April 2023

MARITIME REPORTER AND ENGINEERING NEWS

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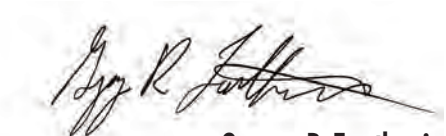
Having served this market for more than 30 years, a constant that has kept me interested and energized is *what I don't know.* Up until about nine months ago, I freely admit that I did not know a lot about Curtin Maritime, it's history, trajectory and business operations today. But then I had a chance meeting in September 2022 with some Curtin Maritime crew at an exhibition in Houston, which led to our cover interview with **Martin Curtin**, founder and CEO of Curtin Maritime. Established in 1997 in California with one boat and two people, Curtin Maritime today is a diverse and growing maritime business.

The story of Curtin Maritime embodies many of the strengths that define maritime as a whole: entrepreneurship, engineered solutions, career creation and risk management, amongst others. But in another sense, it entails some of the more cautionary tales for all involved in maritime, centered on the fact that increasingly regulation seems to be pacing ahead of technology, particularly in regards to fuel transition and decarbonization. There are a handful of maritime corporate goliaths globally that are doing more than their fair share in exploring options, overturning every technical stone in the search to squeeze additional efficiency, fuel and emission savings in the carrying of the world's cargo from point 'A to point B' via waterways. But as you know, the vast majority of companies in this industry are medium- and small-sized companies, and what I've been hearing a lot of lately is confusion regarding the choices, the correct path to take, particularly in regards to fuel and propulsion. Choosing wrong could cost more than money; it could cost the company. I'm all-in for responsible people and corporate entities doing their part – small and large – in tending to our planet. But tremendous pressure is put on the bulk of maritime companies when the targets being set by legislators are not technically feasible.

So I invite you to read our one-on-one with Martin Curtin, who comes across as a straight shooter. Martin is demonstrably proud of the company he has built from one boat and two people in 1997 to a diverse and growing fleet and a team of 270 today. As you may surmise based on the fact that his company is domiciled in California, Curtin takes umbrage with the over-burden of regulation and all that it entails for his company and colleagues. He discusses at length, too, the dramatically increasing cost of finding and keeping the employees that he wants, the employees that his company needs to fuel its future growth; hence the *"Mining for Gold"* headline which leads the Curtin Maritime story starting on page 26.



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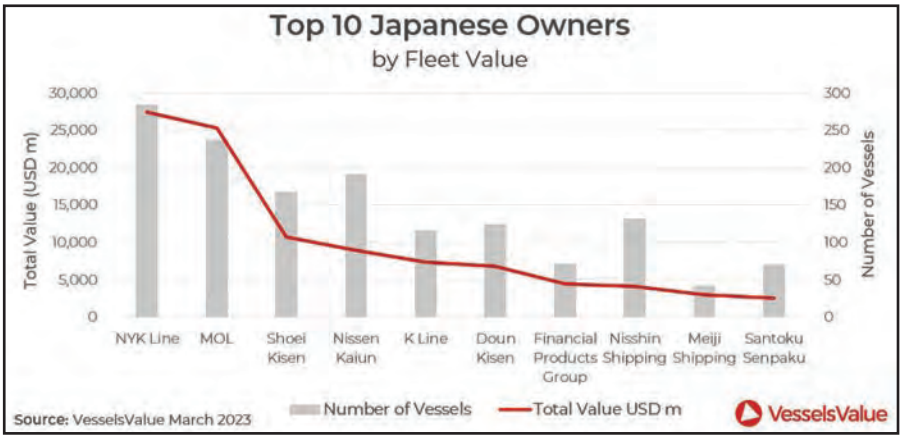
Japanese Shipowners

Japanese shipowners maintain strong world leadership, with the likes of NYK, MOL and K Line investing mightily in technologies driving digitalization and decarbonization.

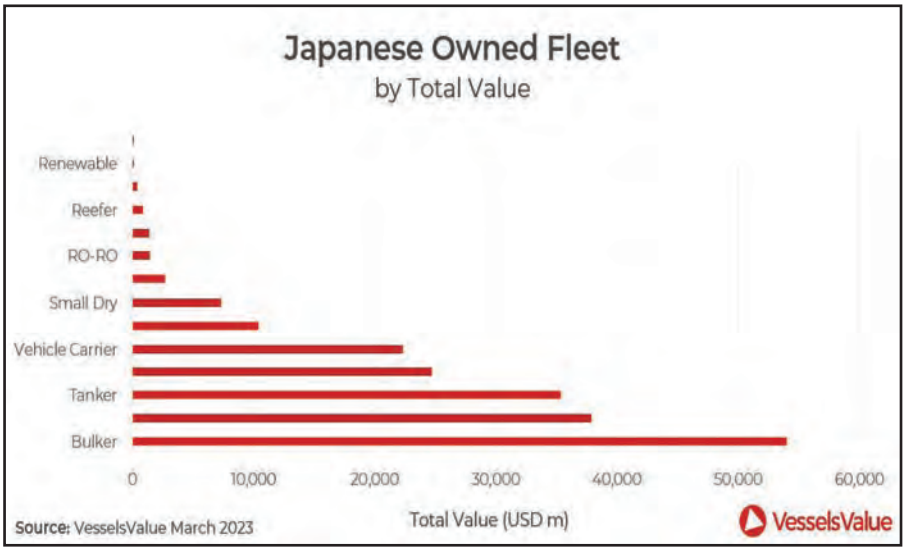
Top 10 Containership Owners by $

Company	# Vessels	Vaule ($)
NYK Line	216	15,443
MOL	186	14,460
Shoei Kisen	156	8,972
Nissen Kaiun	170	7,773
K Line	108	6,443
Doun Kisen	109	5,627
Financial Products Group	71	4,387
Nisshin Shipping	101	3,084
Meiji Shipping	37	1,799
Santoku Senpaku	64	1,954



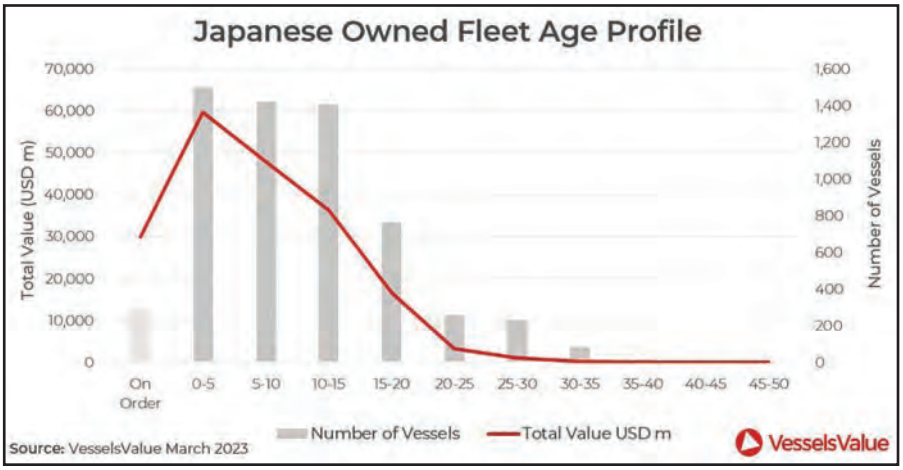
Japanese Owned Fleet

Type	# of Vessels	Value ($)
Bulker	1,892	53,998
LNG	193	37,902
Tanker	1,342	35,404
Container	451	24,699
Vehicle Carrier	342	22,313
LPG	320	10,383
Small Dry	1,231	7,356
Ferry	40	2,696
RO-RO	84	1,441
Cruise	8	1,377
Reefer	38	850
Offshore	24	356
Renewable	9	26
Multigas	1	2
Total	**5,975**	**193,803**



Japanese Owned Age Profile

Age Group	# of Vessels	Total Value ($)
On Order	284	29,838
0-5	1,500	59,680
5-10	1,419	47,831
10-15	1,408	36,265
15-20	764	16,478
20-25	254	3,156
25-30	226	939
30-35	81	229
35-40	11	27
40-45	7	7
45-50	1	9



Tip #46

Tech Evolution Creates Endless Possibilities for Maritime Training

Deserved or not, the maritime industry is notorious for being resistant to change. This was the warning I received over and over when I started our company which develops new learning technologies for our industry. But while we have seen evidence of the refrain "if it was good enough for my training 20 years ago, it is good enough for training now", our experience has largely been the opposite. The maritime industry is indeed willing to embrace new technologies for training where they have shown to have clear benefits. So it is time to cast off the old reputation, pat our collective selves on the back, and take a look back at how the industry has advanced in terms of training technologies and sophistication.

The field of training has come a long way since the days of chalkboards and paper manuals. With the advent of technology, there has been an exponential advancement in the way people are trained, and the maritime industry is no exception. One of the most significant developments in maritime training is the use of simulators. They have gone from non-existent not long ago to commonplace now. Simulators replicate real-world scenarios, allowing trainees to practice their skills in a controlled environment. This technology has been around for quite some time, but it continues to become more realistic with each iteration, providing trainees with an ever more accurate training experience.

Another more recent but significant advancement in maritime training is the use of virtual reality (VR) and augmented reality (AR). These technologies allow trainees to experience simulations of vessel interiors and machinery spaces in a highly immersive way. With VR, trainees can wear a headset that places them in a virtual environment, allowing them to practice their skills in a highly realistic, but completely safe setting. AR, on the other hand, overlays digital information onto the real world, providing trainees with information about their surroundings and the equipment they are interacting with. We are just at the beginning of the potential with VR and AR in maritime.

Aside from simulation, there has also been a marked increase in the use of e-learning platforms. In a short 20 years these platforms have become ubiquitous in maritime training (resistant to change, indeed)! These learning management systems (LMS) provide trainees with access to training materials at any time and from anywhere - whether on shore or on board, making it easy for them to learn at their own pace and at a time that fits their other commitments, whether work or personal. This technology was particularly useful during the COVID-19 pandemic, where traditional in-person training was limited by necessity.

Looking to the future, the potential benefits of technology in maritime training are endless. For example, there is a possibility that artificial intelligence (AI) could be used to analyze data from sensors and other sources such as a simulator or LMS to provide trainees with personalized training recommendations. This could help trainees to focus on areas where they need the most improvement, leading to more efficient and effective training.

Another potential benefit of technology in maritime is the use of blockchain to track training and certification. Blockchain is a secure and decentralized ledger that can be used to store and verify information. By using blockchain to track training and certification, it would be much easier to globally verify the qualifications of maritime professionals, making the industry safer and more efficient.

Technology has made amazing advancements in how people are trained, and the maritime industry has certainly felt the impact. From simulators to e-learning platforms, technology has made it easier for trainees to learn in a more targeted, supported, efficient and effective way. The newest technologies such as AR and VR are just now beginning to hint at their potential for an incredible impact. But even more exciting than what we have seen already, it is the future that holds the most exciting possibilities. AI, blockchain, and so many other technologies will transform the industry in the years to come. It's an exciting time to be involved in maritime training, and the possibilities are endless.

The Author

Goldberg

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Hywind Scotland, the world's first floating wind farm, operated by Equinor.

Signal Film / ©Equinor

Addressing the Challenges of Developing Floating Wind at Scale

Tens of gigawatts of floating wind projects are slated for development in this and the next decade, but many obstacles remain.

By Philip Lewis, Intelatus Global Partners

There has been much focus on the emerging floating wind market of late.

The U.K. is forging ahead with commercial scale floating wind developments through the Scotwind and INTOG awards of at least 24 gigawatts (GW) of floating wind capacity representing close to 1,500 floating turbines that will come on stream through 2030. And this will be soon followed by the award of at least 4 GW of capacity through the Celtic Sea floating wind auctions. The U.S. has awarded floating wind leases with a potential of over 8 GW of capacity in the Pacific and will move ahead with large floating wind leases in the Atlantic this year. Norway is planning to award 1.5 GW of floating wind capacity at Utsira Nord this year and France is targeting bring 750 megawatts (MW) of floating turbines on stream at the end of the decade in the Atlantic and Mediterranean. Spain and Portugal are entering the fray with announcement of multi-gigawatt floating wind aspirations. In Asia Pacific, developers are navigating their path through a complicated permitting framework, where the prize is over 8 GW of floating project potential, mostly off the east coast Usan region. Australia and Japan are also the subject of much interest. This is not an exhaustive list of countries with floating wind aspirations, but a selection of the most discussed.

This all sounds very positive – tens of gigawatts of floating wind projects driving demand for suppliers and contractors in this and the next decade. However, many obstacles remain to delivering on these aspirations. This article goes on to discuss some of these challenges that must be addressed:

- **Permitting:** A feature of offshore wind is the disconnect between aspirational targets and what is realistically achievable in terms of leasing and permitting. An example is Portugal, which has till now permitted less than 100 MW of offshore wind capacity, yet plans to auction, permit and deploy 10 GW of mostly floating wind by 2030. While it is realistic to expect Portugal to award leases for 10 GW by 2030, it is an optimistic timeline to permit, build and deploy the capacity within the time frame.
- **No one standard technical approach:** Although most projects will deploy one of three broad concepts to support the turbine, a semis-submersible (V-column or barge), spar (buoy or hanging counterweight) or tension-leg platform (TLP), there is an ever-growing number of technical solutions being offered. This drives the need for flexibility in the supply chain.
- **Industrialized substructure manufacture:** Using the example of permitting applications for U.K. floating wind projects, developers are seeking design envelope approval for structures with footprints of up to 15,000 square meters. We expect to see substructures in the 5,000-10,000 square meter range. The substructures will weigh each weigh a minimum 3-5,000 tonnes if made from steel and up to 20,000 tonnes if made from concrete. On a 1 GW wind farm, over 60 of these will be required in, most likely a two-year delivery window.
- **Ports:** Deep draft ports will be required to assemble,

launch, support turbine integration, store and maintain structures that will feature turbines with rotor diameters over 220 meters. Floating wind ports will likely host large submersible barges, to transfer and launch substructures, as well as some extremely large quayside cranes, of which there is currently insufficient supply.

- **Turbine supply:** Three western OEMs currently dominate the market outside of China: GE, Siemens Gamesa and Vestas. We anticipate the rise of Asin OEMs, and particularly the Chinese OEMs who are developing 16-18 MM turbines, which only push the potential size of structures even bigger.
- **Dynamic cables:** Floating wind projects will feature subsea cables, and particularly the inter-array cables that connect the turbines, that are different in nature to bottom-fixed wind. New manufacturing capacity is required. Installation of these cables will also call on the subsea fleet, which is increasingly occupied in the oil and gas segment.
- **Floating substations:** Till now only one floating substation has been demonstrated. Although the concept should be familiar to developers of deepwater oil and gas projects, new concepts are required.
- **Installation vessels:** It is often said that floating wind projects require "small" and readily available tugs to support installation. This is not the case. The highest bollard pull anchor handlers featuring the largest clear back decks and biggest chain lockers will be a minimum requirement for many floating wind projects and may even be considered technically inefficient. A new asset class concept suitable for floating wind projects is emerging. These feature bollard pulls in well in excess of 300 tonnes, back decks over 1,200 square meters, AHC cranes with a minimum 250 tonnes capacity and chain clockers to accommodate multiple mooring spreads. It is hard to see these vessels being financed and built in numbers without firm commitments to long-term deployment. To date, we have not seen such commitments.
- **Major component repair and exchange:** Do you tow the structure to port for maintenance as has already been done with one pilot array? Do you maintain in-situ with either floating cranes or turbine mounted cranes, for which there are currently limited technical options? This is a question that the industry is working on but still needs further development.

The floating wind segment presents a great opportunity to advance renewable energy supply and support the offshore and marine industry. But many challenges still need to be addressed to make projects and new supply chain investments financeable and realizable.

Image courtesy USMMA

Critical Thinking Matters on the Bridge

One of the most important skills a Ship's Officer should poses is their ability to recognize when something is out of place. If you don't apply a lot of thought to what you are doing recognizing your mistakes becomes nearly impossible. Thought is required in every step of every process performed on the bridge. With all the modern appliances we use for navigation and collision avoidance today it is very easy to fall into the trap of being reactive to the wishes of the machines without giving much thought to the outcome of our actions. As Instructors we need to constantly reinforce the role that critical thinking plays in our profession. We need to ensure that our students understand that the way the process should always work is that the equipment is there to support their decision-making process not the other way around.

The process 30 years ago was much different than it is today. We manually plotted other ships on our RADAR screen with a grease pencil. We drew course lines on paper charts. Corrections to paper charts were applied by hand. We calculated course, distance and our time of arrival. Our position was something we worked out, not something that we were told. Time was also something we were much more aware of. We calculated the time of sunrise, sunset and local apparent noon. We were much more in tune with the movement of the sun, stars and planets because we used them to fix our position every day. Technology has transformed bridge watchstanding into a much more passive activity. We spend more time observing equipment than being actively engaged in the process and this breeds complacency.

As we train the next generation of mariners we need to ensure that their understanding of the equipment goes beyond what buttons to press. Just as important is how we interpret the data as it's presented to us. We should always emphasize that the output we receive from any machine is based on the input. Just because you see something on a RADAR or an ECDIS screen does not make it the absolute truth. These machines have a variety of input devices that can be subject to error or require additional analysis by the user. An example of this would be speed input. Using Speed over ground or speed through the water as an input can in some cases significantly change the output of your ARPA. Even if both inputs are one hundred percent accurate, they represent two different conditions that can alter the output. Failure to take this into consideration can lead to an inaccurate interpretation of the data as displayed.

Teaching the knobology to our students is normally quite easy. Our students have grown up in a world of computers, tablets and smart phones. The operator segment is rarely a problem. This allows us to spend the bulk of our time looking at the details of how the equipment is set up. In all of our labs

The Author

Ryan

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

the students will spend almost as much time setting up the equipment as they spend underway. Students are required to look at all inputs and ensure they are properly set for the current conditions. They examine the satellite geometry of the GPS in order to determine its level of accuracy. They will determine what information is displayed as well as the alarm settings. The students are observed by the instructor as they set up the equipment and throughout the underway portion of the exercise. The student's final evaluation isn't just based on the success of the voyage, the efficiency of how they used the equipment is just as important. By requiring this level of set up each time the hope is that it will force the students to assume a more active role and get them into the habit of constantly thinking about whether or not the current display settings are giving them all the information they require. Programming the equipment every time they use it gives them ownership; it forces them to think.

When I teach collision avoidance, I require the students to tell me what they think the new course is before they work it out on paper or perform a trial maneuver on the ARPA. My goal is to get them into the habit of thinking about it prior to the calculation that way if they make a mistake it will be much easier to recognize. Think before you execute.

The question we should constantly ask our self is, am I using this equipment in order to make an informed decision or am I blindly following its direction. If we are not fully engaged in the decision-making process then we can never recognize when something isn't right. Technology does not relieve us of our responsibility to think.

Prying Gas Stoves from Dead Fingers

By Rik van Hemmen

When Greg Trauthwein offered me a column in ***Maritime Reporter & Engineering News***, I received little direction with regard to subjects. I have not yet tested his boundaries of my subjects, and maybe, some day, I will try to slip in a column on the role of nautical fiction in the development of modern literature.

So far, I have tried to stick with engineering subjects, although recently I may have pushed the boundaries with discussions on decision making, esthetics and OODA loops.

It occurred to me that in writing on those subjects I had skipped past an important engineering subject that also is not commonly discussed in engineering curriculums.

That subject is data. Data is essential, any discussion on a problem without a solid grasp of data is pointless.

The late Senator Patrick Moynahan is said to have expressed this as:

"You are entitled to your opinion. But you are not entitled to your own facts."

As an engineer I am not sure I agree with the statement. I think it would be more accurate to say:

"You are entitled to your opinions, but not if they have no basis in fact."

Undoubtedly there are complex problems with limited facts where there may be varying solutions and thereby different opinions, but in real life there are even more simple problems that lead to simple factual solutions and therefore clearly flawed solutions should be strongly denounced. That is an exhausting prospect and the real solution actually relates to training people to actually look at data and facts and to draw proper conclusions.

The concept of facts is not uniform in the human condition. To an attorney a fact may be an utterance. This results in cross examination questions like: "Mr. van Hemmen isn't it a fact that Mr. Soandso told you on such and such date that he had seen pigs fly? Yes, or no?" To an attorney the fact is the noise, but to an engineer the message in the noise is the fact, and flying pigs is far from a fact.

So, let's stick with the term data and define it as a verifiable truth. On a philosophical level one can argue that nothing is truly verifiable. One can never know that what one perceives as life is not actually a dream. But allow me to proceed within my dream in a rational fashion. The best truths are the truths that are personally verifiable and repeatable. As such, if I poke myself in the eye it will hurt and will hurt again if I do it again. Then we can proceed with baby steps and assume that if one gets tackled by an NFL linebacker it will probably hurt. Not too far from there, we have schools and text books, which can be quite unreliable. Fortunately, today, we have Wikipedia which is actually more verifiably reliable.

We all know that not everything on the internet is true, but even that is becoming more interesting since at some stage ChatGPT may be able to filter out ungrounded opinions.

And there are so many ungrounded opinions, and they all rely on broken facts.

Take gas stoves.

Yes, gas stoves obviously produce combustion products and therefore may cause health issues. Is it bad? It could be, but, so far, there is no data that indicates people with gas stoves die more readily than people that use electric stoves. Let's face it, we have survived leaded gas, lead paint, loss of ozone, PCP's, DDT, raw sewage and coal soot. A reasonable assumption is that maybe it makes sense not to burn natural gas in the house, but in the whole context of things it is not COVID. Meanwhile too many people love their gas stoves and would never switch to electric.

Imagine switching to an electric stove! Their lives will be over! Maybe gas stoves will be outlawed! We'd better form a "You Can Pry My Gas Stove Out Of My Dead Hands" PAC!

And we are off to the races. I have even heard committed environmentalist complain about the prospect of having to switch to electric stoves.

The bizarre thing is that everything in that discussion is based on bad data.

Let's step through this:

1. Conventional electric cooktops don't work as well as gas cooktops.
2. Induction cooktops work as well as gas cooktops and have many additional advantages
3. Gas cooktops and gas ovens are energy hogs compared to electric ovens and induction cook tops

4. Electric energy can be sustainably provided and natural gas cannot
5. Since there are better technical and environmental solutions, there is absolutely no reason to continue to use gas stoves.

Some of my readers may go: What? No! Electric cooktops suck!

Please do yourself a favor and get the dope on induction cook tops. They are magically good, respond faster than gas stoves, are safer, cost no more than gas stoves, use less energy and are easier to clean. Yes, you need pans that work on induction stoves, but you may very well already own such pans without knowing it, and pans are much less expensive than stoves.

Having said that, let me make a confession. My gas stove broke last year (A leaking valve that would cost more to fix than the cost of the whole range). I went to the store and looked at induction stoves and then went: "I just don't have the time and mental energy to find an electrician and wait for him to show up and install a 240 VAC outlet near my stove. I'll just get another gas stove".

Due to a momentary lack of energy, I am now remarried to a gas stove for another 30 years or so. That is despite the fact that on my boat I have a $300 two burner 1500W induction cooktop that is better and cheaper than any gas cooktop that is available for installation on a boat.

When I confessed my bad decision to a friend of mine, she sent me links to two startups that are going to produce convection stoves with built in batteries. Since stoves run intermittently, and only for short periods at maximum power, that is a wonderful hybrid solution that fixes two issues: power outages and the need to install 240VAC outlets. Once the stove is charged, 1500W with battery backup will always be enough to keep the stove properly powered. A classic hybrid solution, that immediately points to additional benefits such as having battery power to keep a nearby fridge running during a power outage.

So what is the cause of this whole debate?

To some extent it is public ignorance. Induction stoves have been around for 40 years, but somehow never became part of the public stove discussion. Less than 5% of all stoves are induction stoves.

However, I am going to blame the original publishers of the air quality studies. Somehow these researchers found it to be more important to report a problem than a solution.

There were two ways to convey their findings: "Bad news! Gas stoves may be killing your kids" or "Good news! The negative effects of gas stoves can be forever solved with a simple switch to induction stoves". Somehow researcher decision making skills don't match their research skills. As engineers, let's not make the same mistake.

For each column I write, MREN has agreed to make a small donation to an organization of my choice. For this column I select No Limits Café. Induction for Cooking Instruction. https://www.nolimitscafe.org/

Image courtesy Harvey Gulf

OSVs: POWERING THE NORTH AMERICAN MARITIME FUEL TRANSITION

The fuel switch in maritime is on, it's real, and it will be driving vessel design, construction and operations decisions for decades to come. While many still debate the merits of each alternative fuel, OSV industry leaders are at the forefront of driving change, and they need to be, as in North America the OSVs make up 17% of the fleet but contribute 29% of the maritime emissions. ***Barry Parker*** *takes a deep dive into the plans underway to wean maritime operations off fossil fuels.*

Offshore service vessels, along with workboats serving harbors and inland rivers, have embarked on an industry-wide voyage toward reduced emissions of greenhouse gasses. Professor Craig Philip, a faculty member with Vanderbilt University's Center for Transportation and Operational Resilience (VECTOR) and former CEO of Ingram Barge Company, provides this context: "The Maritime Sector has long provided shippers with the most fuel-efficient and sustainable freight transport option, and it has been very exciting for our team here at Vanderbilt to be engaged with the maritime industry, as it embraces new technologies that further also reduce greenhouse gas emissions. And we are particularly proud to be a founding member of the Blue Sky Maritime Coalition (BSMC)."

Founded in 2021, BMSC is a coalition of North American stakeholders with a specific focus on accelerating the transition of waterborne transportation in Canada and the United States toward net-zero greenhouse gas (GHG) emissions.

In July of 2022, it laid out the overall decarbonization challenges for North America. In its publication, "North American Waterborne Transportation Carbon Footprint," BSMC notes that OSVs comprise approximately 17% of the North American fleet, and are the largest single contributor to North American maritime emissions (with maritime CO_2 pegged at 47 million tons in 2018), amounting to 29% of total emissions, as the vessels have relatively high fuel consumption and utilization. The second largest sector for CO_2 emissions is the inland tug and pushboat sector, responsible for 9.3 million tons or 19% of total emissions; followed by the coastal and harbor tug fleet and ferries, with 6.8 million tons and 6.4 million tons respectively.

The BSMC compilations suggest that tankers and Articulated Tug-Barges (ATBs) account for just 3.1 million tons or 6% of total CO_2 emissions in the North American maritime marketplace.

OSV Owners Invest Now

Vessel owners in the OSV, tug, and workboat segments are moving now in their decarbonization efforts. Late 2022 saw an announcement from Caterpillar Marine highlighting an integrated hybrid energy effort to be undertaken with Jackson Offshore.

In announcing a Memorandum of Understanding (MOU) with the offshore operator, the engine-maker said: "The diesel-electric M/V Thunder will be upgraded with a hybrid energy solution to complement its power plant of 2 x Cat 3516 and 2 x C32 generator sets."

Lee Jackson, President and CEO of the OSV operator, said that his company "…is very excited to be partnering with Caterpillar in the development of an energy storage solution (ESS) for our offshore vessels (OSV)."

A major impetus for reducing emissions, with an emphasis on carbon, comes from customers. In the release, Jackson said, "The primary objective of this project is to generate long-term value to our clients as they seek to meet their carbon emissions reduction initiatives."

This was echoed at a late November 2022 Marine Money event held in New Orleans; panelist Shane Guidry, CEO of Harvey Gulf International Marine, discussing the company's report detailing 2021 progress on ESG (Environment, Social, Governance) said "We issued <the ESG report> because that's what our customers wanted."

On the same panel, Todd Hornbeck, CEO of Hornbeck International, which issued a similar report, said: "Our industry has always done ESG."

Panel member Quintin Kneen, the CEO of listed company Tidewater offered a different slant, saying: "Our capital investors are all asking about it… because their investors are asking about it…the push towards renewables is here to stay."

OSVs Plot a New Course

The new directions for offshore vessels can be seen from the experience at Harvey Gulf, and its related companies. BSMC, in its July 2022 White Paper, wrote that: "Alternative fuels are the number one factor that can drastically impact the emission profile of an engine."

Just five out of the 1,664 OSVs operate on clean fuel technology in the U.S., and all of them are owned and operated by Harvey Gulf International Marine.

Harvey Gulf's 'green fleet' utilizes LNG and Bio-LNG as the main fuel sources.

At a June 2022 Marine Money event, Dain Detillier, who runs Harvey Gulf's Q-LNG bunkering business, stressed the importance of measuring actual emissions, described the experience with bio LNG in fueling Harvey America (with one part animal waste mixed with five parts LNG) saying: "It became the first carbon neutral vessel in the United States."

Harvey Gulf is also the only operator in the world with Tri-Fueled (Battery/LNG/ Diesel) OSVs.

In its 2021 ESG report, detailing savings from using LNG, Harvey Gulf says, "In the early stages of analysis, we have shown savings of nearly 130 metric tons of CO2" <compared to diesel operation, on a monthly basis>.

The report also details Harvey Gulf's pioneering moves in energy storage, noting that its Harvey Champion was the first OSV to be battery-powered, in 2020, and its Harvey Energy was the first to be tri-fueled (diesel/LNG/battery).

Harvey Gulf and Hornbeck have both been working closely with SailPlan. SailPlan's Captain Steve Bomgardner, Director of Business Development, when speaking at the recent autumn 2022 conference, reiterated the need for actual measurement of emissions, rather than approximations, in optimization. Fellow panelist, David Cummins (President and

eWolf tug refueling at Corvus shoreside charging station.

Images courtesy Corvus

CEO of the BSMC) talked about Harvey Gulf's experiences, noting that after fitting SailPlan kit aboard Harvey Power, it realized that "station-keeping" was actually its biggest source of emissions.

Bomgardner, describing experiences with one customer's dual-fuel vessels, detailed a finding where running on marine diesel, rather than LNG operation, led to reduced carbon emissions in a particular circumstance.

The message from Bomgardner and Cummins was that actual readings, rather than formula-based estimates, are key for optimizing fuel usage.

The American Bureau of Shipping (ABS), in a report developed around data from Vanderbilt University's VECTOR, looked closely at the inland sector, with findings relevant to offshore vessels. It offered that electrification, with its need for recharging, made sense in fleet boats and towing vessels not working continuously.

The authors noted that: "Biofuels and methanol are feasible non-fossil fuel alternatives because they can be used in some existing marine engines and are supported by current infrastructure."

In looking at the "energy density" of alternative fuels, the report points out: "Only biofuels can be currently stored and used in existing onboard fuel tanks and would provide nearly equivalent power."

One shipyard, Master Boat Builders (MBB), has been at the forefront of the push towards electrification in the workboat sector. In the spring of 2022, the Coden, Alabama yard, delivered a hybrid (Caterpillar diesels and generators) tug to Seabulk Towing, with a design from Robert Allan Ltd.

The vessel, Spartan, which can operate using the Tier 4 main engines, generators, or both- linked to propulsion motors from ABB, has been doing escort work along the Texas Gulf Coast; a second vessel has also been commissioned.

Also under construction at MBB is eWolf, an all-electric tug scheduled for delivery to Crowley later in 2023.

The boat, with a 6.2 MWh battery developed by Corvus Energy and integrated into an ABB electric propulsion system, will be deployed in San Diego, handling ship assists.

Shoreside charging will be done through a pair of Corvus Orca BOBs (the Corvus battery, housed in a 20' container), at quayside when the tug is between jobs. The ABB piloting kit (which could support future autonomous operation) links to a pair of L-Drive azimuth thrusters.

Image courtesy CREST Wind

1. CREST Wind (Crowley / Esvagt) SOV to be built by Fincantieri's Bay Shipbuilding.

2. Tug Spartan operated by Seabulk Towing.

3. Hydrogen One, EBDG's design being built for Maritime Partners.

Image courtesy Master Boat Builders

Image courtesy Maritime Partners

Methanol & Hydrogen

Methanol and hydrogen have been touted as "future fuels," though, the future is happening quickly with the "e-1" methanol to hydrogen generator developed by Element 1, an Oregon-based small-scale, manufacturer of advanced hydrogen generation systems.

Importantly, a lead investor in the company's e1-Marine division is Maritime Partners LLC, a financier (and owner and lessor) of vessels serving the inland sector.

e-1 Marine has been actively marketing a technology where hydrogen fuel cells, which generate electricity similar to batteries, are fed hydrogen produced by a proprietary onboard system "…where methanol is stored in conventional tanks and water is added on-the-go."

Maritime Partners will be the owner of Hydrogen One, a tug designed by Elliott Bay Design Group, to be built at Intracoastal Iron Works near Houma, La., which will deploy the technology. The boat, to be equipped with electrical power distribution and automation technology from ABB, will be chartered to American Commercial Barge Lines (ACBL). Its development team says that the vessel (with economics comparable to a newbuild with a Tier 4 diesel powerplant) could operate over four days in between refueling of methanol, which they suggest is readily available.

The naval architects at Glosten, working closely with ABB, have developed a design (referred to as SA-100) for a harbor tug with L-Drives, powered by methanol-fueled gensets, or,

alternatively, by batteries. Zero emission operation would be possible in the battery mode (which could also be used for peak shaving); the batteries can be charged from the gensets, eliminating the need for lengthy times alongside the quays.

The offshore wind segment, driven by efforts to reduce emissions, with its new fleet of vessels, will be a showcase for alternative fueling technologies.

Empire Offshore Wind, a joint venture between Equinor and bp developing a windfarm in the New York Bight, south of Long Island, has awarded a lengthy charter on a service operations vessel (SOV) to Edison Chouest Offshore (ECO), which will be building the vessel at its Gulf Coast yards.

According to Equinor, "the plug-in hybrid service operations vessel (SOV) will be the first in the US offshore wind sector capable of sailing partly on battery power."

The SOV will sail into the port of South Brooklyn Marine Terminal on battery power, recharge the battery using shore power and sail out of New York Harbor."

Operating under a 10-year charter (with an optional renewal), it is expected to begin service in the mid-2020s.

Fincantieri's Bay Shipbuilding, Sturgeon Bay, Wisconsin, will be building a new SOV for CREST Wind, a joint venture between Crowley Maritime (which will operate the vessel), and the Danish offshore specialist ESVAGT. Diesel-electric powered thrusters have been part of the HAV 832 SOV design, utilized by Esvagt in the North Sea and Baltic regions.

In the more distant future, offshore wind turbines might be used in the production of "green hydrogen", which, in turn, would support production of other green fuels.

Planners have already set their sights on using these fuels to power vessels that serve the wind sector.

Wind turbine maker Siemens Gamesa, which will be chartering the CREST Wind SOV, to be delivered in 2026, in a long-term deal, for work in Dominion Energy's Coastal Virginia Offshore Wind project, sums it up in a recent whitepaper, saying: "Green hydrogen and derived fuels, such as green ammonia, will allow us to put wind power into the fuel tank of a … ship."

RESOURCES:

ABS Report on Decarbonization in the Inland Waterway Sector (prepared by Vanderbilt)
https://absinfo.eagle.org/acton/media/16130/decarbonization-of-the-inland-waterway-sector-in-the-united-states

Blue Sky Maritime Coalition White Paper: North American Waterborne Transportation Carbon Footprint
https://www.bluesky-maritime.org/_files/ugd/8ed502_e544d4d81fc74de9a528b3191fb779a9.pdf

Harvey Gulf Sustainability Report:
https://harveygulf.com/sustainability/esg-report/

Hornbeck Sustainability Report:
https://hornbeckoffshore.com/company/sustainability

Tidewater Sustainabilty Report:
https://www.tdw.com/wp-content/uploads/2022/05/Tidewater-Inc-Sustainability-Report-for-2021.pdf.pdf

Crowley Sustainability Report:
https://www.crowley.com/wp-content/uploads/sites/7/2022/06/Crowley-2021-Sustainability-Report-Final.pdf

Interview: Kevin Sligh Sr., Director, BSEE

After his first year on the job, Bureau of Safety and Environmental Enforcement (BSEE) Director Kevin Sligh Sr. discusses the myriad challenges and opportunities ahead for offshore energy development. While the Bureau of Ocean and Energy Management (BOEM) handles the leasing side and permitting side, BSEE now owns the engineering reviews. With a sharp focus on safety, enforcement and compliance on the Outer Continental Shelf (OCS), Sligh and his team eye the challenges and opportunities in building out offshore wind to the targeted 30GW of offshore wind power by 2030 and another 15GW from floating wind by 2035.

By Greg Trauthwein

How do you see the U.S. offshore energy production changing, and what are some of the key safety and environmental concerns from the BSEE'S perspective?

The first few [Offshore Wind] projects' Construction Operation Plan (COP) were approved by BOEM years ago, and we're starting to look at those engineering reports. The COP is the envelope of what could be built from a turbine and electrical substation facility off the coast. And now we're getting into what they really want to put on the OCS, as in a few years technology changes, from the monopiles to the supporting beam to the blade sizes. Now we're taking a harder look to make sure that the plans are sound and structurally safe before we give a no objection. We are committed to this administration's 30 by '30, which is 30GW (of offshore wind power) by 2030, and then 15GW by 2035 for floating offshore wind. We are learning as fast, and while I don't want to say we're building an airplane while we're flying, we're close to it, and we are exceeding our expectations on these first few projects.

What challenge does BSEE's responsibilities on offshore wind bring to the organization, and how is regulating offshore wind energy different compared to your usual work in the offshore oil and gas sector?

While we are the lead for safety and environmental enforcement and compliance, BOEM is responsible for the leasing and the NEPA [National Environmental Policy Act] work that goes on. So in conjunction, we are both leads; we just have our respective lanes. Now that the split has occurred, we are coordinating reviews. Those FDR [Facility Design

"I've challenged my team to say, 'Hey, we need to really get our arms wrapped around these safety standards.' We don't need one company like Equinor or Ørsted or Dominion working on their own. We need to have consensus-based safety standards that will then be incorporated by reference back into our new 285 Reg that we anticipate we'll be putting out a notice of proposed rulemaking by the end of the year."

Kevin Sligh Sr., Director,

Bureau of Safety and Environmental Enforcement (BSEE)

Image courtesy BSEE

Report] and FIR [Fabrication and Installation Report] reviews are being coordinated between BSEE and BOEM. We've brought on the Army Corps of Engineers and their engineering expertise to help us do the facility design and facility installation reviews moving forward. As offshore wind ramps up and Congress has provided us personnel to do the work, we're in the process of a huge hiring phase, hiring new engineers to be able to do the work and also building out and creating standard operating procedures and notice the lessees to make sure that we're as transparent as possible in communicating with industry.

[Looking at how oil and gas differs from offshore wind], I think they are different risk profiles, and in the future, I will flag carbon sequestration, as we're currently working on a rule with BOEM to figure that piece from a regulatory standpoint. [While offshore oil and gas and offshore wind] are different risk profiles, ultimately, it's all about trying to deliver energy for our country.

How does BSEE see offshore wind energy developing in the coming five years?

Great question, Greg. Within the next five years, we're expecting approximately 24-25 offshore wind projects on 19 leases to be in commercial operations or the late construction phase. By 2028, we'll be up to almost 2,000 turbines on the OCS on those 19 leases, along with 44 electrical substations offshore.

Think of the floating production facilities in the Gulf of Mexico and off the coast of California, 44 of those alone off the east coast [with more to come on the west coast and Gulf of Mexico]. With that, this administration is focusing on high-paying union jobs and skilled positions to be able to build out all of the different needs that are going to occur on the OCS. We're going to stimulate local economies.

What do you see as the primary challenges to having offshore wind energy develop as you envision?

This industry's been around for a long time; onshore here domestically, offshore internationally. There's a lot of regulatory insights that the international community can bring to bear and help us out with. But I go back to my Coast Guard and FEMA emergency management roots; it's coming up with consensus-based safety standards. That's going to be the challenge.

You have different entities … American Clean Power … American Petroleum Institute … the Offshore Operators Committee here in the U.S., and other organizations that are all working on their own standards. I've challenged my team to say, 'Hey, we need to really get our arms wrapped around these safety standards.' We don't need one company like Equinor or Ørsted or Dominion working on their own. We need to have consensus-based safety standards that will then be incorporated by reference back into our new 285 Reg that we anticipate we'll be putting out a notice of proposed rulemaking by the end of the year.

Staying on that safety note, can you describe BSEE's process for conducting inspections of offshore energy production activities and specifically how it ensures adherence to those safety regulations?

In the case of [offshore] oil and gas, we have about 120 BSEE inspectors that go out on the road to the Gulf of Mexico, to the west coast, and to Alaska to conduct risk-based inspections.

We're in the nascent stages of building out what that's going to look like for offshore wind. Do we need that many inspectors to fly out to these turbines? I don't think so. Do we need inspectors to be able to go onto these electrical substations? Of course.

So right now, we're working on an inspections program for offshore wind … an inspections program to make sure that the OCS as it relates to offshore wind, oil and gas, and in the future, carbon sequestration, stays as safe as possible.

What do you see as some of the technological advancements that BSEE is currently looking at to improve the safety and environmental protection in offshore energy production?

Technological advancements can stem from various operations engaged by a production facility. Initiatives can span from routine activities, such as accessing a vessel/tank for cleaning and inspection through cameras/devices to serve as visual aids and to eliminate confined space hazards for personnel, or non-routine activities, such as enhancements for monitoring subsea wells to clearly and definitively observe pressure fluctuations that indicate potential leaks to highly specialized project requiring specialized technical abilities, such as High Pressure – High Temperature projects to new technologies available to address oil spills, such as the Low-Emission Spray Crude Oil Combustor technology [also known as the BSEE Burner].

BSEE's Environmental Compliance Program (ECP) works with BOEM OCS resource leads to assess improved methodologies/new technologies intended to decrease/negate environmental impacts during offshore operations. Examples include the bureaus' coordination with NOAA and NASA on the use of satellites for OCS emissions and discharge detection to help identify chronic violators and assist in inspections, and work with the National Marine Fisheries Service (NMFS) on equipment/methodologies that could be employed during construction/decommissioning operations to reduce noise (pressure-waves/acoustic energy) and poten-

tial impacts on Marine Protected Species.

BSEE ECP also proposes, helps fund, and participates in research led by BOEM's Environmental Studies Program (ESP) that focuses on detection, monitoring, and control devices that could be used to improve environmental protections during OCS energy operations.

What do you see as some of the challenges that the offshore energy industry as a whole will face in the coming years, and how is BSEE preparing to meet those challenges?

The offshore environment is dynamic with certain inherent risks. The offshore energy industry, whether conventional oil and gas or offshore wind, has been at the forefront of advancing technologies, and our continued ability to keep pace with those advances is critical. To do this, we must continue to attract a diverse, talented workforce with skills and expertise in both conventional and renewable energy operations. At the same time, our sister agency, BOEM, has provided incentives, through recent offshore wind lease sales, to the offshore wind industry to provide for workforce training and supply chain development as they work to develop their leases.

What are some of the cybersecurity challenges that the offshore energy industry faces, and specifically, what is BSEE doing to address these challenges?

Last summer when I came on board, GAO [U.S. Government Accountability Office] sent out a report with some recommendations for BSEE to take a look at offshore oil and gas from a cybersecurity perspective. We're at the point now where we're actively building out a cyber strategy here in BSEE as it pertains to being a regulator.

The industry players maintain their own systems, and we're starting to make visits to some of the industry players down in Houston to take a look at their Emergency Operations Centers (EOC) to understand what they're using and ensuring that they have adequate resources to handle cyber. I think industry knows it and gets it. There may be a few players out there, a few of the [mid- and small-sized] entities which I'm more concerned about. But from what I'm seeing, oil and gas companies understand the threat and the risk.

Looking at offshore wind, these electrical substations are going to be connected to the grid. So we're also talking to offshore wind developers about their connections to the grid; their infrastructure concerns.

Can you discuss BSEE's efforts to train and equip its workforce? I know you talked about staffing up, but do you have enough people to manage the workload?

We're growing, Greg. Our most valuable asset is our workforce, our team players, and everything that we can do to get everything that they need is critical. We also have something called the National Offshore Technical Center (NOTC) which produces about 23,000 contact hours per year on training, and it's everything from oil and gas to offshore wind, and now, too, even carbon sequestration.

Watch the full interview with Kevin Sligh Sr., Director, Bureau of Safety and Environmental Enforcement (BSEE), on Offshore Engineer TV.

OETV

Editor's Note: *The preceding is a compilation of both Offshore Engineer TV's video interview with BSEE Director Kevin Sligh Sr. and written responses to questions via email. It has been edited for brevity and clarity.*

All images courtesy Curtin Maritime

Mining for GOLD

The United States historically has been a capitalist's dream, providing opportunity to those with a vision and the gumption to take the risks to turn that vision into reality. ***Martin Curtin,*** *a young tugboat captain with a dream and an entrepreneurial spirit, started Curtin Maritime in 1997, growing the business from a single, converted large army tug to a company with a large and growing fleet, employing 270 today. While the company succeeds, it and its brethren face challenges aplenty, choked by regulation; and increased costs to find and groom the qualified crews to power the next generation.*

By Greg Trauthwein

All images courtesy Curtin Maritime

Curtin Maritime Mariners

Like most CEOs, Martin Curtin holds his employees in the highest regard, and likens the process to find them as mining for gold.

"We don't really create mariners, we uncover them. ***We equate it to mining for gold.*** *The miner doesn't invent the gold, he just finds it and then polishes it up. Sometimes it's in the form of ore and they have to process the ore to get the gold out, but you've got to run a ton of yards of dirt to get some gold."*

Martin Curtin, CEO
Curtin Maritime

More than 25 years ago Martin Curtin took a leap of faith, betting on himself to make his dream reality. "In 1997 I identified a boat – a single screw Cooper Bessemer LS6 direct reversible Army LT," said Curtin. "[A company in] Seattle had done some twin-screw conversions on that class in the past; I had worked on one and liked it."

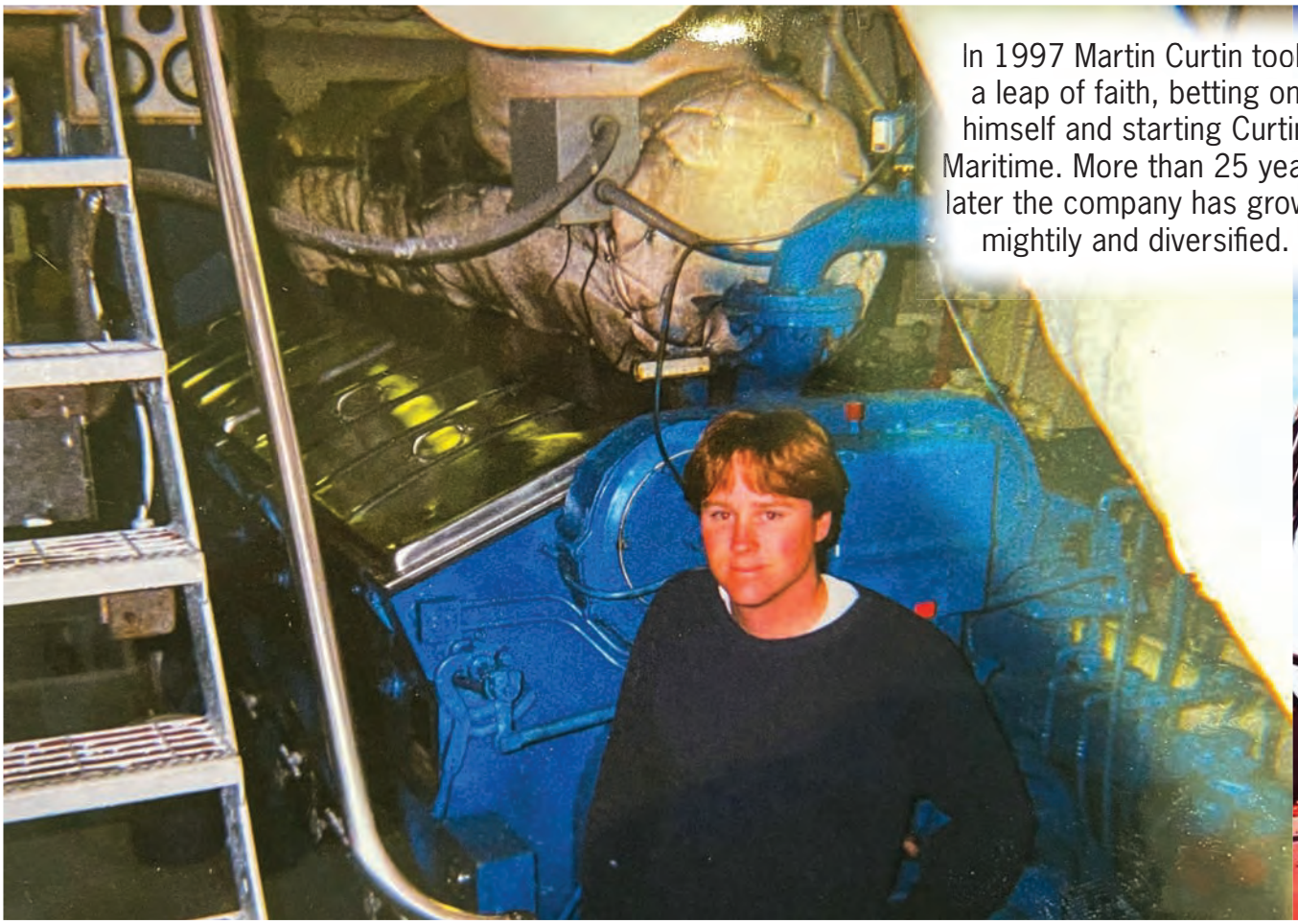
So Curtin embarked on the arduous journey of doing a twin screw conversion, installing a pair of 12-cylinder EMDs and adding Cort nozzles. "That vessel was named Seana C, our original tug," said Curtin. "I didn't really understand how complicated the West Coast towing market is, but I knew that I wanted to be a tug boat captain and I wanted my own tug."

'Complicated' is an understatement, as California possesses some of the most onerous environmental regulations for the maritime industry on the planet. Curtin does not shy from making investment in technology and tonnage to improve its carbon footprint, but he laments regulators that force unobtainable technology goals via legislation.

"It's extremely difficult to do business in California, and if I were starting Curtin Maritime today, it would probably be impossible for me to be home ported in California," said Curtin. "I don't think that our state legislation is aware of the impacts that it's going to have long term, and we're taking it on the chin as far as the regulations go. What we're hoping is that, eventually, when the fanfare of the news cycle goes down, that regulators will start to be realistic."

Curtin Maritime Today

Starting with that single twin-screw tugboat, in the early years Curtin Maritime was on a subtle growth trajectory, building its second boat in 2007, the Sarah C. With its first tug it was capable of the big jobs – 80,000-barrel oil barges and 12,000-ton rock barges – playing in the consistency of the contract towing world. With the Sarah C the company switched gears, moving into the spot market. "We switched into the spot market when we built the Sarah C because we figured we could make more money, and we went from a 3,000-hp, 107-ft. boat to a 1,500-hp, 65 ft. boat," said Curtin. "[While it may have seemed] counterintuitive, we fell into a niche, and through that niche we started doing a lot of work supporting marine construction and dredging. That's when we started to realize that our skillset was well-suited specifically



In 1997 Martin Curtin took a leap of faith, betting on himself and starting Curtin Maritime. More than 25 years later the company has grown mightily and diversified.

All images courtesy Curtin Maritime

to mechanical dredging."

That started the company on a faster growth track, from two employees in 1997, to 20 employees in 2014, to 50 employees in 2016, to 100 employees in 2019, and to 270 employees today.

In 2015 Curtin Maritime built its first pair of dump scows, while also adding a second tug, the Kelly C, a full rebuild and repower.

"Today we operate a fleet of 14 tugboats, four crane barges and five split haul dump scows up to 6,000 yards, as well as two ABS load line ramp barges," said Curtin. "We have an ABS load line four by one in our fleet, the Lost Point. And then we have about a half a dozen inland service charter barges that are spread out between San Francisco Bay, San Diego and LA/Long Beach. We have 185-ft. Tier Two DP1 crew utility vessel that we operate, the Rebekah C," as well as numerous additional support vessels.

The Curtin Maritime tugboat fleet is an older fleet. "The majority of our ocean boats are 1970s vintage, but they were all specifically purchased for performance reasons," said Curtin. "We have a lot of McDermott 126 hulls with Nautican packages on them that outperforms anything built today. All of our big ocean boats were specifically purchased for their offshore towing performance."

While older tugboats mean proportionately higher operating expenses, Curtin said "at the end of the day we have good fuel efficiency, high bollard pull, high towing speeds, and we can offset the age of the vessel and the maintenance cost by performance. The majority of our tugs have either been totally reconditioned or repowered by us. We strategically buy older assets, but very specific ones."

For its capital dredging side of the business, Curtin Maritime builds new because the majority are barges, "and barge cost is a little more palatable."

The company recently commissioned three 6,000 cubic yard dump scows through Gundersen, and it built the DB Avalon, "with what is the largest capacity clamshell dredge in the Americas on it."

"We have another large-scale clamshell dredge that we'll be commissioning in mid-2024, and a series of dump scows that will go along with that," said Curtin. "So we're going to be probably build vessels for the next five years to round out our mechanical dredging side of our business and then obviously the marine transportation component that goes along with those scows and those rigs."

Today Curtin Maritime is dredging in its single largest awarded contract, the Houston Ship Channel deepening and expansion – Project 11, a project that will widen the channel by 170 ft. along its Galveston Bay reach, from 530 to 700 ft. It will also deepen some upstream segments to 46.5 ft.

"We've built the DB Avalon specific for deepening projects," said Curtin. "So all of our focus is in that large scale capital dredging, we feel that there's a lot of opportunity for us there."

Regulation

Martin Curtin grew up on Catalina Island off the California coast, and in his youth spent his free time in the water fishing, spear fishing, boating and camping on the beach. "I want to protect our environment probably more so than anyone," said Curtin. But he laments that some of the decisions being made by regulators are "purely political fodder that ultimately has a negative net impact because of the fact that the rules aren't enforceable."

"One of the things that we try to explain to our local regulators is you can't create innovation through regulation," said Curtin. "It's never worked historically, but they don't seem to understand that."

He said programs like the Carl Moyer Memorial Air Quality Standards Attainment Program, which provided grant funding for cleaner-than-required engines, equipment, and other sources of air pollution, is a positive example of technology investment to cut emissions, as the Carl Moyer Program was implemented as a partnership between CARB and California's 35 local air districts. "But our current regime, for lack of a better term, seems to have another agenda," said Curtin. "They just passed some crazy harbor craft (emissions) rulings that are completely unobtainable."

[**https://www.marinelink.com/news/californias-proposed-harbor-craft-rules-497103**].

In summarizing his sentiments on the state of maritime regulation in California, Curtin is succinct: "I'm pleasantly optimistic because I'm just tired of being depressed over it."

Energy Transition

Most emission reduction conversations start with alternative fuels, and in assessing the current mix of fuels being touted, Curtin sees some interesting options. But like the majority of vessel owner/operators, he is waiting to see how fuel availability and distribution evolves before staking the future of his company on one choice, citing the viability of methanol fuels in California but the lack of infrastructure to deliver it when and where needed. "You can have the best engine in the world, but if you can't get the fuel, it's a waste of time."

Apart from where they operate, Curtin said just as crucial

The Curtin Maritime tugboat fleet is an older fleet. "We have a lot of McDermott 126 hulls with Nautican packages on them that outperforms anything built today. All of our big ocean boats were specifically purchased for their offshore towing performance."

All images courtesy Curtin Maritime

One Technology: Vessel Management Software

In discussing maritime technology trends with industry leaders, ***MR*** always ask for 'the one technology' that in and of itself makes the biggest difference in efficiency and/or safety. Martin Curtin was succinct: new-generation vessel management software (VMS).

Curtin sees modern, centralized VMS as a tremendous tool. "It's creating more of a Pavlovian response for our mariners to go to our Helm Connect vessel management software for everything."

Curtin Maritime uses VMS extensively throughout full vessel operations: "I mean everything down to the deck hand's rounds of cleaning toilets. Mariners know that every time I come on watch, I grab my cup of coffee, I grab the laptop or the tablet and I log in, I put my engine hours in and then my daily tasks." The VMS adds accountability for mariners and crews, creating a central repository for all tasks.

But there's more.

"Being a mariner by trade, a lot of people are hesitant to point something out because then they are the ones that have to deal with it. This is where the term 'pencil whipping' comes in," said Curtin. "They go down into the forward fore peak and see a cracked frame and they may say, 'man, I don't want to have to deal with it.' So they just ignore it."

Curtin said the new VMS has effectively helped eliminate a lot of the pencil whipping, as the problems become a shared or reassigned task. "That's probably the thing that's been the biggest benefit for us safety-wise; taking the onus off the crew a little bit and spreading it back to shoreside, creating more of a village atmosphere."

When Curtin built the Sarah C it went to the spot market. "We fell into a niche, and through that niche we started doing a lot of work supporting marine construction and dredging. **That's when we started to realize that our skillset was well-suited specifically to mechanical dredging.**

deliver the performance needed. "LNG is something that's interesting, specifically where LNG is combined with electric [citing Harvey Gulf's success with the set-up. But [there has been bad luck with] LNG direct propulsion because it just doesn't create the torque," he said.

All things considered, Curtin likes the idea of pure electric based on the simplicity of the system, but admits that for the type of work Curtin Maritime does, it simply does not fit. "It's really like a Tesla versus a Prius, when you start doing hybrid componentry with diesel and batteries and all other things, it becomes extremely complicated."

Today the Curtin Maritime's strategy lies in running boats with highest tier rating possible, but stresses that his home state of California is making even that extremely difficult. "We've got boats that have been repowered within the last year that will be outdated and ruled out within three years: that's kind of criminal in my opinion," said Curtin. "Granted, we'll be able to move those boats to other markets that don't have the emissions ratings that California does, but if California's not careful, they'll have nobody playing with them anymore."

Workforce: Mining for Gold

In assessing the company he started with his company today, Curtin reckons that the closest similarity and biggest differences boils down to a single factor: people.

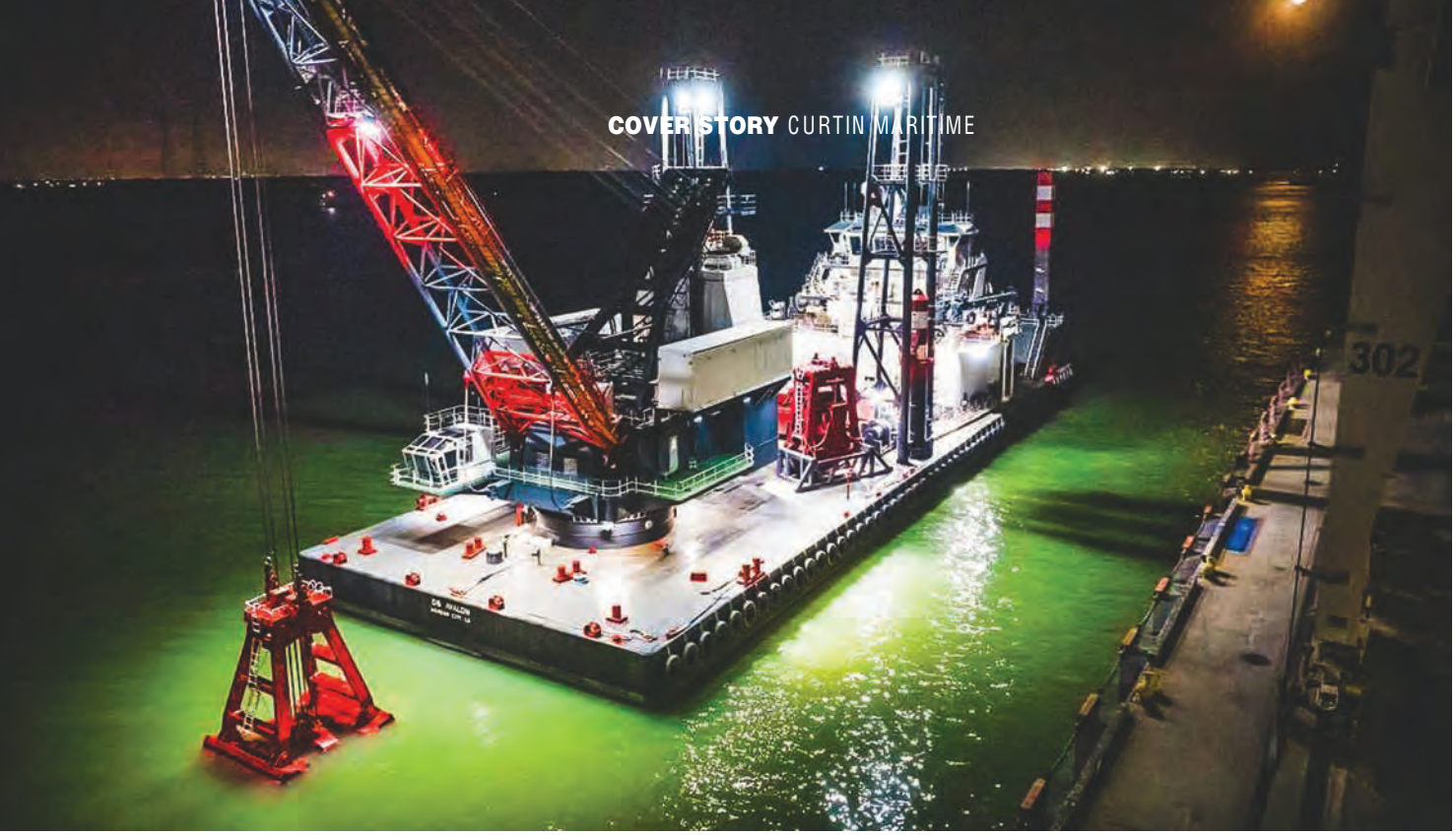
"We've always prided ourselves on a group that provides really solid technical solutions and technical skillset," said Curtin. "I describe our company as a boutique company in the sense that we're not very large compared to some of the industry giants, but we are extremely sophisticated, and what we are able to do far outpaces our physical appearance. But when you go from five to 270 employees, the ability to maintain that standard becomes the most difficult part, maintaining that culture and those foundational components."

Another challenge is finding the employees and crew to power growth. "It's probably the single biggest challenge that our industry is facing … and that's really saying something considering I'm sitting in California getting hammered on emissions. But the personnel issue is a bigger problem for the entire industry."

He believes there remain ample talent to fill the positions, but today it takes far more time and resources to find them.

"Twenty-five years ago, my generation was a little rougher around the edges and looking for more adventure, plus we didn't have the technology dependent issues that today's generations were born with," said Curtin, estimating that 'back then' 50 to 60% of deckhand applicants would work out, where today there is a 70% to 75% attrition rate. "What we've discovered is that just like anything else, we don't really create mariners, we uncover them," said Curtin. "We equate it to mining for gold. The miner doesn't invent the gold, he just finds it and then polishes it up. Sometimes it's in the form of ore and they have to process the ore to get the gold out, but you've got to run a ton of yards of dirt through your mine to get some gold."

"There's still a lot of good fits out there for the maritime industry, but if you need 20 deckhands, you can't just hire 30 and keep 20. If you need 20, you need to hire 100. [Once they're here] it's really about creating a solid career path and timeline, showing them that if they make captain or chief engineer, eventually you'll be making $150,000 a year."



CASE STUDY:
Palmyra Atoll Wreck Removals

While each maritime project comes with its own unique challenges, Martin Curtin said the Palmyra Atoll wreck removal project that it conducted with Global Diving and Salvage for Federal Fish and Wildlife stands out. Located just more than a thousand miles due south of Hawaii, Palmyra Atoll houses a pristine reef ecosystem where Federal Fish and Wildlife has a partnership with the Nature Conservancy for a research station. "It's like the tropical version of Palmer Station," said Curtin.

High wide aerial shot of Palmyra atoll. U.S. Minor outlying Island.

With a crushed coral landing strip and no refueling on the atoll, Curtin said, transport options are limited. "You can charter a G5 out of Hawaii to get there, as it's the only jet that's big enough to get there, land turn around and take off and come back on one load of fuel."

He said the project was interesting for a number of reasons, three different wreck removals that called for custom-built tooling and processes to ensure zero net impact on the reef systems during that process.

For Curtin Maritime is was a six-month dock-to-dock project, and Martin was on it the entire time. "I towed two barges out to Hawaii, where we resupplied and took on additional equipment."

Then he took the trek from Hawaii to Palmyra Atoll, spent three months there and then back to Hawaii and then back to the West Coast.

Pre-planning and logistics were essential, because a charter flight from Hawaii to the job site was $50,000. "So if you needed an outboard prop because you wrecked your unit in the skiff, it was $50,000. And we were a really small company, probably 15-18 people at the time. We meticulously planned that project and performed, and we ended up removing twice the amount of scrap wreck than they had funded, so they went back to Congress mid-project and got additional funding."

PLOTTING YOUR COURSE

All images courtesy Sofar Ocean

*Sofar Ocean is on a quest to extract and put to use data from the world's waterways. Co-Founder and CEO **Tim Janssen** discusses how his team's hyper-focus on data is helping to improve weather routing via Wayfinder.*

By Greg Trauthwein

Tim Janssen and his Sofar Ocean team continue their 'Epic Ocean Data Quest,' remaining laser focused on doing its part to help extract and put to use increasing quantities of information from the world's oceans. For its part, Sofar continues to build scalable networks to gather information premised on its Sofar Spotter buoy. Today, Sofar Ocean has more than 2,500 sensors deployed worldwide, an array that provides more than 200,000 daily updates on ocean weather globally, helping forecasters to improve their forecasts by up to 40%.

While Janssen admits that weather models today do a reasonably good job, the key to making them even better lies in the amount and the quality of information being put in. "I think step one is acknowledging that models are only as good as the data you put into it," he said. "Assuming that the model can do that reasonably well, the way to make them better foundationally is put more information into them; that's why we are hyper focused on creating large networks of sensors … [the oceans are] a very big place."

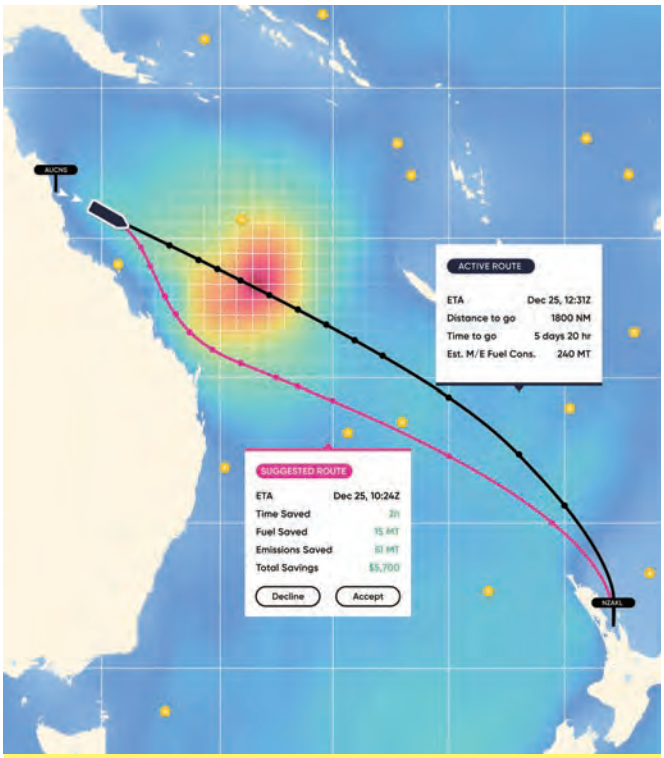
"The principle's very simple, technically it's described as data assimilation, which basically means we're taking all the sensor information we can get our hands on … our own network of thousands of sensors worldwide, satellite data, data from public networks … and we put all of that information into our models on the 'now' state. We tell the model, 'look this is what we know about how the weather is behaving right now, take that, correct whatever you thought was going on, and translate that into what will be happening in the future.'"

"We run our own operational numerical weather forecast models in the cloud, gathering all of this information every six hours, getting everything together, running a forecast cycle, and basically improving the forecast, reducing the uncertainty. From the ground up, the whole system is designed to be a very effective way of reducing uncertainty in forecasts," said Janssen. "How cool is it that a small team like ours can actually run numerical weather forecasts in the cloud? That's cloud computing; it wasn't possible five years ago."

So melding sensors – sensors low cost enough to allow deployment at scale – with IoT capabilities plus real-time connectivity to drive that information to the models creates a dynamic and powerful value proposition.

Wayfinder

Wayfinder is a dynamic voyage guidance system, designed to deliver the most efficient and least weather-restricted speed and waypoint recommendations to a fleet. Powered by Sofar Ocean's global network of ocean sensors, helping to produce



Wayfinder is a dynamic voyage guidance system, powered by Sofar Ocean's global network of ocean sensors, helping to produce accurate marine weather forecasts and inform detailed Vessel Performance Models (VPM).

accurate marine weather forecasts and inform detailed Vessel Performance Models (VPM).

"We built this platform for maritime shipping that's going to help reduce emissions. It's going to be tying into new CII regulations, and it's going to help the industry accelerate its journey towards a more carbon-free future," said Janssen.

Core to Wayfinder's capability is the real knowledge of what weather is happening and is forecast to happen at certain spots in the ocean.

While he admits that Sofar Ocean may be late to the game – considering the amount of time, money and effort shipowners have already poured into optimization; from hull design to weather routing, to propulsion technologies and appendages, to coatings – Janssen believes the holy grail of true optimization is still a ways off for many companies. "I think a lot of ship owners have already invested quite big into technologies to improve their vessels without really knowing what it's going to do for the performance," said Janssen.

He sees the vessel voyage optimization conundrum as stretching far above and beyond simply knowing the weather, as the factors that go into the decision-making process are complex and dynamic, including the weather, vessel specific performance criteria and market variables too, such as the cost for arriving early or arriving late. By incorporating a vessel's specific business and safety constraints, Wayfinder continuously provides operators and crew with the most optimized speed and routes possible.

"What we're trying to do is change the paradigm altogether," said Janssen. "Every six hours is an opportunity for change. Market variables are volatile, fuel prices go up and down daily, weather changes every three hours. To 'set it and forget it' would be a very bad idea if you're thinking about a transoceanic voyage that could be 30 to 40 days."

Every six hours, Sofar Ocean runs through its optimizations based on the latest, comprehensive weather data integration, helping to deliver the next strategy. While getting the best data, processing and delivering strategy is the hard part, Janssen said "we solved that problem." The next challenge is engaging will all partners to both implement, execute and track the strategy to receive tangible results.

"Wayfinder is hyper focused on delivering the best routes and optimization of both waypoint selection and speed. It is optimized to make sure that everybody's looking at the same information, it is on board and onshore, and basically making sure that there is seamless interaction on the same information and that adherence of the best strategy is maximized," said Janssen.

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MARITIMEJOURNAL BOATINGBUSINESS

eOdyn: The Ocean in Motion

Why install sensors aboard, when the ship itself can be the sensor?

By Tom Ewing

Image courtesy eOdyn

Sea Tech's theme in 2022 was "Towards Smarter and Greener Solutions." Safety and efficient operations are fundamental priorities for maritime companies and agencies, from research to defense. Now, concerns about fuel and carbon add new complexities and pressures to decisions about voyages and at-sea operations.

Vessel routing has critical environmental issues. The most efficient course will likely require less fuel. Taking advantage of real-time ocean surface currents offers new possibilities for efficient navigation.

eOdyn is a maritime software company based in Plouzane, Brittany, near Brest. During Sea Tech week, Yann Guichoux, eOdyn's CEO and co-founder, met with a select group of journalists to present and describe how eOdyn uses big data to provide new capabilities delivering measurable benefits to shipowners and to the planet.

eOdyn's technology – in a product called SeaWaze – analyzes ships' AIS (automatic identification system) data that is automatically uploaded to satellites. (100,000 vessels are at sea every day.) eOdyn has built what Guichoux refers to as "Omni-Situ" (OS) technology. For SeaWaze, each ship is an ocean-based sensor. A machine learning algorithm takes the satellite data to create a high-resolution, spatiotemporal ocean surface current map that presents information in near real time and at global scale.

"With SeaWaze," Guichoux explained, "we can provide customers with services that help reduce the environmental footprint of their activities and mitigate risks at sea." Shipping accounts for about 3% of global greenhouse gases. With SeaWaze a vessel can reduce fuel consumption by an average of 5%, Guichoux said.

Historically, ocean currents have been measured using buoys, which are difficult to place, or altimetry satellites, a limited resource since there are only seven in orbit. OS technology generates current information anywhere there are ships – importantly, anywhere there is human activity, e.g., submarines, emergencies, and oil spill response.

"Ocean currents provide information about conditions that affect the performance of sonars used to locate submarines," Guichoux explained, adding that eOdyn "validated our data with the French Navy in 2022 and qualified it for military use." Additionally, SeaWaze data can improve drift predictions for a person overboard, helping to target search areas. Data on ocean currents can help track pollutants at sea to better prepare cleanup operations. (US agencies use a network of coastal high frequency radars for this kind of tracking.)

eOdyn's OS technology is completely digital and provided in SaaS ("software as a service") mode. Guichoux said new service capabilities are planned for 2023, including development of an onboard system called eObox to deliver the real-time ocean currents data to ships at sea.

In the Shipyard

Latest Deliveries, Contracts and Designs

OPV P71 Delivered

Image courtesy Cantiere Navale Vittoria

The flag of the Republic of Malta waves on the Offshore Patrol Vessel P71 to celebrate the entry into service of the new flagship of the Armed Forces of Malta built by Cantiere Navale Vittoria.

At the AFM naval base in Floriana, Valletta, the official delivery ceremony was held for the largest patrol vessel ever built by Cantiere Navale Vittoria. The 75-m unit, built in Italy, will be used in coastal surveillance operations, extended patrolling on the high seas and Search and Rescue operations.

OPV P71 is the result of an order with a total value of more than 50 million euros, obtained by the Venetian company through participation in a pre-selection first and in an international public tender. Measuring 74.8 x 13m and a draft of 3.8m with a full load displacement of over 2,000 tons, OPV P71 can accommodate a crew of nearly 50 and an additional 20 staff. The platform is characterized by an elevated bridge with 360-degree vision capabilities, equipped with ballistic protection, with protected side passages for personnel on the main deck and around the same bridge.

The ship has an aft flight deck, designed to accommodate a telescopic hangar, with equipment for day and night flight operations as well as refueling for a helicopter up to 7 tons such as the AW139 supplied to the Armed Forces of Malta. The aft area below the flight deck features a launch and recovery ramp for a 9.1-meter RHIB with additional space for materials and personnel as well as hatches on the flight deck above for loading / unloading materials thanks to a special service crane placed on the side of the vessel.

A second station also for RHIB of 9.1 meters is located on the starboard side of the platform in the central area of the ship with compensated A-frame crane to launch and retrieve the RHIB even with units underway. Both RHIBs reach a maximum speed of over 40 knots and provide ready aid to the maritime traffic control and search and rescue operations in which the mother unit is engaged. The propulsion of the P71 a pair of medium speed diesel engines, 5,440 kW each, which move variable pitch propellers and drive the ship, at full load, to a maximum speed of over 20 knots. Alternatively, the ship can be propelled at patrol speeds between 9 and over 12 knots by two electric motors keyed to the power take-off of the gearboxes (PTI) and powered by two of the three main generators of 750 kW, medium speed, the ship is equipped with: this diesel-electric solution at patrol speed allows greater efficiency, reduced consumption and above all lower harmful emissions for the most widely used speed spectrum of the unit.

The vessel is equipped with two transverse thrusters, one forward and one aft, and retractable active stabilizing fins that guarantee great stability and seaworthiness. Designed and built under the surveillance of ABS, the P71 is equipped with a 25mm remotely controlled weapon and light machine guns of varying caliber while the integrated command, control and navigation system includes a 2D surveillance radar, a navigation radar and satellite communications.

LNG Bunker Ship Launched in China

Alice Cosulich, the first of two Small Scale & Bunker Vessels for Fratelli Cosulich Group was recently christened and launched at the CIMC SOE shipyard in China. Giulia Cosulich, ESG Corporate Director at Fratelli Cosulich Group, acted as the godmother of the vessel. Alice Cosulich and will sail under the Italian flag with Captain Vincenzo Scotto at the helm. The vessel, which has a 5,300 DWT and can carry 8,200 cu. m. of LNG and 500 cu. m. of MGO, will be fitted with Wartsila's Dual Fuel technology. The most efficient 'boil off' treatment techniques will be offered by the LNG subcooling plant, eliminating any potential environmental effects and minimizing cargo losses. Delivery of the vessel is scheduled for September 2023.

Image courtesy Fratelli Cosulich Group

In the Shipyard

Latest Deliveries, Contracts and Designs

SHI, Kongsberg Ink Pact to Develop Autonomous LNG Carrier

Samsung Heavy Industries Co. (SHI) and Kongsberg Maritime (KM) signed a Joint Development Project Agreement (JDA), an agreement that serves as the basis to develop a design for next-generation 'autonomous' 174K LNG Carrier. In the partnership, SHI will be system integrator with overall design responsibility, while KM will be responsible for the integrated solution designs and have the role as a strategic partner. Last year, SHI completed a successful demonstration of its autonomous navigation technology using a 9,000 ton ship, and has been developing cybersecurity solutions for autonomous ships using Blockchain technology, introducing innovative autonomous operation technology.

Samsung Heavy Industries

EnerGia Coal Carrier Named Kagura

The 235 x 43m, 99,990-dwt coal carrier Kagura for the Chugoku Electric Power Co., Inc. (EnerGia) was delivered at Oshima Shipbuilding Co. Ltd. Under a long-term transport contract with EnerGia, the vessel will use carbon offsets to theoretically reduce its greenhouse gas (GHG) emissions to zero for the entire contracted voyage, making the marine transport of coal under the contract carbon neutral. The ship's name, Kagura, is derived from Iwami Kagura, a masked traditional performance art loved by the people of Japan's Chugoku region.

Fully Electric Harbor Tug Named

HaiSea Marine, majority owned by Haisla Nation in partnership with Seaspan ULC, celebrated the naming and blessing of its tug boat fleet – which includes what is touted as the world's first fully electric harbor tug boats, along with dual fuel (LNG and Diesel) escort tug boats. Once delivered, the green fleet will provide ship-assist and escort towing services to LNG carriers calling at LNG Canada's new export facility in Kitimat in the traditional territory of the Haisla Nation. Members of the Haisla Nation joined representatives from Seaspan, HaiSea Marine and LNG Canada for the naming ceremony at Sanmar Shipyards in Istanbul. The HaiSea fleet will include three fully electric tugs … the ElectRA 2800 and two dual-fuel (LNG and Diesel) tug boats, which are RAstar 4000-DF escort tugs and with 100 tons of bollard pull.

In the Shipyard

Latest Deliveries, Contracts and Designs

NH3 FPSO Concept

Image courtesy DNV/SwitchH2 BV

An industrial scale concept for a floating production unit to produce green ammonia has secured Approval in Principle (AiP) from DNV, and the project is now ready to start the Basic Design phase.

The NH3 FPSO concept is being developed by Netherland-based SwitchH2 BV and Norway-based BW Offshore and will be built through conversion of an existing Very Large Crude Carrier (VLCC) or a dedicated newbuild vessel. Receiving power primarily from a wind farm, the unit will produce hydrogen by electrolysis of seawater and nitrogen through the use of an air separation unit, combining these in an ammonia synthesis unit.

The ammonia gas produced by the unit will be condensed, and the liquid ammonia will be stored in the hull in order to be subsequently offloaded to an ammonia carrier. The NH3 FPSO will be permanently moored but can be relocated as necessary through planned disconnect. The offloading will be done through a floating hose, reeled from the aft ship to the shuttle ammonia carrier midship manifold.

Future-Fuel-Ready Courage Enters Service on the Rhine

Copyright: Covestro Deutschland AG, Michael Rennertz

Following a successful initial loading operation and maiden voyage on the river Rhine, Covestro and HGK Shipping GmbH put into service the new low-water vessel Courage at the beginning of March. Designed future-fuel-ready, it is designed to supply the material manufacturer's customers with finished products from the company's business sites in North Rhine-Westphalia. Sister vessel Curiosity was scheduled to be delivered a few weeks later. The two low-water vessels sport a diesel-electric drive system, which enables the operator to reduce the CO2 emissions by up to 30 percent when compared to vessels that are currently in service. Both vessels can be modified to handle new types of fuels such as hydrogen as soon as these fuels are ready for general market use. The ships can even be used if the water level in Cologne is just 40 centimeters deep and therefore operate even if water levels are extremely low. The vessels are therefore very important, particularly for the factories in Leverkusen, Dormagen and Krefeld-Uerdingen. About 30 percent of the materials produced are shipped from these facilities to customers along the river Rhine.

Majestic Fast Ferry Adds Vessel Trio

Image courtesy Incat Crowther

Singapore's Majestic Fast Ferry Pte welcomed the arrival of three new Incat Crowther-designed passenger ferries: Majestic Peace, Majestic Spirit and Majestic Flair are the first of a fleet of nine Generation 2 Incat Crowther 39s vessels to be added to Majestic's fleet.

Built in Indonesian shipyard PT Cahaya Samudra Shipyard and classed by BV, the 39m ferries are capable of transporting 312 passengers at speeds of up to 32 knots. The main deck seats all 312 passengers in air-conditioned comfort. Powered by a pair of MTU 16V2000 M72s driving FP propellers and generating 1930hp each @ 2250 rpm, the 128 x 32.8 ft. ferries have a service speed of 28 knots and a top speed of 32 knots.

In total, nine more Incat Crowther vessels are in build at PT Cahaya Samudra, including the three new 42m vessels. Majestic Glory and Majestic Honor, the fourth and fifth 39m Generation 2 ferries, will be completed and delivered shortly.

New Concept Targets Heavy Lift for Floating Wind

Image courtesy Damen

The advent of offshore floating wind will demand new vessels concepts, and Damen delivers via its FLOW-SV vessel concept, designed to install ground tackles for offshore turbine floaters. The vessel can load the immense lengths of chain needed to install and secure 9 anchors or suction piles. Instead of mooring 1 floating windmill in a mission, three can be secured. It also applies sufficient proof loading on the anchors to make the installation more efficient.

"With the FLOW-SV, we have developed a vessel which covers the entire process of attaching mooring lines. This vessel, combining the supply, installation, securing and inspection of the ground tackles for floating turbines in one vessel, introduces a big step forward towards large scale installation of floating windfarms," said Wijtze van der Leij, Damen. "At the moment, we are still in the concept phase. But we are now entering a stage where we would like to partner up to refine and customize this concept."

Measuring 150 x 32m, FLOW-SV is a big ship to handle the size and weight of anchors and chains needed for installing

Image courtesy Damen

offshore floating wind turbines, larger than traditional anchor handling vessels. FLOW-SV will be designed to take all materials and equipment needed to install 3 floaters to save time on loading and transit.

When Damen engineers defined the amounts of gear that the FLOW-SV needs to take onboard to be able to install three floaters in a base case of 100m water depth, their calculations added up to:

- five km of chain (chain links of 152 mm diameter)
- 4.5 km of fiber rope of 112 mm diameter
- 9 anchors each weighing 15 tons, and
- about 100 clump weights of 10 tons each, plus D-shackles, tensioners, as well as steel cable.

Getting the gear to the place of operation means the vessel carries a load in excess of 4,000 tons. Depending on seabed conditions, depth and windfarm operator requirements, anchors can be replaced with suction piles to provide a secure ground tackle.

When deploying the anchors at sea, the chain is guided to large winches on the forward end of the large open aft deck, from where it leads over the deck to the stern where it is deployed into the water. A 250-ton crane (at 12.5 m reach) with active heave compensation is installed along the aft deck's starboard side while two smaller cargo rail cranes are available for handling gear on deck. A triple drum anchor winch can deploy 600 tons pulling force.

A unique feature of the FLOW-SV is the combination of bollard pull generated by the thrusters and added pulling force from the bow reaction anchor winch. This adds up to 1,000 tons of proof load. The FLOW-SV deploys the bow anchor and embeds it by reversed bollard pull. She then moves to the spot where the anchor for the floater needs to be installed. After letting out enough chain length, the anchor for the floater needs to be proof loaded, ensuring a secure seabed connection. Using the four thrusters, FLOW-SV has 400 tons of bollard pull. Pulling strength is enhanced by the forward anchor handling winch, that generates another 600 tons. At that moment, approximately 1,000 tons of proof-load is acting on the turbine floater anchor.

Two fixed propellers in nozzles and two azimuthing thrusters at the stern propel the FLOW-SV and provide forward bollard pull. These propellers in nozzles turn 180 degrees to provide ample reverse bollard pull when the bow anchor is set. The azimuthing thrusters are also engaged for dynamic positioning, together with the retractable azimuthing thruster and tunnel thrusters in the bow section of the vessel.

Sea bottom inspection is needed to determine the best spot to install the anchor. FLOW-SV has two work class ROVs with two separate control rooms next to a moonpool. After installing the anchors for the turbine floater, the ROVs can be deployed through the moonpool for inspection of the anchor.

Employment

Chevron Corporation has an opening for a Automation, Electrical, Navigation & Communications Engineering Superintendent in San Ramon, CA. Job duties include operational technical support of 30 internationally trading Oil & Gas carriers focusing on the complex shipboard systems and visit vessels in US domestic waters and across the globe to consult with company operators and contracted vendors. Travel to domestic and international vessels required. The position requires a Bachelor's degree in Electrical engineering or a related field, or equivalent and 84 months of experience in the job offered or a marine-related occupation. In lieu of a Bachelor's degree the employer will accept 2 years of work experience. The compensation for this role is listed on this posting in compliance with applicable law. The selected candidate's compensation will be determined based on his or her skills, experience, and qualifications. The anticipated salary range for this position is $179,754 – $190,000.

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