insisted that the entire gas supply chain needs to be upscaled – not just LNG, but LPG, ammonia, and carbon dioxide too.

Retrofits and upgrades are needed, he said, to improve efficiency. Reliquefaction plant needs to be installed, or methane-to-hydrogen cracking systems, to minimise both methane slip, but also operational emissions.

"Only then can our industry say we have done as much as possible to ensure that the world's LNG fleet is not a brake on the world's energy transition," Mitrou declared.

Maersk Supply Service used the Maersk Mariner to install six mooring lines (hybrid lines of chain and fiber rope) and six drag anchors for the DemoSATH floating wind project.

Maersk Supply Service

ANCHOR HANDLER CONSTRUCTION: WHAT TO EXPECT AS FLOATING WIND PICKS UP

A fleet of newbuild specialized anchor handlers will be required to help build up the emerging floating offshore wind industry. But since the industry is still in its early days, many unknowns have made it difficult for shipyards and their partners to gear up to build this fleet. This article explores complex market demand and technical drivers that help give a better understanding of anchor handler requirements for floating offshore wind.

By Philip Lewis, Director of Research, Intelatus Global Partners

Floating wind is an emerging technology currently being tested in small scale demonstration and pilot projects; at the end of 2022, global floating wind commissioned capacity was less than 200 megawatts (MW). By 2030, close to 6.5 gigawatts (GW) of commercial scale wind farms are planned to be commissioned, the majority in Europe and the Asia Pacific Region. Then, 2030-2035 will see a period a high commissioning activity as the U.S. joins established and also new European and Asia Pacific markets. Floating installed capacity is forecast to reach around 63 GW by 2035.

Whereas floating wind projects will leverage experiences from the bottom-fixed industry, there will also be many differences, particularly in how floating turbines are constructed and installed. A major difference is the need for large anchor handlers and large subsea construction vessels to pre-install mooring systems designed to maintain the position of the floating wind turbines, to tow the structures from port and to hook-up and tension the floating turbines to the pre-installed moorings. Based on a detailed review of technical drivers, Intelatus identifies the optimal size of existing anchor handling tug supply (AHTS) vessels for mooring pre-lay as having a bollard pull of at least 250 tonnes and a clear back deck of over 800 square meters. The capabilities of existing subsea construction vessels with AHC cranes of 250 tonnes and above and large clear back decks are also suitable for certain pre-lay operations. But existing oil and gas market demand and the technical requirements of floating wind projects is unlikely to be met by these existing vessels.

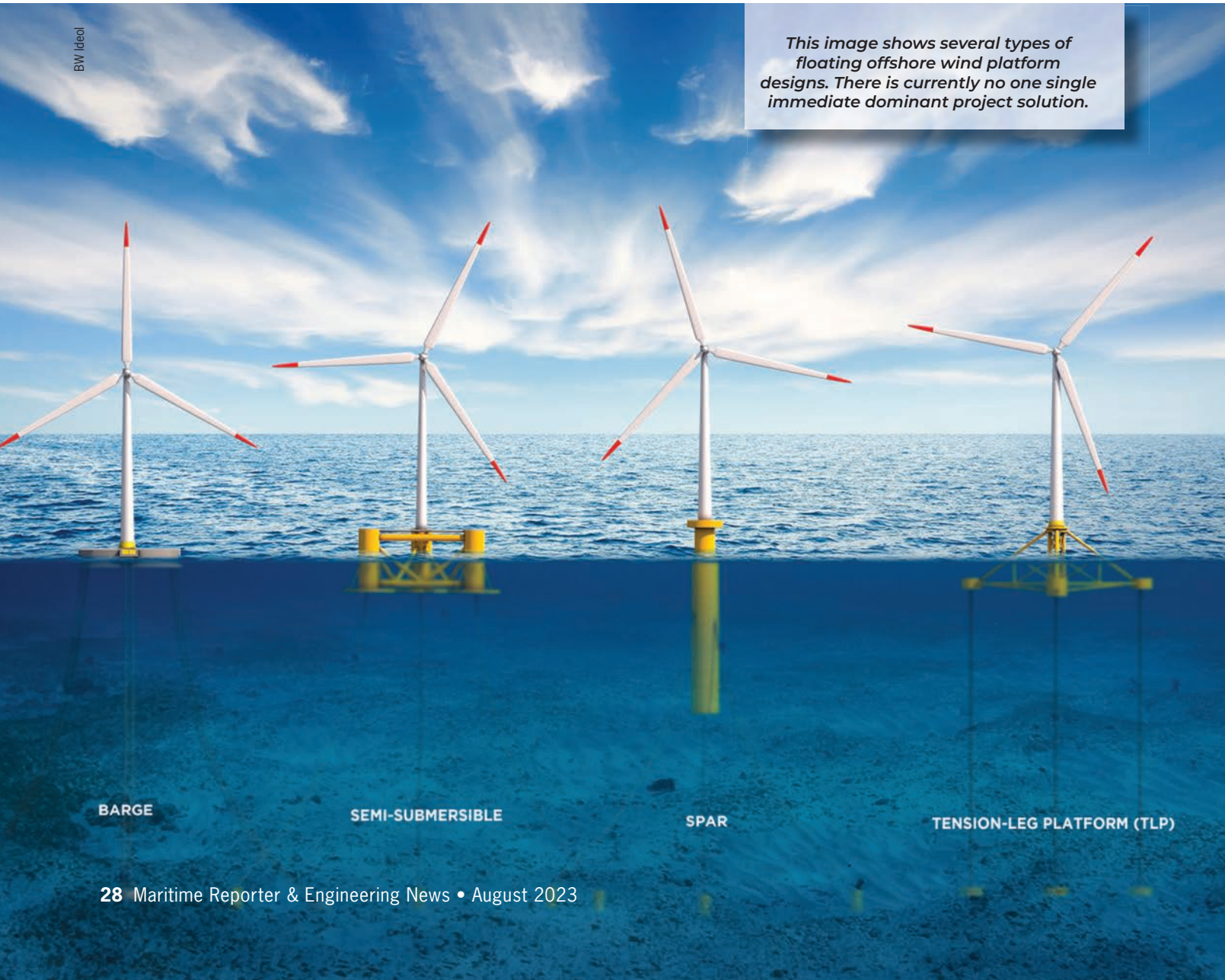
The above capacity projection of 63 GW by 2035 translates to the installation of over 5,000 floating turbines, more than 20,000 anchors and over to 30,000 mooring lines.

Simply put, there will be a large demand for vessels in the anchor handling segment, which has seen limited recent newbuilding activity due to poor market

Several market players have unveiled new vessel designs tailored to the floating offshore wind market. Damen says its FLOW-SV is specifically designed to install ground tackles for floating offshore wind projects.

Jan Arne Wold / Equinor

Anchor handlers connect to first Hywind Tampen turbine to be towed to field in the Norwegian North Sea.



BW Ideol

This image shows several types of floating offshore wind platform designs. There is currently no one single immediate dominant project solution.

conditions in the core oil and gas sector; only six large anchor handlers have been delivered in the last five years. Newbuilding prices for five of these large anchor handlers were around $80-85 million at the time ordering—price levels that are not likely to be achieved in today's building market. Since then, there has been limited activity to guide price estimates, but we have seen costs rise for vessel types across the board. A capital cost estimate of at least $100 million for a similar vessel seems reasonable.

Subsea construction vessel supply is also likely to be stretched by high demand from oil and gas projects.

As a result of market conditions, our forecast identifies a shortage of large anchor handler and subsea construction vessels toward the end of the decade. As demand in floating wind continues to grow, available supply is expected to be reduced further as activity continues to pick up in deepwater oil and gas—a sector that drives demand for large anchor handlers and subsea construction vessels.

So, what do shipbuilders and their supporting partners need to plan for?

With around 100 floating wind design concepts at varied levels of technical maturity, multiple anchor types to accommodate and three principle mooring line materials (chain, wire, and synthetic rope), there is no one single immediate dominant project solution, which drives the need for flexible installation vessels.

Our analysis indicates that the most efficient installation vessels for floating wind projects will not necessarily be classic large anchor handler or subsea construction vessels, but rather hybrid anchor handlers capable of providing flexible solutions to developers and project engineers who have a variety of floating wind technologies, anchors and mooring line concepts to consider.

Several market players are known to be developing floating wind specific vessel concepts that are evolutions of the more traditional designs. Based on our analysis of floating wind project requirements, we expect the next generation anchor handlers to feature:

- High bollard pull, anchor handlining frame and a large AHC crane
- Large back deck
- Multiple large winch drums
- Large chain lockers
- Work class ROVs
- Flexibility to support different tensioning options
- Low or zero emissions operations, battery energy storage systems, etc.
- Embedded digitalization

We anticipate such vessels to cost significantly more than existing large anchor handler designs, with reported estimates in the range of $175-200 million. Such investment requires high day rates and long-term charter commitments, which are generally not available today.

And then there are questions about economics as developers face increasing pressure to keep rising project costs at bay. Many of the builders capable of producing high-spec anchor handlers—including yards in China, Norway and Singapore—and their financial partners continue to deal with the damage of low utilization and newbuilding activity in the OSV segment post 2014.

Many owners experienced financial difficulties and were unable to pay down debts accumulated during newbuild expansion programs initiated between 2008 and 2013, while many of the traditional shipping banks that funded the newbuilding boom took significant impairments, which have left them cautious about lending to OSV projects. Many private equity vehicles suffered heavy losses from OSV investments. Finance is still available from new market entrants and alternative capital providers. However, the appetite for financing new vessels comes with many restrictions.

One thing is certain: shipbuilders will need answers (and commitments) sooner rather than later if the floating wind industry hopes to minimize the severity of projected vessel shortages.

Intelatus Global Partners **has recently published a floating wind installation vessel forecast report, available here:** ***https://intelatus.com/Business/FloatingWindInstallationVessels*****. For more information or to inquire about the report, contact Philip Lewis at** ***philiplewis@intelatus.com*****.**

BW LPG

LPG: DUAL-FUEL ENGINES PROVE THEIR WORTH

BW LPG has demonstrated the value of dual-fuel LPG operations beyond the company's initial aim of meeting IMO 2020 Sulphur Cap regulations.

By Wendy Laursen

In October 2020, the LPG carrier BW Gemini became the first very large gas carrier (VLGC) to have its low-speed main engine converted to an LPG dual-fuel engine. The project started several years earlier, sparked by Oslo-listed BW LPG's preparations for the IMO's 2020 Sulphur Cap regulations.

Compared to heavy fuel oil, LPG reduces Sox emissions by approximately 97%, particulate matter by approximately 90%, CO2 by approximately 15% and NOx by approximately 20%.

The world's largest owner and operator of VLGCs, BW LPG's fleet has a total carrying capacity of over three million cubic meters, and the company recognized the advantages of retrofitting rather than replacing tonnage. CO2 emissions are around 95–97% less for a retrofit than building a new ship, and retrofitting takes two months compared to two years for a newbuilding.

Engine Technology

MAN Energy Solutions provided the engine technology, and Klaus Dahmcke Rasmussen, Head of Projects and PVU Sales at MAN PrimeServ, said that by leveraging LPG as a marine fuel, vessels benefit from savings due to lower fuel consumption and full dual-fuel flexibility which guards against sensitivity to post-2020 fuel-price fluctuations. The ability to use LPG cargo as a supplemental fuel source also reduces time and bunker fees.

In June 2022, under MAN PrimeServ's supervision, the conversion of the main engine of the BW Malacca to dual-fuel was completed at Yiu Lian Dockyards in Shenzhen, marking the last of a series of 15 such retrofits for BW LPG. During the vessel's five-year drydocking, the ship's MAN B&W 6G60ME-C9.2 type engine was retrofitted to an MAN B&W 6G60ME-C9.5-LGIP capable of operating on fuel oil and LPG.

MAN claims its B&W ME-LGIP is the world's first and only dual fuel engine with liquid gas injection that allows switching between conventional HFO, MGO, and LPG fuels without any loss of performance or efficiency. The modular design principle of its ME-C engines allows simple conversions to LGIP, says Rasmussen.

"As an additional feature, the LPG engine has great poten-

tial for being a solution to handle the volatile organic compound (VOC) issue in shuttle tankers and other crude oil carriers. This is because the engine features innovative options for burning the liquid VOC. The engine can burn any mixture of propane and butane, and furthermore, the mixture can contain significant amounts of ethane. All heavier hydrocarbons normally contained in the liquid VOC can be used as well."

SAFETY CONSIDERATIONS

LPG doesn't take more space than LNG, and it's simpler to handle because it doesn't require cryogenic storage. As LPG propulsion on large two-stroke diesel engines was a pioneering technology, safety was understandably a priority concern. LPG had not previously been allowed in the engine room prior to the trial of LPG propulsion technology. This was largely due to the nature of LPG – being heavier than air, it flows downward and remains near the bottom and in spaces where it can be a safety issue.

To manage this concern, extra detectors and double-walled fuel pipes were installed. If hydrocarbons are detected, the supply flow is automatically shut down and immediately switched to compliant fuel, which is always available as a standby. With these robust safety measures, BW LPG successfully secured regulatory changes from class and flag to accept and approve the use of LPG in the engine room.

PERFORMANCE

The investment cost for the retrofits was around $8–9 million per ship, and 2022 was the first year all 15 VLGCs were sailing. LPG has proven to be 10-12% more efficient compared to diesel or heavy fuel oil on BW LPG's ships. Even if the company hadn't been prompted by the IMO 2020 sulfur cap, converting to LPG would still have made financial sense.

Prodyut Banerjee, Vice President and Head of Operations at BW LPG, says: "We have been systematically scaling up our intake of LPG as fuel to maximize emissions reduction, and maximize earnings by reducing the cost of fuel." He adds, "Our engineers are also honing their expertise in dual-fuel engine management."

In 2022, the 15 LPG-powered vessels bunkered approximately 46,000 metric tons of LPG, saving about US$7.4 million in fuel costs. BW LPG also reduced carbon emissions by approximately 27,000 MT by using LPG as fuel. This translated to an approximate 15% reduction in CO2 emissions. Added to that was a 99% reduction in SOx emissions and a 10% reduction in NOx emissions.

"It has now been over a year since all 15 of our retrofitted vessels are on water. We also welcomed a dual-fuel newbuilding to our pool fleet recently. We continue to keep our focus on flawless operations and to maximize the environmental, economic and operational benefits of LPG propulsion," said Ba-

nerjee. “Our vessels are sailing at peak service levels and are fulfilling all commercial obligations, and we are always looking to optimize our LPG fuel usage based on best operational outcomes for each voyage.

“Moving forward, and with an eye on new environmental regulations, these LPG-powered vessels will be able to maintain maximum service speeds for the foreseeable future. We will continue to harness the benefits of using LPG as a transition fuel, reducing our emissions and benefiting from better economics.”

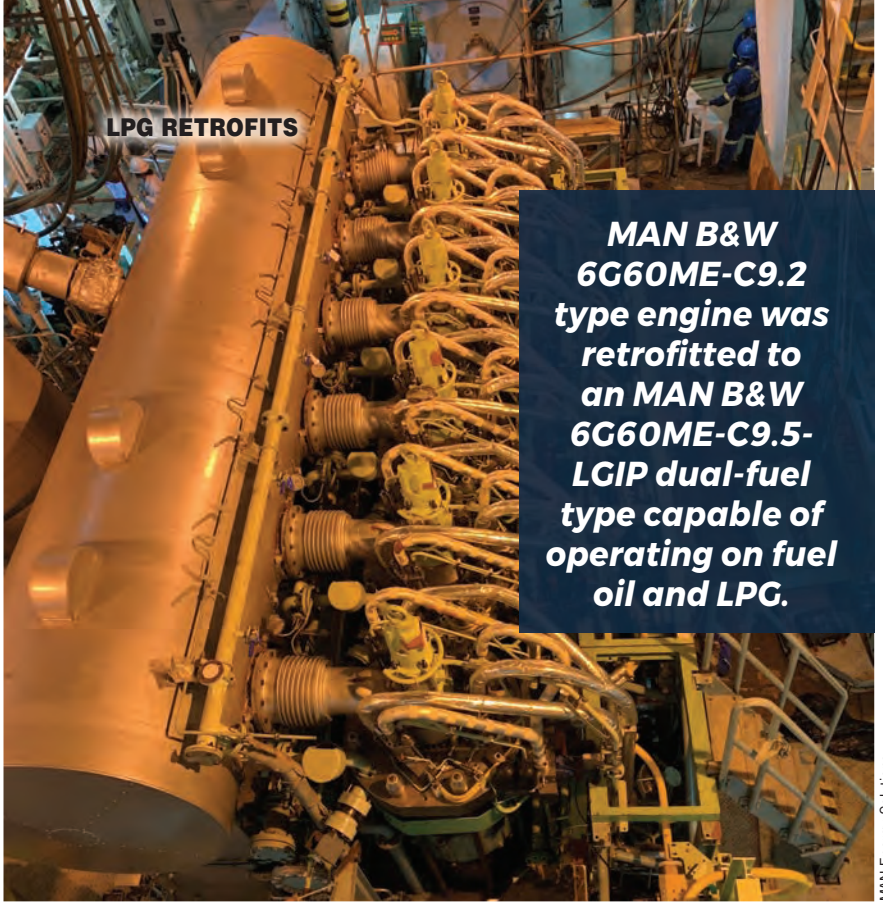
MORE ORDERS

BW LPG is not the only shipowner benefiting from LPG propulsion technology. In January 2023, COSCO Shipping Heavy Industry (Guangdong) announced that it will retrofit the main engines on two LPG carriers operated by Tianjin Southwest Maritime. In doing so, it is exercising the option in a contract signed with MAN PrimeServ in October 2022 to retrofit two other LPG carriers.

The individual MAN B&W 6G60ME-C engines on Gas Libra and Gas Scorpio will be retrofitted to dual-fuel MAN B&W 6G60ME-LGIP engines when they enter drydock in January 2024.

MAN Energy Solutions reports that ME-LGIP engines have now surpassed 120 orders, with 35 already in service. Most of the current orders for LPG carriers over 30,000cbm include ME-LGIP technology, enabling these vessels to use their own cargo as fuel. Rasmussen says LPG is quickly becoming the de facto standard in this segment. “Currently, we estimate that there are over 150 VLGCs with single-fuel engine technology that could benefit from conversion to LPG-running.”

BW LPG is now looking further into the future and exploring alternative fuels such as ammonia, as it’s a good hydrogen carrier and a zero-carbon fuel. The company is looking at it closely and dedicating resources to exploring ammonia as marine fuel with equipment suppliers such as MAN.

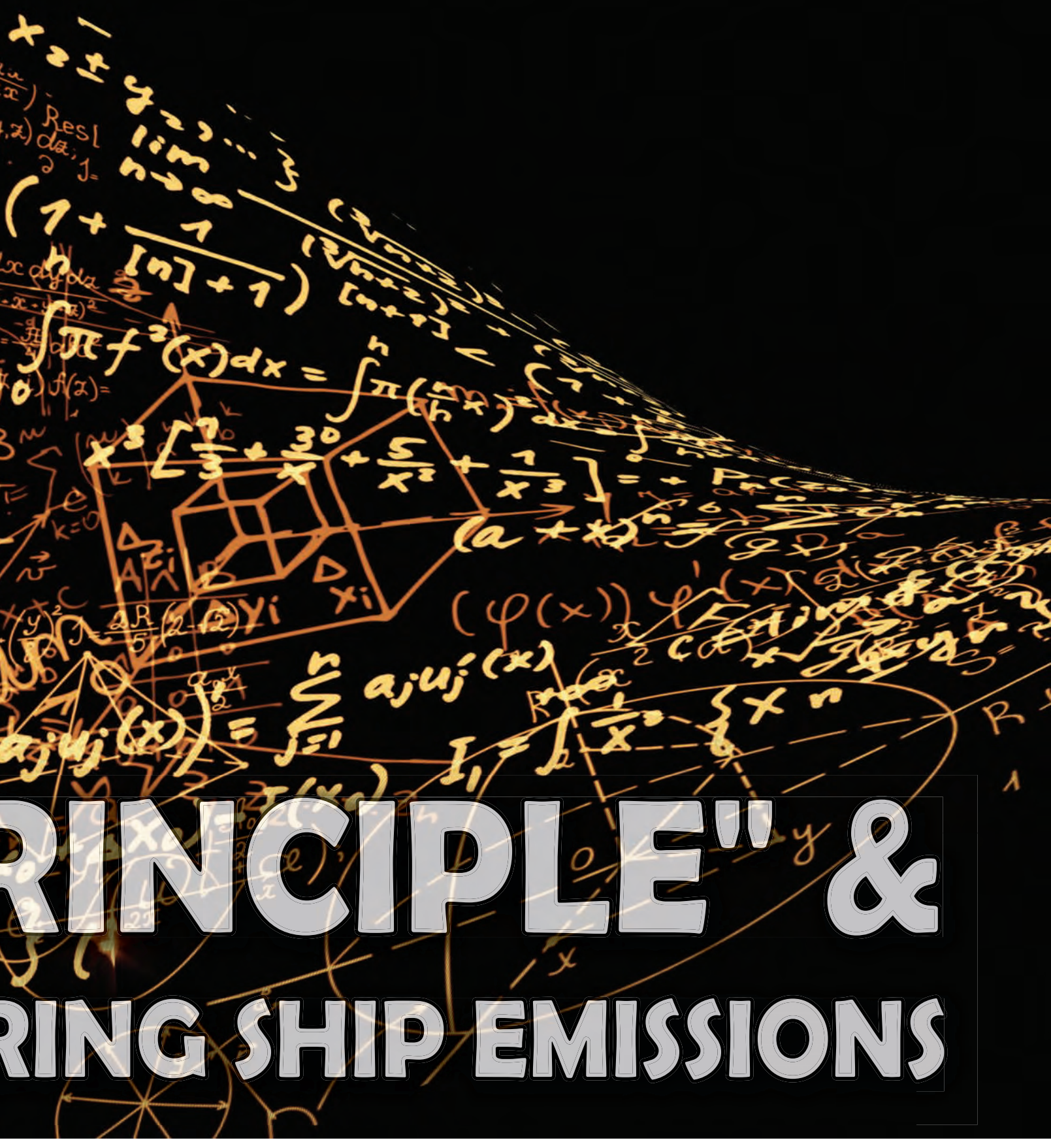


MAN B&W 6G60ME-C9.2 type engine was retrofitted to an MAN B&W 6G60ME-C9.5-LGIP dual-fuel type capable of operating on fuel oil and LPG.

MAN Energy Solutions

THE "KISS PR

MANAGING, MEASUR



RINCIPLE" &
RING SHIP EMISSIONS

HydroComp is a well-established, small engineering firm focused on hydrodynamic and propulsion system simulation, providing design tools for engineers and naval architects to focus on vessel performance, including emissions. **Don MacPherson**, HydroComp's long-tenured Technical Director, discusses the impacts of tightening emissions regulations, with insights on maximizing new vessel designs and refits.

By Greg Trauthwein

Don, maritime has been in the crosshairs of regulators to reduce emissions. What do you see as the top new regulatory issues that are impacting ship and boat design, and owners, today?

What I'm seeing may be a bit of a contrarian stance and perspective. We've had an opportunity as a solution provider for many years to participate in a number of regulatory working groups for emissions in a broader sense. Both the greenhouse gas emission side, but also in the emerging aspects of underwater radiated noise. And I've seen some things that make me question objectives and motivations, not that the people involved are not well intended, certainly they're intelligent.

What, exactly do you mean?

There seems to be a tendency to focus on a methodology; I would use the term orthodoxy in some cases, but that might not be fair in this particular instance. They're focusing on how to do compliance, rather than trying to achieve broad compliance with simpler methods; for example, the EEXI calculations that are prevalent right now. Those are a pretty tightly controlled set of calculations through the various class agencies, prescribing a calculation approach using specific types of CFD calculation. The people providing the calculations have to show a competency through experience and validation calculations; that is technically valid, I understand the objectives of that. They want to make sure that everything is appropriate and in a comparative way across the board; but it's unnecessarily complicated.

The lower limit of the bandwidth of companies that are going to have to consider this [are for vessels] as small as 400 gross tons, and that's not a very big ship. We have one company we work with, a big international bulk carrier company, with four ships that are exactly the same: same hull; same propulsion plants; same missions. They have one set of calculations to do for that particular ship group. But a small company running one ship has to do exactly the same level of effort, and it's an onerous task.

There are, in my opinion, simpler methodologies using reduced order methods that achieve the same end. They're grounded in empirical testing and they fulfill the same objectives.

For years, I've personally questioned the merits and the appropriateness of class societies developing the regulations themselves, and also providing services to fulfill those regulations.

I know there are firewalls between the different groups and it's not a big problem, but the unnecessary complicatedness of the EEXI calculations speaks to maybe there's a simpler way to achieve that. And if what you're after is broad compliance, you want to make things as easy as possible.

At the outset you mentioned underwater noise. What's Hydrocomp's involvement in that area?

We've been working with a couple international groups on formally developing compliance regulations for underwater radiated noise. There are people on the regulatory side, people in the biological sciences side, and then there are engineers and naval architects like myself. For whatever reason, this group is hung up on empirical testing as the way to fulfill compliance, as opposed to what I would term rules-based compliance.

I understand how they get there, because noise has always been tested, but interior noise testing for human response is very different than broad propagating radiated noise of a variety of different biological receptors. All the different marine mammals and sea life that are going to be affected by a ship's radiated noise. It's not the same thing.

You can take a pelican case with equipment and you can bring it to any ship and do interior testing functionally. Completely appropriate to do that as a test-base system.

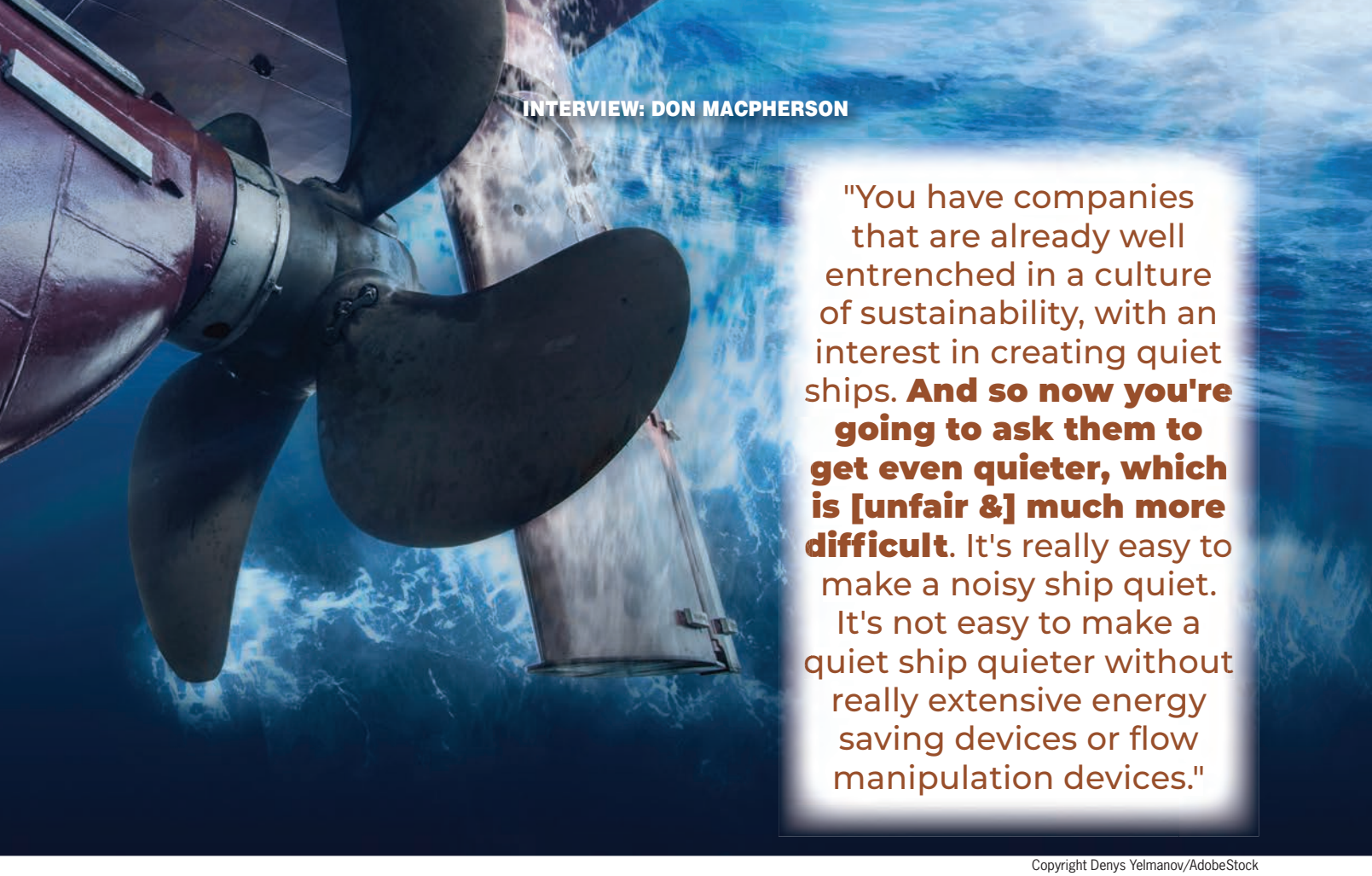
"The unnecessary complicatedness of the EEXI calculations speaks to maybe there's a simpler way *... and if what you're after is broad compliance, you want to make things as easy as possible."*

Don MacPherson
Technical Director, HydroComp

The reverse is true for underwater radiated noise, where you have remote test facilities, which are expensive and are not common. Each facility is unique, so how do you calibrate everything to have a fair playing field. There's a whole host of reasons why this has greater uncertainty in the test. Because you have computations for correcting reception, which is what you actually record with the transducers back to a common source level. So what you're looking for are sound pressure levels at the source. Because that's the only common place that you can establish a benchmark that you can then establish a compliance regulation against.

My thinking is that a rules-based approach – similar to how classification societies use rules for a propeller blade strength, or structural properties of a ship, or even damage stability calculations; we don't test a ship to damage in order to determine whether it's going to be safe or not. We use a rules- or a calculations-based approach, and I would propose for underwater radiated noise that is going to be the way to achieve the greatest compliance.

They say that 80% of the cost of a ship is determined in the first five to 10% of the work. Which makes sense because you lock in so many things about whole geometry, propulsion options, at the outset. All of the characteristics of a ship are locked in during that initial design, and if we can include underwater radiated noise, greenhouse gas emissions and those sorts of things early in the design process, we are going to achieve broader international compliance than we could with testing. It's going to be faster, it's going to be cheaper, and ultimately, it's going to be more fair, collectively.



"You have companies that are already well entrenched in a culture of sustainability, with an interest in creating quiet ships. **And so now you're going to ask them to get even quieter, which is [unfair &] much more difficult**. It's really easy to make a noisy ship quiet. It's not easy to make a quiet ship quieter without really extensive energy saving devices or flow manipulation devices."

With some of the testing that is being proposed, what they're saying is that we're not going to bring everybody down to a noise level. What we're going to initially propose is that all ships get quieter by a certain decibel, a certain sound pressure level.

That's totally unfair because you have companies that are already well entrenched in a culture of sustainability, with an interest in creating quiet ships. And so now you're going to ask them to get even quieter, which is much more difficult to do. It's really easy to make a noisy ship quiet. It's not easy to make a quiet ship quieter without really extensive energy saving devices or flow manipulation devices.

So how is HydroComp a part of that emission reduction discussion?

Principally through our NavCad software tool, [with users] from small surface vessels, UV companies to the largest merchant shipbuilders, designers, operators. With NavCad you have a variety of different abilities to answer those 'what if' questions as a part of this hydrodynamic and propulsion system simulation.

We view everything here at HydroComp as a system problem first, and the system is a vessel propulsor drive system where you have interrelated aspects of performance between the vessel and the propulsor. This could be a propeller or water jet surface drive or cycloidal drive. Then you have relationships up the drive line from the propulsor to the prime mover, which could be a diesel engine, a gasoline engine, electric motor of a variety of different types.

And then you have to provide an energy source, an energy source that might be liquid in terms of a fuel that has a certain heating value and densities associated with it. Or it might be an electric motor amperage demand where you're looking at trying to establish a battery budget or what you have to do in order to provide for recharging at different locations if it's a ferry. What NavCad can provide is the ability to look at different 'what if' scenarios early in the design stage, where you're going to get the greatest bang for your buck in achieving the best outcomes.

Early on you may have opportunities where slight changes in whole geometry can achieve significant savings in resistance, savings that extend through thrust demand and up the power train into fuel consumption and GHG emissions. And NavCad takes you all the way through to that GHG production predictions and estimates of what you're going to be able to see.

That can then lead to very interesting discussions early on because it's a good way to communicate to stakeholders, and you don't have to have a special PhD or advanced degree to run those calculations.

I understand the philosophy of making those critical design decisions early in the process, because as the design and construction progress, it gets exponentially more expensive to change. How common is it for ship owners and builders to embrace that notion?

Great question and a tough one to answer because you can never be in a customer's head and really understand their motivation. But a couple truths have become clear over the years. One, if it's not regulated, it's an option. If it's an option, there has to be some personal or corporate motivation to fulfill that.

I'm not a big believer in altruism. People do things altruistically to feel good, and a lot of people feel good by investing in the future. My parents were both public school teachers, and they are wired that way. Certain companies are going to be wired that way; doing things because they view it as the right thing to do as opposed to it's the most profitable thing to do. Now, to be fair, sometimes the right thing to do also is the profitable thing to do.

But when you talk about really looking downstream, that's very difficult.

What specifically does HydroComp offer to help owners design and run their vessels with reduced emission reductions?

The biggest thing is in how NavCad, either as a purchased product or as a consulting and engineering service from HydroComp, can answer those early technical aspects of business questions. That's the biggest thing. Now, it can also be used for retrofit evaluations, which is something is interesting with EEXI is coming up. You can create a sea trial study and then you can begin to look at [different design elements] like engine limiters, propeller options, adding a bulbous bow.

As we get onto component optimization, we have our prop elements tool for optimized propeller design, PropCad, which is what our manufacturers would use for the design and construction of propellers. And then a sister-company that Jill Aarons launched a few years back with Adam Kaplan, our propeller tools specialist in the house, is an inspection tool called TruProp. That can really help for smaller propeller, the motor yacht work community to really begin to dial in higher classes of propeller tolerance, which can lead to a little emissions improvement too. And everything you can do to make a propeller more precise will help with underwater radiated noise.

What kind of results for mission reductions can a typical client expect with the solutions that you propose?

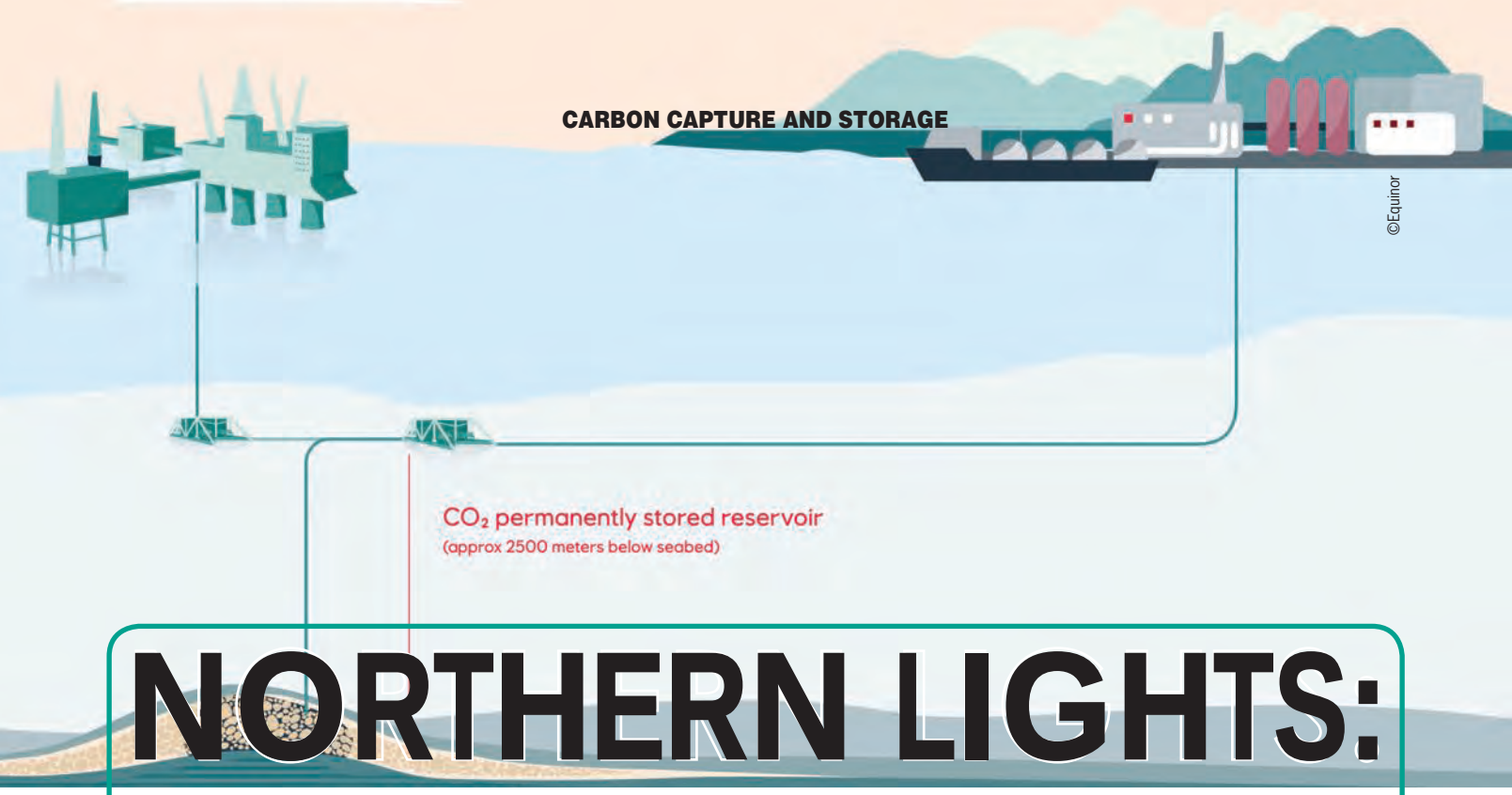
That's another tough question to answer because so much of that relies on the culture of the people driving the ships. A number of years ago, we were involved in the development of the software side of what's functionally a cruise control for ships. It was a U.S. Coast Guard R&D Center project, and we found on their medium endurance cutters we could save 18% by allowing the system to drive the ship with a target speed; which was ridiculous. First of all, I didn't believe it. I had to do a separate engineering study to prove to myself that that was even possible. And it was.

It's easy to find big gains if your ship is very poor to begin with, or if the operational culture is, "I've got three days to get there, but I want to go spend a couple days in port, so I'm going to run fast in order to do it."

If your priority is to save fuel, it starts with the culture of the operation.

But to answer your questions, I use a metric of 5%. Almost anything in hydrodynamics is limited to about a 5% improvement. And like I said (in discussing underwater radiated noise) the better you are, the less improvement you're going to be able to see.

But it all starts with the culture. Maintenance is culture. Operation is culture. Making the system function in the best way it can, is culture. Giving you the best components of that system; that's design.



NORTHERN LIGHTS: TRAILBLAZING THE PATH TO NET ZERO EMISSIONS

In the global quest for achieving net zero emissions and slowing down global warming, carbon capture and storage (CCS) technology has merged as an important solution. Among the notable projects being developed in the field is the Northern Lights offshore carbon capture and storage project in Norway, a country with long experience with offshore CO2 storage.

By Bartolomej Tomic

The transition to a sustainable energy future requires innovative solutions that go beyond simply halting fossil fuel projects.

Carbon capture and storage (CCS) has emerged as a critical technology to address emissions from hard-to-abate industries.

"CCUS is a necessary bridge between the reality of today's energy system and the increasingly urgent need to reduce emissions. Not only can it avoid locking in emissions from existing power and industrial facilities, it also provides a critical foundation for carbon removal or negative emissions," Dr. Fatih Birol, Executive Director at the International Energy Agency, said recently.

In a speech in October 2022, Kadri Simson, European Commissioner for Energy, said, "I believe that CCUS has incredible potential in our race to reach climate neutrality. And without CCS and CCU, it will be practically impossible to limit the global warming to the 1.5 degrees Celsius objective."

She said that the Commission modeling showed that the EU will need to capture and utilize or store between 300 and 640 million tonnes of carbon dioxide per year by 2050 to meet its climate goals.

There's been a notable recent surge in offshore carbon capture and storage news, with offshore storage licenses recently either granted or pending in the U.K. and Norway, a giant off-

The Transocean Enabler Rig was used to help estimate the capacity of the Northern Lights storage.

Transocean

shore CCS project sanctioned in Malaysia, as well as projects planned for the U.S. Gulf of Mexico.

For now, let's focus on a project that, while not yet pumping CO2 under the seabed in Norway, already has significant milestones to show for and will soon be ready for operation – the Northern Lights.

The Northern Lights – a celestial phenomenon name for a project that's mostly about the areas below the seabed – is led by a joint venture between Equinor, Shell, and TotalEnergies, which entered a partnership to work on the offshore CO2 storage project back in 2017.

Back in 2019, while the project was still being in the works and yet unsanctioned, Equinor's then Chief Executive Eldar Saetre said Nothern Lights could become the world's first cross-border CO2 storage.

Since then, the project has been approved, backed by the Norwegian government, offshore storage capacity and offshore injection tests completed, Northern Lights JV company formed, some cross-border CO2 transport deals struck, transport ships ordered, and recently, significant onshore works completed in Øygarden municipality in Norway, where CO2 receiving terminal is being built.

The Size

The Northern Lights JV plans for the project to have an initial storage capacity of 1.5 million tonnes CO2 annually, with the captured CO2 set to be permanently stored in a saline aquifer, 2,600 meters beneath the seabed.

The plan is for CO2 from emitters who sign deals with

Northern Lights JV to have their CO2 offtaken by liquefied CO2 carriers, shipped to the onshore plant in Øygarden for an intermediate storage, and then transported by a 110 km pipeline to an offshore subsea storage.

While the initial storage capacity is 1.5 million tonnes of CO2 per year, plans are in place to increase capacity as demand grows across Europe.

In 2020, Northern Lights drilled the first CO2 exploration well that confirmed that the reservoir in the Johansen formation, at 2.600 meters depth, is suitable for safe and permanent CO2 storage.

Offshore drilling operations in 2022 at the EL001 storage license (granted in January 2019) confirmed the storage capacity of at least 5 million tonnes CO2 per year.

The wells were been drilled using Transocean's semi-submersible drilling rig Transocean Enabler.

Worth noting, the European Commission in January 2022 announced that EU countries had agreed to award Northern Lights €4 million for Front-End Engineering Design (FEED) studies for the expansion of the Northern Lights CO2 transport and storage capacity to over 5 million tonnes per year.

The planned expansion will include subsea facilities and capacity increase of the onshore receiving terminal in Øygarden.

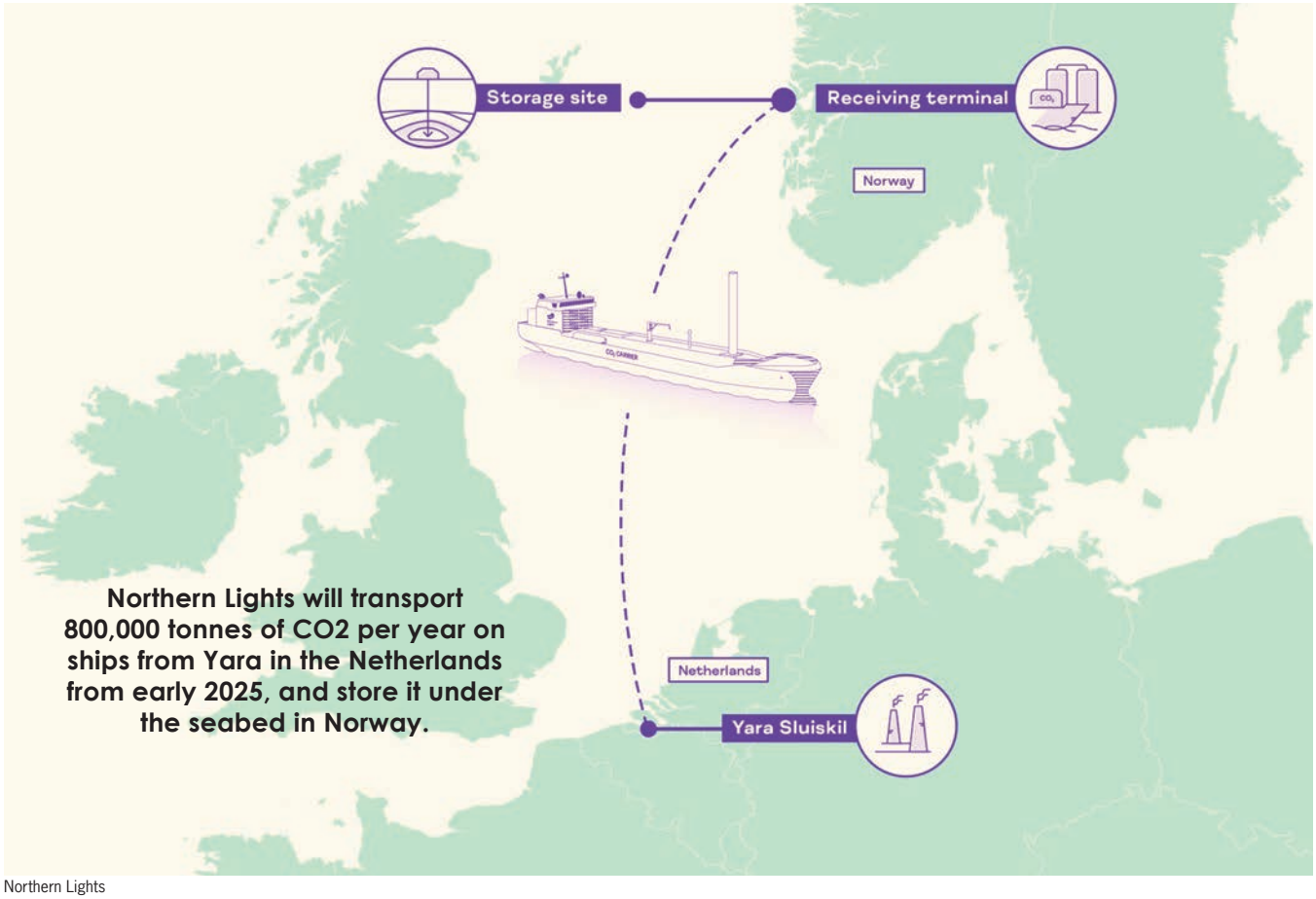
Clients

As part of the first phase of the project, 80% funded by the Norwegian government, Northern Lights has reserved 800,000 tonnes of CO2 per year for the Heidelberg Materials cement factory in Brevik and the Hafslund Oslo Celsio waste-to-energy plant, to fulfill its obligations as the transport and storage component of Longship, the Norwegian Government's full-scale carbon capture and storage project.

Apart from this, in August 2022, the Northern Lights joint venture struck its first commercial deal. The agreement was signed with fertilizer maker Yara, to store CO2 captured at Yara's Dutch operation. Under the agreement, 800,000 tonnes of CO2 per year will be transported on ships from Yara in the Netherlands from early 2025.

Announcing the Yara deal, Shell's then CEO Ben van Beurden said, "We are proving that this actually works. The fact that it can is a major breakthrough because this is now a pathfinder project for similar projects in Europe."

Another vote of confidence for the project came in May, 2023 when the Northern Lights joint venture signed a deal with Orsted to transport and store 430,000 tonnes of biogenic CO2 emissions per year from Orsted's two power plants in Denmark.



Northern Lights

Northern Lights/Equinor

Børre Jacobsen, Managing Director of Northern Lights, then said, “This agreement confirms the commercial potential for CCS and demonstrates that the market for transport and storage of CO2 is evolving rapidly."

The deal was signed after Ørsted won public funding from the Danish Energy Agency under the first Danish tender of the CCUS Fund to develop a CO2 capture hub for the biomass power stations Asnæs and Avedøre, from which CO2 will be shipped to the Northern Lights reservoir.

“From 2026 Northern Lights will be shipping the first cargo of biogenic CO2 from Denmark to Norway,” Børre Jacobsen said.

In May 2022, Northern Lights JV also signed a memorandum of understanding with Cory, a U.K. based waste management and recycling company, for Cory to potentially ship carbon dioxide from its 'energy from waste operation' on the River Thames in London to Northern Lights’ subsea CO2 storage facilities. A firm deal has yet to be signed.

In its annual report for 2022, Northern Lights said that its existing agreements had fullfiled the capacity for the first phase of the project, with the customer pipeline for commercial volumes for the phase 2 development progressing. According to Northern Lights JV, half of these prospective clients come from waste incineration and cement companies, along with hydrogen, refineries, and steel/metal companies.

Building Liquefied CO2 Carriers

In October 2021, Northern Lights ordered two CO2 carriers for the project from China’s Dalian Shipbuilding Industry Co.

The Chinese shipbuilder is building two 130-meter-long liquefied CO2 carriers, each with a cargo size of 7,500 m3.

Northern Lights adapted ship designs used for transporting liquefied petroleum gas, adding a liquefied CO2 carriage sys-

Did you know?

Northern Lights, while the first project of the kind in Norway, is not the first offshore carbon storage project in the country. Namely, according to the Norwegian Petroleum Directorate, since 1996, CO2 has been removed from the Sleipner Vest gas in the North Sea and injected in the Utsira Formation. One million tonnes of CO2 from the Equinor-operated Sleipner field are stored in the subsurface every year.

Also, according to NPD, since 2007, 700 000 tonnes of CO2 per year has been stored at the Snøhvit offshore field in the Barents Sea. CO2 is separated from the gas in the process facility on Melkøya before it is sent by pipeline down into a reservoir located around 140 kilometers from land. Regular surveys are performed to monitor how injected CO2 fills the storage area.

tem and insulation to maintain a temperature that keeps the CO2 in a liquid state, including a special high-tensile-strength nickel steel alloy with a tank wall thickness of 50 mm.

The two vessels, designed to transport liquid CO2 with purpose-built pressurized cargo tanks, are expected to be ready for delivery by mid-2024.

Being built for a project that aims to reduce emissions, the vessels themselves are designed for low-emission operations. The main fuel for the ships will be LNG. Other innovative technologies, such as a wind-assisted propulsion system and air lubrication are planned to be installed to reduce carbon intensity by around 34% compared to conventional systems.

The Danish marine pumps specialist Svanehøj is supplying deepwell cargo gas pumps for the two CO2 carriers.

First steel for the ships was cut in November 2022, and the keel laying ceremony was held in April 2023. The ships, classified by DNV and sailing under Norwegian flag, are expected to be delivered in 2024. Once delivered they will be operated by "K" LINE on behalf of Northern Lights JV.

Onshore Storage Tanks

In its 2022 annual report, Northern Lights said that the Øygarden CO2 receiving terminal had been more than 75% completed by year end.

Since then, the percentage has increased, as the company on June 2 said that it had installed all 12 CO2 storage tanks at the plant.

These tanks, standing at 32.5 meters tall, boast a capacity to store nearly 700 tonnes of CO2 each.

They will serve as an intermediate storage for the CO2 brought in by the ships, before being transported into the subsea aquifer. Aker Solutions was responsible for the lifting and installation of the tanks.

Also, the terminal could be expanded by a second jetty to cater for additional volumes of imported CO2 from larger ships, additional intermediate storage for CO2 with additional volume, and additional CO2 export pumps, as supported by the EU, as mentioned earlier.

First Mover

In the 2022 annual report, Northern Lights' Jacobsen said, Northern Lights CCS is a key technology to decarbonize hard-to-abate industries in Norway and Europe, and reach the goals set in the Paris Agreement, achieving net zero emissions by 2050.

"The message from IEA and the IPCC is clear; net zero is near impossible without CCS.

"In 2024, we will be ready to receive CO2 volumes, initially through Longship (Norcem and Celsio), and then also commercial volumes. One of the defined key success criteria for the Norwegian Government, and for us, is to demonstrate the potential in CO, transport and storage as a service.

"It is an important part of our mandate to share our knowledge and experience as a catalyst for creating a commercial CCS market. Northern Lights is a first mover, and we encourage others to follow."

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In the Shipyard

Latest Deliveries, Contracts and Designs

HOS

EASTERN SHIPBUILDING, HOS TEAM TO CONVERT **OSV TO SOV**

U.S. offshore vessel owner Hornbeck Offshore Services, best known for its offshore oil and gas support vessel services, is looking at business opportunities in the growing U.S. offshore wind sector as well as in offshore accommodation services in the oil and gas area.

For that, Covington, La. based Hornbeck Offshore contracted Eastern Shipbuilding Group to convert one of its recently acquired 280-foot offshore supply vessels (OSV) to a service operation vessel (SOV) to meet the growing demand of the U.S. offshore wind market, as well as to serve the demands of the petro-energy flotel market.

Capable of supporting both construction and O&M activities, the U.S. flag, Jones Act-compliant vessel was originally constructed by Eastern in 2014 and will be converted at the company's 300-acre Allanton Shipyard in Panama City, Fla. It is expected to be available in the spring of 2025.

The HOSSOV 300E has been designed in collaboration with VARD, the original designer of the vessel, to address the key "desirements" of the U.S. offshore wind client community based upon VARD's other recent SOV designs, Hornbeck Offshore said.

According to Hornbeck Offshore, the service operation vessel will have the capacity to accommodate up to 90 or more persons in flotel or offshore wind service mode, with safe, stepless walk-to-work transfer capabilities in up to 2.5m sea states.

The SOV will be equipped with an Uptime 30m motion-compensated offshore gangway, a 10-ton 3D-compensated crane, helideck, enclosed warehouse and stepless boat landing.

Its existing diesel-electric powerplant will be enhanced by a 1,500 kW-hour battery hybrid power system, enabling reduced emission during offshore operations and in harbor transit, the U.S.-based shipowner said.

The SOV accommodations will be constructed to ABS Comfort Class habitability notation standards, and, Hornbeck Offshore said, will include a host of onboard amenities typical of a newbuild SOV.

Hornbeck is not the first U.S. offshore vessel owner to convert an oil and gas supply vessel for work in the U.S. offshore wind market. Des Allemands, La. based Otto Candies is converting two of its OSVs to operate as SOVs for wind projects in waters off the U.S. Northeast coast.

Mitsubishi Shipbuilding Launches **LNG Bunkering Vessel KEYS Azalea**

Mitsubishi

Mitsubishi Shipbuilding christened and launced a liquefied natural gas (LNG) bunkering vessel, the first to operate in western Japan, built under contract for KEYS Bunkering West Japan Co., Ltd. The ceremony took place at the Enoura Plant at MHI's Shimonoseki Shipyard & Machinery Works in Yamaguchi Prefecture. The new vessel, christened KEYS Azalea, is scheduled for delivery in March 2024 following outfitting work and sea trials.

KEYS Azalea is equipped with a dual fuel generator engine capable of using both LNG and marine diesel oil as fuel, a first for LNG bunkering vessel in Japan. When operating in gas mode, it will provide exceptional environmental performance with considerably reduced emissions of carbon dioxide (CO2), nitrogen oxide (NOx), sulfur oxide (SOx), and particulate matter (PM).

KEYS Bunkering West Japan is a joint venture company established in February 2022 to supply LNG fuel for ships and operate a coastal transportation business in the Kyushu and Setouchi Regions.

$1B Contract for Trio of Next-Gen Italian Navy Patrol Boats

Fincantieri

As part of the OPV (Offshore Patrol Vessel) acquisition program of the Italian Navy (MM), Orizzonte Sistemi Navali (OSN), the joint venture owned by Fincantieri and Leonardo with stakes of 51% and 49% respectively, signed with the Directorate of Naval Armaments of the General Secretariat of Defence/DNA, the contract for the construction of three new generation patrol boats, with an option for three more.

The value of the contract for the first three boats is $1B, including the related logistic support services.

When completed the 2,300-ton vessels will measure 95m long and accommodate 97 crew. Among the most innovative features is the naval cockpit, developed for the Multipurpose Offshore Patrol Boats (PPA) of the MM on the basis of a revolutionary requirement: an integrated station, co-produced by Leonardo and Fincantieri NexTech, which allows the conduct of the ship and aeronautical operations by only two operators, the pilot and the co-pilot, who have incorporated the figures of the officer of the watch on the bridge and the commander.

From this position, located on the command bridge, it is in fact possible to manage both the machines, the rudders and the platform systems and some functions of the combat system.

ABS/DSIC

7,100 TEU ALS CERES *First of Six for Asiatic Lloyd*

ALS CERES was delivered to ABS class on May 29 and is the first in a series of six 7,100 TEU container carriers designed by Shanghai Merchant Ship Design and Research Institute (SDARI) and built by Dalian Shipbuilding Industry Company (DSIC) for Asiatic Lloyd Maritime LLP, Singapore. The new, energy-efficient hull design and a fuel-efficient main engine that is compliant with NOx Tier III requirements, translate to a vessel with a low fuel consumption in comparison to its peers of the same vessel type, size and service speed.

"ALS CERES is a great example of how the maritime industry is implementing energy-efficient technologies to meet global decarbonization targets. The successful conclusion of the project is a testament to the dedication and efforts of the ABS China Engineering and Survey Operation teams that supported this project and worked together to deliver this state-of-the-art vessel for the next generation," said Pier Carazzai, ABS VP of Engineering Europe and Middle East.

ALS CERES is assigned with the ABS Ammonia Fuel Ready Level 1C and Methanol Fuel Ready Level 1C Class notations, indicating that a concept-level design study has been carried out for future conversion to ammonia and methanol fueling. The vessel is also one of the first to feature the ABS FOC notation, an enhanced standard reflecting additional fire-fighting methods.

In the Shipyard

Latest Deliveries, Contracts and Designs

MAERSK'S NEW *METHANOL-FUELED* CONTAINER FEEDER

Maersk

Maersk has taken delivery of what it says is the world's first container feeder to be fueled by methanol.

The 2,100 TEU vessel was built at Hyundai Mipo Dockyard and Hyundai Heavy Industries and features dual fuel main and auxiliary engines from MAN Energy Solutions that are able to operate on methanol.

The ABS-classed vessel, HMD Hull #4168 embarked on its maiden voyage from Ulsan to Copenhagen for a naming ceremony in September, when the ships is expected to take the name Laura Maersk. The Danish shipping giant has signed a deal with Dutch producer OCI Global on the delivery of green bio-methanol for the 21,500-kilometer journey.

"The green methanol market is still in its infancy and frankly we had not expected to be able to secure a maiden voyage on green methanol for this vessel. So, we are very proud to have achieved this significant milestone. We expect a diverse green fuel mix for the future, with green bio-methanol from biomass waste being available now," said Morten Bo Christiansen, Head of Energy Transition, A.P. Moller – Maersk.

Maersk said the introduction of its newest container vessel is a significant step toward realizing its commitment to becoming carbon neutral.

The dual-fuel vessel will pause in Copenhagen right outside the Maersk headquarters on its way to the Baltic Sea, where it will be operating going forward. The feeder vessel will bring real experience for Maersk seafarers in operating the new type of fuel as the company prepares to receive a fleet of new, large oceangoing dual-fuel engine powered ships from 2024.

Maersk currently has on order 24 additional green methanol-powered ships, including a dozen 16,000 TEU and six 17,000 TEU ships at South Korea's Hyundai Heavy Industries, plus six 9,000 TEU ships ordered from Yangzijiang Shipbuilding in China. The company is also planning to retrofit existing vessels with dual-fuel engines capable of running on methanol.

A New Name in *Middle East Ship Repair*

SAFEEN Drydocks

AD Ports Group and Premier Marine Engineering Services LLC formed a new joint venture, SAFEEN Drydocks. The joint venture is structured as a 51% ownership by AD Ports Group and 49% by Premier Marine. The new enterprise will offer a broad range of vital services including drydocking, afloat repairs, ship building and refurbishment. The hub of SAFEEN Drydocks' operations will be located at Khalifa Port and encompass a 45,000 sq. m. shipyard and repair facility, 350m quay wall for vessel afloat repair, and a floating dry dock for vessel maintenance and refurbishment. The floating dry dock is expected to commence operations in July of 2023, while the shipyard has already begun work with construction of two barges for a UAE-based client. Once fully up and running, the hub will be operated by SAFEEN Drydocks and be fully equipped to accommodate a range of vessel types including tankers, bulk vessels, container ships, offshore vessels and jack-ups.

In the Shipyard

Latest Deliveries, Contracts and Designs

$560M *Explora I* Delivered

Fincantieri

MSC Group Cruise Division – Explora Journeys – saw the launch by Fincantieri of Explora I, the first of four new luxury cruise vessels for MSC's new luxury travel brand.

The first ship cost $560m, part of a four-ship newbuild plan for a cumulative $2.6B.

Explora I will depart on her maiden voyage on August 1 from Copenhagen in Denmark. The luxury vessel will spend several weeks in Northern Europe offering a number of different itineraries and will then cross the Atlantic Ocean to spend the winter in North America and the Caribbean Sea before returning to Europe in the summer of 2024 for a few cruises in the Mediterranean Sea.

Explora II is currently under construction at the Fincantieri shipyard in Genoa Sestri Ponente and will enter service in August 2024. EXPLORA III will be the first of two liquefied natural gas-powered vessels to join the Explora Journeys fleet, with delivery expected in 2026, while EXPLORA IV in 2027.

All Explora ships are outfitted with Selective Catalytic Reduction (SCR) technology, connectivity to the shore power grid, underwater noise management systems and a wide range of energy efficient equipment.

NYK to Build Its Sixth LPG Dual-Fuel Very Large LPG / Ammonia Carrier

NYK

NYK is announced the order of its sixth liquefied petroleum gas (LPG) dual-fuel very large LPG/liquefied ammonia gas carrier (VLGC) from Kawasaki Heavy Industries Ltd. (KHI). The ship will be built at the KHI Sakaide Works shipyard and is set for delivery in 2026.

This vessel is the eighth in NYK's fleet of LPG-fueled LPG carriers and the sixth in a new type of vessel capable of carrying ammonia and thus flexibly responding to various trade patterns.

In addition to the LPG dual-fuel engine, the ship 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 regular seagoing transit, realizing full navigation with LPG fuel will be possible except for the use of a small amount of pilot fuel as an ignition source.

When LPG is used as fuel, exhaust gas from the ordered VLGC will contain at least 95% less sulfur oxide (SOx) and 20% less CO2 than NYK's conventional VLGCs using heavy-oil fired engines.

The vessel is expected to be given notations byClassNK as a VLGC that has a preparatory design in accordance with the guidelines issued by ClassNK so that this vessel may use ammonia fuel in the future.

Iannis Giakoumopoulos - REA - Naval Group

Jacques Chevallier French Navy Force Supply Ship

Jacques Chevallier, the first of the four force supply vessels (BRF) of the "Logistics Fleet" program (FlotLog), was received by the Directorate General of Armaments (DGA) for delivery to the French Navy. Launched in 2019 and built in Saint-Nazaire by Chantiers de l'Atlantique and Naval Group, the Jacques Chevallier returned to its home port of Toulon in March 2023 to carry out a sea trial campaign dedicated to the refueling system at sea and the combat and communication system. The building has successfully completed a first phase of sea trials and is now joining the French Navy's naval action force. The final assembly of the second BRF, Jacques Stosskopf, will begin in Saint-Nazaire at the start of 2024, for delivery in 2025. With a greater cargo and fuel carrying capacity than their predecessors, but also better tactical capabilities, the BRFs are intended to replace current tankers and will support the carrier battle group, articulated around the aircraft carrier, and the naval action groups. The BRF Jacques Chevallier is the first of a series of four ships in the FlotLog program, the order of which was notified in January 2019 to the Momentary Group of Companies formed by Chantiers de l'Atlantique and Naval Group. The FlotLog program is piloted by the DGA, in cooperation with Italy, under a contract with the Joint Armament Cooperation Organization (OCCAR). In the partnership, Chantiers de l'Atlantique is responsible for all of the design and construction of the four vessels and is responsible for the integration and assembly of on-board systems. Naval Group is responsible for designing, developing, integrating and maintaining operational the ship's military systems, including the combat system and the systems contributing to the reception capacity of aircraft and the loading of ammunition.

Technical characteristics:
Displacement at full load: 31,000 tons
Length, o.a.: 194 m
Width, o.a.: 27.60 m
Accommodation: 200
Fuel carrying capacity: 13,000
Total installed power: 24 MW

CMT 4000 Barge Retrofit

Carver Marine Steel Works

Carver Marine Steel Works recently accomplished its most significant project and haul to date on the CMT 4000 hopper barge, measuring 260 x 52.5 ft. The project began with iron work, where the Carver team cropped and renewed more than 120,000 pounds of steel in the lower three-ft. bottom of the barge.

Furthermore, Carver upgraded the binwalls on the barge, installing a new lower-profile type, which greatly improved cargo operations, making them faster and more efficient. Following this crucial step, Carver shifted the CMT 4000 with its 820MT Marine Travelift into its expansive 73,600 sq. ft. "Barge Building" at the Port of Coeymans.

In the Barge Building, the remaining topside repairs were conducted, including internal and external prep and coating application. This project holds significant importance for Carver Marine Steel Works, as it marked the largest and most challenging retrofit completed by the company to date, completed within a four-month timeframe.

In the Shipyard

Latest Deliveries, Contracts and Designs

AmFELS Delivers **LNG-Fueled MV Janet Marie**

Pasha Hawaii took delivery from AmFELS the MV Janet Marie, the second of two new Ohana Class, 774-ft. Liquefied Natural Gas (LNG) powered container ships. The new vessel joins Pasha Hawaii's fleet serving the Hawaii/Mainland trade lane, as well as the company's first Ohana Class vessel, MV George III, which began service on August 17, 2022.

Operating on liquefied natural gas from day one, the new Jones Act vessel surpasses the International Maritime Organization (IMO) 2030 emission standards for ocean vessels, as does its sister ship, George III. The ships are named in honor of George Pasha, III and Janet Marie Pasha, the late parents of The Pasha Group President and CEO George Pasha, IV, marking three generations of service to Hawaii.

Pasha Hawaii

Freire Shipyard

Freire Shipyard to Build ***IFREMER Research Vessel***

Freire Shipyard signed a contract with IFREMER - the French national institute for ocean science - for the construction of a new 40.3-m vessel for the French oceanographic fleet. It will be designed to deal with all disciplines of oceanography in Atlantic coastal areas: geosciences and paleoclimatology, physical oceanography and biogeochemistry, biological oceanography, and ecosystem functioning, from the coastline to the continental shelf. It will also perform duties related to fishery on the continental shelf and will accommodate a crew of 12 people and 10 scientists, allowing for training campaigns with teachers and students on board.

The oceanographic research vessel stands out for the wide range of energy savings technologies and low-consumption solutions implemented: from the hull design, the design of the power plant, the power distribution system, the heat recovery system, the level from thermal insulation to the efficiency of air conditioning.

The diesel electric propulsion system will combine three main variable speed generator sets (suitable for operation on biodiesel), two shaft lines driven by electric motors and a DC electric distribution system, which together with a battery pack will offer great performance of the power plant, optimization of consumption, good redundancy, and outstanding acoustic performance (not only in terms of compliance with BV COMF 2 class notation but also with DNV SILENT-F standard). The dynamic positioning system and the electric bow thruster facilitate the maneuverability of the boat.

It will have an oceanographic marine telescopic main crane at the stern for marine use designed to launch and to recover scientific equipment (corer, buoys, etc.) and general handling on the aft part of the vessel. In addition, she will have a type A stern gantry, a T-type lateral gantry and a telescopic rail beam for CTD maneuvering. For fishing operations, this boat will also have two trawling winches and a removable net drum.

Derecktor

DERECKTOR *BLAZES A TRAIL IN* COMMERCIAL HYBRIDS

Derecktor Shipyards NY delivered another commercial hybrid vessels, its fourth delivery of an aluminum hybrid catamaran, this one to the University of Vermont (UVM). The RV Marcelle Melosira, will serve as a floating classroom and laboratory, enabling advanced research operations and hands-on educational programs. Designed by Chartwell Marine and built in collaboration with UVM and Chartwell, the 19-meter (64 ft) research catamaran has been crafted to fulfill the functions outlined by UVM's Rubenstein School of Environment & Natural Resources. These functions include low emissions, low fuel burn rates, a stable and safe platform for research, high maneuverability, and the ability to tow trawls, sleds, and plankton nets. The vessel will also facilitate the launch and recovery of scientific equipment, small remotely operated vehicles (ROVs), and sediment sampling devices. RV Marcelle Melosira is equipped with dual control stations to maximize operability and offers a large interior space and an expansive exterior aft deck area. The vessel is designed to operate on Lake Champlain in up to 1.5-meter Significant Wave Height conditions.

UVM, through its strategic vision "Amplifying Our Impact," is committed to research initiatives that strengthen healthy environments and societies. The construction of the RV Marcelle Melosira aligns with this vision, and the vessel's arrival at the Rubenstein Ecosystem Science Laboratory on Lake Champlain in 2023 will mark an important milestone in advancing scientific exploration and education.

RV Marcelle Melosira is the fourth new build using hybrid systems supplied by BAE. Derecktor recently signed a contract to build two 65-ft. hybrid catamaran ferries for Chatham Area Transit in Savannah, Georgia. The waterjet driven vessels will operate on a route connecting downtown Savannah with Hutchinson Island, home of the Savannah Convention Center. Delivery is expected in 2024.

"Handing Over the Keys" to the Shipyard

Andreas Laible

The insolvency administrator of the MV Werften Group, Dr. Christoph Morgen, handed over the symbolic key of the Wismar shipyard to Bernard Meyer of Meyer Wismar. The shipyard, which has been owned by TKMS since June 2022, has been leased back by the insolvency administrator and subleased to Meyer Wismar for the completion of the cruise vessel located in the dock hall.

"Over the course of the past year, we set up good solutions for the three shipyard locations in Mecklenburg-Western Pomerania, Neptun Ship Design in Rostock, the prefabricated module plant in Wismar, the hotel in Wismar, as well as for Lloyd Werft in Bremerhaven," Dr Morgen, said. "With the handover of the shipyard to Meyer Wismar we're now marking the beginning of the next shipyard chapter."

Insolvency administrator Dr. Morgen also announced that the mass loans granted by the state government of Mecklenburg-Western Pomerania for the shipyards in Wismar and Rostock-Warnemuende amounting to around 13 million euros plus interest, will be repaid in full in August 2023.

Bayonne Drydock

BDD Completes USCG Cutter William Tate Fix

Earlier this year, Bayonne Drydock used its new Mobile Boat Hauler (MBH) to hoist the US Coast Guard vessel William Tate. The William Tate is a 175-ft. Keeper Class Cutter homeported in Philadelphia, Pennsylvania. The project was Bayonne Drydock's first full drydocking package with the United States Coast Guard accomplished using the MBH. The scope of work included a full preservation package, install of a new deck covering system, and bow thruster overhaul.

Bayonne Drydock continues to demonstrate the ability to service multiple vessels simultaneously in both the Government and Commercial sectors. The William Tate drydocking was completed on time and on budget while work proceeded on the USNS Watkins, US Army Corp of Engineers Hayward, and several other commercial projects. Bayonne Drydock can now provide full drydocking services to eight vessels at any given time using the MBH's 4-acre laydown area. The facility is also home to a 1,092-ft. Graving Dock and 1600-ft. of pier space, where the USNS Watkins repairs were carried out. Bayonne Drydock is currently scheduled to begin its next project with the USCG in August, hauling the 154-ft. Sentinel Class Cutter Angela Mcshan.

Brix Marine

BRIX Marine Delivers Artemis: Redefining Wildlife Adventuring on the Kona Coast

BRIX Marine delivered Artemis from its custom PaxCat portfolio, designed for Hawaiian Adventures, a provider of immersive wildlife experiences on the Kona Coast. Artemis is a 42 x 16-ft. vessel, purpose-built to enhance their mission of cultivating connections between communities and marine wildlife.

Artemis is equipped with Twin Volvo D11-510 with IPS 650 boasting an impressive 510 horsepower and dual counter rotating forward facing propellers. "The maneuverability that you get with the Volvo IPS drives will take most of the anxiety out of docking in the dark, tough weather, and tight spaces, which we often deal with in Kona," said Shane Aggergaard, Founder of Hawaiian Adventures.

Artemis incorporates many design features that optimize wildlife viewing, offering unobstructed sightlines and comfortable spaces for passengers and crew alike.

"BRIX Marine in Port Angeles came up with an amazing design and, with a collaborative effort of many people, created what I feel to be the finest small tour boat in Hawaii," said Aggergaard.

Artemis' Main Deck welcomes guests on a spacious and comfortable open-air ride. Padded forward-facing seats are strategically positioned at the optimal viewing angle for all passengers, offering uninterrupted views of the captivating surroundings. The deck provides ample shaded and full sun seating options, ensuring guests' comfort throughout the journey. Just astern of the main seating area, a spacious and clean marine head (private restroom) is available, along with complimentary cold drinks, sunscreen application mirrors, and integrated trash receptacles. The soft SeaDek (EVA foam decking material) adds a touch of luxury, allowing guests to enjoy a barefoot feel during their adventure.

©Lhyfe

It's (Really) Not Easy Being Green (Hydrogen)

While the jury is still out on maritime 'fuel of the future,' green hydrogen is seen globally as a particularly invaluable part to the process – as well as a potential fuel – particularly in the fight to decarbonize heavy and long-haul transport industries like shipping.

While the promise is real, the challenges are many, including the high cost of renewable energy sources themselves, the energy-intensive electrolysis process and the development of infrastructure. Similar to other giant strides in technology, the mass production of green hydrogen will take a broad mix of political will (ie. funding), corporate nerve and individual innovation.

Going Offshore

Producing green hydrogen in the offshore environment presents a number of advantages, led by the abundance of renewable energy (such as integration into the rapidly expanding offshore wind grids globally) to generate electricity to run the power-hungry electrolysis process. In addition, readily abundant seawater can be used to cool the electrolyzers, helping to boost efficiency and reduce costs.

But these offshore pluses are weighed down with an equal, if not greater number of risks, including the much higher CapEx and OpEx costs due to the inherent challenges associated with working efficiently, cost-effectively and safely in the offshore environment; the logistical challenges of delivering the hydrogen from the sea to the shore; and last but certainly not least, the many unknowns of operating the electrolyzers – designed and optimized for onshore operations – in the caustic offshore environment

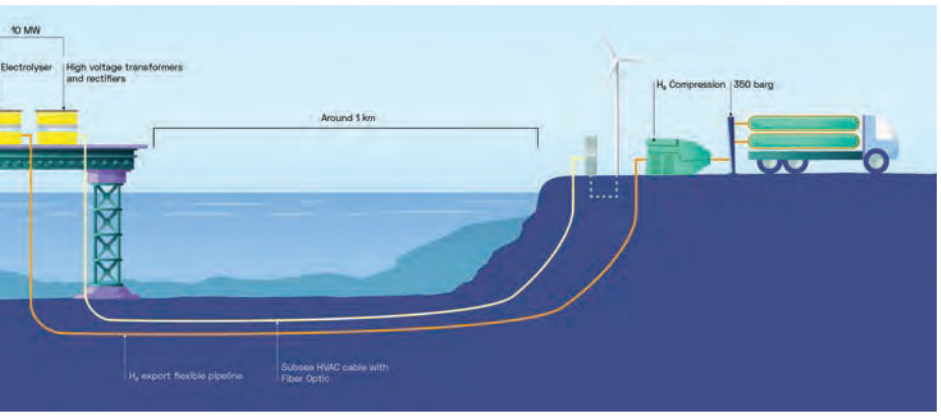
Despite the negatives, Lhyfe, a French company hellbent on meeting and beating the challenges, earlier this summer announcing a "world first:" Its Sealhyfe pilot project started producing green hydrogen in the Atlantic Ocean, 20 km off Le Croisic, France and now connected with the SEM-REV power hub. "As of June 20, 2023, the platform began producing its first kilos of offshore hydrogen, marking a milestone for the future of the sector. The progress of the Sealhyfe trial once again demonstrates Lhyfe's ability to bring about concrete advances in the hydrogen industry and at great strides," Lhyfe said in a press release. With the aim of scaling to commercial production, Lhyfe opted to choose a challenging trial area. Lhyfe said that the 1 MW electrolyzer supplied by Plug will be put to the test under real conditions on a floating platform, a WAVEGEM platform, engineered by GEPS Techno, that was re-engineered to stabilize the production unit at sea. Connected to Central Nantes' SEM-REV offshore testing hub operated by the OPEN-C Foundation, a hub that is already linked with a floating wind turbine, FLOATGEN, engineered and operated by BW Ideol.

The Sealhyfe platform, which is less than 200 sq. m., is designed to produce up to 400 kilograms of hydrogen a day.

In another project, Dutch offshore wind farm developer CrossWind awarded Italy's Rosetti Marino a new engineering, procurement, construction, installation and commissioning (EPCIC) contract for an offshore green hydrogen production and storage pilot plant dubbed the Baseload Power Hub, which will be located within CrossWind's Hollandse Kust Noord offshore wind farm, 18.5 km off the Dutch coast. CrossWind is a joint venture between Shell (80%) and Eneco (20%). According to Rosetti Marino, the project will convert excess wind energy to green hydrogen through an electrolyzer and store it as green hydrogen that can be converted to electricity when needed via a fuel cell, including also battery storage for shorter-term power storage. The aim of the project is stabilize power flow when the wind isn't blowing as briskly and/or during power demand surges.

The scope of work of the contract awarded to Rosetti Marino SpA includes detailed engineering of the Baseload Power Hub, procurement of material and equipment, construction

LEFT: Lhyfe's Sealhyfe offshore hydrogen production pilot, on WAVEGEM platform; FLOATGEN floating turbine (BW Ideol) at the SEM-REV offshore testing site. BELOW: Illustration of the HOPE Project.



work, transport and installation at sea, and commissioning and start-up of the platform. Activities are due to start immediately and are expected to be completed by the end of 2025. As for the Hollandse Kust offshore wind farm, it last month produced its first megawatt-hours (MWh) of electricity, and delivered it via TenneT's offshore grid to the Dutch mainland. In the coming months, production capacity will be constantly increased, so the wind farm will eventually generate 3.3 TWh a year. When complete, the Hollandse Kust Noord wind farm will have a total installed capacity of 759 MW.

There is [$22m worth of] HOPE

Lhyfe also announced that the HOPE project, which it is coordinating as part of a consortium of nine partners, has been selected by the European Commission under the European Clean Hydrogen Partnership won a $22m grant. "With HOPE, Lhyfe and its partners are moving up a gear and aiming for commercialization. This large-scale project (10 MW) will be able to produce up to four tons a day of green hydrogen at sea, which will be exported ashore by pipeline, and then compressed and delivered to customers. "Through these two pioneering projects in offshore hydrogen production, Lhyfe aims to validate industrial solutions which it will submit in response to future calls for projects from various governments, to help achieve the target set by the European Commission as part of the REPowerEU plan of 10 million tons of clean hydrogen produced in the European Union by 2030," Lhyfe said. To achieve this, Lhyfe has already signed partnership agreements with wind turbine developers and offshore power specialists, such as EDPR, Centrica and Capital Energy. atthieu Guesné, Founder and CEO of Lhyfe said: "Our team – supported brilliantly by our partners – has achieved a genuine feat of technology in successfully designing this first floating green hydrogen production site. We are extremely proud to be the first in the world to produce [green] hydrogen at sea.

"This has been our wish since the launch of the company and we continue to move very quickly on offshore, which for us represents a tremendous development opportunity for mass producing hydrogen and decarbonizing industry and transport. We are continuing to build on the successes we have had so far, firstly to prove to the world that transition is possible today, and of course to accelerate it."

THE HOPE PROJECT

HOPE Project Innovation Development

- **Recycled offshore barge:** The structure housing the production unit will be a second-hand jack-up barge, demonstrating transformation of infrastructure previously used for oil and gas while also helping to reduce costs and lead times.
- **10 MW PEM electrolyzer:** This compact electrolyzer will be the first of its size to be installed offshore.
- **Seawater treatment system:** This low-energy system which is compact, economical and able to use the heat emitted by the electrolyzer, will be used for the first time to produce green hydrogen from seawater purified by evaporation.
- **Underwater flexible hydrogen pipeline for hydrogen export:** The hydrogen will be exported ashore via a flexible thermoplastic composite pipeline of over a km long, which for the first time will transport hydrogen produced at sea.

HOPE Project Partners

- **Lhyfe (France):** Engineering, equipment procurement, works supervision, operation, optimization of the overall production, export and distribution system, project coordination.
- **Plug (the Netherlands):** Supply and engineering of the 10MW electrolyzer.
- **EDP NEW (Portugal):** Contribution to the optimization of operations and impact analysis. Steering of techno-economic studies for large-scale developments.
- **POM West-Vlaanderen (Belgium):** Project implementation support in the testing area (studies, permits) and analysis of the social, economic and environmental impacts of the project.
- **CEA (France):** Optimization of operations via digital simulation.
- **Strohm (the Netherlands):** Supply of the subsea flexible thermoplastic composite pipeline (TCP).
- **Alfa Laval (Denmark):** Supply of the seawater treatment system.
- **ERM - Element Energy (France):** Coordination support.

Fast Facts on the HOPE Project

- **What: H**ydrogen **O**ffshore **P**roduction for **E**urope (**HOPE**). The production site will comprise three units: production and compression (at medium pressure) at sea, export by composite pipeline, then compression (at high pressure), storage and distribution onshore.
- **Size:** 10 MW/up to 4 tons of green hydrogen produced a day
- **Funding:** $22m grant from the European
- **Where**: The North Sea, off the port of Ostend
- **Why**: For the first time in the world, green hydrogen will be produced at sea and then exported ashore via a composite pipeline to supply the needs of the regional ecosystem. The aim is commercialization
- **When**: By mid-2026

Tech Files

Tools

Weiler

Tiger 2.0 Cutting, Grinding

Weiler Abrasives debuts the Tiger 2.0 zirconia alumina and aluminum oxide cutting, grinding and combo wheels. Designed for demanding metal fabrication industries like shipbuilding, pressure vessel and heavy equipment fabrication, these abrasives help cut through inefficiencies, safety issues and labor shortages that prevent companies from doing their best work. In addition to offering fast cutting speed, Tiger 2.0 wheels last up to 40% longer. Tiger 2.0 wheels are available in Type 1, Type 27 and Type 28 options. These wheels range in size from 4 to 9 inches and are intended for use on portable angle grinders.

weilerabrasives.com/tiger-2.0

L.S. Starrett

TENNAX-PRO Saw Blades

L.S. Starrett Co. introduced TENNAX-PRO Bi-Metal Band Saw Blades designed to cut challenging tubes, pipes, profiles and structural shapes in both single pieces and bundles. Designed to provide lower noise and vibration as well as improved cutting performance. Starrett TENNAX-PRO Band Saw Blades feature high-speed M-42 steel teeth with a new special tooth geometry/ profile. The blades are available in widths of 3/4", 1", 1 1/4", 1 1/2", 2", and 2 5/8", and can be used with manually operated, gravitational, and hydraulic machinery, making them a versatile and adaptable choice.

www.starrett.com/tennax-pro

Saint-Gobain Abrasives

"Norton for Aluminum"

Saint-Gobain Abrasives introduced "Norton for Aluminum" Thin Wheels for the right angle cutting and grinding of aluminum and other non-ferrous soft metals. The wheels have a range of features and benefits including a 5/8"- 11" hub for quick, tool-free wheel changes. Help ing to keep metal surfaces clean for defect-free, corrosion-free welding, the new wheels have a contaminate-free bond which does not need any waxes or lubricants. The new wheels are available in 1/4" Grinding Type 27, 1/8" Cutting/ Notching/ Grinding Type 27, .045" Right Angle Cut-Off Types 01/41 and 27/42, and Straight Cut-Off Type 01/41.

www.nortonabrasives.com

Emuge-Franken USA

PunchDrill

Emuge-Franken USA introduced PunchDrill, a new drill design offering high feed drilling which doubles the feed rate compared to standard drills without increasing the axial force or spindle speed. PunchDrill reduces machining forces and optimizes chip-breaking, producing cycle time savings of 50% or more when machining cast aluminum alloys with at least 7% Si content and magnesium alloys. EMUGE PunchDrill is available in drilling depth ranges up to approximately 8 x D, the nominal diameter range from 0.129" to 0.472" (3.3 mm to 12 mm).

www.emuge-franken-group.com

©KSB SE & Co. KGaA

Pneumatic 1/4-turn Actuators

KSB Group launched a new generation of pneumatic 90° quarter-turn actuators. The double-acting and single-acting pneumatic actuators of the ACTAIR EVO and DYNACTAIR EVO type series are designed for actuating all types of part-turn valves, such as butterfly valves, ball valves and plug valves. Applications include power generation, refinery engineering and shipbuilding. The double-piston actuators can be operated with compressed air to ISO 8573-1 from 3 to 8 bar. Maximum torque is 8000 Nm for the double-acting type, 4000 Nm for the single-acting variant.

https://www.ksb.com/en-global

Lehmann Marine

The CUBE Battery System

Lehmann Marine debuts a marine battery system to accompany its COBRA system. The air-cooled CUBE system was developed, according to the manufacturer, with a superior energy density that can be stacked flexibly for optimum use of space. Designed to be compact, modular with an innovative air-cooling technology, CUBE can be freely configured in strings of up to 1,000 VDC; scalable from a few kWh to several MWh.

www.lehmann-marine.com

Tech Files

Tools

MarineShaft Resolves Shaft Bearing Failure

A chemical tanker suffered a bearing failure off the coast of Sweden, and subsequently the ship was towed to Denmark and lay at anchorage of Skagen. Danish-based mechanical machine workshop MarineShaft, which specializes in class-approved cold straightening of bent shafts and rudder stocks, was called and dispatched two technicians onboard to dismantle and remove the damaged intermediate shaft bearing. The following morning the vessel was towed to a lay-by berth and the bearing was sent to MarineShaft workshop in Hirtshals. In-house, the re-metaling of white metal in the split intermediate shaft bearing began, and once the in-house repair was completed, MarineShaft delivered the bearing back to the vessel, working to re-install and test the repair. MarineShaft attended a successful sea trial, and the repair was class-approved by ABS. ***This job (from disassembling to installation and final sea trial) was done in eight days.***

MarineShaft

MarineShaft has the capacity for centrifugal casting of up to 400 kg of white metal. The white metal is melted using a purpose-built crucible furnace, and the centrifugal casting is carried out with the bearing placed in a lathe.

www.marineshaft.com

Mobile, Robiotic Welding for Shipbuilding

Italian companies Comau and Fincantieri presented the first result of their joint collaboration with Automatica: **MR4Weld (Mobile Robot for Weld)**, a mobile robot, an innovative outdoor automation solution, designed to improve the quality, performance and well-being of operators during labor-intensive welding activities.

The MR4Weld mobile robot is being tested and will be used in the Fincantieri shipyards to autonomously weld steel structures, with the possibility of increasing operations up to to 3 times compared to a manual process, the companies project.

The system features a high payload 6-axis articulated robot, equipped with a welding torch installed on a tracked undercarriage and with an integrated vision system to autonomously identify weld joints. It is designed to provide a better weld quality with improved ergonomics.

Comau, Fincantieri

MR4Weld is designed to be managed by a single operator during transfer and welding activities. The system also uses digital tools to collect welding and manufacturing data, which can be used to track weld joints.

Techcross

BWMS Refit Saves 20%

Techcross installed a BWMS in the engine room of an existing tanker using its patented “Engine Room Solution." To date, it has been applied only to new ships. One set of ECS 1000B model was installed on the 50,400 PC tanker owned by Horizon Tankers Limited S.A. using Techcross’ solution. This solution can help reduce more than 20% of purchasing and installation costs. Moreover, a noteworthy point is that by removing the pipes installed for flow measurement during deballasting and leaving only the sampling lines, which makes it possible to achieve an additional cost savings of 2~30% in installation.

www.techcross.com

Glamox

Glamox Lights Substation

This giant structure is one of three offshore high-voltage direct current substations being built for Dogger Bank, the world’s largest offshore wind farm, located off the North East coast of England. This first substation is pictured in the dock at Haugesund, Norway, where it was fitted with more than 640 specialist marine LED luminaires, ahead of its transportation to Dogger Bank A in the North Sea, where it is now in location and being prepared for the start of operations. Glamox, a world leader in lighting, won the order from Aibel to light Dogger Bank A, B, and C substations.

www.glamox.com

Technology Manufacturers' Input More Critical than ever for Effective Maritime Regulations

By Dr Stelios Kyriacou, Chief Technology Officer, ERMA FIRST

Next year marks a crucial milestone for the International Maritime Organization's (IMO) Ballast Water Management (BWM) Convention, with all ships required to meet the D2 standard for ballast water management by September 8, 2024. D2 specifies the maximum number of viable organisms allowed to be discharged. In most cases, it requires the installation of a ballast water management system (BWMS) on board the vessel.

2024 will be a pivotal moment for the ballast water market and while it is true that the retrofit market will diminish and leave behind only a small newbuild market, some challenges will remain. These will primarily be related to enforcement of the Convention, matters related to Port State Control and how to deal with non-compliance. Manufacturers, especially those with a large customer base, will still have an obligation to provide technical support and services. Furthermore, by the time the 2024 deadline arrives, 20 years will have passed since the BWM Convention was adopted by the IMO. One of the main reasons for it taking two decades for the Convention to be ratified, is that regulations were written, and views were expressed before the treatment technologies were available. Regulators were also unaware of how best to treat ballast water.

Since that time, ballast water treatment systems have been developed and evolved that perform well and consistently to meet the requirements of both the IMO and US Coastguard. Challenges remain, notably in the case of ports where water quality affects the performance of some treatment technologies. However, despite the delays, thousands of vessels have been retrofitted with effective ballast water treatment technology. Put another way, significant work has been done to protect the marine environment from aquatic invasive species, and that work continues.

Learning from the Past

Even so, if other environmental regulations are to have the desired effect, lessons need to be learned from the failings of the BWM Convention, which highlight a need for technology manufacturers to have greater involvement in the regulatory process. It is a fair assumption, that had equipment manufacturers been invited to participate in early discussions surrounding the BWM Convention's development, the many amendments and subsequent delays might have been avoided.

It is a well-known fact that there is a lag between technology development and regulatory affairs, as the speed at which technology advances outpaces the regulatory process. But it is essential that regulators have a more informed understanding when developing rules, especially where technology and investment is required.

For example, we can already see parallels between the BWM Convention and the Carbon Intensity Index (CII) regulations. The CII regulation has the potential to be one of the most impactful decarbonization regulations brought in by the IMO. However, it is only part of the equation, and it has been well reported that the regulations

"If other environmental regulations are to have the desired effect, ***lessons need to be learned from the failings of the BWM Convention*** *... It is a fair assumption, that had equipment manufacturers been invited to participate in early discussions surrounding the BWM Convention's development, the many amendments and subsequent delays might have been avoided."*

Dr. Stelios Kyriacou
Chief Technology Officer, ERMA FIRST

do not currently take into consideration the realities of ship operations.

Currently, the CII calculation is based on a ship's transit period only and assumes a full cargo load. It does not take into consideration other aspects of ship operations, such as the length of time a ship spends in port, or the impact slow steaming could have on emissions.

In the case of port operations, shore power solutions can completely eliminate emissions while at berth, and this is an area that has gained a great deal of attention. It is also expected to be included at the upcoming MEPC 80 meeting where low- and zero-carbon ship technologies will be discussed.

The Importance of Industry Input

Shore power is not a new concept, and the CARB regulations related to the use of shore power connections in select Californian ports for 80% of vessels first came into force 15 years ago. Since then, China and the EU have also brought in their own rules related to the use of shore power. So, we might ask why port operations are not included in CII calculations.

Recognizing the environmental and operations benefits of shore power, ERMA FIRST designed BLUE CONNECT, a next-generation alternative maritime power (AMP) solution that enables a connection between the ship and port's electrical grids. This allows the ship to shut down its diesel-fuelled auxiliary engines and generators which reduces noise and vibrations along with the emission of pollutants including particulate matter, nitrogen oxides, sulphur oxides, carbon oxides and other volatile organic compounds. Furthermore, BLUE CONNECT was recently officially categorised as an ESD by DNV and recognized as a solution that can have a positive impact on future CII ratings. The CII regulations are due to be reviewed in 2026, and I truly believe manufacturers will have amassed enough data and information to prove how such solutions can effectively support decarbonisation. I hope that the next revision of the regulations will account for the presence of such devices, recognize their potential and introduce their use to the rules. But for this to be done properly and prevent a repeat of the delays experienced with the BWM Convention, technology manufacturers need to be involved in the review process. The maritime industry is a rule driven sector, and regulations continuously evolve. However, we need a more open and collaborative approach to rule development. Regulatory development is a complex process and the fragmented landscape where regional and international rules, regulations and standards exist, can make it somewhat difficult to navigate and implement efficiently. In situations where manufacturers are not involved in regulatory discussions at the highest level, it is important to be proactive and engage with regulators and fellow industry stakeholders wherever possible. By closely monitoring developments and increasing dialogue between manufactures, class societies and regulators, we can ensure that when new regulations are introduced, they are fit for purpose and products and services are ready to meet compliance-driven demand.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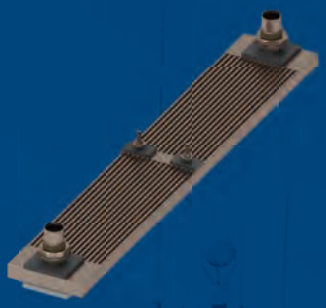

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