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MARITIME REPORTER AND ENGINEERING NEWS

SINCE 1939

March 2019

One-on-One with Expedition Cruise Pioneer

SVEN LINDBLAD

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Corrosion Control
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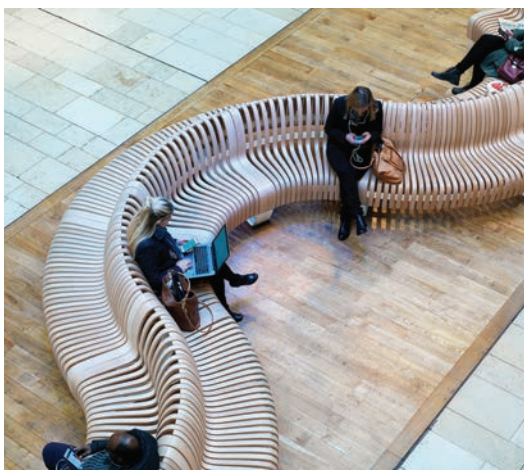

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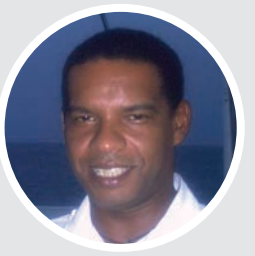
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Editorial

Cruise Control

Cruise shipping has always been an interesting sector of the maritime market, equal parts hotel accommodation/entertainment and maritime technological evolution. Cruise shipping maintains its torrid pace of growth, with 30 million passengers projected to take a cruise in 2019, up nearly two million from the previous year, according to the Cruise Lines International Association (CLIA) *Cruise Trends & Industry Outlook*. In addition, CLIA members, which account for the lion's share of the global fleet, will count 272 vessels by the end of 2019, 18 delivered this year alone. While the number of vessels is a small fraction of the overall global fleet, the industry collectively continues to wield significant influence, a driver for technology, innovation and environmental stewardship that has infiltrated other sectors.

Our report 'Smooth Sailing' kicks off this month's cruise coverage, and here author Barry Parker seamlessly melds a report that provides both insight on the financial side of the business as well as the technical side. While much of our focus rightfully is gazed on the two publicly traded behemoths – Carnival Corp. and Royal Caribbean – we also venture inside MSC Cruises, the industry's largest privately owned company which is in the midst of an unprecedented **$13 billion expansion** that will bring its fleet to 25 vessels by the mid 2020's. As has been the trend in the sector, these ships are big, and next to deliver from the Chantiers de l'Atlantique yard at St Nazaire, France, are MSC Bellissima and MSC Grandiosa, the first of two Meraviglia-Plus ships (6,335 passenger capacity) will come into service in 2019. Further out on the MSC horizon are two new Seaside class (5,646 passenger capacity), and four dual fueled World Class vessels (6,850 maximum passenger capacity).

Is Bigger Better?

Contra to the 'bigger is better' philosophy is the subject of our cover story, **Sven Lindblad**, a true pioneer in the Expedition Cruise sector. In fact, a big part of the growth story in cruise is the rapid development of the expedition, luxury expedition and river cruising sectors, with a long list of new players and vessels.

The seeds for the feature on Lindblad – which starts on page 34 and runs through 41 – were planted last year when I was in Tianjin, China, for The 4th China Maritime Finance (DFTP) Summit, including day one dedicated exclusively to the growth and future for China's cruise industry. It was here that I met **Nikolaos Doulis**, Senior Vice President, New Buildings, Lindblad Expeditions, who previously was with Celebrity Cruises for 24 years, leaving in 2017 as the Director of Fleet Operations. During our time together in China Doulis was effusive with his enthusiasm for the expedition cruise sector and his admiration for Sven Lindblad, "one of the best bosses I've ever had." Hailing from Sweden but currently residing in New York City, Lindblad is an explorer at heart, counting **Capt. James Cook** and **Sir Ernest Henry Shackleton** as heroes, and according to Doulis Lindblad is "one of the most well-travelled people on Earth." Lindblad Expeditions' alliance with National Geographic allows him to take people to the Arctic on cruise ships filled with teaching moments that transform passengers into stewards of our planet, as above and beyond all else he is about helping to uncover yet preserve some of the world's less-known wonders.

While the Lindblad expeditions ships are smaller, they deliver a big experience. The latest under construction is *National Geographic Endurance*, a vessel that Doulis calls "the best expedition vessel ever built." Being built in Norway at Ulstein and scheduled for delivery in January 2020, the big differentiator on Lindblad Expeditions ships are the space allocated for guests: the 12,400 gt Endurance is being built to accommodate 126 passengers whereas similar sized vessels for others are designed and built to accommodate 200 to 250 passengers.

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SubM

What a Long, Strange Trip it's Been

Orange Beach, Alabama: I've never actually been here before, and it is a (long) 40 minute drive south, once you exit I-10. It's worth the visit. Who knew? Some of the most beautiful beaches I've ever seen. I'll definitely be back. But, enough about me.

At the TBS 2019 Conference, Pat Folan and his TBS crew have organized a well attended event that centers on the process of obtaining a COI under the new subchapter M rules. A raft of tug and towboat operators – most of them smaller outfits – who have embarked upon the subM journey, traveled to Alabama from all over the country. Also in attendance is the United States Coast Guard. In the middle of my one-week, four-state epic journey across the breadth of the U.S. Gulf Coast, I popped in to catch the best of this event, now in its second year.

The Coast Guard Option

The conference kicked off with a primer on the so-called 'Coast Guard' option. Presenting this information were three Coast Guard representatives from the local sector, who also fielded a flurry of questions from operators thirsty for a better understanding of the process and its many timelines. For its part, the Coast Guard did not disappoint. And their view of the ongoing journey to compliance for as many as 5,300 previously uninspected vessels (nationwide) begins right at here at USCG Sector Mobile, Alabama. It turns out that subchapter M, even for the Coast Guard, can be a moving target, and a regulatory mission that many of their inspectors are still sifting through, just like the rest of us.

Probably the most telling part of the Coast Guard's presentation involved the disclosure that as many as many as 670 vessels (as well as reoccurring deep draft work) fall under the supervision of this sector (Mobile), including 210 inspected towing vessels. In stark contrast, just four qualified inspectors are available to handle that workload. We asked if it was realistic to expect that those four individuals could possibly handle that volume, especially with the introduction of the subM work to the mix. What followed was a roundabout reply that concluded with advice that encouraged operators (especially those considering the Coast Guard option) to contact and coordinate with their local OCMI's as soon as was possible. "July 20 is just around the corner," said the Coast Guard presenter. It certainly is, or operators previously operating in an uninspected world, subM brings many adjustments to day-to-day operations. For those smaller, one and two-boat operations that didn't have the financial wherewithal to participate in the AWO's RCP program, the gulf widens. Manning and personnel management is just one of many areas of (new) concern.

Towboat operators accustomed to carrying all sorts of miscellaneous extra personnel to construction, dredging and other such endeavors will now have to account for who and how many are allowed on board, who is not, and provide accommodations for those who are. The days of hot bunking are over. Separately, the geographical coverage for a vessel accustomed to impromptu deviations from rivers over to lakes and then to near ocean service will forever be more closely defined. If it isn't allowed on the COI, you shouldn't be there and if you do go, and there is a casualty, it'll impact not only your punishment but your insurance coverage, as well.

Oh, and depending on where you get permission to roam, that might now require the installation of EPIRBs. And, like their blue water cousins, strict adherence to the Coast Guard minimum rest period rules will be enforced. For an industry deeply invested in the "six on / six off" culture, the balancing act will be an interesting one to watch develop. Likewise, security was discussed as an increasingly important aspect of towboat operations. No longer can an unmanned barge necessarily be left unattended at a terminal – not unless the terminal itself is so certified to provide the level of required security. Coast Guard personnel from Mobile reported this week that this was already becoming an issue.

There are myriad kinks to work out of the system. Reminiscent of the 'venue shopping' that eventually led the Coast Guard to consolidate the 17 Regional Exam Centers (REC) into one central hub of authority in Martinsburg, WV, towboat operators who operate between and straddle multiple Coast Guard sectors can do a little venue shopping of their own. Don't like the answer you get in Mobile? Well, take it up river for another opinion.

For its part, the Coast Guard says that they are aware of the situation and that, "OCMI's have telephones, and they frequently talk to one another." Despite obvious headcount restraints in terms of available local subject matter experts, Coast Guard personnel this week insisted that they will do all in their power to make the bridging process work for those who choose the Coast Guard option. To that end, they were reaching out into the local towing community to ask, "Where are you in the SubM process," and, reminding them of impending deadlines, asking, "How are you going to get there?"

As of November 6, a rundown of Sub-

chapter M progress, IAW with all Coast Guard Districts, shows slow progress towards the finish line, with almost 75% of all operators choosing the TSMS option. By year end 2018, only about 200 COI's had been issued nationwide for an estimated target fleet of 5,300 vessels. Hence, if you are shooting for the Coast Guard option and aiming to beat that July 2019 deadline, but also haven't yet contacted your local OCMI, you're unlikely to make the deadline. What then? Coast Guard Sector Mobile couldn't say what the penalty for that might be – they were standing by for advice from headquarters.

The TPO Side

TBS Founder (Captain) Pat Folan was next up to brief attendees on what they could expect if they went the TPO route. There was something for everyone: good news, bad news, laughter and tears. Getting right to the point, he started off by saying, "The little guy can make it." And, despite TSAC predictions that as much as 30% of operators could drop out because they are unable or perhaps unwilling to meet subM requirements, Folan insists that the trend thus far has been nevertheless encouraging in that regard.

For example, it turns out that more than a few one boat operations were evolving into two boat firms through mergers and acquisitions. The expectation that larger operators would quickly swallow up these entities hasn't yet materialized. For these still tiny enterprises, the TPO's and other firms – like TBS, for example – are there to guide them through the sometimes confusing labyrinth. Folan's folksy presentation, built on decades of on-the-water experience in this wide reaching sector and a lot of common sense, resonated well with his audience.

Folan quickly addressed the news that there was no firm answer to the question of what would happen to those who could not comply by July 20. He advised simply, "Let's not find out." And then, having gotten the full attention of a room primarily consisting of one and two tug operators, he gave them the somber news that a fully compliant quality system can take as many as seven years to implement. That's a tall order for some operators, especially those whose primary business target isn't necessarily marine towing operations, and who also only have until July to get at least part of it done. One member of the audience put it best when he deadpanned (tongue in cheek), "My firm owns and operates two towboats; that's by necessity, not by choice." More than a few heads in the room bobbed in agreement.

The nature of the industry became fully transparent when Folan revealed that his business mix involves an impressive 50 firms, but who also operate just 127 vessels. And that metric is at the heart of the matter when it comes to who might survive, and who will not. The quality of an operator's marine personnel and the rate of turnover in those fleets are both key indicators of whether an operator can make it to the Promised Land.

Folan, of course, also led the gathered towboat operators through the bits and pieces, forms and rules, and the ideal sequence and timeline that might lead to a successful outcome. But, for all that, simple compliance isn't enough. In the pages of *MarineNews*' January 2019 print edition, for example, Captain Lee Boone, Chief of the U.S. Coast Guard's Office of Investigations & Casualty Analysis, warned readers, "The fear of getting bitten by the U.S. Coast Guard is NOT why you should have a SMS. Fear usually gets you compliance at best, concealment at worst; falling far short of the target for which we all should be aiming … For all its merits, however, we should all keep our eyes open for the pervasive by-product called compliance culture, wherein safety is static, only achieves the minimum, and exists mostly to satisfy regulators; all of which leads to overconfidence in our system, which can be dangerous."

Captain Boone was, in that context, talking about passenger vessel operators. But, he could've been talking about any number of domestic marine sectors. Separately, Folan this week expressed the same sentiments a little bit differently, telling his listeners, "You want a Captain who can run a waterway, but also one who knows how to run a boat." The message from both is clear: compliance, without 'buy-in' from the personnel tasked with making it happen in practice, is arguably as dangerous as no safety system at all.

Success Stories

Folan wound up his Day One remarks by reassuring those in attendance that not only was compliance possible, the smaller mom and Pop operators can and should achieve excellence, as well. To that end, everyone – top to bottom, from the CEO right on down to the newest deckhand – had to be fully invested in the journey. He pointed to Marine Towing of Tampa as one such example. The recipient of the first ever COI under the subchapter M rules, the firm now impressively has all of its four boat fleet in compliance.

For those that follow this lead, it will indeed be a long strange trip. At the same time, the dialogue at this year's TBS Conference showed that anyone can do it. That said; whichever route you do choose, the time to pick up the pace is now. Sure: we don't (yet) know what will happen if you don't. But Captain Pat Folan puts it best when he says, "Let's not find out." I think that's good advice. And, if you made the long journey to Orange Beach and managed to pick up just one gem of wisdom, that's a good one to remember.

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HazSub Spill Response Plans

On August 18, 1990, the Oil Pollution Act of 1990 (OPA 90) was enacted into law. Section 4202 of that Act amended the Federal Water Pollution Control Act (FWPCA or Clean Water Act) to require tank vessels and marine transportation-related facilities to prepare and submit to the US Coast Guard plans for responding, to the maximum extent practicable, to a worse case discharge, and to a substantial threat of such a discharge, of oil or a hazardous substance carried in bulk as cargo. The only real difference between the requirements regarding oil and hazardous substances was that a hard deadline was mandated for oil spill response plans, while there was no deadline for hazardous substance spill response plans.

Working diligently, the Coast Guard, the maritime industry, environmental advocacy groups, and other stakeholders developed regulations for an oil spill response regime and the required plans were submitted to and approved by the Coast Guard within the statutory timeframe. Once that project was completed, the Coast Guard commenced initial planning for the significantly more complex hazardous substance (HazSub) spill response plans. This new project was more complex for a variety of reasons. There are numerous HazSubs (see 40 CFR Part 116), each with its own characteristics.

While oil and oil products are transported by numerous marine carriers and facilities (a few of which require close supervision), HazSubs are transported by a lesser number of marine carriers and facilities, the vast majority of which are highly professional. Thus, HazSub spills are few in number and generally of small quantity. That does not mean that HazSub spills never occur.

On February 28, 2004, the chemical carrier Bow Mariner, sailing approximately 45 nautical miles off the Virginia coast, caught fire and exploded while the crew was engaged in cleaning residual methyl tert butyl ether (MTBE) from cargo tank number eight starboard. The tank vessel sank about 90 minutes later. Of the crew of 27, only eight survived. The cargo of over three million gallons of ethyl alcohol was released, along with the vessel's fuel oil. From an environmental viewpoint, ethyl alcohol is not a designated HazSub and dissipates rapidly in water. Almost all chemical carriers, though, are frequently engaged in the carriage of HazSub and significant volumes of HazSubs are transported through US ports.

Other chemical tanker accidents have been documented. On 17 December 1985, a chemical tanker was loading benzene at a chemical facility in Kurashiki, Japan. A Teflon ring had been inserted between a guide pipe and a float of a level gauge of the tanker to prevent noise. The Teflon ring insulated the float against the hull and an electrical charge accumulated. A spark was generated, igniting benzene vapor in the headspace of the hatch, resulting in an explosion and fire on the vessel, which spread to the pier. The tanker was towed away from the pier. Fires on both the tanker and the pier were extinguished. The tanker suffered extensive damage. On 9 January 2011, the small chemical tanker Seiyo capsized and sank off Sado Island, Japan, spilling approximately 1,000 tons of vinyl acetate monomer. The chief engineer died in the casualty and the master went missing and is presumed dead. On 8 January 2019, the chemical tanker Aulac Fortune suffered an explosion and fire off Lamma Island, Hong Kong, apparently due to the accumulation of flammable gas in a cargo tank. The explosion could be heard up to 20 km away. Of the 25 crew members, one died, and another went missing and is presumed dead.

The lesson to be learned is that marine transportation casualties involving chemical tankers are few in number, but have the potential for high consequences.

The chemical transportation sector has undertaken a variety of measures to minimize the risk of marine transportation casualties. The US Congress, though, was of the opinion that more needed to be done, particularly with regard to coordination between that industry and federal agencies such as the US Coast Guard and the Environmental Protection Agency (EPA). Those agencies have reached the conclusion that the industry efforts are satisfactory.

On 25 June 2018, the EPA issued a notice proposing no new HazSub spill prevention and response requirements under OPA 90. On 8 February 2019, the US Coast Guard issued notices withdrawing its previously proposed rulemakings for HazSub spill response plans for tank vessels and marine transportation-related facilities. The Coast Guard stated in those notices that the proposed rules are no longer appropriate due to the current state of spill response in the chemical industry. The Coast Guard avers that it remains committed to fulfilling its OPA 90 mandate and intends to better analyze the current spill response capabilities of the chemical industry before conducting any further rulemaking in this area.

In my opinion, the EPA action is contrary to the Congressional mandate. The failed Coast Guard rulemaking, on the other hand, constitutes a failure of imagination. While the chemical industry is to be lauded for its safety record, there are certain measures, required by OPA 90, that appear to be missing. The law requires the appointment of qualified individuals empowered to implement spill response plans and the sharing of those plans with the federal government. The chemical carriers and facilities are required to have under contract spill response contractors (similar to OSROs) and salvage and marine firefighting (SMFF) resource providers so that response contracts do not have to be negotiated after a casualty occurs. Regular drills and exercises are also required.

I recommend that the Coast Guard meet with the marine transportation chemical sector and determine which current industry measures can be considered as providing an equivalent level of safety to measures mandated in OPA 90. The gaps identified can then be filled in a rulemaking. This will meet the Congressional requirements while simultaneously improving safety, security, and protection of the marine environment.

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Virginia Targets Offshore Wind

Strong Foundation in Place for Collaboration, Future Success

Virginia officials have established a well-planned, extensive strategy to build out an offshore wind industry, including wind towers for electricity generation and the supply chain to support that extensive infrastructure and operations. The State's big picture is ambitious: developing 2,000 MW of offshore wind by 2028.

As currently envisioned, VA's offshore wind development will likely start this year with two 8-megawatt wind turbines 27 miles off the coast of Virginia Beach. This is a Dominion Energy pilot undertaken in partnership with the Danish wind company Orsted. The project is called "Coastal Virginia Offshore Wind;" it has been somewhat on-again/off-again because of cost recovery issues for DE.

In 2018, however, the regulatory picture changed big-time when VA's legislature passed a critical energy bill called the "Grid Transformation and Security Act." This bill reset emerging renewable energy projects as being "in the public interest" an important change in status allowing a utility to recover at least some costs, say for a research or experimental project, through ratepayers' electric bills.

Another critical building block that emerged in late 2018 was the establishment of an energy related business directory called the "Virginia Offshore Wind Supply Chain Resource Network Directory." Its purpose is to connect "offshore wind developers, wind turbine suppliers

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VIRGINIA'S BIG PICTURE AMBITION IS 2,000 MW OF OFFSHORE WIND BY 2028. AS CURRENTLY ENVISIONED, VA'S OFFSHORE WIND DEVELOPMENT WILL LIKELY START THIS YEAR WITH TWO 8-MEGAWATT WIND TURBINES 27 MILES OFF THE COAST OF VIRGINIA BEACH.

BONDAREFF EMPHASIZED **THE IMPORTANCE OF BVGA'S RECOMMENDATION FOR A CENTRALIZED OFFSHORE WIND OFFICE.** SHE SAID VOWDA, AT ITS MARCH MEETING, WILL WORK ON BEST WAYS TO PUBLICIZE THE NEW SUPPLY CHAIN DIRECTORY.

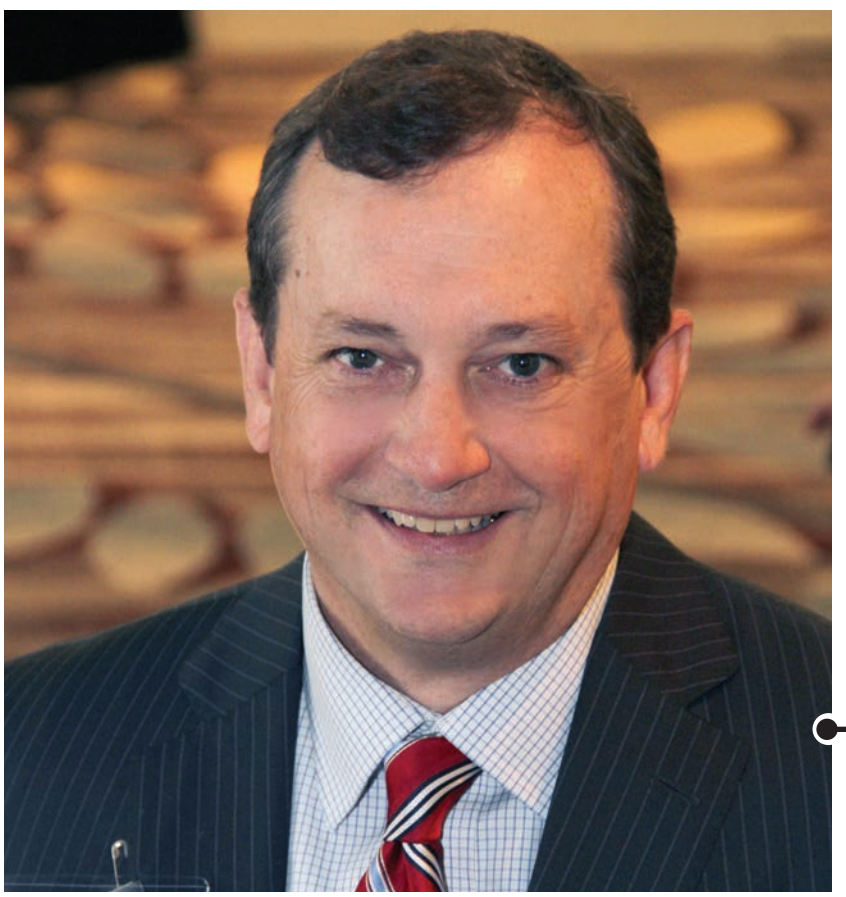
JOAN BONDAREFF,
MARITIME ATTORNEY, BLANK ROME, WASHINGTON, DC & CHAIR OF VOWDA'S NINE-MEMBER BOARD OF DIRECTORS.

Photos: Joan Bondareff

and other prime contractors with Virginia professional services, manufacturers, equipment and material suppliers and other general service providers relative to all phases of an offshore wind project." For details go to the Virginia Offshore Wind Development Authority (VOWDA) website.

Virginia's Department of Mines, Minerals and Energy (DMME) is the lead state Agency for the Directory. DMME has formed a Partnership with the Virginia Maritime Association (VMA) and the Virginia Ship Repair Association (VSRA). This Partnerships Team is focused on identifying current Virginia suppliers with core maritime and manufacturing-related expertise.

The Directory allows a company to present its critical offerings and skillsets. In addition to basic contact information – names, telephone, city/state location, etc. – the Directory lists, very briefly, engineering capabilities, equipment resources, manufacturing abilities, marine services and a brief description of specialized offerings. In mid-February the Directory included 92 companies. Most



Photos: David White

WHITE SAID VMA IS SEEKING WAYS TO **"COLLABORATE TO BRING (OFFSHORE WIND) INDUSTRY TO THE REGION. WE WANT EVERYONE TO 'LEAN IN',"** HE CONTINUED, "TO ATTRACT INDUSTRY, NOT JUST IN VA BUT IN OTHER MARKETS. WE ARE WELL POSITIONED TO PLAY A SIGNIFICANT ROLE FOR CONSTRUCTION, SUPPLY AND SERVICE UP AND DOWN THE ATLANTIC COAST."

DAVID WHITE,
EXECUTIVE VICE PRESIDENT, VMA

were from Virginia, but there were also companies listed from Louisiana, Minnesota and Ohio.

The Directory raises two important questions: (1) Who's looking at the Directory and (2) How will it be used to help build out and operate this massive new energy system? A Directory is of little value if it just languishes somewhere on some obscure website.

These questions are still under discussion. Al Christopher is the Director within DMME's Division of Energy. Christopher said that as wind work starts in VA the Directory serves as a way for a business to "raise its hand and get noticed" by project managers looking for knowledge, skills and abilities.

Currently, the Directory is housed within DMME's operations. That's likely tentative, and DMME staff is evaluating where the Directory would best be placed. One idea is within a possible new "office of offshore wind," or similarly named official site, an idea under consideration within the current Virginia legislative session. Even beyond the Directory, Christopher said that a centralized office of offshore wind would serve as the prime initial contact point for VA's wind projects and related work.

As this is written (mid-February), funding and details for a possible offshore wind office are still in play within VA's legislative session. Unfortunately, time is running out because the session ends February 23. However, some kind of central wind office is broadly supported. Funding for such an office has been part of previous Governors' budgets and it is also one of five critical recommendations presented by BVGA Associates, a consultancy working with Virginia to advance offshore wind.

Another likely scenario for early wind work is through research projects, funded by a mix of federal, state and private-sector dollars. For example, in 2017, the US Department of Energy (DOE) established the National Offshore Wind R&D Consortium. Virginia joined the Consortium this January, along with Maryland and Massachusetts. The Consortium includes established wind energy companies, e.g., Deepwater Wind, Shell and Orsted, as well as the Carbon Trust, the Renewables Consulting Group and DOE's National Renewable Energy Laboratory (NREL).

Critically, the Consortium has money - $41 million funded over four years. DOE pledged $20.5 million: $18.5 million for the Consortium and $2 million for DOE's federal labs to support the Consortium. DOE chose NY State's Energy Research and Development Authority (NYSERDA) – through a competitive process – to be Consortium administrator. With wind, NY is all-in – the state matched DOE's $18.5 million, accounting for almost half of the $41 million total.

To get started, the Consortium has three priority R&D topics:

- Wind plant technology advancement;
- Wind resource and physical site characterization; and,
- Installation, operations and maintenance, and supply chain technology solutions.

This is all new work, really upcoming work. The Consortium held the first meeting of its Board of Directors in October 2018 at which it approved its R&D roadmap, which, importantly, will be updated and kept current, a site to keep on a checklist. (The Consortium is advertising for an Executive Director.) The first R&D solicitation was planned for February. Initial project awards are expected by end of March.

In addition to the regional R&D Consortium, Virginia has its own Virginia Offshore Wind Development Authority (VOWDA), established by the legislature in 2010 "to facilitate, coordinate, and support development of the offshore wind energy industry, offshore wind energy projects, and supply chain vendors" and to establish public-private partnerships to promote offshore wind. VOWDA's focus areas include "identifying regulatory and administrative barriers" and recommendations "to encourage and expedite offshore wind industry development."

Joan Bondareff, a maritime attorney with Blank Rome in Washington, DC is Chair of VOWDA's nine-member Board of Directors. She was asked about priority topics and goals for 2019. Like DMME, Bondareff emphasized the importance of BVGA's recommendation for a centralized offshore wind office. She said VOWDA, at its March meeting, will work on best ways to publicize the new supply chain Directory. Finally, Bondareff supports developing a list of potential public and private "offtakers," potential energy customers, e.g. Amazon2, who might purchase this new energy.

As noted, the Virginia Maritime Association (VMA) is one of the partnership organizations working with DMME to advance wind energy opportunities. VMA has been active in critical areas, beyond its work with DMME. Last fall, for example, it teamed up as a sponsor with the Sierra Club to update businesses regarding wind opportunities. Its recent past president was on VOWDA's Board.

David White is VMA's Executive Vice President and Will Fediw is Vice President, Industry & Government Affairs. They said VMA is pleased by Virginia's moves on offshore wind. VMA largely supports BVGA's recommendations,

one of which, as noted, is establishing a singular offshore wind office. Fediw said that would be a significant first policy move because that new office could then be charged with following up on BVGA's other recommendations (more below).

Regarding the Dominion Energy/Orsted two-turbine pilot project White said VMA is working to educate its members about opportunities. Importantly, and again referencing concurrent state and regional initiatives, VMA's message to businesses is to keep their eyes open for work not just in Virginia but within the multi-state R&D Consortium. White said VMA is seeking ways to "collaborate to bring (offshore wind) industry to the region. We want everyone to 'lean in'," he continued, "to attract industry, not just in VA but in other markets. We are well positioned to play a significant role for construction, supply and service up and down the Atlantic coast."

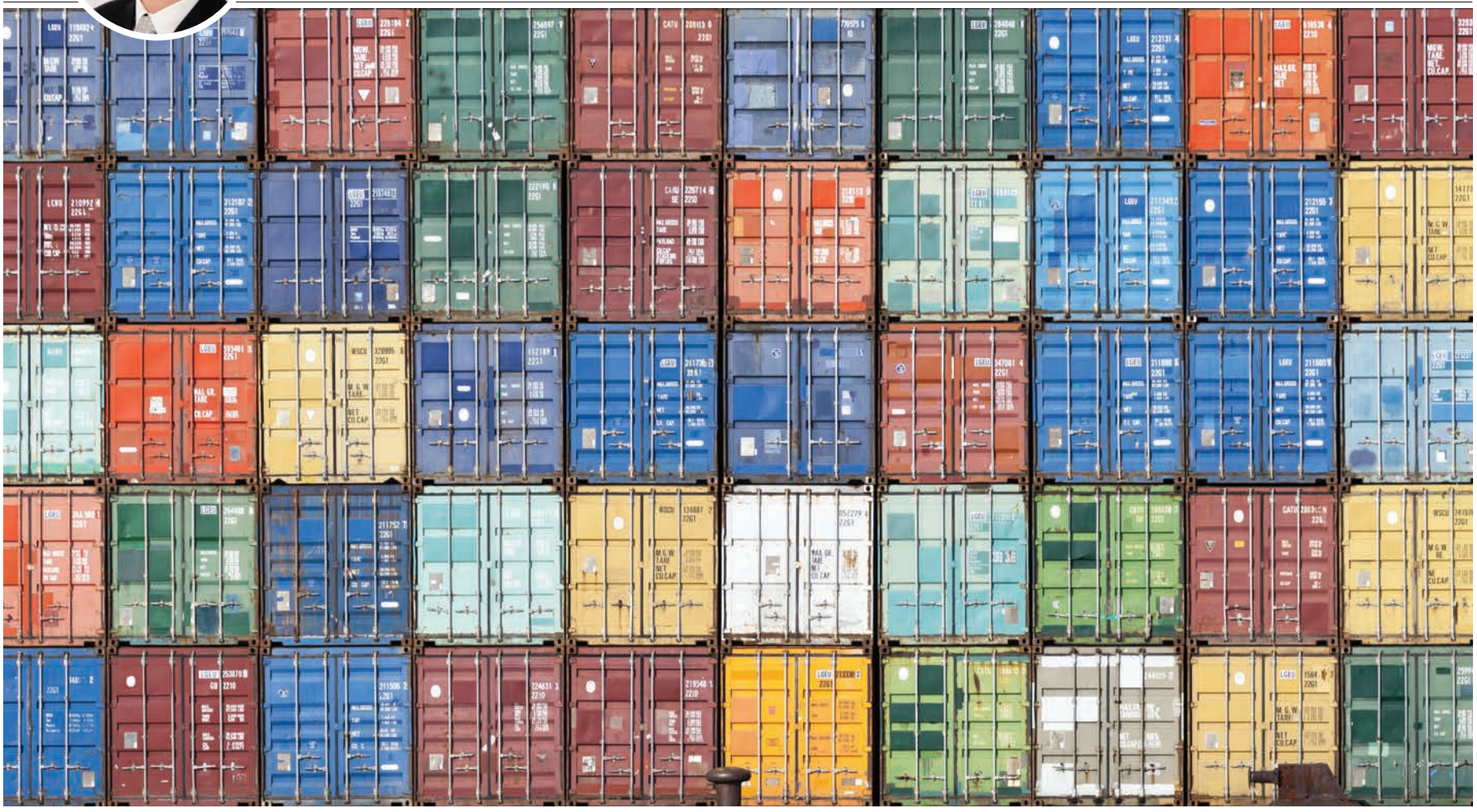
BVGA's recommendations are worth a closer look because the suggestions have been incorporated within Virginia's overall 2018 Energy Plan. Here's a summary of BVGA's five major recommendations (for offshore wind):

- Create a "Virginia Office for Offshore Wind" to provide a clearinghouse and facilitator to advance offshore wind. Provide regular updates covering market and technology development, project schedules, supply chain opportunities and other resources as appropriate, and to develop a roadmap "to achieve the Commonwealth's 2GW offshore wind commercial development goal by 2028."
- Work toward a multi-state regional supply chain cluster, offering the industry a wide, multi-state network.
- Solicit and attract "anchor tenant" suppliers, with a focus on major components.
- Enable and grow partnerships and infrastructure.
- Focus on workforce development.

At center stage now is Orsted's work with Dominion Energy on the pilot, two-turbine Coastal Virginia Offshore Wind project. Hayes Framme, with Orsted, said that onshore construction will likely start this spring. Site analyses to prepare for offshore construction is expected in 2020. Material fabrication – for cable, foundations and turbines – will start in 2019. Framme was asked whether Orsted will work with the new supply Directory. He said Orsted tries to "use all available tools to identify potential supply chain partners in the markets in which we operate. Sourcing materials, services, and workforce locally is important to us and we work to do this when possible." Importantly, Dominion Energy is on VOWDA's Board of Directors and VOWDA, of course, is directly linked to the Directory.

Important first step: are you on the Directory?

Lars Fischer
Lars Fischer is Managing Director, Softship Data Processing Ltd., Singapore



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Restoring Balance

The repositioning of empty containers costs the liner industry an estimated $15-20 billion every year according to Boston Consulting Group (BCG), as containers sit idle at a depot or are repositioned to a different loading point while empty. This is time spent not earning revenue, while incurring additional costs, and is estimated by BCG to account for 5-8% of total operating costs for an average container liner. These expenses can include inland repositioning by rail or road onto a different port or terminal, the costs of shipping to another location, transhipment costs at terminals, and depot storage costs as well as all the associated administrative, handling, labor and third-party costs incurred throughout. This is a significant burden for carriers working hard to maintain already slim margins. While this has been a problem that has plagued the liner segment for decades, as an industry, we too have been sitting idle while technological and software solutions for addressing this problem have been developing at pace around us. There is a wealth of granular data from ports, terminals and depots now available to us thanks to a greater degree of automation and digitization across global supply chains. With this resource, the liner industry should have far greater control over repositioning operations than it currently does. This is why Softship has paired with the National University of Singapore (NUS) to build a digital solution.

By applying exceptionally complex but reliable mathematical algorithms which configure supply and demand scenarios, software will be able to empirically assess every available repositioning solution given the scenario parameters and calculate the most efficient repositioning route. The result will be more agile, flexible and cost-effective container shipping solutions.

Understanding the root causes

There are several reasons for the repositioning dilemma. An inherent asymmetry in global supply and demand for containerized cargoes is the main causal factor. China exports more containerized cargoes than it will ever need to import from most countries, for example. This means that spent containers are either left collecting dust at the discharge port or terminal or sent to sit in a nearby depot. Each of these containers costs the container line in lost earnings until there is a suitable laden voyage from the same location. This can take weeks or months.

Alternatively, the spent container can be transported empty to a nearby port or terminal to collect a new load or can be sent directly to a customer. Repositioning containers incurs the inland as well as international transport costs involved in moving to a point of demand. In many cases, the reallocation of these vital assets can cost almost as much to move empty as when loaded – all but eliminating the profit gained on some journeys.

When freight rates are particularly

high, it is often cheaper to simply purchase a new container where supply is required, rather than incur all the associated repositioning costs. According to figures shared by research group Transport for Geography, about 1.5 to 2.5 million TEUs worth of containers are manufactured annually (with 90% of this happening in China). The group suggests it costs around $2,000 to manufacture a 20-foot container, or $3,000 for a 40-foot container. At the time of writing, the Freightos Baltic Exchange Container Freight Rates puts a 40-foot shipment China/East Asia to North America East Coast at $3276.

Calculating the cost

Currently, most repositioning is calculated using a 'rule-of-thumb' assessment of likely supply and demand; rather than business intelligence and careful consideration of every plausible repositioning option. Carriers do not always have specific information for future loadings available, and therefore often have to rely on guesswork. Shipping lines try to pass the additional expense on, but often have to absorb these costs themselves in order to remain competitive.

Despite being a well-established problem, it is still currently very difficult to optimize container repositioning processes. This is because the number of possible repositioning permutations is so high, that with the tools currently available (mostly spreadsheets), it is extremely difficult to identify the most cost-efficient repositioning plan. This is why there is significant opportunity for a software solution to truly revolutionize the liner industry, and to make a measurable improvement to profitability.

This should soon change. Softship, as part of a newly launched research initiative in Singapore is now working to develop a digital solution to this costly problem.

Softship has signed a Memorandum of Understanding (MOU) with a newly launched research institution, The Center of Excellence in Modelling and Simulation for Next Generation Ports (C4NGP), to develop a digital solution for optimizing global container repositioning procedures. The C4NGP, launched in October 2018 is a collaboration between the National University of Singapore (NUS) and the Singapore Maritime Institute (SMI), based at the NUS. Six other industry partners signed their own related MOU's with C4NGP, and together will jointly develop 'digital twins' of next-generation ports and maritime systems.

Establishing a new equilibrium

Softship's container repositioning tool will seek to simulate and solve the real-world inefficiencies in re-locating empty shipping containers, to create cost savings for container operators and increase visibility across the supply chain. The ultimate objective is to minimize the total relevant costs such as transportation cost, handling cost, and holding cost, while giving liner operators and managers greater control over their operations.

It will make it much easier for operators to understand and visualize exactly where empty containers are, where there is demand for containers and how to optimize the route for reallocation. Having a birds-eye view will make it easier to formulate the most pragmatic solutions, optimize container usage and minimize the time containers spend travelling empty. This will reduce costs, increase container turnaround and lower unnecessary waste in global containerized shipping. Repositioning of empty containers, and the significant associated costs, is an issue that has plagued the shipping industry for decades and is the result of an inherent geographical trade imbalance which the shipping industry cannot redress, but it should be able to better manage. Container ship owners and operators should no longer sit idle, like their empty assets, as there are solutions to be found.

Alexander Buchmann
Alexander Buchmann founded Hanseaticsoft in 2009 to develop software solutions for shipping companies. Since March 2017, Lloyd's Register one of the world's largest ship classification societies, holds a share in the company.

Digitalization

& A Connected Workplace Culture

Images: Hanseaticsoft

Technology, from mobile to cloud to social media, have all had an enormous impact on the way companies operate and interact with their staff and customers. However, research from technology media company IDG, found that while 89% of companies plan to adopt a digital-first strategy, only 44% of them have actually done it.

While the shipping industry has been slow to adopt digital technology, there are signs this is changing. According to the Navis Business Bellwether report – an ongoing benchmark study designed to track the perceptions, intentions and mind set of the global maritime industry – approximately 90% of respondents expect their company to increase technology spending this year and 56% indicate spending will increase by six percent or more. Investing in technology, particularly cloud technology, could bring tremendous benefits to shipping companies – improving collaboration between teams on shore and at sea and creating a connected workplace culture that supports strategic business goals. However, companies need to be mindful of how they approach digitalization.

Changing Teamwork

A recent blog post on Slack, the work collaboration hub, on what digital transformation means for companies highlighted that many companies who approach digital transformation focus on the digital – the platforms and processes – rather than the transformation part.

The idea that businesses could just buy a piece of software and instantly increase productivity is appealing. But fundamentally, digital transformation is about changing how teams work together, not only what technology they're using to get that work done.

A report by the Seafarers International Research Center found that part of the effective operation of a modern vessel is determined by the quality of the relationships between shore side personnel and sea staff and recommended companies take steps to address the gulf between ship and shore personnel in order to improve ship-shore relations.

Cloud technology is doing just this for shipping and helping land and sea teams work together more efficiently. Cloud-based software is enabling companies to optimise the management of their entire fleet, automate their processes, improve their communications, increase their business performance, improve operational efficiencies and drive down costs.

The cloud is having a significant impact on the way companies now operate and will in the future. One of the major issues for companies is that tasks are carried out by both land and sea teams which can lead to a lack of transparency and overview across all departments.

The challenge has been how to integrate the systems and processes of different departments to a central data source. For example, the same information might get requested multiple times from the captain, which forces him to respond manually to each request.

The cloud is helping solve this, as it is enabling information to be centralized and made accessible no matter where staff are based. It is ensuring that systems and processes are integrated and data silos removed – allowing operators to gain a complete 360-degree overview of their fleet and entire operations. And most importantly, this is changing how information is exchanged and accessed. There is no more need to send emails back and forth, requesting or forwarding information. Data that is entered at one end is automatically available to everybody else using a cloud-based solution.

Shipping companies using the cloud have information available in real-time regardless of time or location, reducing time spent on administration.

Cloud Tech in Practice

A major benefit of cloud technology is the improved communication between staff on board ships and those in head office, so whether that's crew planning, the execution of payroll or the evaluation of seamen, digital data is always up-to-date and available where it is needed.

The cloud is also helping companies automate and improve tasks such as purchasing and stock planning as well as complying with regulations such as keeping track of waste, sewage and sludge disposals. Even staff well-being can be addressed using cloud applications, as crew shifts and rest periods can be tracked to ensure companies comply with industry guidelines and standards.

One company benefiting from cloud technology is the Peter Döhle Group, a provider of shipping services with more than 500 vessels. As a global company, the Peter Döhle Group demands safe, secure and quick information flows between all relevant parties ashore and at sea.

The company wanted to integrate and align information about its vessels and data from external partners with its internal company processes in one platform, plus have accurate and up to date fleet management information for all parties

at any time, regardless of their location.

It was hoped that being able to access this information would accelerate information processing and improve the company's ability to react to events as they happen. Other goals were to remove data silos, which were costing the business time and resources, speed up communications and increase the efficiency of its vessel management.

The company adopted Hanseaticsoft's Cloud Fleet Manager solution to gain a single platform through which their entire fleet can be managed. The platform centralizes information so it can be viewed, analyzed and processed in real time using apps and mobile devices.

Today, Cloud Fleet Manager is used as a central, company-wide communication and information platform which has improved information accuracy and reliability and added business value. The extra work that used to be involved in managing data redundancies in Excel spreadsheets is a thing of the past.

Evolving Tech

A key benefit of using cloud applications is that they are constantly updated and improved as new technologies become available. These updates are automatically installed with no need for manual effort and help shipping companies future proof their business.

There is no doubt that cloud technology is helping teams work better and more efficiently together. Without the cloud it would be extremely challenging for crews, head office teams and other parties to keep up to date with processes and other management and administrative issues.

Improving how teams work together has enabled shipping companies to become more agile and responsive. In turn this digital transformation across the industry is helping companies meet ongoing challenges that could impact profitability and growth in the future. Companies not already embracing digitalisation should make it a priority in 2019.

Ben Kinnaman
Ben Kinnaman is the founder and CEO of Greensea Systems, Inc. He has spent his career in the marine industry and created the OPENSEA open architecture software platform Greensea uses to advance marine robotics. bkinnaman@greensea.com

The Future of Autonomous Robotic Hull Grooming

Ship hull biofouling has significant impacts on fleet readiness, ship performance, cost, and the environment. Biofouling results in increased hydrodynamic drag which results in greater fuel use and greater emissions per distance traveled than a hydraulically-smooth hull. A study by Schultz, et al. found the typical fouling rating (FR) of a US Navy DDG-51 class vessel, FR-30, increases fuel consumption by 10.3% over a hydraulically-smooth DDG-51. Results showed that reducing this fouling rating to FR-20 would lead to savings of $340K per ship and more than double that when the hull was kept at a fouling rating of FR-10, saving the US Navy nearly $800K per hull annually. And while such studies on commercial vessels are almost non-existent, similar economic impacts of fouling are certain. A recent report cited the EMMA MAERSK, a 397m container vessel, estimated spending approximately $20K per day in propulsive fuel lost to biofouling.

The economic impact of fouling is also due to costly conventional cleaning and containment activities . A study in 2016 commissioned by the US Coast Guard, determined the cost to remove light biofouling from a ship's hull to be $0.33 per ft2 (approximately $3.55 per m2). Based on that estimate, complete biofouling removal from a DDG-51 would run more than $10k, while the cost to remove biofouling from a Panamax class container ship would run more than $98K. These estimates are for traditional cleaning methods, which degrade the ablative coatings used for anti-fouling, leading to dry-docking for re-coating once every few years. Dry-docking a large ship may run as much as $1M-$2M.

Fouling also has significant environmental impacts, from greenhouse gas emissions associated with increased propulsive fuel costs, to the toxins released by in-water cleaning. Many countries are now requiring containment of in-water cleaning or prohibiting the practice while in port. The traditional, intense cleaning processes used to clean fouled hulls are costly, inefficient for operations, damaging to the hull coating, and environmentally unacceptable. An alternative to the reactionary intense cleaning process is the regular and thorough disruption of growth on the ship hull coating by gentle brushing with small soft-bristled brushes. This process, referred to as hull grooming, akin to brushing one's teeth every day to avoid a monthly dentist visit and annual root canal. Research led by Dr. Geoffrey Swain at Florida Institute of Technology's Center for Corrosion and Biofouling Control (FIT CCBC) has pioneered the methodology and practice of hull grooming, demonstrating it to be a cost-effective practice to control biofouling, while releasing far fewer toxins into the water than clean-

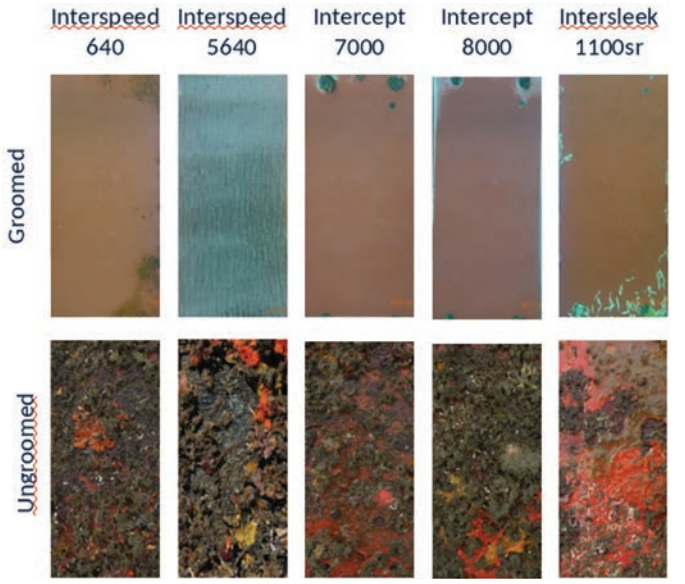
Grooming Robot on a small vessel at pier side as imaged by another grooming vehicle.
Photo Courtesy Greensea Systems

ing. Because hull grooming only lightly brushes the ship hull and does not remove coating, containment is not necessary and the life of the original coating is extended, lengthening the period between costly dry docking. Additionally, hull grooming is done with light-weight brushes making very gentle contact on the ship hull. This permits hand-held brushes that can easily be operated by divers or even brush tools that can be operated by small hull-crawling robots. The lack of need for heavy equipment to launch and recover a cleaning tool, further adds to the cost-benefit.

To be effective though, hull-grooming must be done as regularly as once a week or more and must be thorough, leaving no voids or omissions. (Continuing with the previous analogy of teeth brushing, imagine brushing all but a few teeth - a dentist visit is still in your future.) The regularity and thoroughness requirements for hull grooming present challenges to viability. For instance, a DDG-51 class ship comprises approximately 22% of the US Navy fleet by number and approximately 22% by wetted hull area. Grooming the total wetted area of this portion of the US Navy fleet once a week is logistically and financially prohibitive without a robotic means of doing so. Even with a robotic solution, the grooming time could be more than 15 hours per ship if using a single small robot and ensuring 50% overlap of grooming paths.

Several efforts over the last decade have contributed towards advancing a robotic grooming capability. These efforts have produced proven tooling, grooming methods, robotic platforms, quality assurance processes, and non-magnetic attachment methods to allow robots to crawl along a ship hull. Why then, after almost a decade of research and no fewer than 15 commercially available "hull cleaning robots", do we still not have a solution that is really ready for adoption by the ship husbandry community? The reason is as old as robotics. Until the robot can do the job as expected with minimal operator input and until the human-robot relationship is optimal, a robot is not applicable for the job.

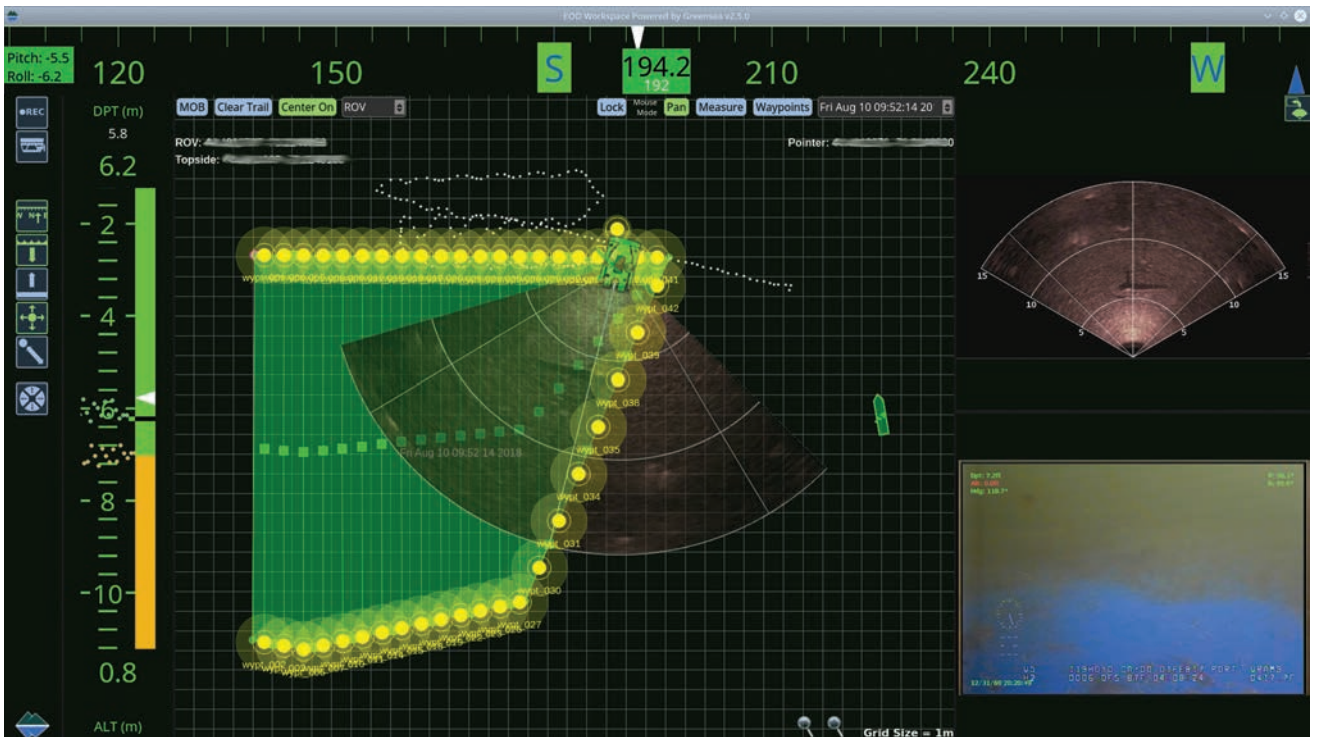
A robot being able to do a task relies on three primary considerations: navigation, control, and communication. Navigation: Can the robot accurately know where it is in the environment and how to get to where it is required? Control: Can the robot accurately maneuver and operate for the task? Communication: Can we meaningfully communicate our commands to the robot and interpret the status of the robot? Failure to provide completely for any of these considerations prevents an optimal robotic solution. This, we feel, is why a hull groom-



Above
Grooming vehicle at work.
Photo Courtesy Greensea Systems

Above Right
Two years of grooming.
6in x 12in coated panels groomed weekly (top) compared to panels left ungroomed (bottom).
Photo Courtesy Greensea Systems

Right
Autonomous hull grooming robot **user interface.**
Photo Courtesy Greensea Systems



ing robotic solution has not yet been delivered.

Greensea Systems, Inc., a software company specializing in advanced navigation, control, and autonomy solutions for marine robotics, partnered with the hull-grooming team from FIT CCBC in 2017 to explore an optimal robotic solution for hull grooming. With funding from the US Navy's Office of Naval Research, the Greensea and CCBC FIT team fielded a prototype robotic system in 2018 that can autonomously groom a ship's hull with very little operator input, while providing an on-hull positioning accuracy of less than 0.15m RMS. This prototype system used a commercially available ROV system fitted with a guidance and control system developed by Greensea and a grooming brush tool developed by FIT CCBC.

Accompanying the navigation solution, Greensea utilized their advanced mission planning and autonomy software modules used for Remotely Operated Vehicles (ROVs). These OPENSEA software modules provide the tools and capabilities for specifying a region to groom, planning the grooming coverage, and executing an autonomous grooming operation. The operator can supervise as a Subject Matter Expert (SME) or leave the vehicle alone to conduct the operation unassisted. The role of autonomy in the robotic grooming process is critical for the viability of this process due to the time required to ensure 100% coverage on the ship hull.

To provide the navigation and autonomy capabilities for the hull grooming robot, Greensea leveraged OPENSEA, their open architecture software platform. The autonomous hull grooming robot uses an inertial navigation system and a multibeam sonar to provide feature-based awareness of the robot's position on the ship hull. The entire hull grooming system is implemented in a vehicle-agnostic tractor skid inclusive of the navigation and control systems, autonomy, sonar, and grooming tool. The grooming skid can easily adapt to most commercial ROVs. Greensea is commercializing the system in 2019 on a VideoRay MSS ROV.

An intuitive graphical user interface developed from Greensea's software for Explosive Ordnance Disposal (EOD) teams provides the communication with the robot necessary for a technician to plan, execute, and document the hull grooming process. The Hull Grooming Workspace provides a view to plan the grooming operation by region, sonar overlay for obstacle avoidance, and video for complete situational awareness. Graphical indicators on the screen record the progress of the vehicle on the hull and show the grooming swath. The Workspace also allows technicians to save and recall grooming plans, log obstacles and obstructions, and log all data for archival and replay.

Greensea's accurate hull relative navigation solution is enabling autonomous robots for hull applications and has made hull grooming a viable alternative to in water cleaning that is cost effective and environmentally responsible. Greensea is commercializing the autonomous hull grooming robot, as well as the enabling navigation and grooming technology, in 2019.

***Footnote**: Greensea and FIT CCBC would like to thank Office of Naval Research and DARPA for development support on the autonomous hull grooming robot as well as the feature-based navigation and localization technology used by the navigation system.*

Coat with Confidence

HoldTight's family of surface prep products works to ensure the integrity of your vessel's coating system

While much maritime press focuses on 'autonomy' and 'digitalization,' every vessel owner will attest that the most critical system to keep a commercial vessel 'shipshape' and generating revenue is the quality and integrity of its coating system; literally the first and arguably the most critical line of defense against one of the most corrosive environments on the planet. HoldTight offers a family of products to ensure that your vessel is cleaned, maintained and coated to the highest quality standard.

The Prep: HoldTight 102

It all starts with bare metal, and an independent test confirmed that HoldTight 102 removes all salts and other contaminants. But cleaning is just half the battle, as the product also prevents flash rusting to ensure that the cleaned surface remains clean, free of chlorides and is ready for coating.

As is the case with many great product innovations, the developers of HoldTight 102 worked in the industry, involved in producing early wet abrasive blasting equipment. It was here that they encountered a major problem: blasting with water and abrasive caused flash rusting within minutes. They found conventional rust inhibitors to be "film-forming," meaning they were effective in inhibiting rust formation, but they also inhibited coating adhesion: a major barrier for the wet abrasive blasting market.

With that experience they devised HoldTight 102 which provided the wet abrasive blasting market with a way to clean surfaces so thoroughly that flash-rust would be inhibited for hours or days. How? HoldTight 102 removes all hygroscopic contaminants – salts, acids, greases and other – and ensures that no new residue is introduced after cleaning, keeping the surfaces clean and ready for priming and coating. As the prevalence of water abrasive blasting grows, so too does the market for HoldTight 102.

Meet the Family

While HoldTight 102 is a critical first step, it is not the only one as the company offers a range of complementary products and systems, all mono-focused on improving the integrity of marine coatings.

- **HT 365:** HT 365 is a new thin film coating that can be applied to blasted surfaces, preserving the blast and preventing flash rust and corrosion for up to one year. It can be applied to untreated surfaces or those that have been treated with HoldTight 102. Applied by brush, spray or dipping, and easily removed by high pressure washing with HoldTight 102-treated water. It's great for vessel maintenance, storage and transportation of bare steel.
- **Water Quality Test Kit:** Although most potable water works well with HoldTight 102, the water quality test kit can be used to verify water quality and identify any potential water problems that may interfere with the performance of HoldTight 102, measuring pH levels, water hardness and conductivity.
- **DeFelsko PosiTector SST (soluble salt tester):** This is a sophisticated measuring device for surface ions, supplied to spec for HoldTight. This user-friendly technology can be employed both before using HoldTight 102 to determine the extent of surface contamination and after blasting/rinsing with HoldTight 102-treated water to measure the cleanliness of the prepared surface.

Andreas Glud
Andreas Glud is Group Segment Manager, Marine, Dry Dock, Hempel A/S

Moving with the Tide

The maritime industry has always followed a path of gradual improvement, albeit with many opting to travel the route of least resistance. In some ways, this is a good thing. A cautious approach to navigating change brings stability, assurance and predictability. This measured attitude toward managing change has been fundamental to ensuring that the commercial shipping industry remains the most financially viable transportation solution for moving most goods around the world. But, we now live in very unpredictable times, and the world around us needs more than reliable shipping services; it needs future-proof solutions.

To address climate change - the most significant challenge of this and future generations - treading water is not going to be an option for those maritime companies looking to survive and thrive. Significantly reducing the impact of shipping operations on the natural environment, while remaining the most financially viable logistics solution requires ingenuity, perseverance, ambition and – quite honestly - a leap of faith.

The International Maritime Organization (IMO) has imposed increasingly stringent environmental regulations on the shipping industry over the past decade in particular, but 2020 and 2050 are the beacons we are all heading toward.

Jumping in, head-first

First on the horizon, the IMO's Marpol Annex IV 0.5 percent global sulfur (SOx) emissions regulation marks a significant step-change for global shipping and will inevitably bring disruption in the shorter term as shipowners, operators managers adapt. This regulation, which requires ships to either burn low sulfur marine gas oil, install an exhaust gas emissions scrubbing system, or burn liquified natural gas (LNG), does bring significant burden of cost. It's been on the cards for a while, but confusion and protracted debate about the most viable options and issues of fuel availability have left many in a scramble to the finish.

While this is problematic for individual companies, what we see now is that the shipping industry can and will change, and perhaps more importantly, the industry is now showing signs that it wants to change in the name of 'the greater good.' We have seen that adopting eco-technologies on vessels has moved toward becoming a central tenet of maritime Corporate Social Responsibility. We have also now reached a consensus that investing in environmentally friendly solutions does deliver a return on investment, and there is an increased willingness to spend more to save more.

Using the right hull coatings solution has been an important part of this trend, and the results are bearing fruit. At Hempel we have seen a noticeable step-change in how customers are approaching their analysis of protective solutions. Excellent environmental credentials, longer periods of protection between dry docking periods and the ability to enhance fuel efficiencies are now top of the list in selecting the right coatings.

Shaping solutions

Fouling can dramatically affect a ship's hydrodynamics and the frictional resistance from the roughness caused by slime on a ship's hull can result in an increase in fuel consumption of up to 18 percent in efficiency (on average over five years) as the ship burns more fuel just to maintain a given speed. This problem is exacerbated on vessels with unpredictable trading patterns and longer idle periods. Choosing a hull coating which reduces drag, minimizes downtime, enhances physical durability and protects assets for the longest period of time should be the first go-to for every ship owner and operator, as the efficiency gains translate directly into cost savings. The fuel savings also translate directly into lower emissions and reduced environmental impact.

Reaching this end, however, requires a forensic approach. Using intelligent software and working closely with coatings experts, long-term trends can be monitored using in-service KPIs to develop and deliver an optimum protective coatings solution for that vessel. This data intelligence is evidence of the latent efficiency savings to be made (and where other eco-technologies can complement to deliver overall operational cost savings). This is exactly what Hempel's SHAPE (Systems for Hull and Propeller Efficiency) system does. Based on the ISO 19030 framework, SHAPE defines a methodology to measure changes in hull and propeller performance and using the resulting data, provides a set of bespoke performance indicators for hull and propeller maintenance, for each vessel. The process is simple and there are six key stages to gathering the data.

First, the vessel's individual speed power reference curves are established. This is followed by the collection of in-service data which is then cleansed and purified to eliminate extreme operating conditions and the effects of environmental factors.

Next, a precise speed loss calculation is performed. This is a critical measure for understanding vessel performance and fuel efficiency as the power increase and speed loss are directly related. From this, the four vital performance KPIs can be calculated and a coatings solution tailored to the specific trading requirements of the vessel can be developed.

Gaining positive momentum

This level of detailed, empirical evidence is crucial if shipowners and opera-

tors, as well as coatings manufacturers including Hempel are going to be able to continue to adapt and meet yet more stringent environmental regulations in future. The IMO has now committed to reducing total annual greenhouse gases (GHG) emissions from the commercial shipping industry by 50 percent compared with 2008 levels. Doing so will mean reaching peak emissions as soon as possible, before radically reducing all GHG emissions across operations.

The target has been set in line with the United Nations Paris Agreement, and was ratified – in a very positive sign – with very little objection. Reporting suggests that from the absolute reduction in emissions, the strategy prescribes a 40 percent energy efficiency improvement by 2030 compared with 2008, pursuing efforts for a 70 percent improvement by 2050. Achieving this will require all across the maritime industry to work in the spirit of collaboration to develop new and improved solutions.

Looking at the bigger picture, it is important to recognize that we are not travelling alone in the challenge of tackling climate change. It would be defeatist to suggest that the maritime industry has been singled out by regulatory authorities wanting to implement regulations which seek to limit GHG emissions. This is, and should be, a concerted global effort. We, alongside other major industries, nation-states and individuals will be expected to play our part. The fact that so much emphasis has been placed on the shipping industry to deliver reflects the importance of our industry to enabling and maintaining life as we know it.

We may be wading into choppy waters, where the current is pushing full force towards an altogether different operating environment for the shipping industry – one defined by a vessel's ability to move goods worldwide, at a profit, without detriment to the natural environment. Meeting the IMO's 2050 target will without doubt be difficult. It will involve cost and we will be moving against the tide. However, if we proceed with cautious optimism, we will get there, and will continue to move most of the world's goods worldwide, at a profit, without detriment to the natural environment. Simply treading water and avoiding this challenge, is not an option.

Smooth Sailing

As the global cruise industry enjoys it most robust period of growth ever, the question invariably becomes:
How long can it last?

Photo: MSC

By Barry Parker

Cruising, which is a blend of the hospitality and maritime businesses, continues to grow at a historic pace. The Cruise Trends & Industry Outlook publication from Cruise Lines International Association (CLIA) projects a passenger count of 30 million in 2019 – up nearly 2 million from the previous year. By year end 2019 CLIA members – a veritable 'who's who' of the largest brands – will have 272 vessels, 18 of which will have entered the market during the year.

Ocean liners gave way to cruising beginning in the 1960's; by the late 1990's and early 2000's, a consolidation wave swept over the cruise business, creating the big mega-brands led by Carnival Corporation (the parent of brands including Cunard, Costa, Princess Cruise, Holland America, among others) and Royal Caribbean (with its own well known vessels complemented by Celebrity Cruise, Azamara and others including recently acquired Silversea, in the expedition sector). The middle tier includes independents Norwegian (listed on NYSE) and privately owned MSC Cruises; numerous smaller operators work in different niches of the market.

MSC Cruises, the industry's largest privately owned company, is in the midst of a $13 billion expansion which will bring its fleet, following the delivery of MSC Meraviglia in 2017, to 25 vessels by the mid 2020's. Still on order are four Meraviglia class ships.

In recent years, the headlines have been dominated by megaships built through megabuild programs funded by multi-billion capital raises. MSC Cruises, the industry's largest privately owned company, is in the midst of an unprecedented $13 billion expansion which will bring its fleet, following the delivery of MSC Meraviglia in 2017, to 25 vessels by the mid 2020's. Still on order are four Meraviglia class ships. Next to deliver – from the Chantiers de l'Atlantique (formerly STX) yard at St Nazaire, France, are MSC Bellissima and MSC Grandiosa, the first of two Meraviglia-Plus ships (6,335 passenger capacity) will come into service in 2019. A sister, MSC Virtuosa, will be completed in 2020. A fifth vessel, ordered in mid-2018 for just more than $1 billion, will have dual fuel (MGO or LNG) capability with a 2023 delivery date. Further out on the MSC horizon are two new Seaside class (5,646 passenger capacity), and four dual fueled World Class vessels (6,850 maximum passenger capacity).

Show me the Money

From a funding perspective, cruise vessels can attain higher 'advance rates' (the percent of vessel value provided by lenders) than many bank-financed commercial vessels. Law firm Watson Farley Williams (WFW), a maritime specialist, explains that its teams advised long-standing client MSC Cruises on a $3 billion for three of the vessels described above. They explain: "The financing structure provides construction financing for the vessels as well as post-delivery financing in respect of 80% of the total cost of construction of the three vessels."

The law firm, headquartered in London, also provides insights into the complexity of such large financings, saying that the funding "…was provided by a syndicate of lenders with Société Générale as lead mandated lead arranger, Citibank N.A. as initial mandated lead arranger and BNP Paribas, HSBC France, Banco Santander and Unicredit AG as mandated lead arrangers." They add that Export Credit Agency assistance – which offers actual loans, as well as insurance on bank credits, lowering their cost – was provided by Bpifrance Export Assurance.

Form, Function, Power

In the cruise segment, form and function are both important. As vessel designs have evolved, MSC touts its two existing Seaside vessels (just under 5,000 maximum passenger capacity) MSC Seaside and MSC Seaview as "…rewrite<ing> the rulebook of cruise ship design, blending indoor and outdoor areas to connect <passengers> with the sea like never before…", referring to glass walled promenade along the vessels' port and starboard sides, and an abundance of balconies. Function also impacts the power and propulsion side of vessel design; the competition for passengers also drives choices of itineraries. As explained by Brunvoll, a leading manufacturer of thrusters deployed across many cruise brands, "…vessels like to park close to city centers…" The equipment provider also makes the case that: "Larger ships bring economies of scale – but also the potential for higher operational risk."

The previous winners of the largest cruise vessels leaderboard, with capacities of 5,500 lower berth passengers, were Royal Caribbean's Oasis-class vessels (in excess of 225,000 gross tons). Beginning with the 2009 built Oasis of the Seas, this behemoth was followed by Allure of the Seas (2010), and then Harmony and Symphony (with a maximum capacity of nearly 6,700 passengers). While much marketing attention for these floating cities is often focused on the "hotel" side – rooms and suites, restaurants and activities – the operational side is paramount.

As vendors have developed pods and

Photo: Silverseas/Miko Marine

MOORING MAGNETS FOR POLAR CRUISE SHIP

The allure of expedition cruise ships is the ability to deliver travelers as close as possible to natural wonders, safely and efficiently, often onboard small zodiacs and RIBs. Getting passengers on and off the small craft is paramount to safe operations. **Silversea's Silver Cloud** has started using high-powered magnets to create additional mooring points on the hull of the ship for such excursions, magnets from **Miko Marine** (Norway) that each have a holding power of 500 kg. The magnets are designed to allow Zodiacs and other boats to be held close against the ship before being relocated to the point where passengers must disembark for excursions. For safety, the magnet is fitted with a break lever that enables it to be immediately released from the hull by the boat's crew.

Silver Cloud is equipped with two crane-launched inflatable Zodiac boats that are used for providing inshore excursions, each carrying a pair of Miko MAM magnets.

Photo: Silverseas/Miko Marine

thrusters offering the maneuverability needed for a broad range of port visits, the state-of-the-art for power and propulsion has moved towards diesel electric. Symphony's massive diesel-engine plant consists of four Wärtsilä 12V46F's each at 14,400 kW, and two 16V46F units, each providing 19,200 kW for a total output 81,600 kW (which converts to about 109,000 horsepower- about 30% more than Maersk "Triple-E" containerships).

Propulsion is provided by three 20,000 kW ABB "XO" Azipods, leaving significant wattage for the hotel load.

Royal Caribbean will now be debuting its Spectrum of the Seas (4,800 passengers), described as "…first Quantum-Ultra class vessel…", also a diesel electric configuration.

Designed for the burgeoning Chinese market (with different configurations for rooms and gaming and shopping spaces), its first cruise commences in April 2019 following its delivery from Meyer Werft, Papenburg. The vessel represents an enhancement of the Quantum-class ships Quantum of the Seas (roughly 4,900 passengers at maximum capacity, built 2014), Anthem (2015), and Ovation (2016). A sister to Spectrum, Odyssey is aimed at the U.S. market and is scheduled to be delivered in 2020.

Spectrum is also diesel electric, with four Wärtsilä diesels (2 x 19,200 kW and 2 x 14,400 kW each) and two Caterpillar generators (2,500 kW each). The propulsion configuration consists of two 20,500 kW ABB Azipod XOs, with four 3,500 kW Brunvoll bowthrusters forward.

Spectrum of the Seas

Royal Caribbean's Spectrum of the Seas (pictured below, 4,800 passengers) is described as RCL's "…first Quantum-Ultra class vessel…" Designed for the burgeoning Chinese market, its first cruise commences in April 2019 following its delivery from Meyer Werft, Papenburg. Spectrum is diesel electric, with four Wärtsilä diesels (2 x 19,200 kW and 2 x 14,400 kW each) and two Caterpillar generators (2,500 kW each). The propulsion configuration consists of two 20,500 kW ABB Azipod XOs, with four 3,500 kW Brunvoll bowthrusters forward.

Photo: Royal Caribbean International

Keeping it Clean & Green

As with other sectors of shipping, IMO 2020 fuel rules and the overall mandate to improve its environmental footprint looms large for the cruise industry Cruise shipping, in fact, is arguably more sensitive to environmental concerns than the general shipping sector as their assets are much more conspicuous to the public eye. Reduction of all emissions is a headline issue in the C-Suite of every cruise company, and there have been strong moves towards reduced emissions of sulfur and nitrogen through switches to low sulfur fuels in advance of the IMO deadline, through installing exhaust gas scrubbers (while burning fuels with a higher sulfur content), but also by consuming alternative fuels, primarily LNG.

Carnival Corp, with a preponderance of vessels trading in Emissions Control Areas (ECAs) decided early on that it would comply with stringent sulfur burn requirements by cleaning exhaust gasses with scrubbers. Carnival had installed scrubbers on 60 vessels (across its multiple brands) by late 2017, and was contemplating further installations aboard additional vessels by 2020. In its 2018 Annual Report, the company noted: "We

MARINER SKILLS ASSESSMENT:

'THERE'S AN APP FOR THAT!'

Carnival Corporation partnered with **Marine Learning Systems** to develop an App for mariner skills assessment. Dubbed **SkillGrader**, the App was designed to help standardize Carnival Corporation's training and assessment across the company's fleet of 105 ships and 9 brands, according to John Allen, Carnival Corporation's Director of Maritime Professional Development. Carnival Corp. designed a performance-related training approach where crew were

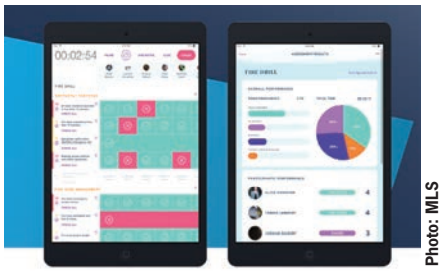


Photo: MLS

to be placed within targeted training programs based on their assessment results, rather than assuming no prior knowledge and enrolling crew into every course. This required developing a new technical system that could support consistent assessment of any officer, while on-board any ship. SkillGrader enables these efforts with a tablet-based application that allows any trainer or supervisor to objectively and reliably assess employees. The application uses a binary grading scheme to reduce human bias that can lead to variation. After the assessment, SkillGrader automatically analyzes the data collected and delivers a comprehensive report on individual and team performance.

www.marinels.com

Costa Venezia, which debuted in March and is destined for the Chinese market.
Photo Courtesy Costa Cruises.

Cruising to China

Costa Cruise's newbuild Costa Venezia will be positioning from the Mediterranean out to the Far East, beginning in early March with onboard activities including a Venetian "Carnival" celebration as the vessel "...follows the path of Marco Polo..." eastward, albeit through the Suez Canal. From mid-May, the ship will be homeported in Shanghai. The buying power of the Chinese burgeoning middle class is well known. Cruise travel is complementing their consumption of automobiles and previously out of reach luxuries. Initially, the rapidly expanding market is already being served by European built vessels (such as Costa Venezia, Quantum of the Seas, MSC Splendida and others), but change is in the wind, specifically to design and delivery vessels purpose built for the market. For example onboard amenities and space configurations – with enhanced shopping and gambling areas – vary significantly from Western serving ships.

Chinese yards are venturing into the deeper waters of cruise ship construction and the infrastructure required. "Here in China we saw an unbelievable opportunity, as it is a country that has the intention, the interest and the resources to develop its market for passenger vessels" said Carlos H. Reyes, Tillberg & Reyes Group Co., Ltd., in an interview with Maritime Reporter. "The largest cruise lines are expanding in Asia, and there is a need for cruise ship building, ship repair and refurbishment in China." Reyes is a partner with Tomas Tillberg in one of the world's foremost design houses serving the global cruise market, but the organization's endeavors span far beyond design, as it operates a subsidiary based in Shanghai, China, which is can help guide cruise vessel owners from start to finish, with insight and experience in tapping the emerging Chinese maritime finance market to hands-on contact and full project management with the yard to ensure that the hotel operations and interior outfit are completed to world class standard. "First and foremost, from the owner's perspective, is proving that the production is world class (in China)", a process that, in Reyes' estimation, is neither short nor straight.

Reyes and his team were involved in the Greg Mortimer, project, a ship being built in China at China Merchant Heavy Industries (CMHI). The vessel's owner, Sun Stone Ships, will then put the luxury vessel on long-term charter to Aurora Expeditions, which will deploy her in the Antarctic. A sister expedition vessel will be delivered in 2020.

"We signed the first project with SunStone, which is a framework agreement for 10 ships to be built at China Merchant Heavy Industries in Haimen, China. China Merchants was very supportive, doing all that they could to make the project happen," said Reyes. Tillberg & Reyes Group Co., Ltd. were the brokers for the project, and it also helped in developing the financial structure. "The owner is a very experienced owner in the expedition vessel segment, so they knew exactly what they wanted. We needed to have engineering from Europe which relates to the engineering relative to a passenger vessel," something they do not have at a Chinese shipyard ... yet, said Reyes.

The shipyards in China will soon be building larger vessels, with the support of Carnival Corporation- which has formed a joint venture with China State Shipbuilding Corporation (CSSC). Two 133,000 gross ton vessels (roughly 4,000 passenger capacity), the first set to deliver in 2023, will be built for a new Carnival cruise brand aimed at the Chinese market. In a complicated deal first announced in early 2017, Fincantieri will provide technical support to the Shanghai Waigaoqiao Shipbuilding yard (a subsidiary within CSSC). Costa Cruises, another Carnival brand, is also planning to reposition two smaller vessels (2,100 passenger capacity) into the Chinese market in late 2019, to jump-start the Carnival / CSSC China offering.

ONE LNG-FUELED CRUISE SHIP IS IN OPERATION WTH 31 ON ORDER FROM OPERATORS INCLUDING CARNIVAL, DISNEY CRUISE LINE, ROYAL CARIBBEAN INTERNATIONAL AND MSC.

STEVE ESAU, GENERAL MANAGER OF THE SEA/LNG CONSORTIUM

Continued from page 29

have been installing advanced air quality systems on our ships. These efforts are mitigating much of the impact from the ECA requirements. Given the installation schedule, we expect to use a greater percentage of low sulfur fuel in 2020, which may increase our fuel costs." In late 2018, Carnival was a founding member of Clean Shipping Association 2020, an industry group promoting the use of scrubbers generally, against a backdrop of concerns about open loop scrubbers in particular.

A new cruise entrant, Virgin Voyage, will deploy "hybrid" scrubbers from Wärtsilä on its three 2,770 passenge vessels, the first dubbed Scarlet Lady and under construction at Fincantieri Sestri (near Genoa where it was floated out in early Februrary 2019). Delivery is scheduled for 2020.

With new operators come new templates for business relationships with vendors and equipment providers. The scrubbers, and other onboard systems (including catalytic converters) are covered under a long-term maintenance agreement between Wärtsilä and Virgin Voyages, where the vendor is incentivized in providing economical and sustainable operations.

Recently, LNG has predominated where operators have gone to alternative fuels. Steve Esau, General Manager of the Sea/LNG consortium, told Maritime Reporter, "…One LNG-fueled cruise ship is in operation (AIDAnova- operated by AIDA, a Carnival brand) with 31 on order from operators including Carnival, Disney Cruise Line, Royal Caribbean International and MSC Cruises."

Peter Keller, Sea/LNG's Chairman, noted in a blog posting that AIDANova had entered service in December 2018 . The 6,600-passenger vessel was delivered from Meyer Werft- Papenburg, with a pair of sisters to follow in 2021 and 2023. Its four 15,440-kW MaK M46DF engines are from Caterpillar.

At least one cruise giant has been thinking beyond LNG; Royal Caribbean has suggested that its new LNG-powered Icon-class vessels (around 200,000 gross tons), with the first to be delivered in 2022, will see its LNG fuel supplemented by hydrogen fuel cells.

JAPANESE MARINE ECO PRODUCTS

JAPAN JSMEA
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http://www.jsmea.or.jp/eco-products

Japan Ship Machinery and Equipment Association (JSMEA) has published a booklet called **Japanese Marine ECO-Products**, which introduces products that member companies manufacture and sell that contribute to saving energy and helping the environment. Copies are distributed widely among ship owners and shipbuilding companies worldwide.

The **Japanese Marine ECO-Products** booklet carries information on more than 40 items, such as engines,propellers and other energy-saving products as well as emission-gas and ballast-water treatment systems and other ecologically friendly products. As such, the booklet is a useful reference when ship owners, shipyards and other customers select machinery and equipment for new projects, as it contains product features and specifications as well as contact and other information.

The online edition of **Japanese Marine ECO-Products** is available at http://www.jsmea.or.jp/eco-products

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Sven Lindblad

Explorer, Photographer, Expedition Cruise Shipping Trail Blazer

Intrepid explorer and wildlife photographer Sven Lindblad blazed the trail for environmentally sensitive travelers to Antarctica on Lindblad Expedition's fleet of cruise ships with National Geographic.

By Lisa Overing

You can tell a lot about a man by whom his heroes are, whether famous athletes, virtuoso musicians, brave warriors or movie stars. As we age, we choose our heroes by their moral compass, seeking wisdom, inspiration and truth about our world during our dwindling time on this planet.

As adventurers who led men in adverse conditions, explorers Capt. James Cook (1728 - 1779) and Sir Ernest Henry Shackleton (1874 - 1922) are Sven Lindblad's heroes. Risking their lives in search of scientific and geographic knowledge, each explorer made epic trips to Antarctica, a destination now within the grasp of the average traveler on an expedition cruise ship led by Sven Lindblad and National Geographic.

While Lindblad's not risking his life like explorers of yore, he does feels the weight of the world upon his shoulders. As a new niche bringing scores of travelers to Antarctica and the most fragile, remote areas of the globe, the dawn of expedition cruise ships created a seismic shift in quest of the earth's most outer limits. "I never thought in my lifetime I would see too many people in Antarctica," said Sven Lindblad. "It is at risk of becoming commoditized, which is psychologically unfortunate. It has not happened yet, but I see a distinct possibility."

Wrestling with the concept of leaving no footprints, Lindblad's responsibility is to change people's behavior, educating everyone that the environment is an essential partner, not some alien creation that is merely tolerated.

"How do you get people to think differently?" said Lindblad. "To protect our asset? We must commit to

Lindblad Expeditions' alliance with National Geographic allows Lindblad to take people to the Arctic on cruise ships filled with teaching moments that transform passengers into stewards of our planet, exchanging ideas amid natural beauty and wonder.

Photo: Michael Nolan/Lindblad Expeditions

Photo: Sven-Olof Lindblad

Photo: Sven-Olof Lindblad

Photo: Stewart Cohen

Photo: Sven-Olof Lindblad

Photo: Adam Cropp

eliminating plastics in our supply chains. The amounts of plastic in our oceans is horrible and we must face essential change."

Capt. Cook would likely advocate the world quit dumping plastics and garbage in the oceans he crossed in three epic expeditions around the globe, including first to cross the Antarctic Circle in 1773. Sailing thousands of miles across largely uncharted areas in voyages of discovery, Cook navigated and mapped lands, islands and coastlines during the first recorded circumnavigation of New Zealand.

"Capt. Cook was not an exploiter," said Lindblad. "He was a true explorer with a variety of remarkable qualities," he enthused, continuing, "Cook was a great navigator, curious and deeply concerned about the future of places he visited, like Tahiti or Australia. He worried about what would happen to these pristine areas when westerners bringing disease and destruction would come and settle. Places he visited had generally happy social structures, far more so than Europe."

Lindblad Expeditions' alliance with National Geographic allows Lindblad to take people to the Arctic on cruise ships filled with teaching moments that transform passengers into stewards of our planet, exchanging ideas amid natural beauty and wonder.

"We're broadening guests' understanding," said Lindblad. "We're not trying to keep it all to ourselves. Clearly, there is growing interest to visit remote parts of the world. Clearly, people will try to capitalize on this. Every month, I hear some new entity coming from somewhere. The ship is only part of the equation. I know how our ships behave, but others who mimic, will they take the same level of care?"

Lindblad is concerned the expedition cruise ship category could get a bad reputation harming pristine places, by not being prepared. Unnecessary accidents could accelerate.

"It's hard to believe all these companies will be successful because they underestimate how hard the work is," he said. "I am delighted when someone comes into the market and does their job to elevate the category. There are few opportunities in life for perfect solutions.

NOW 68 AND LIVING IN NEW YORK CITY'S WEST VILLAGE, SVEN LINDBLAD HAILS FROM SWEDEN. EARLY ADULTHOOD WAS IN KENYA WHERE HE LIVED UNTIL FROM 1969 TO 1977. NATURE, WILD PLACES AND PEOPLE WHO UNDERSTOOD REAL SURVIVAL CHALLENGES IN AFRICA SHAPED HIS FORMATIVE YEARS.

Everything becomes a scale with positives and negatives, and when positives outweigh negatives, proceed with good conscience."

Now 68 and living in New York City's West Village, Sven Lindblad hails from Sweden. Early adulthood was in Kenya where he lived until from 1969 to 1977. Nature, wild places and people who understood real survival challenges in Africa shaped his formative years.

A young Sven's company was originally a division of his father's enterprise, Lindblad Travel. It became independent a few years later. Now Lindblad Expeditions is an innovative travel company offering marine-focused expeditions aboard a fleet of eight owned ships (nine in 2020) and five chartered with over 70 itineraries.

"My father, Lars Lindblad, had a deep sense of conservation and believed there are new possibilities for human experience and understanding," said Sven. "He built his business incorporating these values and was an accidental entrant into the travel business, he wanted to explore the world. Of course, he is one of my great heroes, with what he did with Lindblad Travel."

The renowned adventure-travel pioneer, Lars Lindblad, led the first laymen traveler groups to the Galapagos, Antarctica and other regions, all of which need careful care for future generations.

"Think about coral reefs disappearing entirely, the whole food chain of the ocean interrupted and ceasing to function," he said. "That's scary, motivating stuff. The greatest wonder on earth are coral reefs. The temperature of the world is heating up, and our environment is threatened by that. Coral reefs depend on water temperatures that don't rise above certain levels."

Lindblad believes contributing to scientific knowledge and communicating are our assets; this allows us to help people interconnected in balance in a sacred place.

"We can't be ostriches, can we?" said Lindblad. "I am not being pessimistic, I am realistic. We must be proactive and leave value. We must protect our asset and avoid destructive intrusion. A surfer doesn't want to go to Bali and surf through plastic bags."

Photo: David Vargas/Lindblad Expeditions

Built to Explore

A cruise industry veteran of more than 25 years, ***Nikolaos Doulis****, Lindblad Expeditions' SVP, New Buildings, discusses with* Maritime Reporter & Engineering News *the build plan for "the best expedition cruise ship ever built."*

By Greg Trauthwein

Born in Greece to a seafaring family, Nikolaos Doulis was destined for a maritime career. His father was a ship captain and eventually a ship owner, and to support the family business he wanted his son to have an engineering education. So at the age of 14, Doulis started spending more time in and around ships, in workshops, learning the technical ins and outs of ship machinery and systems.

"This was the best thing to happen for my career, because I learned how to work," said Doulis, who today serves as Senior Vice President, New Buildings, Lindblad Expeditions, the Norwegian-based expedition cruise pioneer.

While his father's family business was the impetus for his technical career, by the time he graduated Aspropyrgos Maritime Academy in Greece with a BA in Marine Engineering, his father's shipping company Pyrgi Chios Shipping Co. – which at its height owned 16 ships, including bulk carriers and ferries – had gone out of business due to the financial crisis. His father returned to sea as a captain and Doulis, who always had a fascination with the passenger vessel industry courtesy of summer jobs working on cruise ships, joined Celebrity Cruises in 1993 working as an apprentice on ships.

Doulis work ethic and technical acumen was evident early on, and his career accelerated. By the age of 30 he had become Celebrity Cruises' youngest ship manager, and by the time he left Celebrity Cruises in 2017 to join Lindblad Expeditions, he was the Director of Fleet Operations.

While Doulis enjoyed a long and successful career with Celebrity Cruises, he felt there was something missing. For starters, Celebrity Cruises was a part of the Royal Caribbean company, but it did not grow and expand like the other brands. "Celebrity has a great technical team, but Celebrity was … at the time … 'the poor brother of Royal Caribbean;' we did not expand like Royal Caribbean," said Doulis.

"I saw that we were starting to lose good talent because we weren't growing and offering new opportunities." Eventually Doulis was a driving force in launching several of the company's specialty cruise operations, including Celebrity expedition, Azamara Cruises and TUI Cruises. "One of the things that excited me most was the expedition cruising," he said.

Enter Lindblad Expeditions.

"When the opportunity came about with Lindblad, I moved to Seattle and what I found most exciting was the chance to work with Sven Lindblad; he's one of the best bosses I've ever had and one of the most well-travelled people on Earth," said Doulis. "This gave to me the opportunity to learn the expedition cruise business even better with Sven and the amazing team at Lindblad. Lindblad is the best in the expedition business."

As SVP in charge of newbuilding, his mission is clear: "I am responsible for the newbuilding program of the company." Today Lindblad Expeditions owns eight vessels and charters several more, with one newbuilding in the works for delivery in early 2020. Lindblad Expeditions in fact has two fleets, the Ameri-

“ … the best expedition vessel ever built … ”

Above: Nikolaos Doulis, Senior Vice President, New Buildings, Lindblad Expeditions, and the model of National Geographic Endurance at the tank testing facility, sporting Ulstein’s signature ‘XBox’. **Below:** Doulis (far left) and **Sven Lindblad** (third from left) at the keel laying ceremony.

Photos: Lindblad Expeditions

National Geographic Endurance
Main Particulars
DNV GL:1A, Passenger Ship, ECO, NAUT(AW), PC(5), Clean Design, BWM(T), Recyclable, COMF-V(1), COMF-C(1), VIBR, Silent(E), BIS, LCS(DC)

Range:	15,000 nm at 12 knots
Speed	16.5 knots
Power:	2 x 2975 kW
Engines:	2 x GE 8L250MDC
	2 x 12V250MDC
Length, o.a.	124.4 m
Loadline length	119.4 m
Breadth, molded	21 m
Depth, molded to upper deck	24.9 m
Depth, molded from freeboard	7.5 m
Scantling draft	5.7 m
Design draft, molded	5.3 m
Freeboard @ scantling draft	1.8 m
Freeboard @ design draft	2.2 m
Deadweight, max. draft	2,100 tons
Deadwegith, design draft	1,250 tons
Gross tonnage	12,300 tons

Cabins
-- 12 Large balcony suites (40 sq. m.)
-- 28 Balcony suites (19 sq. m.)
-- 17 Standard suites (17-18 sq. m.)
-- 4 Crew single (Deck 6) (21 sq. m.)
-- 3 Crew (Deck 4) (15-18 sq. m.)

Photo: Lindblad Expeditions

National Geographic Endurance (above, under construction, left, rendering of completed vessel) will be delivered in early 2020. The ship is outfitted with a host of advanced technology to deliver passeners efficiently and safely into some of the world's most remote regions.

Photos: Lindblad Expeditions & ABB

can fleet and the international fleet. "The American fleet are ships built in the U.S., operating with American crew and U.S.-flagged," said Doulis. The latest editions to this fleet are the National Geographic Quest & Venture built by Nichols Brothers Boatbuilders.

Meet National Geographic Endurance

While the expedition cruise ships are smaller than the mainstream consumer cruise ship goliaths, their mission and unique operating envelope demand equally high levels of preparation, design and outfit. The latest under construction is National Geographic Endurance, a vessel that Doulis calls "the best expedition vessel ever built."

Being built in Norway at Ulstein and scheduled for delivery in January 2020, Doulis said that the big differentiator on Lindblad Expeditions ships are the space allocated for guests, noting that the 12,400 gt Endurance is being built to accommodate 126 passengers whereas similar sized vessels for other companies are being designed and built to accommodate 200 to 250 passengers. "On our ships there is much more space per passenger," said Doulis, "more gross tonnage per passenger than any other expedition company."

The main differentiator in the expedition segment versus the larger, mainstream ships is the point of focus, as Doulis explains.

"In the expedition sector, the ship is not the focus, the destination is the focus. Don't get me wrong, the expedition cruise ships are functional and beautiful, but we don't have water slides, we don't have ice rinks and we don't have roller coasters … the ship is a tool to take you to the destination safely and comfortably," said Doulis. "Our mission is to deliver the destination. With us you're not swimming in a pool on the ship, you're swimming in the sea. You're getting an authentic experience."

With operations in some of the most remote and ecologically pristine locales on the planet, including a 35-day Antarctica cruise, delivering and returning passengers comfortably and safely with little environmental impact is the focus of Lindblad Expeditions.

Central to is mission of operating safely and efficiently is the ship's propulsion system. When selecting the propulsion system for this Polar Code 5 standard ice class vessel, Doulis said LNG was considered, but that it didn't make sense for this ship at this time. "We investigated LNG, but given the delivery time of the vessel we couldn't find LNG supply in the areas we go," said Doulis. "Also, for our vessels, we have a redundancy allowing us to go 50,000 nm, and for a small vessel like that, the LNG tank size was an issue." While LNG as fuel is not used today by Lindblad Expeditions, he foresees the mainstream take-up by bigger cruise companies in the not-to-distant future.

"I think after a few years all cruise ships will be built with LNG fuel. This will be the next big thing in the cruise industry. Instead Lindblad Expeditions opted for a diesel/electric solution with GE diesel engines at its core powering ABB Azipods, a technology familiar to Doulis from his years with Celebrity. The GE engines that are both EPA Tier 4 and IMO Tier 3 certified, and in Doulis' opinion "the most environmentally friendly diesel engines that exist." In addition Endurance is based on the signature Ulstein XBow design, a design proven to increase fuel economy and passenger comfort, as the innovative hull slices through the waves to help reduce slamming and vibration.

ABB Onboard with Lindblad Expeditions

While the National Geographic Endurance is a smaller cruise vessel with 69 cabins, there is nothing small about the level of technology of products and systems onboard, as the polar ship must be able to, safely and efficiently, carry its 126 passengers and crew in and out of some of the world's most remote and harsh weather locales.

ABB is a major system supplier on the vessel, delivering a comprehensive scope of power, automation, propulsion and digital solutions, melding ABB's experience in both the cruise and ice class vessel sectors. "We have a big supply on this vessel, starting with the propeller, the Azipod propulsion system, a pair of our DO pods, well suited for this ship because of their high ice class (PC 5)," said Marcus Högblom, Head of Passenger, Dry cargo and Ice Segment, Global Sales at ABB Marine and Ports. According to Högblom these will be the first DO pods delivered with Silent E notation, meaning there is additional noise mitigation so as to not disturb the wildlife in sensitive areas.

While the Azipods are the most visible part of the ABB supply – the star of the show – ABB's electric power and propulsion plant, its automation system and its remote monitoring and diagnostic system – ABB Ability – collectively are the heart and soul.

ABB Ability System 800xA is designed to further improve efficiency and safety of the polar newbuild. It integrates power, propulsion and vessel management systems into one platform, enabling both crew and onshore teams to get a comprehensive overview of all the information needed to operate the vessel in the optimal way. "Even though the ship is remote, it is not alone," said Högblom.

In addition, all control and monitoring applications have a uniform look and feel, allowing for a more intuitive user experience. The vessel will be connected to ABB's Collaborative Operations Center infrastructure which monitors the performance of ABB technology on board and remotely connects operators with ABB, particularly crucial for this vessel operating for extended periods in remote areas.

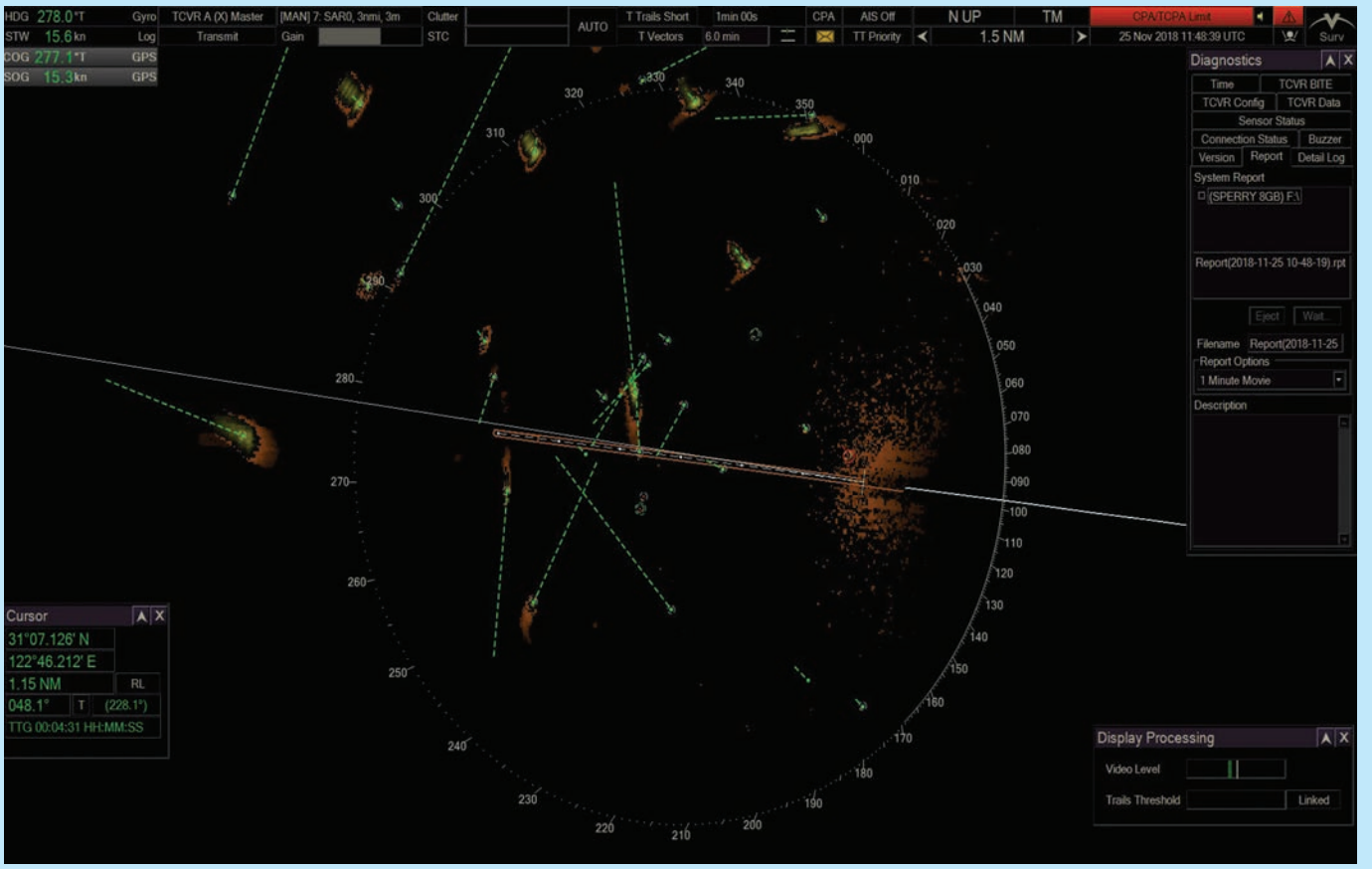
As the cruise industry continues to power through this historic period of growth, Högblom sees opportunity in many sectors, particularly the smaller expedition/luxury segment. "The big ships are still coming out, but there are a limited number of shipyards that can build them, and the biggest controlling factor today is the number of slots available at the shipyards," said Högblom. "In the smaller, higher end expedition and luxury segment, we see new players, new ships, new destinations and new opportunities. The sector is booming."

"EVEN THOUGH THE SHIP IS REMOTE, IT IS NOT ALONE."

Marcus Högblom, Head of Passenger, Dry cargo and Ice Segment, Global Sales, ABB Marine and Ports

Photo: Furuno

Nichols Brothers Boat Builders (NBBB) last year delivered National Geographic Venture, number two of two 100-passenger expedition cruise ships contracted by and built for Lindblad Expeditions for exploratory cruising in Alaska; Baja, California; the Pacific Northwest; Costa Rica & Panama and Belize. National Geographic Venture measures 238.5 x 44 x 10-ft. and is a Jones Act coastal cruise vessel, purpose-built for exploring coastal waters, shallow coves, and fast-moving channels where wildlife congregate. **Both vessels feature a complete Furuno navigation solution** installed by Mackay Marine's Project Management Group. The suite of electronics aboard each vessel includes FAR3210 and FAR3220 Radars, as well as two FMD3200 ECDIS consoles, GPS, AIS, GMDSS, VDR, and Doppler Speed Log systems. The electronic charts used in navigation are nearly always on display in the spacious passenger's lounge, allowing travelers to view the ship's location, speed and course in real time.



SeaGuard differs from conventional radar by using a very high-resolution solid state transceiver which can scan for targets almost simultaneously across six different frequencies, resulting in improved 'clutter' correction and better performance, especially in bad weather.

Image Courtesy Sperry

SeaGuard High Res Radar

Originally developed for naval use, SeaGuard can enhance situational awareness in congested waters and improve search and rescue operations

Sperry Marine unveiled SeaGuard, a high-resolution radar system designed to deliver a higher standard in navigational awareness for operators of very large cruise ships. Originally developed for navy use, the long-tenured marine electronics maker has already bagged a signature reference for the system. According to Pascal Göllnitz, Associate Product Manager, Sperry Marine, SeaGuard has been installed on Royal Caribbean Cruise Lines' Quantum of the Seas.

Originally designed as a naval surveillance radar capable of identifying small targets in water, SeaGuard differs from conventional radar by providing very high resolution in a solid state transceiver which can scan for targets almost simultaneously across six different frequencies. "We originally designed the surveillance radar software with a high-end solid state doppler transceiver which can do air and surface surveillance," said Göllnitz. "This system, together with an additional set of naval features, has been installed on an Offshore Patrol Vessel for the Chilean Navy."

Substituting the conventional magnetron receiver delivers improved 'clutter' correction and much better performance, especially in bad weather, according to the manufacturer. SeaGuard can support navigators when maneuvering in congested ports and harbors and can also assist with search and rescue in the event of a casualty involving passengers or crew. "As cruise ships continue to grow in size and passenger numbers increase, so do the navigational risks they encounter and operators are more concerned with minimizing the risks of collision," said Göllnitz. "It's also a regrettable fact that cruise ships can be involved in searching for people lost overboard. It is no exaggeration to say that being able to quickly identify and retrieve people from the water can be a life saver."

SeaGuard is intended as an auxiliary system for use in specific operational conditions, providing an additional layer of situational awareness. "The transceiver can meet and exceed the IMO performance requirement and we may consider putting it through the type approval process at a later stage," said Göllnitz. "Currently we are focused on providing versatile features and profiles for a variety of applications. It's to be noted that using it as main navigation radar would prohibit the use of some profiles which are currently in place for tasks like search and rescue." To help navigators keep a close eye on activity in congested waters or quickly begin a search and rescue operation, Sperry Marine has designed the interface to be as intuitive as possible, with a display and menu structure very similar to its navigation radar and ECDIS platforms.

"While a conventional navigation radar typically shows large targets, SeaGuard is designed to focus on and distinguish small targets in the water that a navigator normally wouldn't choose to see," adds Göllnitz.

While cruise is a prime target for the SeaGuard system, Göllnitz said there are additional ares of interest. "Cruise is the big focus and see a huge market potential in the cruise sector for SeaGuard; this is a sector that can adopt military level technology for civilian applications. Requests are coming from a variety of different areas other than cruise including offshore and fishery as well as for critical infrastructure protection and coastal security segments and law enforcement."

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David Thomson
graduated from the University of Strathclyde in Glasgow as a Naval Architect, moving directly into the computer aided design industry where he implemented 3D design software in over 20 shipyards. Most recently he led a small team at AVEVA dedicated to developing the next generation of VR and AR apps to realize the vision of the digital asset on the world's largest engineering projects

AR & VR Training Simulation in Industrial Marine Operations

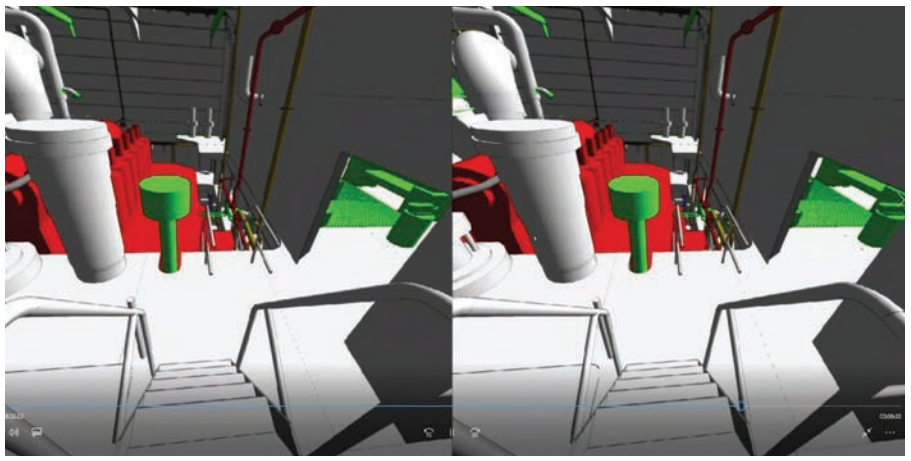
Few ever want to imagine the worst-case scenario when it comes to operating a vessel. Assets like the Titanic (valued at $400 million) and the Costa Concordia ($570 million) were not just expensive mistakes, but deadly and resulted in thousands of lost lives. Amidst many factors, human error and operating mistakes rank as the number one cause of disasters at sea and worse, are preventable through proper training and instruction. As with any industry that operates complex assets, there is minimal room for error in marine operations, especially when those errors can have dire consequences. With the advent of technological advancements in 3D simulation via Augmented Reality (AR) and Virtual Reality (VR), industrial companies are now able to train seafarers in a safe and secure environment.

Traditional vs. Simulation Training

The costs of traditional training are usually tied to officer-led programs in a classroom-style setting. Comparing the investments of time and money needed to pull officers from their jobs to lead these classes with the low-retention rate of classroom-style training hardly justifies the use of such methods.

Even if officers were in supply, capital was abundant, and the time to fly new members out to train at a facility wasn't an issue, a vessel's physical location would still complicate the process. Whether under construction, or at sea, familiarization is a key portion of training a new crew. Passenger vessels alone can be as many as 19 decks high, non-symmetrical in design and have complex layouts to accommodate entertainment venues. Traditional methods don't always allow enough time for crews to

1.



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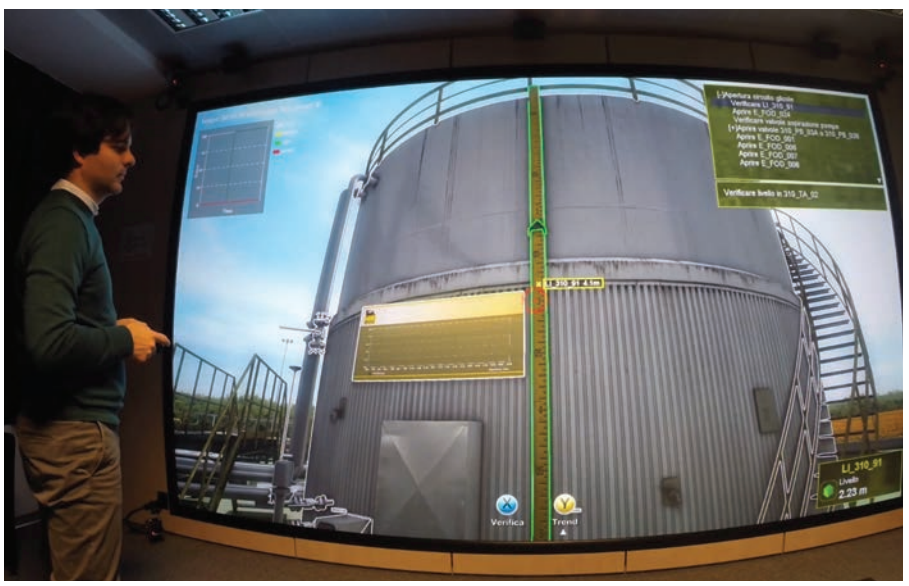


Source: AVEVA

become familiar with the ship before it leaves port. Imagine the difficulty of lowering life boats into the water during an emergency if nobody knows how to operate a crane or even where they are located. Virtual environments eliminate the risk of exposing new employees to critical situations on-site where proper experience before boarding the vessel would be crucial. Through AR and VR, we can circumvent these long-standing problems with traditional methods as well as allow for a connection between theory and application of training.

Historically, AR and VR were used exclusively by entities like NASA and the United States military due to the high

Images, starting top, opposite page and moving counter clockwise

1.
Inside a typical large ship model generated from a real-world vessel.

2.
A 3D simulated view of a site in the real world augmented with digital elements.

3.
Operators and Engineers can use their VR avatars to train together and learn how to handle almost any simulated scenario.

All Images Courtesy AVEVA

3.

costs of creating a virtual world. The use of simulation training tools were also limited due to a lack of access, unrefined tools and a workforce unfamiliar with new technology. However, the evolution of simulation software into a more accessible form has advanced so far that one can now access asset and operational data from a mobile device.

Paired with a lower price tag, the mainstream use of AR and VR in other areas (namely the gaming industry with mobile games and VR headsets), and a younger work force that has matured alongside this new technology, companies today can offer variety in operating training systems by including AR/VR elements that were not previously interactive and engaging compared to traditional classroom and on-site methods. This advancement is key in enabling the familiarization of assets before new employees even set foot on a vessel, thus eliminating the need for on-site training, risking damage to assets and endangering the workforce while learning on-site. These technologies have never been more accessible nor widespread, and an argument can be made that the integration of these capabilities is needed to stay competitive in an ever-evolving digital landscape.

What is a Virtual World?

AR and VR both operate with digital elements from a created virtual world. The virtual world is simply a digital representation of real-world assets that offer some form of interaction. A 2D sketch of a boat can be converted digitally, and a virtual world can be made from that model. The ability to walk around the deck of the vessel, open valves, operate an engine, open doors and generally interact with the boat via AR or VR are what constitute a virtual world.

What is Augmented and Virtual Reality?

Augmented reality provides digital elements to real-world data through a mobile device. It is the combination of virtual and graphic three-dimensional images that are transmitted to a user. The key difference from virtual reality is that the immersion and interaction from AR comes from overlaying images from the virtual world to augment views in real life. Superimposing virtual images, videos and even text can be heightened or modified in real-time.

Virtual reality in contrast does not augment the external environment, but rather immerses the user through an interactive system platform such as a 3D visor. Within the virtual environment, users can interact with objects and simulate images that replicate assets in the real world.

Uses of AR and VR

The ability to access virtual images, graphs and data in real-time changes the way projects can be executed and managed. Imagine being miles away from a computer on the site of an offshore rig or boat and having important data available through a mobile device. A ship crew or a surveyor in need of assistance in repairing or maintaining an asset would be able to receive information through a digital overlay of real-world objects. From that point, AR could even provide step-by-step guidance through digital overlay of an engine or an oil filter, et al.

Augmented technology makes possible the support and clarity of previously inaccessible system operations. Operators and engineers on-site would be able to become familiar with components through AR without the risk of damage to physical assets. AR provides industrial companies, whether they be marine, power or energy, the advantage of easy access to important data and creative solutions to training and simulation at a reduced cost.

Compared to the early days of limited virtual capabilities, the replication of real-life objects into VR in present day is worlds apart from its predecessor. Use of platforms such as Oculus Rift gives industrial companies widespread access to powerful VR capabilities, not just in accurately replicating an environment, but also in the ability to interact inside of a given simulation. As mentioned, if the physical boat isn't available, then VR circumvents that issue allowing crews access to a crucial component to familiarization training.

Digital training solutions create sophisticated simulations within the virtual world from 3D model design. VR gives operators the option to plan, evaluate, rehearse and train without having to experience a crisis first hand. This type of proactive training provides an accurate, safe environment that can improve safety and prepare workers in the case of an emergency. Seafarers can familiarize themselves with ship systems before going out to sea and avoid the risks of mistakes due to a lack of experience. Companies will not have to depend solely on experienced employees to give new hires information, but can supplement and add variety to how their workforce can learn proper practices. Finally, when training new crews, the frequency of training affects the retention of knowledge. Using VR, crews can run through scenarios as many times as they want until they achieve perfection. VR enables industrial companies to train their personnel efficiently and effectively in exchange for zero risk, minimal cost and minimal time investments.

Conclusion

As mobile phones become more advanced in technology and the use of VR in commercially sold items like the Oculus Rift become more widespread, it is without a doubt that the use of AR and VR will be streamlined. AR/VR obscurity is far behind, as it integrates into the technological landscape. With an ease of accessibility and a more familiarized work force that consumes technology daily, there are few reasons not to accept AR and VR as commonplace technologies that industrial companies will eventually need to adopt.

The ability to simulate and access data has proven to be invaluable in industries outside of marine and explains why AR and VR are becoming more popular. Utilizing augmented reality and virtual reality provide creative solutions to costly, age-old problems. Companies no longer risk training employees haphazardly and can ensure safety and results through AR and VR. The benefits of this technology aren't limited to simply minimizing time, money and effort, but serve as another means of keeping up with a competitive industry transitioning into a digital age.

The AVEVA HoloDemo bringing 3D and virtual into the real world. Source: AVEVA

Image Courtesy AVEVA

1-on-1 with
Captain Ted Morley

All Images Courtesy MPT

*"**Z-drive training** is still a larger driver as more and more new tugs are coming online. Additionally, **liquid cargo simulations** are becoming increasingly important in the industry."*

Captain Ted Morley, COO, Academic Principal, MPT

Fort Lauderdale, FL-based Maritime Professional Training (MPT) is a progressive and diverse mariner training center, long-tenured and regularly investing in the latest systems and supplied to keep its broad-based clientele coming back. Capt. Ted Morley, Chief Operations Officer, Academic Principal, MPT, discusses developments over the past year.

How specifically is MPT investing today?

MPT continues to evolve and expand it's simulation facilities, investments in projector technology and computer hardware help increase the level of immersion and improve the quality of the simulation. Additionally, on-going industry training for the staff ensures that their knowledge is relatable and pertinent to the needs of the students.

Where do you see opportunities in 2019 and beyond?

Regulatory compliance continues to be a main driver across all the sectors but we are seeing an increase in non-regulatory training and simulation. That trend will continue next year as more companies are looking to standardize their training methodologies, technology helps achieve that.

How have attitudes toward maritime simulation training evolved over the past few years?

More and more companies are seeing simulation training as an investment and as a tool to reduce downstream costs through efficiency and competency. Realistic simulators, with real-world equipment have greatly improved the range of courses and techniques that they can be used for, thus making them more and more relevant. Competency based assessments are a must as we look to the future of more complicated vessels with fewer crew.

What technology or technique do you see as the driver for your simulation training business?

Dynamic Positioning was a huge driver for years but the on-going downturn in offshore development and exploration has led to a drop in that segment, fortunately there are other technologies that benefit from simulation training. Z-drive training is still a larger driver as more and more new tugs are coming online. Additionally, liquid cargo simulations are becoming increasingly important in the industry.

We understand you had an interesting recent project with a cruise line. As this is the cruise shipping edition, would you care to share?

We recently completed a project for a large cruise line that included both on-board and simulation training. The unique aspect of this was that we were able to observe the current methodology in use onboard, review the audit findings, and work collaboratively to come up with solutions. Those solutions were then tested on the full mission bridge and engine room simulators here at MPT, fully vetted by the company, and then put into play in the real world. The benefits of seeing those solutions fully tested out prior to implementation onboard is a huge safety factor. We were also able to adjust the company training program to ensure that it was able to satisfy as many regulatory requirements as possible, thus saving the company money and standardizing procedures throughout the fleet.

Inmarsat's Fleet Xpress, as selected by Lindblad Expeditions, provides high-speed, global, reliable coverage to remote regions of the world.

Image Courtesy INMARSAT

Making the Right Connection

The satcom link is ever more critical to maritime's future, built on the rapid, seamless flow of digital information, a digitalization trend that is driving everything from ship equipment maintenance to, eventually, autonomous ships. **Tom Mulligan** *reports.*

With 20 years of experience in the satellite communications field, Rob Parkin, KVH's Sales Director for the EMEA region, has witnessed the digitalization trend in the "connectivity revolution," noting that different parts of the world and different markets have their own communications and connectivity needs. He said that the world can be divided into three core shipping regions: the Americas; EMEA (Europe, Middle East and Africa); and Asia-Pacific, each with its own special satellite communications (satcom) requirements. The Americas, for example, has fewer large shipping fleets but a large number of smaller operators, mainly fishing vessels, local transportation vessels such as ferries, and small-scale cargo transportation vessels. Shipping in the EMEA region, however, is based on large fleets and focused around three main hubs, Germany, Scandinavia and Greece, with the northern areas generally being more advanced in the adoption of new communications technologies. In the Asia-Pacific region the centers are Singapore, Hong Kong and Shanghai, where the effects of globalization of trade can be clearly seen through the extent of operations and extensive movement of goods from China to world markets, "the barometer of economic trade," as Parkin has put it.

"Goods were moving around the world by ship way before aviation became a major means of cargo transportation," Parkin noted, "and shipping is, by its very nature, a conservative industry that is slower to adopt new technologies. Up until about ten years ago, slower and narrower bandwidth connectivity solutions, primarily offered over L-band, were the norm for shipping fleets. However, the industry now finds itself at a crossroads with respect to communications technology. In the period 2008-2018 technologies have continued improving while the shipping industry has experienced a downturn in business. With companies having to operate as competitively as possible in order to stay in business, a Darwinian effect has come into play – the lower number of shipping companies also being reflected on the supply side as industry in general goes through a consolidation and corporate globalization process."

Investment opportunity

Parkin continued: "Older communications technologies are becoming outdated and obsolete," adding that there is now the opportunity for the industry to invest in new technology. "The technology is in itself about 20 years ahead of where the shipping industry is, but we have seen and are still watching what's happening on land – things like satellite TV, Big Data analytics being applied to the movement of goods in the supermarket sector, and so on. Shipping needs to be ultra-competitive and needs a new style of management based on the optimization of performance through technology, operations and staffing – it's essential to identify what sort of data is needed and how to use it."

Parkin said that the answer is the use of VSAT connectivity, providing more communications capacity at higher speeds and lower prices: "As behavior on land evolves, shipping is becoming part of a bigger picture," he said, "and this is reflected in the increasing adoption of autonomous operations, which have large data flow requirements. The question is how to drive connectivity whil at the same time remaining competitive, bearing in mind that communications technology affordability has dropped dramatically. Nowadays, broadband technologies, such a High Throughput Satellite Ku- and C-band technologies, are meeting the needs of the industry,

"IT IS ESSENTIAL THAT THE SHIPPING INDUSTRY ADOPTS NEW COMMUNICATIONS SYSTEMS TO REMAIN A MODERN, EFFICIENT AND EXCITING INDUSTRY THAT CAN ATTRACT THE BEST YOUNG TALENT AVAILABLE."

ROB PARKIN,
SALES DIRECTOR
FOR THE EMEA REGION, **KVH**

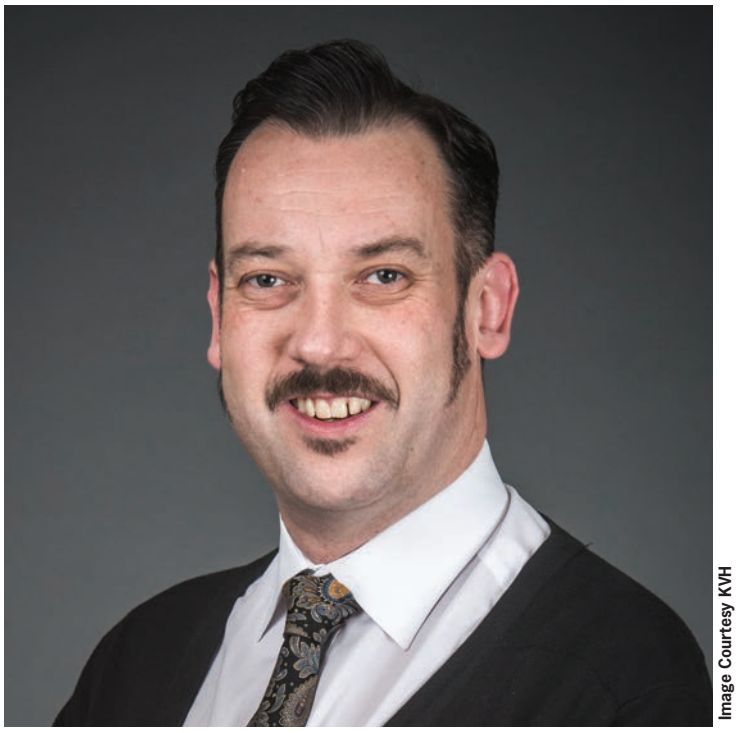


Image Courtesy KVH

and represent a more affordable means of communication – this is an important area of activity for KVH."

Combined solution

KVH's approach to providing the most modern communications technologies and services for the shipping industry is to combine hardware, software and monthly airtime service into one solution: the company manufactures its own antenna, produces its own software and operates its own network. This combined solution thereby offers a lower entry barrier for shipping companies looking to implement new communications systems – "we subscribe our systems as a service, there's no need to buy expensive equipment or sign up to any service commitments – short- or long-term – normally associated with ship connectivity solutions," said Parkin, adding that many ships' connectivity kit is approaching the end of its life and is technically outdated. "It's a service we provide, 'Connectivity as a Service' – there's no capex or commitment involved, simply a subscription to a digital service at a much-reduced risk.

"Aside from the operational benefits, shipping companies need to install these kinds of new communications systems as young people starting their careers at sea demand modern essentials such as access to the Internet – there needs to be a holistic approach to shipping and taking the human aspect into account is essential – and this is why it is also essential that the shipping industry now adopts new communications systems to remain a modern, efficient and exciting industry that can attract the best young talent available," Parkin concluded.

Cruise liner connectivity

An example of this approach is provided by connectivity and IT solutions specialist Marlink: the company recently renewed its contract with adventure and expedition cruise liner Hapag-Lloyd Cruises for existing vessels and new adventure cruise ships in production to provide its quality Sealink services on the latter's fleet of four cruise vessels, plus two new cruise ships which are due to enter operational service later this year. The contract renewal reflects Hapag-Lloyd Cruises' desire to meet the requirements of the growing market for adventure and expedition cruises, as the ships are now operate in remote areas that were previously considered inaccessible for cruise ships, such as the Arctic and the Antarctic.

Marlink's Sealink service is designed to provide stable, dependable and flexible global connectivity for secure onboard ship management, enabling seamless internet access for passengers and crew alike, and provide carrier services for onboard GSM services for passenger voice, SMS and data connectivity: "The recent addition of new satellites and overlapping Ku-band beams to the Sealink network is designed to reinforce Marlink's status as the natural choice to

Images Courtesy MARLINK

Images Courtesy KVH

Left: **KVH's IP-MobileCast** content delivery service brings news, sports, movie, and TV content on board via satellite, a great boost for crew welfare.

Above: **XChange is Marlink's** centralized communications management system, streamlined and integrated to enable crew communications management and seamless switching between satellites, VSAT or L-band carriers.

Above, Left: A **Marlink Sealink VSAT dome** in position and providing stable, dependable and flexible global connectivity on board ship.

Image Courtesy INMARSAT

accompany Hapag-Lloyd Cruises' ongoing expansion into expedition cruises," it said.

Marlink's VSAT network coverage from Canada's east coast to the western tip of Alaska has been facilitated by the recent addition of a new satellite, which is broadly representative of the overlapping connectivity that ensures that Sealink provides optimal, comprehensive high throughput onboard services, even in the most distant regions.

VSAT for the tanker fleet

In January of this year, Marlink was awarded a contract renewal to expand its Sealink VSAT service to international shipowner Transpetrol. The renewal secures access to Marlink's global network and VSAT solutions for the entire tanker fleet and two planned new buildings due for delivery within the next 18 months. Operating a diverse fleet from medium-range tankers to Aframax and Very Large Gas Carriers (VLGCs) on global routes, Transpetrol has a need for always-available data and voice communication for operations and crew welfare, and Marlink has provided a standardized solution integrating Global Ku-band VSAT with L-band backup to address this.

Marlink said that Transpetrol will extract more value from Marlink VSAT through an increased Committed Information Rate (CIR) and Maximum Information Rate (MIR), enabling it to use new digital applications and provide more access for crew, and that Transpetrol's business and operations will be further protected from cyber-attack through Marlink's highly resilient network and the deployment of SkyFile Anti-Virus, now part of Marlink's extensive Cyber Guard portfolio, on board each ship.

Core to running Transpetrol's connectivity solution is the XChange centralized communications management platform, which offers a streamlined and integrated system enabling crew communications management, and seamless switching between satellites, VSAT or L-band carriers, as well as the hosting of Transpetrol's chosen value-added services which include XChange Cloud, a new secure and scalable platform for the optimized transfer and synchronization of files between ship and shore, and vice versa.

Driving innovation

Inmarsat owns and operates a broad global portfolio of satellite networks specifically designed for customer mobility, and holds a multi-layered, global spectrum portfolio covering L-band, Ka-band and S-band designed to enable a wide breadth and diversity in the solutions it provides. The company is a driving force behind technological innovation in mobile satellite communications, and has made substantial investments in new technology, operating across a diversified portfolio of sectors, including the maritime, government and aviation satcom markets.

Inmarsat is now providing global Fleet Xpress connectivity for the Lindblad-National Geographic expedition ship, National Geographic Venture, which is designed to explore coastal waters, shallow coves and fast-moving channels where wildlife congregates. The vessel completed a first voyage in December 2018 before a spending its next season in Baja California. Pacific North West coast and Alaskan cruises are also planned.

In total, Fleet Xpress is now installed on board six of the Lindblad Expeditions ships, including National Gepgraphic Venture's sister ship National Geographic Quest, delivered in 2017, with retrofits made on Sea Bird, Sea Lion, Endeavour II and Islander. Fleet Xpress is fully integrated with the ships' phone systems (PABX), and the internal communications platforms and local area networks used to optimize vessel operations.

New market

Expedition cruising is creating a significant new market for Fleet Xpress systems, according to Christian Cordoba, Inmarsat's Maritime Channel Manager: "Combining the data speed of Ka-band and continuous L-band back-up with purpose-designed and easy-to-install 1m terminals allows Fleet Xpress to achieve 24/7 coverage, stability and reliability, including high-speed IoT connectivity, whether the ship is in the Arctic or miles up an inland channel," he said.

Cordoba said that the new generation of expedition cruisers have especially high expectations for connectivity, which is considered a lifestyle entitlement: "For adventure cruisers today, connectivity is part of the package they are paying for;

Inmarsat's Network Operations Center is located in the company's headquarters in London, UK.

Image Courtesy Intelsat

"FOR A DIGITAL BUSINESS MODEL IN MARITIME TO BECOME A REALITY, MARITIME COMMUNICATIONS AND APPLICATIONS PROVIDERS MUST BE ABLE TO RELY ON A FAIL-SAFE, FAULT-TOLERANT COMMUNICATIONS NETWORK."

MARK RASMUSSEN, VP & GM, **INTELSAT**

this is an audience which expects a highly educational vacation, but also to share experiences online instantaneously. Service reliability and speed become hotel management issues that affect brand reputation, ratings and repeat business," he said. "From the owner's perspective, Fleet Xpress is also the answer because these compact ships don't have the real estate for the sizeable terminals larger cruise ships use to connect via C-band. Meanwhile, L-band alone falls short on data speeds and Ku-band services may work with compact shipboard terminals, but they simply can't achieve the global coverage the itineraries demand. The fully proven reliability of Fleet Xpress in service, and the robust and established I-5 and I-4 satellites supporting Ka-band and L-band respectively, were also proving persuasive in attracting new types of shipowners to the high-speed data network," he said.

"With passenger safety in remote locations reliant on connectivity, it's also fair to point out Inmarsat's investment in the new and award-winning SafetyNET Maritime Safety Information and RescueNET Search and Rescue messaging systems. Inmarsat is also the only ship/shore connectivity provider whose services are fully approved under the International Maritime Organization's Global Maritime Distress and Safety System."

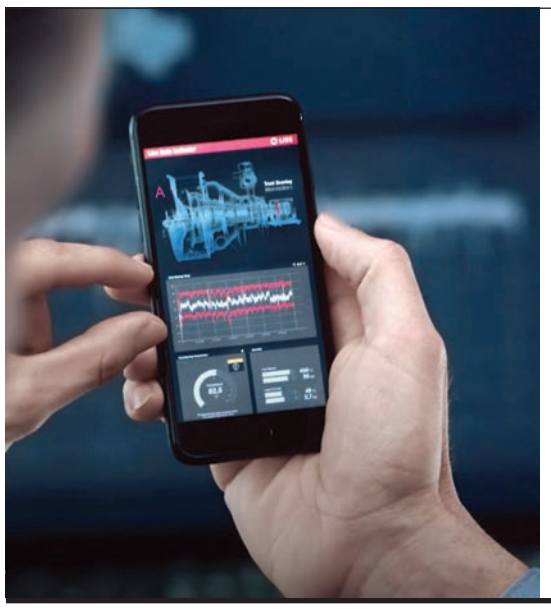
A final word

Mark Rasmussen, Intelsat's Vice President and General Manager, Mobility, provided a final comment on the state of affairs in the maritime satcom sector: "As shipowners and managers face challenging operating conditions, many are embracing digitalization as a means of lowering operational costs and taking advantage of big data analytics to enable new services that improve vessel efficiency. However, for a migration toward a digital business model in maritime to become a reality, maritime communications and applications providers must be able to rely on a fail-safe, fault-tolerant communications network. Intelsat supports its solution partners by combining multiple layers of high-throughput satellites (HTS) and wide beams with a next-generation managed terrestrial infrastructure, allowing them to provide ship operators with ultra-reliable, high-speed connectivity needed for digitization. While L-band solutions are important for emergency or backup communications, this low-speed connectivity simply cannot provide the throughput needed for today's business operations.

"Through our solution partners, Intelsat offers the largest global network for ship operators, including our Intelsat Epic high-performance satellites and the award-winning Flex Maritime offering. This robust, flexible and resilient platform enables ship operators to add a level of service, coverage and throughput that has not historically been available in the marketplace. KVH was the inaugural partner for Flex Maritime. KVH's large-vessel customers saw data speeds triple and, in some cases, increase by a multiple of six.

"One of the applications that will play a growing role in making operations more efficient is the Internet of Things (IoT). Given the ubiquity of space-based communications, space-based platforms will play a critical role in supporting IoT applications aboard vessels and helping operators realize the potential of interconnected devices anywhere they operate around the world. However, for IoT to have the greatest impact, different technologies must be integrated into an economically viable hybrid network that takes advantage of the respective strengths of each platform."

Rasmussen concluded, "As more vessel operators transition to the always-on connected ship and move closer to the fully autonomous ship, concerns about cybersecurity take on a new and more complex meaning. The systems and networks will have to be secure in order to mitigate risk of unauthorized access. At Intelsat, we understand that business-critical applications require the highest levels of reliability, availability, and cybersecurity safeguards. Intelsat is the only satellite operator that has been audited by the independent auditing firm KPMG and completed a Service Organization Control 3 (SOC3) review of security controls. While our systematic approach ensures optimal protection, we remain vigilant and constantly evaluate and adjust our security posture to address emerging threats. This will become even more important as we move to an era of the autonomous ship."



MAN CEON Platform: Backbone of Digital Service Business

MAN Energy Solutions introduced its new digital platform, MAN CEON, designed to collect and evaluate operating and sensor data, enabling real-time monitoring of marine or power plant engines, turbines and compressors.

"MAN CEON is the new backbone of our developing digital service business," said Per Hansson, Head of Digital and Strategy at MAN Energy Solutions. "All of our machines, whether engines or turbomachinery, are equipped with hundreds of sensors that transmit data constantly. MAN CEON enables the efficient collection, storage and evaluation of these data volumes. The platform is scalable, designed to monitor several thousands of customer installations in parallel its data processing capacity exceeds that of many major social media platforms. Furthermore, we are monitoring down to the level of small sub components, much like with a 'digital twin', with high-resolution data available on demand. To do this, we employ state-of-the-art, cloud-based technology and algorithms that automatically identify and report problems."After connecting their installation to MAN CEON, customers can access the platform via a web application on their PC, or by using a mobile terminal; data is sent and processed continuously. Encrypted data transmission and a multi-level authorization procedure during login ensure maximum data security. The operating data of all systems and ships networked via CEON can be transmitted to MAN service centers in real time. From here, MAN proactively support customers with problem solving and maintenance, support which includes video and audio live chats.

Furuno Debuts FAR22X8BB

After more than 60,000 installations since its debut 15 years ago, Furuno's FAR21X7 will cease production this year, making way for the next-generation series of IMO-compliant radars, the all-new FAR22X8BB. The Furuno FAR22X8BB Radar Series is available in 12kW or 25kW X-Band, 30kW S-Band, or 250W Solid State S-Band configurations. Each model is supplied in a 'black box' configuration, allowing the choice from a variety of displays to fit the needs of the vessel, including Furuno's own MU190 19-in. LCD's for SOLAS Category 2 ships, and MU231 23.1-in. LCD or MU270W 27-in. Wide Screen LCD's for SOLAS Category 1 vessels.

The FAR22X8BB series incorporates some of Furuno's newest features, such as a simplified user experience, as well as ACE and FTT operational innovations. Automatic Clutter Elimination (ACE) adjusts clutter reduction filters and gain settings automatically according to sea and weather conditions, maintaining an optimized Radar display and freeing the navigator's attention for other operations. Furuno's Fast Target Tracking (FTT) function allows the user to manually or automatically track up to 10 targets. Tracked target speed and vector display are available in seconds, making quick work of assessing hazards from approaching or moving targets.

In the FAR22X8BB series signal processing begins directly in the gearbox, where the analog signal is converted and digitally transmitted to the processor via Ethernet connection. The result is less noise and higher sensitivity. Brushless motors spin the antenna which, depending on the model, can be anywhere from a sleek 4-ft. X-Band all the way up to a 12-ft. S-Band antenna array.

Hatteland's New 43" Premium Quality Display

Hatteland Display released a new 43-in premium quality display as part of its Series X Multi Vision Display (MVD) product family. The ultra-high definition (UHD) system features the same 4K panel technology as existing Series X MVD variants to help create a clear, bright picture. With 3840×2160 pixels compared to 1920 x 1080 on full high definition (FHD) displays, UHD is a significant technology improvement that empowers maritime technology manufacturers to develop new, more ergonomic and user-friendly bridge consoles and designs. While the crystal clarity of the image contributes to reducing human error due to easy viewing in all light conditions and angles, the UHD format also allows for multiple inputs to be displayed in real-time, opening the possibility to reduce the number of displays needed.

ChartWorld Launches World-First ECDIS Capabilities

ChartWorld announced the launch of its next-generation eGlobe G2+ ECDIS. eGlobe G2+ is the world's first 4K ECDIS, displaying chart data in ultra-high definition, greatly improving ECDIS visibility and safety, route planning capability and overall situational awareness. ChartWorld's ultra-high definition 32-in. screen provides clear chart presentation and touchscreen functionality, while its processors providing speed and reliability.

The move is seen by the company as a step toward improved and expanded digital navigation, whereby data input with grow exponentially and the functionality of the ECDIS unit on a large commercial ship is finally approaching the ease of use, clarity and accuracy of a common smartphone. eGlobe G2+ functionality is based on ChartWorld's eGlobe G2 system.

Renolit Dolphin S Trials on Lake Constance

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The twin-hulled catamaran ferry Constance has been doing the trip between Friedrichshafen and Constance for more than 24 years, each year attracting crowds of guests, as well as some submerged unwanted guests: mussels and barnacles attaching themselves to the hull and creating drag. Even with antifouling applied, the vessel had to come out of the water every two years for cleaning.

RENOLIT DOLPHIN S is a biocide-free antifouling film that could be a solution.

RENOLIT MARITIME system partner "bodensee-bootsfolierungen.de" was given the job of applying test strips of this film to the forward sections of the underwater hulls where the mechanicals loads are the greatest. The rest of the catamaran's hulls as well as the other two catamarans that the ferry company operates on Lake Constance were treated with conventional antifouling paints. This allowed the functionality of RENOLIT DOLPHIN S to be tested in a direct comparison. The manufacturer reports good results, as a catamaran coated with film would only have to be taken out of the water every five years, mainly because above the speed of 5 knots the film is self-cleaning. Moreover, the application of RENOLIT DOLPHIN S is totally emissions-free.

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RONJA STORM: 4.5 million gallons of water/day

*Ronja Storm's hull has arrived at the Havyard yard in Leirvik, ready to become **the biggest wellboat in the world**. No other ship in the world has a freshwater production facility as large as that of Ronja Storm. The boat can produce 16.8 million liters of freshwater a day.*

Ronja Storm will be the world's biggest in more ways than just being much longer than other wellboats at 116m. There are also no other ships in the world that have such a big freshwater production facility. The boat can produce 16.8 million liters of freshwater a day, thereby potentially covering the daily freshwater consumption of 100,000 average Norwegians.

Nor are there any other wellboats that can match her fish tank capacity or have such a great capacity for processing and transport of fish. Its capacity is nearly twice that of the average wellboat. No other boats have four fish tanks, and no others can load 1,000 tons of fish an hour. That means 3,300 big salmon per minute.

In addition, no other wellboats have used a direct current system before. Ronja Storm is the very first, and the system will save fuel and ensure good handling of the fish.

"Ronja Storm is the biggest in the world not only in terms of its actual size," said Kjetil Myren, Senior designer, Havyard Design & Solution. "The focus has been on thorough and reliable handling of large amounts of fish, which has required new solutions and equipment to be developed. Clients and end users have challenged us down to the tiniest detail, and the result is that Ronja Storm will be a giant in every way." Ronja Storm is being built for Sølvtrans, which will rent the wellboat to Huon Aquaculture in Tasmania just off Australia. Myren explains that the fish transporting and processing needs there require the large dimensions. "The salmon must be treated and transported many times throughout their life cycle, and bathing the fish in freshwater is an effective and environmentally friendly method. Producing our own freshwater makes the treatment more sustainable, as you avoid using natural freshwater, which is a scarce resource, you save time and fuel from not having to fetch it, and you don't have to filter it. The water is of course reused as well."

When the salmon is treated that often, it must be possible to take them out of the cages quickly and with care to avoid stress and reduced growth. This is why such enormous systems are needed to handle the fish. To ensure fish welfare and survival, robust and redundant systems are also incorporated. Ronja Storm will be delivered to Sølvtrans autumn 2019.

Photo:s David Zadig

NB 135, Ronja Storm by the dock at the yard in Leirvik in Sogn. **BELOW:** From left: (all with Havyard Ship Technology) Process Manager Jan Andre Førde Systad; Project Manager Svein Frode Eggesbø; EVP Lasse Stokkeland; and Process Manager, Production Håkon Bosdal.

Exmar opts for Luminultra

EXMAR Ship Management selected the LuminUltra Quench-Gone Aqueous (QGA) test kit to monitor the quality of the drinking water produced on board the LPG FSO NKOSSA II. The decision follows the success of the QGA solution in analyzing the quality of the water produced by reverse osmosis aboard accommodation barges operating offshore West Africa. The QGA test kit has been in constant use over the past four years aboard EXMAR Offshore Services' 450 POB barge Nunce and the 300 POB Wariboko. The LPG FSO NKOSSA II will be equipped with the kit later this month and the company is considering its use aboard LNG and LPG vessels. Using a single analysis based on the measurement of Adenosine Triphosphate (ATP), Quench-Gone Aqueous (QGA) provides a rapid and interference-free determination of total microbiological concentration in any filterable water sample with a wide detection range.

Designed for low-solids, low-biomass concentration applications, the speed and portability of the QGA kit enables tests from many points in a water generation system to detect elevated microbial growth levels in real-time. Results are available in under five minutes.

The LuminUltra Quench-Gone Aqueous (QGA) test kit monitors the quality of the drinking water aboard ships.

Ferry Fatality Puts Focus on Wastewater Mgmt.

Wastewater management on any vessel is a critical part of vessel operations, particularly when that vessel is a passenger vessel. The importance of maintaining chemical toilets on board was raised following an incident in February on board a Sydney Harbor-operating passenger ferry in which a high level of toxic gas was detected in a toilet cubicle after a passenger was fatally injured.

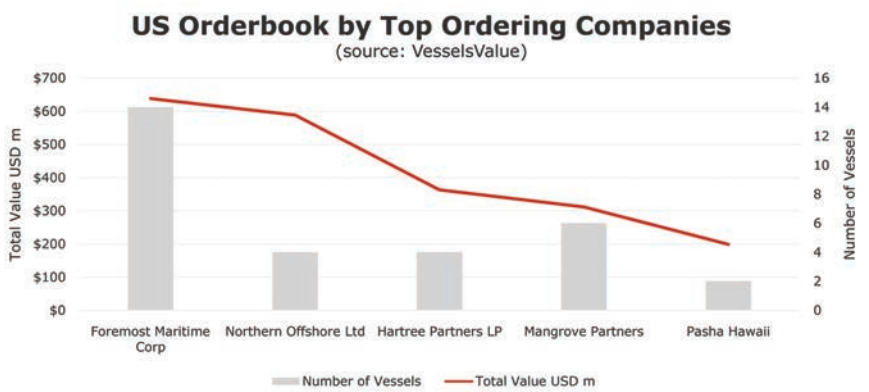
A 39-year-old passenger was found unconscious in a toilet cubicle aboard the Lady Rose and could not be revived by paramedics. While the reasons behind her death are unconfirmed, during the initial investigation HAZMAT crews detected hazardous levels of hydrogen sulfide gas in the toilet cubicle.

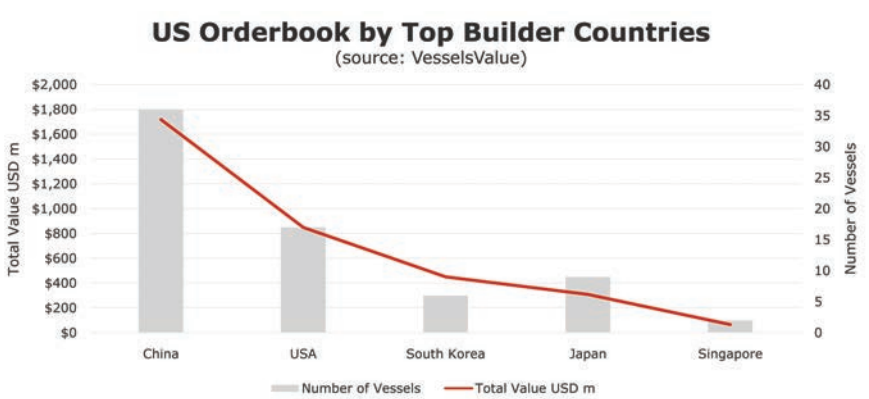
"This dreadful story serves to highlight the issues of poorly maintained chemical toilets and poor or obstructed ventilation in these small toilet cubicle spaces," said Mark Beavis, Managing Director, ACO Marine. "Some small passenger vessels do not have installed treatment systems and therefore store wastewater in holding tanks, but if these are not regularly flushed and aerated then the contents can become anaerobic and generate lethal H2S gas."

Hydrogen sulfide is a gas produced during the decomposition of waste. In modest concentrations of between 700 and 1,000ppm it is toxic and can lead to sudden collapse and death, according to the Occupational Safety and Health Administration (OSHA).

Beavis believes one simple way of protecting passengers from the hazardous gases generated from untreated effluent is to ensure that all bathrooms and toilet cubicles are fitted with sensors.

"Sensors with integrated alarms on the bridge would allow for more immediate action in the event of any hazardous gas leaks and the integrity of the seal between the cabin space and the wastewater holding tank should be checked regularly. No doubt the enquiry will throw more light on the cause and effect of this case and whilst a biological treatment system would not be a practical solution for a day boat, better wastewater management practices are clearly required," he said.





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U.S. FLEET

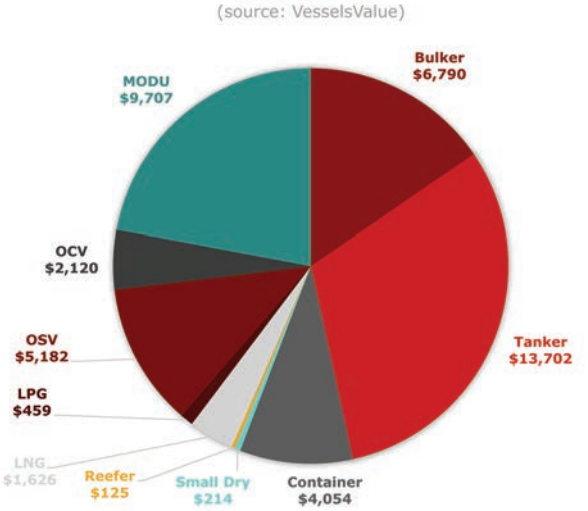
Vessel Type	Live		On Order		Total	
	# Vessels	Value ($)	# Vessels	Value ($)	# Vessels	Value ($)
Bulker	339	$5,746	22	$1,043	361	$6,790
Tanker	424	$13,067	11	$636	435	$13,702
Container	159	$3,530	13	$523	172	$4,054
Small Dry	82	$214			82	$214
Reefer	21	$125			21	$125
LNG	16	$1,626			16	$1,626
LPG	13	$459			13	$459
OSV	1,284	$4,910	18	$271	1,302	$5,182
OCV	88	$1,756	5	$364	93	$2,120
MODU	127	$9,118	4	$589	131	$9,707
Grand Total	**2,553**	**$40,551**	**73**	**$3,427**	**2,626**	**$43,978**

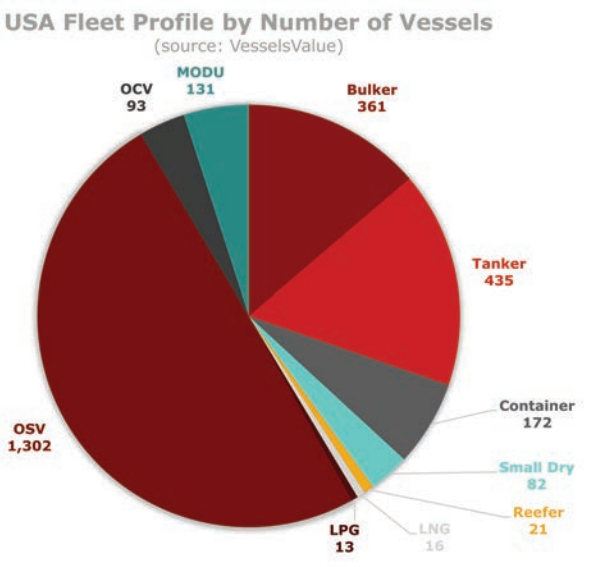
Top U.S. Ship Owners by Value

Vessel Type	Live		On Order		Total	
	# Vessels	Value ($)	# Vessels	Value ($)	# Vessels	Value ($)
Noble Drilling	29	$3,120			29	$3,120
Rowan	25	$2,234			25	$2,234
Edison Chouest	233	$1,893	5	$109	238	$2,001
Scorpio Tankers	55	$1,877			55	$1,877
DHT Holdings	27	$1,590			27	$1,590

Top U.S. Ship Owners by Value by Number of Vessels

Vessel Type	Live		On Order		Total	
	# Vessels	Value ($)	# Vessels	Value ($)	# Vessels	Value ($)
Edison Chouest	233	$1,893	5	$109	238	$2,001
Tidewater	181	$825	6	$73	187	$897
SEACOR Marine	77	$211	3	$28	80	$239
HOS	74	$962	2	$180	76	$1,142
GulfMark	66	$293	--	--	66	$293





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Woods Hole, Martha's Vineyard and Nantucket Steamship Authority

NOTICE OF

REQUEST FOR PROPOSALS

FOR CONSULTING SERVICES

TO ASSIST THE STEAMSHIP AUTHORITY IN TRANSITIONING TO A PROCESS-BASED APPROACH TO MANAGEMENT, INCLUDING THE DEVELOPMENT AND IMPLEMENTATION OF A NEW SAFETY MANAGEMENT SYSTEM (SMS) AND QUALITY MANAGEMENT SYSTEM (QMS)

CONTRACT NO. 03-2019

The Woods Hole, Martha's Vineyard and Nantucket Steamship Authority (the "SSA") has issued a Request for Proposals ("RFP") from consulting firms to assist the SSA in transitioning to a process-based approach to management, including the development and implementation of a safety management system (SMS) across its fleet and facilities as well as a quality management system (QMS) across its entire organization, as recommended by HMS Consulting, Glosten and Rigor Analytics (collectively, "HMS") in the report they issued on their comprehensive review of the SSA's operations, dated December 13, 2018 (the "Report"). The SSA has not yet established a deadline for the submission of proposals, but will do so in a subsequent addendum to the RFP. At this time, the SSA anticipates that the deadline for submitting proposals will be in late April or early May 2019 so that the SSA will have sufficient time to respond to consulting firms' questions and suggestions regarding the RFP after they have had sufficient opportunity to review both the RFP and the Report.

In order to receive electronic versions of the RFP, the Report, and all subsequent addenda issued by the SSA to the RFP, please email the SSA's Procurement Officer, Peggy Nickerson, whose email address is **pnickerson@steamshipauthority.com.** Electronic versions of those documents may also be requested by calling Ms. Nickerson at (508) 548-5011, ext. 515, during the SSA's regular business hours.

The SSA is utilizing a RFP procurement process for this Contact. Under such a process, the selection of the most advantageous proposal will be based upon price and other evaluation factors specified in the RFP. The RFP fully details the procurement process and the requirements for each proposal, and persons interested in submitting proposals for the Contract must comply with the provisions hereof.

Unless all proposals are rejected, the SSA shall award the Contract to the eligible and responsible consulting firm who offers the most advantageous proposal to the SSA, based upon the RFP requirements and the evaluation criteria established for the Contract. In this regard, the Total Proposal Price is only part of the evaluation process, as more fully detailed in the RFP.

The SSA is soliciting competitive proposals pursuant to a determination that such a process best serves the interest of the SSA and the general public, and not because of any legal requirement to do so. The SSA reserves the right to accept or to reject any and all proposals, to modify or amend with the consent of the consulting firm any proposal prior to acceptance, and to waive any informality, all as the SSA in its sole judgment and discretion may deem to be in its best interest.

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