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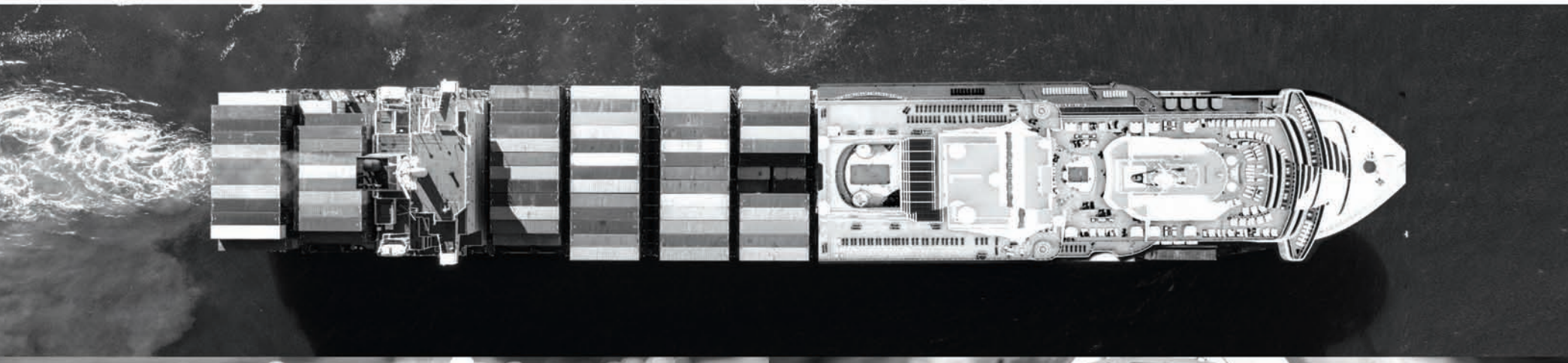

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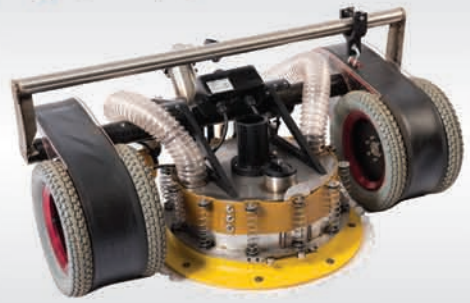

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Editorial

Fuel for Thought

This is a historic edition for Maritime Reporter & Engineering News, and not simply because we are one edition away from our big 80th Anniversary edition. This is special because for the first time in my tenure, we have a father/son duo authoring articles, better known as **DiRenzo²**.

I have known the elder DiRenzo, Joe DiRenzo III, for most of my 28 years in this seat, and if you have any dealings with the United States Coast Guard, it's a fair bet that you've run across Joe DiRenzo, too, as he is Director of Research Partnerships at the Coast Guard Research and Development Center.

In this edition he authors a piece headlining our 'Thought Leadership' coverage on Port and Ship Security, looking at Artificial Intelligence and Machine Learning and its role as a potential force multiplier for Coast Guard missions. Following recent articles in our pages on the need for the Coast Guard to modernize now to better carry out its missions, I can say without hesitation that DiRenzo III's article is spot-on regarding the need to tap modern, electronic means to better complete its many missions. His story starts on page 18.

The younger **Joe DiRenzo** is a force of his own, a top USCG Academy graduate now residing in Norway. Our team at *Maritime Reporter & Engineering News* became more familiar with DiRenzo IV during our recent trip to Oslo for Norshipping in June, as he was an integral part of our coverage of this high-profile and exceptionally busy international shipping conference and exhibition. Per previous editions, DiRenzo has a key eye on ship fuel trends, topical of course with the looming IMO2020 deadline coming in about three months. In this edition, and presenting an interesting twist on the fuel debate, DiRenzo explores the use of 'Green Ammonia' – or the conversion of excess renewable energy into ammonia, then back again to usable energy – starting on page 31.

Despite the fact that this wasn't billed as the "fuel" edition, in reality every edition could be the fuel and emission edition, as it is these regulations and technologies that are the top item on the agenda of every reputable ship owner. Last month Waterfront Shipping Company Ltd., took delivery from South Korea's Hyundai Mipo Dockyard of two new 49,000 dwt methanol dual-fuel ships, powered by second-generation MAN B&W ME-LGIM two stroke dual-fuel engines, and it will take another two before year's end.

While the story of these newbuilds, one of which grace this month's cover, is a compelling story, the real story is the amount of experience that Waterfront already has operating ships on methanol: in total more than 60,000 hours since it received its first ship in 2016. Waterfront is surely ahead of the pack in this regard, and the company is also interested to share its experiences with the global shipping community.

In this edition, on page 49, we present a short story on the two new ships. Coming in the October 2019 edition – our "Marine Design Annual" and *Maritime Reporter & Engineering News'* 80th Anniversary edition – we take a much deeper dive with **Paul Hexter**, the President of Waterfront Shipping, and **Fredrik Stübner**, Marinvest's Director Ship Management, to learn more about design, construction and life-cycle maintenance pros and cons of methanol fueled ships. Arguably the biggest 'pro'? Meeting IMO Tier III emissions standards without the need for exhaust gas after treatment.

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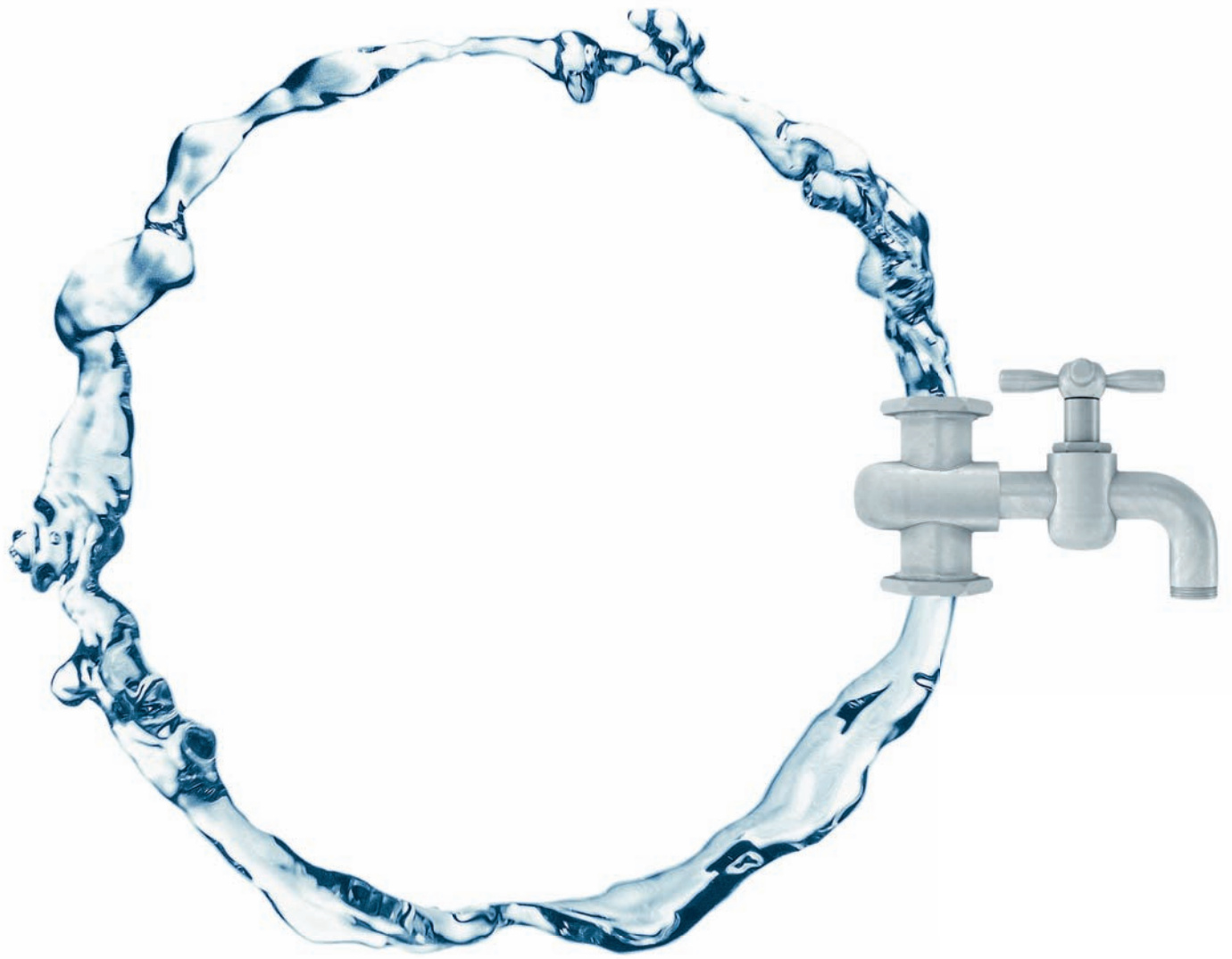

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Murray Goldberg is CEO of Marine Learning Systems which provides software and services to optimize knowledge, skills and behavior in maritime operators. In his former life he was a computer science faculty member at the University of BC researching online learning and assessment delivery models and their effectiveness. This led to him develop WebCT, a learning management system that was used by 14 million students in 80 countries.

Training Tips for Ships
Tip #4 – Never Give the Same Exam Twice

Image Courtesy Marine Learning Systems

We've all heard the stories, and many of us have seen it first-hand: the completely ineffective assessment practice of giving the same multiple-choice exam to people over and over. The only time this is ever acceptable is when all of the people writing the exam are doing so at the same time and are supervised to ensure they are not sharing answers. However, giving the same exam to different people over a period of months or years ensures that exam grades are going to go up over time – sometimes quite markedly. Sadly, this is not because people are learning more. It is because the people who wrote the exam earlier are sharing the answers with those writing it later. This is no surprise, and it creates real issues.

The most obvious problem with the practice of exam reuse is that the assessment results become meaningless. They are not an accurate reflection of the trainee's knowledge, and they cannot be used as a measure of training quality. And, of course, with exam answers in hand, trainees will bypass the learning materials and go straight to the exam – rendering even well-designed training useless.

Possibly the most damaging effect, however, is that the training program loses credibility and respect in the eyes of trainees. To a trainee, reuse of exams signals laziness and a lack professionalism in the training organization. They will respond in kind.

Thus, the lesson here can hardly be overstated: never give the same exam twice. If you are doing so, now is a great time to stop.

Does This Mean Constantly Creating New Exams?

No – though it may mean some changes. Most people who are reusing exams are doing so because they are delivering paper-based exams or using poorly built computer-based training. In the case of paper exams, it is difficult and expensive to create a new exam each time it is given. In the case of poorly constructed computer-based training, the program is "static", so the same exam is delivered to every person who completes the training.

The alternative is to randomize your exams. With exam question randomization, no two trainees will get the same exam. Instead, they will each get a different mix of exam questions, and in a different order. This kind of exam randomization requires a learning management system (LMS). But fortunately, nearly all modern professional LMSs support exam question randomization. So if you have access to an LMS, there is a good chance that you already have the capability.

What Does This Mean for Assessment Consistency?

The idea of giving each trainee a different exam may raise the concern that we lose consistency in our assessment practices. After all, it is critical that we measure everyone by the same standard. However, making it easy to share answers by reusing exams completely distorts the playing field – so we already have a problem. Additionally, exam randomization does not have to be quite as "random" as it sounds. Instead, done correctly, controls can be applied to ensure that the same competencies are covered, to the same degree, with questions of roughly equal difficulty. How do we do this?

Check back here next month and we will see in Training Tips for Ships! Until then, safe sailing!

MarTID 2019 Report

The 2nd Annual report from the historic MarTID survey initiative to study global maritime training practices, investment and thought is now available. The surveys draw on insights from shipowners and operators, maritime education and training institutions and seafarers. The insightful report is available free for global distribution @

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USCG VIDA Policy Proposal

On 31 July, the US Coast Guard published a notice in the Federal Register stating that it is seeking comments on a draft policy letter that, if adopted, would establish the Coast Guard's policy for acceptance of type-approval testing protocols for ballast water management systems (BWMSs) that render nonviable organisms in ballast water and may be used in addition to the methods under existing regulations. This policy would include the process for incorporating accepted protocols into the type-approval procedures established under existing regulations; the acceptance of laboratories to evaluate applicable treatment technologies; and the certification of BWMSs that render nonviable organisms in ballast water. The comment period closes on 30 September, which seems like a short period in which to consider issues of such consequence to the marine industry, but this is the maximum comment period allowed by the Vessel Incidental Discharge Act (VIDA).

VIDA constitutes Title IX of the Frank LoBiondo Coast Guard Authorization Act of 2018, Public Law 115-282 (signed into law of 4 December 2018). The purposes of VIDA are: (1) to provide for the establishment of uniform, environmentally sound standards and requirements for the management of discharges incidental to the normal operation of a vessel; (2) to charge the Environmental Protection Agency (EPA) with primary responsibility for establishing standards relating to the discharge of pollutants from vessels; (3) to charge the Coast Guard with primary responsibility for prescribing, administering, and enforcing regulations, consistent with the discharge standards established by the EPA, for the design, construction, installation, and operation of the equipment and management practices required onboard vessels; and (4) to preserve the flexibility of States, political subdivisions, and certain regions with respect to the administration and enforcement of standards relating to the discharge of pollutants from vessels engaged in maritime commerce and transportation.

With regard to ballast water issues, the statutory provisions are more specific and give the Coast Guard the lead in establishing standards. Special standards are addressed for vessels with empty ballast tanks. Vessels that have already installed BWMSs will, with certain limitations, be grandfathered so long as their current systems are maintained in proper working condition, are maintained and used in accordance with manufacturer specifications, continue to meet discharge standards applicable to the vessel at the time of installation, and have in effect a valid type-approval certificate issued by the Coast Guard.

For ballast water discharge purposes, the terms 'live' and 'living' shall not include an organism that has been rendered nonviable or preclude the consideration of any method of measuring the concentration of organisms in ballast water that are capable of reproduction.

Following publication of the draft policy letter discussed above and consideration of public comments, the Coast Guard is required to publish a final policy letter describing type-approval testing methods, if any, for BWMSs that render nonviable organisms in ballast water. The BWMSs are to be evaluated by measuring the concentration of organisms in ballast water that are capable of reproduction based on the best available science in addition to the methods already utilized. In developing a policy letter, the Coast Guard shall take into consideration a testing method that uses organism grow-out and most probable number (MPN) statistical analysis to determine the concentration of organisms in ballast water that are capable of reproduction and shall not take into consideration a testing method that relies on a staining method that measures the concentration of organisms greater than or equal to 10 micrometers and organisms less than or equal to 50 micrometers. This provision effectively directs the Coast Guard to adopt the IMO process of using the 'most probable number' (MPN) method for determining the effectiveness of BWMSs.

The Coast Guard, in consultation with

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the EPA and in coordination with the Aquatic Nuisance Species Task Force, is also charged with establishing a framework for federal and intergovernmental response to aquatic nuisance species risks from discharges from vessels, including the introduction, spread, and establishment of such populations.

The draft policy letter, and eventually the final policy letter, apply only to testing protocols for BWMSs that render nonviable (as defined in VIDA) organisms in ballast water. Testing protocols accepted under the policy letter that render organisms in ballast water nonviable based on the best available science may be substituted for methods identified in current protocols. The draft policy letter states that Coast Guard does not currently know of any type-approval testing protocols for BWMSs that render nonviable organisms in ballast water that are based on best available science. This particular statement in the draft policy letter is curious since the IMO and the vast majority of the maritime community (other than the USCG and the EPA) accept the MPN method as one of the best available scientific methods for determining the efficacy of BWMSs. The purpose of the policy letter is to establish the process be used by the Coast Guard for accepting type-approval testing protocols.

The instructions for submitting testing protocols are extensive and specific. It is beyond my limited range of knowledge and experience to comment on those instructions, other than to note the confusion engendered by the apparent contradiction between the VIDA-directed approach toward MPN and the apparent reluctance of the Coast Guard to adopt the MPN protocol into its official policy.

I do, though, propose an addition to the current policy that will improve the transparency of BWMS type-approval testing protocol.

It is important that the playing field between the various accepted independent laboratories (ILs) be as level as possible. This is necessary so that a BWMS preliminarily approved or disapproved by one IL be highly likely to achieve the same result from any other of the accepted ILs.

One way to maintain this level playing field is to prohibit ex parte communications between the Coast Guard and one or only some of the accepted ILs. Communications from one IL to the Coast Guard must be shared with all other accepted ILs. Likewise, all communications from the Coast Guard on this issue must be shared with all of the accepted ILs. The process must not only be fair, it must be seen as fair by all stakeholders and the public.

The changes to the US ballast water management system regime promise common-sense reform and improved international consistency. Hopefully, the Coast Guard can implement these changes in a smooth, logical, and open process.

Tor-Ivar Guttulsrod is Director, Global Gas Solutions, ABS

Thinking Smarter Not Bigger
Small Scale FSRU

The global search for lower carbon forms of energy and demand for cost-effective ways to serve power demand in emerging markets and remote locations is driving interest in floating storage and regasification units (FSRU).

FSRUs are a faster and more flexible way to import natural gas to power-constrained places, so demand for the units is increasing and the business case for owning them is growing stronger.

Their model for supplying energy and transport fuel is historically well proven: they offer faster development timelines and lower initial capital costs compared

Credit: © dmplot/Shutterstock

to onshore regasification, opening new markets the possibility of importing liquefied natural gas (LNG).

According to the International Gas Union's annual report, as of February there were 12 FSRUs on order (including conversions) at world shipyards. The existing fleet is largely supporting development projects across the world and prospects for them are growing stronger, particularly in Asia, the Middle East, Africa and South America.

As demand for LNG rises (Clarksons forecasts an 8% jump in LNG trade this year), the improving business case for supplying it on a 'small scale' is moving more projects to the stage of final investment decisions (FID).

Any FSRU project – small to full scale – requires a proven business case. However, small-scale endeavors also need to balance the risks associated with national legislation, base load cargo volumes and whether the economics of supply can provide adequate returns on investment.

While individual owners and operators will make decisions on a case-by-case basis, in the full scale FSRU market, the trend is towards ownership of the assets rather than chartering; economics and politics are the main influencers.

Among notable small-scale projects, the Bali LNG terminal was an early mover, comprised of a floating regasification barge and a 26,000 cu. m. floating storage unit. It has been operational since 2016.

Exmar ordered a 26,000 cu. m. regasification barge speculatively, rather than against specific projects. This unit has since been chartered by Gunvor towards a targeted project but is not yet operating.

Other vessels are under construction in China for planned use in Africa.

Elsewhere, a tender for small-scale energy supply in Indonesia, including regas units and storage barges, has been offered on more than one occasion, but has not yet materialised.

Indonesia has approximately 7,000 islands that need electricity. For those locations, LNG is the logical answer, being cheaper and cleaner than the coal-fired alternatives, and offering the added potential to be used as a fuel for local transport.

These types of projects illustrate the economic challenges of small-scale LNG supply: there needs to be a commitment to provide minimum volumes, but the asset owner also needs to operate at the economically attractive rates that are more easily achievable at larger scale projects.

Also, the unit costs at which suppliers can deliver LNG are not always straightforward.

Whether the gas is being sold as a measure of energy content (MMBtu) or weighted volume (tonnes), the infrastructure and transport costs are not linear and can be a challenge to attain a delivery price that suits the market.

Operators must also navigate local conditions. Since power markets are subject to regulation, price fluctuations and national laws may make it more difficult to operate some types of vessels in price-sensitive markets.

Markets such as Asia, the southern hemisphere or the Caribbean may be demographically suitable for small scale LNG, but the relationship has to be based on long-term government commitment and access to finance.

The challenge for designers and builders is to develop small-scale LNG projects that meet all these requirements simultaneously. Without the ability to benefit from economies of scale, they must find ways to build these complex units in ways that are simple enough to lower the overall cost of delivery.

In technical terms, there is not a huge difference between providing classification for a full scale FSRU and a small-scale unit, but smaller units can be more complex in execution.

For these, designers need to think more closely about hazards, since there is much less space for escape routes or blast walls; comprehensive safety studies are even more essential.

Only a handful of shipyards can build at the level of complexity that is required for FSRU units. These yards tend to be in South Korea or China. Of current full-scale FSRU projects, ABS is classing a 170,000m3 unit under construction for Turkish operator Botas at South Korea's Hyundai Heavy Industries, and another Dynagas order under construction at Hudong Zhonghua Shipyard in China.

In general terms, it appears that the speculative ordering of FSRUs is slowing, although there is likely to always be room for taking a longer-term view of the market. It is likely that a good portion of new orders may be underpinned by specific project needs.

With the era of the very big floating exploration and production-related gas projects slowing, there are questions about LNG's role in the world's decarbonization efforts.

Many governments have identified LNG as part of the solution. Sentiments like these have forecasters such as Clarksons' estimating that the LNG fleet will outnumber very large crude carriers by 2026. But others see it more as a transition fuel, with demand gradually strengthening until the production of renewable fuels can be established at affordable prices.

In this market uncertainty, short-term spikes in demand can be expected, though perhaps the first generational model of take or pay over 20 years is behind us. But, clearly, designers, builders and operators of small-scale FSRUs need to think smarter, not bigger.

Dana Merkel is an associate at Blank Rome LLP and prior to joining Blank Rome, she worked through the International Organization of Masters, Mates, and Pilots as a Third Mate and Qualified Member of the Engine Department ("QMED") for several international shipping companies in the container, dry bulk, and tanker segments of the industry.

Opportunities and Challenges with Maritime Autonomous Surface Ships (MASS)

Maritime autonomous surface ship ("MASS") technology continues to advance at a rapid pace around the globe. Although it's not being embraced as quickly in the United States commercial market as other parts of the world, U.S. industry professionals and regulators look forward to continued development and implementation as a means to improve efficiency and safety.

Opportunities

The U.S. Maritime Administration ("MARAD") hosted "Achieving Critical MASS: Spotlight on the U.S. Vessel Automation Industry" July 22 and 23, 2019, encouraging discussion between U.S. industry leaders and automation technology providers. With an impressive and wide-ranging slate of speakers, topics included the current state of technology, benefits and challenges of automated systems, the business case for automation, and the workforce of the future.

Completely unmanned, automated vessels operating in international trade will not likely be seen for years to come, and may not ever be possible for some vessel types. However, smaller unmanned vessels are being tested and put into service regionally and automation technology is being integrated in some form on all vessel types and services.

The capability to operate unmanned is a particularly attractive option for vessels involved in operations that are dangerous or tedious, such as oil spill response vessels, fire boats, and rescue boats. Automation technology installed on a spill response vessel will soon be trialed in Portland, Maine to demonstrate the value of MASS technology and ability to continue response operations in situations when crew is not yet available or would be in danger due to toxic fumes or other safety hazards involved in a response. Automation technology is also being used on search and rescue vessels to improve efficiency of search operations and response time. Other vessel types that may benefit from unmanned capability include survey vessels, tugs, and vessels that are on relatively short, dedicated routes. Use of automation technology does not necessarily mean reduction or elimination of the crew. While elimination or reduction of crew provides attractive cost savings, vessel owners indicate that there is also value in reduction of risk. Many of the products showcased at the Achieving Critical MASS conference are being used to augment instead of replace crew. In an industry where the vast majority of casualties are caused by human error, automation has great potential to avert these casualties. Automation technology can improve situational awareness and permit transfer of some decision making to automated functions to enable the fastest possible response in a quick changing environment.

Advanced automation, and specifically unmanned vessels, has also been touted as the ultimate vessel type for environmental protection. Unmanned vessels generally operate with cleaner power systems, such as batteries or diesel electric. Because there is no crew, none of the hotel services are needed, such as sewage systems, and no garbage is generated. The technology being developed for use on vessels is also being tested in ports. These land-based systems are said to assist in use of automation on vessels, as well as provide a number of benefits to the port, including improved security and vessel traffic monitoring.

Challenges

Implementation of automated systems is not without its challenges. Neither U.S. nor international regulations were drafted with automated vessels in mind and vessel owners must find a way to fit within the framework of existing regulations. This can be particularly challenging when a reduction or elimination of crew is sought. Issues such as who is in charge of an unmanned vessel, how to maintain a proper lookout through automated systems, and how to determine safe manning levels when automated systems are involved, among other issues, remain to be solved.

The International Maritime Organization ("IMO") Maritime Safety Com-

DNV GL

mittee is working to address the rapid development of MASS and initiated a Regulatory Scoping Exercise in July 2017. The exercise involves an in depth review of existing IMO instruments to determine how they must be adapted to accommodate autonomous vessels in the future. Although the exercise is expected to conclude in 2020, it will likely be years before changes to IMO instruments come into effect. In the meantime, the Maritime Safety Committee approved interim guidelines in June 2019 to assist Administrations and industry in conducting MASS trials.

Speaking at the Achieving Critical MASS conference, Deputy Maritime Administrator Richard Balzano stressed that the U.S. Coast Guard was very willing to work with the maritime community in determining a path forward for use of automation technology. The U.S. Coast Guard already has regulations and policy in place addressing use of automated systems to replace personnel or reduce overall crew requirements. These regulations and policy have been used in the past to achieve crew reductions in both engine and deck departments. However, as crews are reduced further, there becomes potential conflict with other existing U.S. and international regulations, particularly related to watch and watchstander requirements. In addressing these novel questions, it is imperative for innovators, industry, and regulators to work together to determine a path forward for MASS technology in the United States.

In addition to regulatory hurdles, use of MASS technology poses social challenges. Reductions in crew can mean a reduction in cost. To the maritime labor community, however, it means fewer jobs. Although officers may find jobs ashore overseeing autonomous vessel operations that are in many ways comparable to their shipboard positions, ratings are not as likely to find similar positions ashore. On the other hand, Balzano noted that the United States is currently in a mariner shortage and would need at least 1,800 more mariners to operate surge sealift ships if activated. He suggested that automation technology could help reduce manning requirements for these vessels and negate the mariner shortage.

Another challenge is earning trust. The trust of society, regulators, and of the shipowners and operators themselves. As with any new technology, trust will build slowly over time as reliability is proven over and over again. Automation technology will go from assisting crew operations and situational awareness to allowing fewer crew to do more, to permitting remote operations, to allowing fully autonomous operations. The rate at which the cycle progresses will vary widely based on the type of vessel and regulators involved.

The maritime industry is constantly evolving. In a relatively short history, we went from sail, to steam, to diesel. We went from break bulk to colossal container ships. Change is coming yet again in the form of advanced vessel automation technology.

Rik van Hemmen is the President of Martin & Ottaway, a marine consulting firm that specializes in the resolution of technical, operational and financial issues in maritime. By training he is an Aerospace and Ocean engineer and has spent the majority of his career in engineering design and forensic engineering.

AIS: *Skidmarks on the Ocean*

Many years ago, I received a call from an attorney who wanted me to get on the plane to Houston right away to take a look at damage on two ships that had collided in the approaches to Houston.

He told me that both vessels had become confused, had started to turn and managed to occupy the same bit of ocean at the same time. His preliminary analysis indicated that, if he could prove the other vessel turned first, his vessel was in the clear.

This was in the late eighties or early nineties, the course recorders had not been running, there was no VDR, and no electronic navigation record. I told the attorney that there were no skid marks on the ocean and to figure out who turned first would be impossible. He was very persistent and said: "I don't care I just want you to look at the damages and maybe you can think of something." It turned out that I managed to prove that the other vessel turned first based on physical damage to the vessels only. Someday, I may discuss the technical aspects of this proof, but as this column will show, that it is about as useful as proving that certain types of buggy-whips are better than others. This column is about our changing world where we went from a world without skidmarks on the ocean to a world filled with ocean skidmarks.

I don't know who truly originated the AIS concept and I would love to find out. I have done some research, but that knowledge appears to be lost in time. Whoever thought of it deserves some special recognition because it is a very clever concept on almost too many levels to count. I am not looking for some ponderer who said: "Why don't we put tracking equipment on ships?" That is nothing new or even interesting. I am looking for the person who said: "Hey,

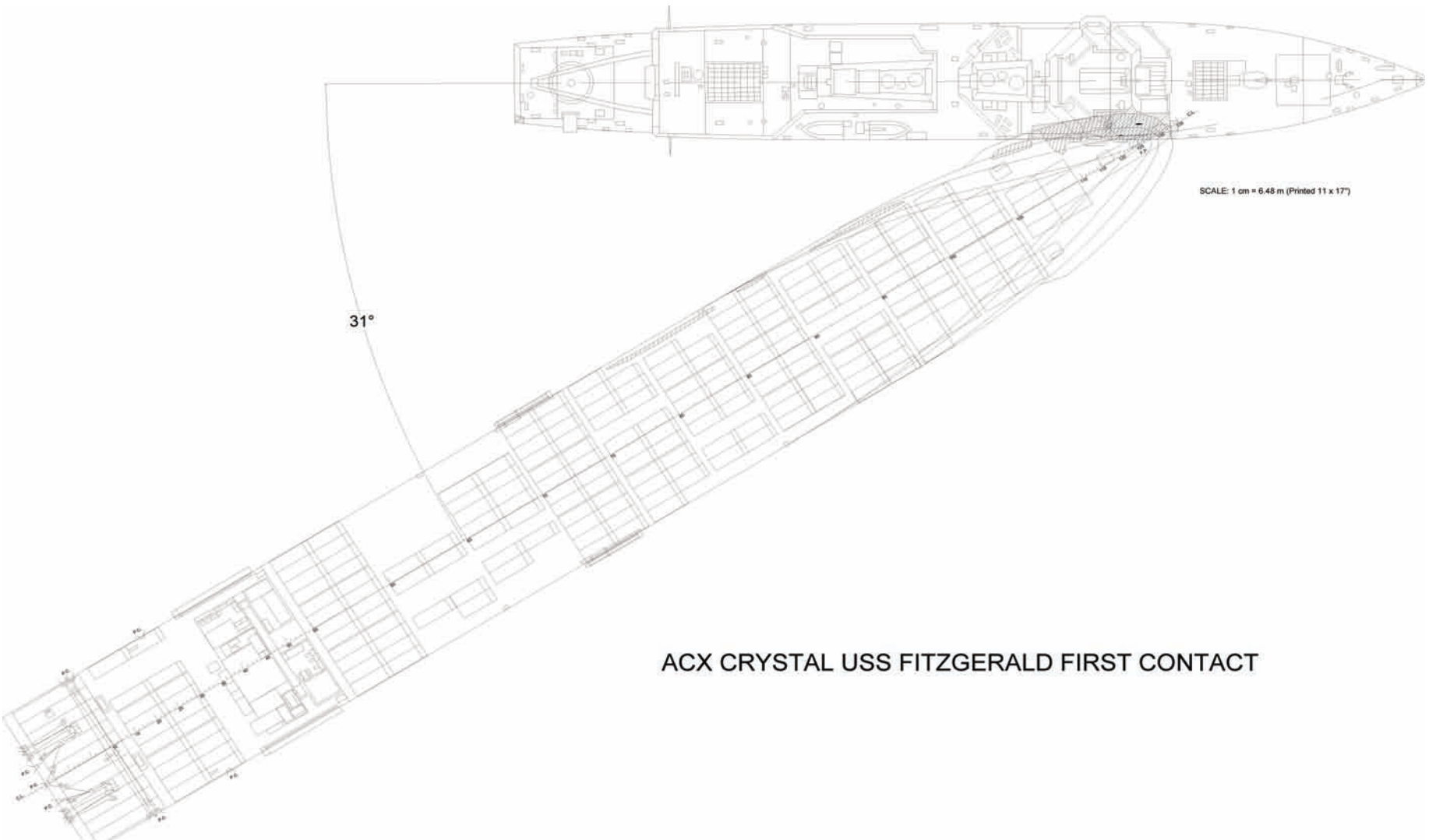


Image: Rik van Hemmen

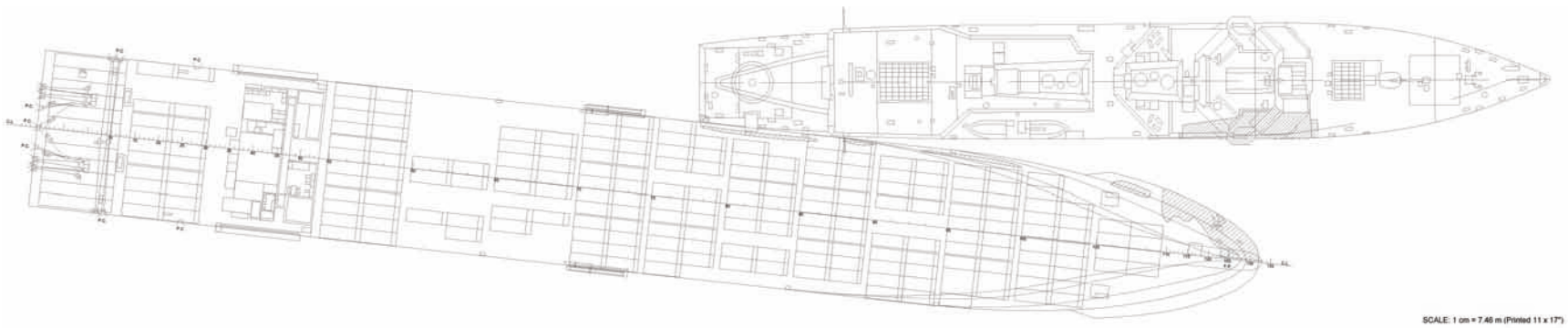


Image: Rik van Hemmen

why don't we have standard VHF radios interface with the ships GPS and transit a couple of data bits that other ships and shorebased stake holders can receive and use as they see fit?"

It is possible that the concept arose organically and there is no real inventor. As near as I can figure the concept gained currency after 9/11 and the USCG was a major driver to get it regulated through IMO. Regardless, I very strongly doubt that whoever thought of it actually realized how incredibly useful this little idea was.

This is something that occasionally occurs in the march of technology. It is all about unintended consequences and the trick is to have more technology with useful unintended consequences and less technology with bad unintended consequences (This by itself is one of the world's most difficult things to figure out and requires deep systems analysis that too few communities engage in)

AIS has tons of good unintended consequences and only a few bad unintended consequences, and the price at which it was achieved was tiny in the world of technological change. What was at first nothing but a short range position transmitter intended to help Vessel Traffic Systems, today, has become a swiss army knife of maritime information useful to just about everybody in the maritime adventure. I can go on to list the benefits, but readers of this magazine already know what AIS does for them today. However, I don't even think we have seen the end of change due to AIS. Today we have port approaches that are paved with digital skid marks. While it is quite a bookkeeping puzzle to sort out all the rather faint and intermingled VHF AIS signals at longer range, not too long from now we will have worldwide coverage of AIS using satellite mounted receivers. Interestingly we will achieve this while the airplane industry is still trying to figure out how not to lose airplanes once they fly over open oceans. Meanwhile the cost continues to be small. The original large ship investment was around $6,000 per ship, barely worth complaining about at IMO. Today AIS transceivers are less than $2,000 and even small craft owners no longer bother buying VHF transceivers without AIS transmit capability. While the satellite receivers are much more sophisticated, even the cost of those receivers is peanuts compared to what other systems like LORAN, GPS, SATCOM, RADAR and ECDIS have cost.

As a member of the SNAME annual meeting paper review committee (coming to Tacoma in late October) I just reviewed an interesting paper on predicting the risk of collision in busy sea lanes. This is a paper proposed by maritime researchers in Bangladesh who can simply dial in to the open source data available to everyone. By dialing into the data they made a first pass at trying to figure out when shipping lanes become too crowded and when the risk of collisions rises sharply.

So what are the negative consequences?

I have heard some people complain about a lack of independence in having to let everybody know what they are doing. I am not sure that is a negative consequence and, rather, it may be the loss of an unfair advantage. In this regard some sneaky ship operators may turn off the AIS midocean to dump some oil over the side. Interestingly Skytruth is doing some work on using satellite imaging to look for oil slicks on the ocean. So far, the ability to do this is limited, but it a big data problem, which means it is a computer problem that will eventually get sorted out. But if the ship had its AIS turned off how do you identify the ship? Again, it is a big data problem; it takes computer power, but it is solvable. Ships have to turn on their AIS near ports, and matching departures and arrivals with spill locations on the ocean can be done.

Navy ships would like to be unseen. One cause of the USS Fitzgerald collision was the US Navy's refusal to use AIS in a busy shipping lane. (Ironically when we were asked to take a look at the ACX Crystal/USS Fitzgerald collision I had to blow the dust of the old time "no skidmark" collision analysis methods.)

The Navy has now decided to use AIS during port approaches and departures, even for the Navy there are advantages to being seen when necessary.

For each column I write, *Maritime Reporter & Engineering News* has agreed to make a small donation to an organization of my choice. For this column I nominate Portside NY aboard the tanker Mary Whalen. Portside has started a new joint project with NY Public School 676. Hopefully the donation can help set up a permanent AIS display of New York harbor aboard the Mary Whalen for the kids to watch the harbor's traffic.

Dr. Joe DiRenzo is the Director of Research Partnerships at the U.S. Coast Guard Research and Development Center. He is the former project manager for the service's AI/ML project involving disaster response planning, a retired USCG officer, and former cutter Commanding Officer. He is a frequent contributor to Maritime Reporter & Engineering News, and Maritime Technology Reporter.

AI & Machine Learning

Force Multipliers for Coast Guard Missions?

Artificial intelligence (AI) and machine learning (ML): mention these two terms and the listener may instantly think of the ads displayed as you view your favorite online news site. This is one version of what AI/ML might be. Given the state of AI and ML research today, these advanced mathematical techniques represent something the U.S. Coast Guard should explore for mission application. To do this, common definitions need to be created, challenges understood, and practical use cases examined.

It has been proven in applications within private industry and medicine that AI/ML techniques can be beneficial in predictive analytics. An example is the use of AI in enhancing accurate initial diagnosis of radiology slides; within the retail sector, AI has already been demonstrated by Amazon via customer intelligence. Ever wonder why other recommendations of items to buy are provided when you make a purchase online? This new sales tactic is a practical application of a form of these advanced mathematical techniques.

However, to present a balanced perspective, there can be significant challenges to the use of AI/ML which should not be ignored. One challenge was highlighted in an article by Michael Chui, James Manyika and Mehdi Miremadi, writing in the January 2018 McKinsey Quarterly. Noted the article, "The complication is that massive data sets can be difficult to obtain or create for many business use cases." Another possible challenge may be in the "quality" of the data. How accurate is it? The third challenge may be the ability to transition the deliberate research to a practical application and developing all new training applications to build "hands-on" operators.

One of the Coast Guard's primary strategic documents provides a guidepost to exploring how AI/ML might be used. From the Strategic Plan 2018-2022:

"The rapid advancement in technology across our personal and professional lives presents game-changing opportunities for the Coast Guard, if properly harnessed. To fully understand the potential impacts of emerging technologies on Coast Guard operations, we will: Evaluate emerging technologies, such as unmanned platforms, data analytics, block chain encryption, artificial intelligence, machine learning, network protocols, information storage, and human-machine collaboration for possible use in mission execution." This simple statement underscores the importance of exploring possible applications.

To begin to understand applications, definitions and context are needed. In 1959 researcher Arthur Samuel opined that it might be possible for computers to "learn for themselves." This was followed 34 years later with a discussion regarding "artificial intelligence" which was initiated in 1995 by Dr. John McCarthy from Dartmouth College. These actions created a framework for a definition. In addition, a Dec. 6, 2016, Forbes magazine article written by Bernard Marr provides, "Artificial intelligence is the broader concept of machines being able to carry out tasks in a way that we consider "smart." Continued Marr, "Machine Learning is a current application of AI based around the idea that we should really be able to give machines data and let them learn for themselves." Do you see the difference between the two terms?

Seems pretty simple on the surface.

The demand signal to explore the ways that AI/ML can be used for decision making is at a fever pitch both in the United States and around the world. The U.S. and its allies are pitched in an "intellectual arms race" with China and Russia on how AI can be used. In 2018, the Department of Defense (DoD) created the Joint Artificial Intelligence Center which has leveraged a wide range of Subject Matter Experts and partnered with academics, industry, and other federal partners. A new DoD AI strategy entitled "Harnessing AI to Advance Our Security and Prosperity" was also released.

The strategy's summary's preface notes, "AI is rapidly changing a wide range of businesses and industries. It is also poised to change the character of the future battlefield and the pace of threats we must face." The strategy further enforces that the research, analysis, and application of AI with the Coast Guard for different missions must be looked at as a team sport … partnerships are the key.

The strategy's summary continues, "We cannot succeed alone; this undertaking requires the skill and commitment of those in government, close collaboration with academia and or non-traditional centers of innovation in the commercial sector, and strong cohesion among international allies and partners. We must learn from others to help us achieve the fullest understanding of the potential of AI and we must lead in responsibly developing and using these powerful technologies, in accordance with the law and our values." The type of collaboration and partnership highlighted in the DoD strategy is equally imperative for the Coast Guard's success in development and application of AI/ML techniques. But how does a service explore the possibilities for AI/ML application across a range of missions?

The author recommends the following four mission areas for initial exploration:

(1) Marine Safety Inspections and Port State Control Boardings: Using data from years of previous inspections, an applied AI/ML approach could potentially develop a refined process that decision makers could consider in concert with intelligence and risk models. An AI/ML application would potentially enhance the analysis efforts as tactical efforts are refined.

(2) Search and Rescue planning and execution: The Coast Guard employs a very sophisticated model for SAR planning. Its Search and Rescue Optimal Planning System has some capability to look at Course of Action development … but what if these advanced mathematical techniques could be used to refine search patterns based on past success and help decision makers consider the best asset combinations?

(3) Oil Spill Response: As far back as 1998, Miroslav Kubat, Robert Holte, and Stan Matwin published the article "Machine Learning for the Detection of Oil Spills in Satellite Radar Images" which discussed the idea of using AI/ML applications to support the response to an oil spill. Nowadays, especially following the Deepwater Horizon event, the need to understand as much as possible

THE 10TH ANNUAL MARITIME RISK SYMPOSIUM
is scheduled for Nov. 13-15, 2019, at SUNY Maritime in New York.
www.sunymaritime.edu

about the spill and analyze its future movement, and how best to deploy assets from unmanned aerial vehicles to Vessels of Opportunity might be a proactive AI/ML application. Research published in 2014 in the journal "Abstract and Applied Analytics" analyzed modeling oil-spill detection with swarm drones as a starting point.

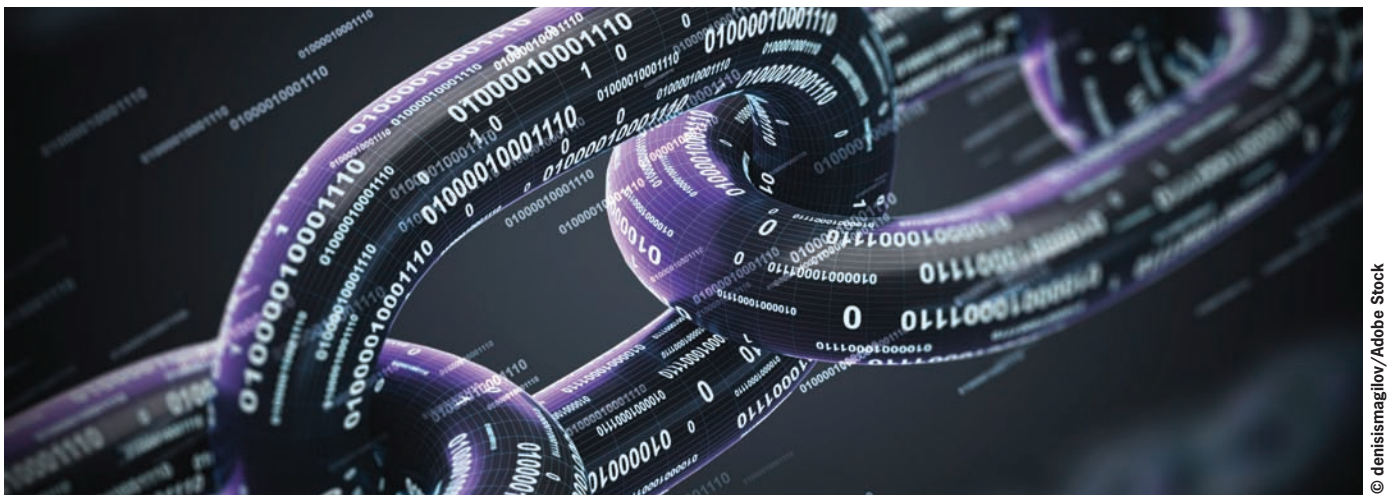
(4) Law Enforcement Operations: Planning for this mission is both deliberate and guided by a wide range of factors with the key being actionable intelligence. For example, Coast Guard units under the tactical control of a task force might benefit from this type of analysis to affect end-game operations. AI/ML applications could be a real benefit, possibly integrating onboard sensors with maritime patrol craft and other nation assets to put our interdiction end-game assets in the right place.

From using artificial intelligence to detect fraud in credit card usage to applying machine learning to help doctors interpret radiological images, these advanced mathematical techniques are making an impact on a range of professions and their requirements. These four specific Coast Guard mission areas are suggested for exploration of the application of AI/ML. It is the author's belief that using these advanced techniques may make a difference in USCG policy development, training, exercise conduct, planning, and mission execution. As a nation we are just beginning to see the power of these advanced mathematical techniques, in many facets of life – by positioning the Coast Guard to take advantage of them, the end result may be products that assist decision makers to help mission accomplishment.

The opinions included in this article are those of the author and do not represent an official position of the U.S. Coast Guard.

Captain Andrew Kinsey is Senior Marine Risk Consultant, Allianz Global Corporate & Specialty.

Maritime Port & Ship Security: Drills & Training for Real World Conditions



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The United States Coast Guard Marine Safety Alert 06-19 (USCG MSA 06-19) outlines a February 2019 incident aboard a deep draft commercial vessel that called on the Port of New York / New Jersey after experiencing a significant cyber incident that impacted their shipboard network. The Safety Alert stated in part:

"An interagency team of cyber experts, led by the Coast Guard, responded and conducted an analysis of the vessel's network and essential control systems. The team concluded that although the malware significantly degraded the functionality of the onboard computer system, essential vessel control systems had not been impacted. Nevertheless, the interagency response found that the vessel was operating without effective cybersecurity measures in place, exposing critical vessel control systems to significant vulnerabilities."

This incident provides valuable guidance on how we should evaluate the security readiness of terminals, vessels and associated infrastructure. It also highlights the importance of how security drills and crew training should be developed and conducted. A key take away of the USCG MSA 06-19 is that the Coast Guard strongly encourages all vessel and facility owners and operators to conduct cybersecurity assessments to better understand the extent of their cyber vulnerabilities. This needs to be a vessel and facility specific review as each asset can have unique exposures. The good news is that there are very good free assets available to help conduct this review. The Department of Homeland Security Cybersecurity and Infrastructure Security Agency (CISA) website provides cybersecurity resources and best practices for businesses https://www.us-cert.gov/resources. One resource that should be studied is the Cyber Resilience Review (CRR). The CCR Self-Assessment provides a measure of an organization's cyber resilience capabilities and provides a helpful User's Guide that provides information on conducting self-assessments, evaluating cyber resilience capabilities and providing guidance for follow-on activities. The CRR Self-Assessment also enables an organization to assess its capabilities relative to the National Institute of Standards and Technology (NIST) Cybersecurity Framework (CSF), and a crosswalk document that maps the CRR to the NIST CSF is included as a component of the CRR Self-Assessment Kit.

A Cyber Security Self-Assessment is the beginning, but it is critical that training and drills are incorporated to help maintain and improve port and vessel security. Cybersecurity training is available on the U.S. Small Business Administration website (https://www.sba.gov/course/cybersecurity-small-businesses/).

All employees have a role in cybersecurity and cyber is a critical component of overall physical security. ID cards and swipe cards are in regular use for facility access and these are just a few of the many operational systems that can be compromised in a cyber incident. Training needs to start with new hires and include all employees. As with any business plan, it is critical that upper management be invested in the success of operational security. It is also important to solicit and respond to rank and file input. The best procedures are those that are developed with robust involvement and communication, as well as being subject to regular review and evaluation. A procedure should not just look good on paper; it also needs to be functional and address a real need.

It is also important to include business partners in security drills to help develop and strengthen relationships and establish a sound training foundation. Having feedback from outside an organization is vital to developing and maintaining a robust security posture. An adequate response plan in the event of an actual incident is critical, and it is important to conduct training in real world conditions. This means not solely relying on IT-based systems to respond to a security incident, but instead to utilize manual backup systems. It also means that operations need to be evaluated and plans made to reduce operations in the event that automated systems are not available, or cannot be relied on.

As was stated in our Allianz Global Corporate & Specialty 2019 Safety and Shipping Review, technology is now widespread in the maritime industry, and critical to the running of ships, ports and logistics. The growing use of connected technology in the maritime sector is expected to be a positive for both safety and claims. Electronic navigation tools, ship-to-shore communications and the greater use of sensors have the potential to improve navigation and help avoid groundings and collisions.

In 2017, the International Maritime Organization (IMO) adopted its Maritime Cyber Risk Management in Safety Management Systems resolution, which requires ship owners and managers to incorporate cyber risk management into ship safety by 2021. However, this is a current threat that needs to be acted on now, not put off until the regulations go into effect. While new technology and the Internet of Things have introduced many new exposures and threats, in many ways current security training reflects the same goals and objectives we had when steaming in piracy waters in the 1980's; present a hard target and have a plan that can survive a punch in the mouth.

Gary Roughead, Admiral, U.S. Navy (Retired) is a former chief of U.S. Naval Operations and former Commander of the U.S. Pacific Fleet.

Privinvest's Deliveries to Mozambique
A Model for Africa

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Media reports about Mozambique's failure to launch a fishing and security fleet and its subsequent $2 billion debt default seem destined to torpedo, or at least set back similar efforts to build needed coastal security and national fishing fleets across Africa. That must not happen.

The systems and equipment Mozambique bought a few years ago from shipbuilder Privinvest could serve as a template for coastal African nations seeking to rightfully benefit from their natural resources and lift their populations out of poverty.

I have long monitored African maritime security challenges from piracy to other illicit activities in that vast continent's rich exclusive economic zones and welcomed an opportunity to conduct a thorough, independent assessment of the Mozambique maritime projects. I concluded the vessels, systems and equipment procured by Mozambique are appropriate to the tasks for which they were acquired, including commercial fishing and coastal security. They can advance Mozambique's economic and security interests and can help other African nations do the same.

Mozambique is the world's second-poorest nation (behind the Democratic Republic of Congo) yet it is remarkably rich in offshore resources. Its undersea natural gas reserves of nearly 3 trillion cubic meters ranks as the world's 13th largest. The nation's abundant fish stocks can be a source of revenue, jobs and much needed dietary diversity, according to the World Health Organization. In addition, Mozambique's 1,400-mile coastline and three deep-water ports are well-positioned to build a robust regional ship repair and maintenance industry to serve its own fleets and commercial vessels of other nations operating in the Indian Ocean.

Mozambique, like many coastal nations in Africa, faces the threats of piracy, sea robbery, smuggling, trafficking in drugs, weapons and people and illegal migration.

The Mozambique maritime projects wisely took a comprehensive approach to Mozambique's opportunities and challenges with a plan to secure its sovereign waters, create a viable offshore fishing industry and begin building a maritime industrial sector.

The government pursued an integrated solution and acquired a range of capabilities that included maritime domain awareness radar sites, operations centers, patrol vessels, aircraft, an afloat-maintenance ship and fishing vessels. Privinvest was a good choice as a supplier because of its network of shipyards and record of building integrated maritime systems for major navies. The ships are modern, capable, and impressive, yet not overly complex.

Privinvest also delivered operating-base enhancements, shipbuilding and repair facilities, training classrooms and programs, spare parts and transferred intellectual property licenses and technologies. The set of capabilities is a solid foundation for growing a larger maritime capability.

Mozambique launched the projects with minimal maritime infrastructure, few professional mariners, and without the direct involvement of its armed forces.

Unfortunately, the undertaking lacked a national strategy to attract, recruit and retain the minimum number of personnel needed to operate and maintain the acquired maritime capability and infrastructure.

But all is not lost. Mozambique can still revive the fleets and systems and the rest of Africa can learn from the experience.

Like Mozambique, Tanzania, Mauritania and Senegal have massive natural gas discoveries. Ivory Coast, Angola, Algeria, Egypt, Equatorial Guinea, Republic of Congo and Cameroon have major finds as well. African waters are also a major source of the world's seafood, with Congo, Somalia, Guinea and Gambia among the world's fastest-growing fish export countries.

If they are building from a nascent maritime infrastructure, other African nations first step must be to prioritize the recruiting, training, and retention of personnel. Buying the correct vessels and systems and using them effectively are two different things. Without trained, motivated crews, capable vessels, like those of Mozambique, are likely to become expensive, dormant waterfront decorations.

Second, nations should take advantage of existing organizations of their armed forces to avoid duplicative overhead costs and to use the military personnel system to recruit and manage talent. This also enhances interoperability with regional navy and air force command and control systems.

Third, take a comprehensive approach. Selecting a multifaceted contractor like Privinvest that can deliver modern fishing and security vessels, littoral surveillance systems and vessel maintenance and repair has significant downstream benefits. This approach can ensure uniform design as well as a consistent and reliable supply chain and maintenance.

Finally, Mozambique was smart to buy the intellectual property rights to the vessels it acquired. This gives it the ability to build an indigenous shipbuilding and ship repair industry and earn revenue by selling to other countries that want to "buy African."

By turning a "tuna scandal" into an opportunity, Mozambique could become a maritime leader and an enviable model for a new maritime Africa.

Breviglieri

With 50 years of history, the Azimut | Benetti Group is recognized as the world's largest motor yacht builder (global orderbook 2019). For nearly 10 years Azimut has been producing a wide range of luxury motor yachts in Brazil. Maritime Reporter´s correspondent in Brazil interviewed Italian executive Davide Breviglieri, CEO of Azimut Yachts do Brasil.

By Claudio Paschoa

Davide Breviglieri, CEO of Azimut Yachts do Brasil at the Azimut boatyard in the state of Santa Catarina.

Image Courtesy Azimut Yachts

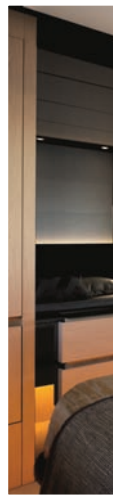
Founded in 1969 by Paolo Vitelli, still the main shareholder, the group is present in 70 countries and has a network of 138 sales and service offices, bringing together the successful brands Azimut Yachts and Benetti, each serving different market segments. “The Group offers a huge range of motor yachts, with over 45 models in production, from 34 feet to 100 meter super yachts. In terms of global production units, there are five factories in Italy and one in Brazil. In Brazil, the production unit was installed in 2010. Currently, Azimut Yachts brand produces yachts between 40 to 100 feet (in Brazil) for the national and international markets,” said Breviglieri.

Brazil has long been an attractive market for Azimut, which has an extensive list of high end clientele in the South American country. “Even long before installing a factory in Brazil, the Brazilian customer has always been very sensitive to branded products that carry the highest quality and Italian excellence. In addition, Brazil has great potential for the nautical market, with a coastline of almost 7,500 km in addition to over 40,000 km of inland waterways, coupled with a climate suitable for navigation during the 12 months of the year. We arrived in Brazil carrying extensive experience in the nautical world and also aiming to contribute to a developing sector,” said Breviglieri.

Sales in Brazil have been historically significant to the Italian yacht builder, and there has also been an upward trend in sales during this decade. According to Mr. Breviglieri - “Since 2010, sales have grown by 5 to 10% per year. In terms of yacht type, it has been six consecutive years increasing the size of the yachts, models over 50 feet, produced here to fit the profile of our Latin American client who wants a model upgrade, as well as reaching a range of clients that did not feel the reflexes of the crisis. Increasing vessel size also demonstrates the significant development of our technical capacity in Brazil. The production of an 83 foot yacht, for example, which takes about four months to assemble, is four times as complex as a 40 foot boat.”

Azimut Yachts has maintained a pragmatic and proactive management policy since its inception in Brazil. Foreseeing and adapting to different economic scenarios and attracting new clients from the “nouveau riche”. Breviglieri emphasized that -“Thanks to a strategic vision of planning and management, and together with the Italian headquarters, when we set up our production unit in Brazilian soil, we anticipated moments of crisis and economic fluctuations. This, combined with the undisputed quality of our products and worldwide brand recognition. In mid-2014, we started the export process, especially to other countries in South America and the United States. Moreover, in Brazil, we successfully bet on the sale of larger boats directed to a specific audience (Triple A) that did not feel the effects of the crisis. These factors contributed to maintaining our growth rates year on year.”

The port city of Itajaí in the state of Santa Catarina in South Brazil is one of only a



The Azimut 74-ft. motor yacht cruising at speed.

Inset top left:
The wheelhouse, Sand Oak & Glossy Ebony Version.

Inset top right:
A cabin, Sand Oak & Glossy Ebony Version.

All images Courtesy Azimut Yachts

few boatyard hubs in Brazil "Santa Catarina was the state chosen for the largest concentration of suppliers, logistics, security, workforce training capacity, and tax incentives. It is still a challenge to find specialized labor because the boating industry is still young in Brazil.

However, there is potential, and for this, we constantly invest in training with Italian specialists so that we can increasingly professionalize our employees and follow exactly the same product standard developed in the global unit of the brand," said Breviglieri.

Azimut Yachts, currently employs around 400 highly specialized workers at its 20,000 sq. m. production unit. The design of the yachts is developed by world renowned professionals in the Italian headquarters and all models produced here follow the exact same standard of excellence and rigorous quality control of the Italian headquarters. Breviglieri pointed out that "In Brazil, the best selling models today are the largest ones, above 50 feet. In our range of products made in the country, we have the models of Azimut Yachts: Azimut Verve 40 (sport luxury marketed especially to the United States); Azimuth 50; Azimuth 56; Azimuth 62; Azimut 74; Azimut 83; Great Azimut 27 Metri (new); Large Azimut 30 Metri."

Azimut´s shipyard in Brazil is the most modern yacht production unit in Brazil, with direct links to their Italian headquarters and boasting state of the art boat construction equipment."We have launched trends in the world nautical market in terms of technology and design. As an example, one is 100% pure carbon fiber used in the superstructure of models such as Azimut 74a and Azimut Grande 27 Metri, which began to be manufactured in Brazil. This means more lightness, better navigability, volume scaling and stability. Reducing the boat's weight enables the brand to invest heavily in luxury details and finishes, including metals, stones, glass and wood. In terms of design I can exemplify with Azimut 62, an internationally awarded design revolution in the nautical world. Italian Achille Salvagni (one of the 100 best designers in the world according to AD Collector and included in the "A" list by Elle Decor USA) has managed to bring the whole atmosphere of a home into the boat with elegant furniture, curved lines and at the same time. versatile which makes it possible to create different environments and atmospheres," said Breviglieri.

On being asked what differentiates Azimut yachts from other nationally manufactured yachts, Breviglieri said "Azimut is a global brand and successful worldwide. We go beyond product excellence. There are 50 years of history and launch of world trends to the nautical market. Not only are we yacht makers, we are by our customers' side to lead them to an unforgettable experience. In addition to products, which bring innovative technologies, design and comfort items, we differentiate ourselves with services offered by providing full support to our customers directly from the factory." The CEO of Azimut Yachts in Brazil sees a bright future for the yacht market in Brazil and Latin America, and looks forward to continued company growth and new yacht designs."Brazil and other South American countries, due to the climate and waterways, have great nautical potential. Our vision for the coming years is one of growth. As a reference in the nautical market, our focus is to bring constant news to the public and increasingly encourage the sailing experience,"concluded Breviglieri.

Volvo Penta's Future is **Automated, Connected, Electric**

Photos from left:
Volvo Penta autonomous docking system was put to the test on this 68-ft. yacht.

PTA81, Volvo Penta's test vessel fitted with the electromobility system ahead of the Älvsnabben 4 ferry re-build, part of Gothenburg's ElectriCity project.

The new IMO Tier III D8 engine.

Maritime Reporter @ the helm!

From self-docking yachts to all-electric ferries to new engines, drives and controls, Volvo Penta opened the doors at its global R&D and testing center in Gothenburg, Sweden, to Maritime Reporter & Engineering News earlier this year to learn about and to test drive the organization's latest marine propulsion tech. While the main focus was on the products, the big picture push is Volvo Penta's drive toward hybrid and electric drives to feed the increasing demand for carbon neutral solutions.

By Greg Trauthwein

Photos Greg Trauthwein & Volvo Penta

Innovation in the maritime propulsion sector – from small high-speed engines to the largest, most powerful slow speed engines – has proceeded at breakneck pace in recent years, driven by new regulations aimed to dramatically cut or eliminate altogether carbon emissions from marine vessels.

Volvo Penta has been a driver in this regard, and like most of the major engine companies, it has the heft of a global, multi-market organization behind it.

"The discussion really starts with the Volvo Group which develops trucks, construction equipment, busses and marine equipment," said Johan Inden, President, Region Europe, and head of the Volvo Penta's global marine segment. "What we see as the macro driver are cities becoming more densely populated, and many of these cities are situated along major waterways." Inden notes that more than 50 cities today have subscribed to the Paris agreement of having CO2 neutrality in their plan for the future. "With this comes significant investment in their logistics systems. We're working with several cities, including Gothenburg (where we're from) looking at building a multi-modal transport system of electric platforms: electric busses, electric refuse trucks and, of course, electric vessels on the waterways with Volvo Penta's electric propulsion system. That's the macro driver: cities are looking at their infrastructure and starting to make investments."

To this end, as a part of Gothenburg's ElectriCity project, Volvo Penta partnered with ferry operator, Styrsöbolaget to introduce electric propulsion to an existing ferry that will link both sides of the Göta Älv River. The ferry – Älvsnabben 4 – will be converted into an electric propulsion vessel with the refit scheduled to begin in early 2020. To start the process, Volvo Penta fitted the electric technology into its own test boat to evaluate. The test vessel – known as PTA81 – may be slightly smaller than the ferry, but it has the same batteries, controllers and electric motors that will be used on the Älvsnabben 4. The technology being tested is not just applicable for ferry operations, it will be relevant for most marine electromobility applications, and has been proven elsewhere in the Volvo Group.

The development of the PTA81 prototype is in fact a collaborative effort between Volvo Penta and the Volvo Group, with considerable technology sharing to help deliver electromobility no matter the vehicle.

"IN TERMS OF ELECTRIFICATION, WATERWAY TRANSPORT IN BIG CITIES LENDS ITSELF WELL TO ELECTRIFICATION, WHERE THERE IS A PREDICTABILITY, A CLEAR PICTURE OF THE ENERGY REQUIRED AND INFRASTRUCTURE FOR CHARGING STATIONS. **SO THE AREA THAT WE SEE MOVING FORWARD AT THE FASTEST PACE FOR FULL ELECTRIFICATION IS PASSENGER TRANSPORTATION ON CITY WATERWAYS."**

JOHAN INDEN, PRESIDENT, REGION EUROPE, AND HEAD OF THE VOLVO PENTA'S GLOBAL MARINE SEGMENT

Watch Johan Inden on Maritime Reporter TV @ www.marinelink.com/videos/video/power-up-volvo-penta-expands-its-power-range-100333

While in previous generations a maritime claim of 'being green' might have equated to little more than marketing slogan, Inden said that the push for environmentally sound solutions is a real market driver today. "In terms of electrification, waterway transport in big cities – whether it's goods, whether it's passengers – lends itself well to electrification, where there is a predictability, a clear picture of the energy required and infrastructure for charging stations," he said. "So the area that we see moving forward at the fastest pace for full electrification is passenger transportation on city waterways. When you move to hybridization, you widen the business case where you combine a traditional propulsion system with an electric system."

"Our investment into the R&D that goes into this electric propulsion is growing. I think it's important to realize though, while we speak more about electrification, there are many different ways of becoming more sustainable and investing toward the future," said Inden. "It's everything including the fact that all of our marine engines are classified for HVO, synthetic diesel that allows you to reduce your carbon footprint by up to 90% approximately just by using a different fuel. That, combined with electrification, means that we're investing in several different technologies to build a platform that is available both today and in the long-term."

From Macro to Micro

While much of the chatter in the trade press tends to look at the big picture, the performance of the Volvo Penta equipment was clearly the star of the company's show at the its global R&D and testing center – Krossholmen – earlier this year. In a word the performance was 'superb' as tested. Part of the Volvo Penta value proposition is not simply debuting new product via PowerPoint and technical specification, but to engage those who write about technology via hands-on trial at sea.

"At Krosholmen we launched the D4 and D6 range targeting the commercial maritime and the leisure market. We followed up at Norshipping with an upgrade or our D8 engine with a new marine rating and the introduction of the new IMO aftertreatment for the D8 (already available on the D13)," said Inden.

Full technical specification of the D4 and D6 can be found on page 29, but the performance of the units as tested was flawless with the signature Volvo Penta torque.

Available from 150 to 480 hp Volvo Penta´s D4 and D6 marine engines received a full overhaul and update to deliver a 'hat-trick' for vessel owners; more power, better reliability and lower cost of ownership.

To be succinct, the re-engineering of the D4 and D6 engines are far more than skin deep, as the company's philosophy was to 'look at the system from the propeller to the antenna,' with more than 300,000 engineering hours and more than 40,000 test hours dedicated to the project.

And the company has a solid installed base on which to draw, with more than 100,000 D4 and D6 units already powering boats worldwide. The 3.7 liter D4 and the 5.5 liter D6 engines are designed and built solely for marine purposes, and a large portion of the engines have been reengineered to deliver greater power and reliability. The upgrade list is long, including a new engine management system, anew fuel injection system, a new turbocharger and a new supercharger. In addition, the cylinder head, pistons, and valves are reengineered to withstand higher torque.

The engineering modifications include new materials. For example, the cylinder head, piston and crankshaft are all stronger by design and new materials has been introduced such as a Diamond Like Carbon (DLC) coating on the piston pin to reduce friction and increase durability. The common rail fuel injection system now features higher pressure – 2,000 bar. Controlled by a new Engine Management System, this enables more precise calibration of parameters controlling the injection, so the engines run even smoother and are more fuel efficient.

In top spec the D4 now has a maximum output of 320 hp, while the D6 in top spec boasts 480 hp, offering 10% more power across the range while simultaneously delivering 1% to 7% better fuel economy.

Meet the IMO Tier III D8

In step with the rapidly evolving environmental requirements, Volvo Penta revealed a D8 engine and after treatment system to meet IMO Tier III, a regulation which stipulates a reduction in nitrogen oxides (NOx) emitted of around 75 percent compared to current IMO Tier II levels. The new emissions restrictions

All specifications are available in either 12 or 24V.

New D4/D6 technical specifications: IPS

D4D6	HP	RPM	Rating
D6-IPS400	300	3,300	4
D6-IPS450	340	3,400	4
D6-IPS500	380	3,500	4
D6-IPS600	440	3,700	5
D6-IPS650	480	3,700	5

New D4/D6 technical specifications: Sterndrive

D4D6	HP	RPM	Rating
D4-150A	150	3,400	4
D4-230A	230	3,500	4
D4-270A	270	3,500	4
D4-300A	300	3,500	5
D4-320A	320	3,600	5
D6-300A	300	3,300	4
D6-340A	340	3,400	4
D6-380A	380	3,500	4
D6-400A	400	3,500	5
D6-440A	440	3,700	5

New D4/D6 technical specifications: Inboard

D4D6	HP	RPM	Rating
D4-175 I	175	2,800	4
D4-230 I	230	3,400	4
D4-270 I	270	3,500	4
D4-300 I	300	3,500	5
D4-320 I	320	3,600	5
D6-300 I	300	3,300	4
D6-340 I	340	3,400	4
D6-380 I	380	3,500	4
D6-440 I	440	3,700	5
D6-480 I	480	3,700	5

for vessels entering the Baltic Sea and North Sea will be implemented in 2021.

The D8 will be certified to comply with these newest IMO III emission regulations, as well as international emissions standards – US EPA Tier 3, China 1 & 2, and NRMM IWW Stage V. The product will be released in two steps: the first release will be IMO II, EPA, and China legislations and – in mid-2020 – the second release will result in compliance with IMO III and European inland waterways regulations. The D8 inherits its IMO III technology from the D13. Volvo Penta initially launched its IMO III solution for its 13-liter models, and subsequently made it available for a host of marine propulsion and genset applications.

The D8 engine offers a power output up to 313kW for inboard and auxiliary applications, and up to 265kW when used as a genset. In both roles, the reduction in NOx will go from currently permitted levels of 7.7 g/kWh down to 2 g/kWh

The new D8 MH and MG was designed to deliver significantly lower noise and vibration levels, a lighter engine reportedly without comprising power, reliability and durability.

The D8 was first introduced in 2016 for Marine High performance and Leisure applications. This was followed by a new variant that boasted a 3-4 rating, making it suitable for commercial Light duty, planing and semi-planing boats. The Volvo Penta D8 MH is an in-line 6-cylinder, 7.7-liter diesel engine with common-rail fuel injection, double overhead camshafts and twin-entry turbo, featuring a rigid cast-iron cylinder block and cylinder head.

As a genset the D8 comes complete with engine, generator and monitoring system, all tested and ready for installation onboard. D8 based gensets will deliver power in 50 Hz and 60 Hz in a range from 136kWe to 250 kWe and come with major classification societies certificates.

This compact engine has been created for vessels that have to maximize volume for payload. The compactness of the engine is mirrored in the SCR muffler, which is designed to be small and versatile with its three possible outlets and accepting vertical as well as horizontal mounting.

The D8 engine combined with Stamford generators create a genset portfolio tailor-made to auxiliary power generation. This engine is also powerful enough to be the base power provider in compact diesel-electric and serial hybrid propulsion systems. Not only that, it can also be the ideal 'reborn' propulsion system for inland or coastal vessels.

Photo credit Visit Svalbard.

Longyearbyen is the largest town in Svalbard and may become one of the first large scale consumers of green hydrogen or ammonia produced from wind farms in Finnmark.

Using "Green" Ammonia to Transport Clean Energy

Ammonia, the same pungent solution used in fertilizers and cleaning agents, may one day be the key to transporting renewable energy around the world.

By Joseph DiRenzo, PE

There are currently a number of government and corporate projects assessing the feasibility of converting excess renewable energy from sources like wind, solar, tidal and nuclear into ammonia and then back into usable energy.

In its purist form, ammonia or NH3 is composed of one nitrogen and three hydrogen atoms making it an ideal candidate to chemically bind excess renewable energy. Like several other chemical compounds, ammonia can be transported by chemical tanker in liquid form to end-users. Based on its near ambient liquification point, it may be more appealing to transport ammonia over longer distances than hydrogen. Once unloaded, ammonia can be converted back into usable energy and heat with fuel cells, gas turbines, or combustion engines.

In a push to become a carbon neutral society, countries like Norway are considering projects which would demonstrate this concept on a large scale. To determine its technical and economic feasibility, a study was conducted to determine if excess wind energy produced in Finnmark, the most northern county in mainland Norway, could be converted to either compress hydrogen or ammonia and delivered to the isolated island of Svalbard. These projects are examples of a potential new norm in transporting renewable across the globe via vessel. To shed some additional light on the topic, this article explores the Svalbard project in Norway and considers how the maritime industry could play an important role in this growing energy market.

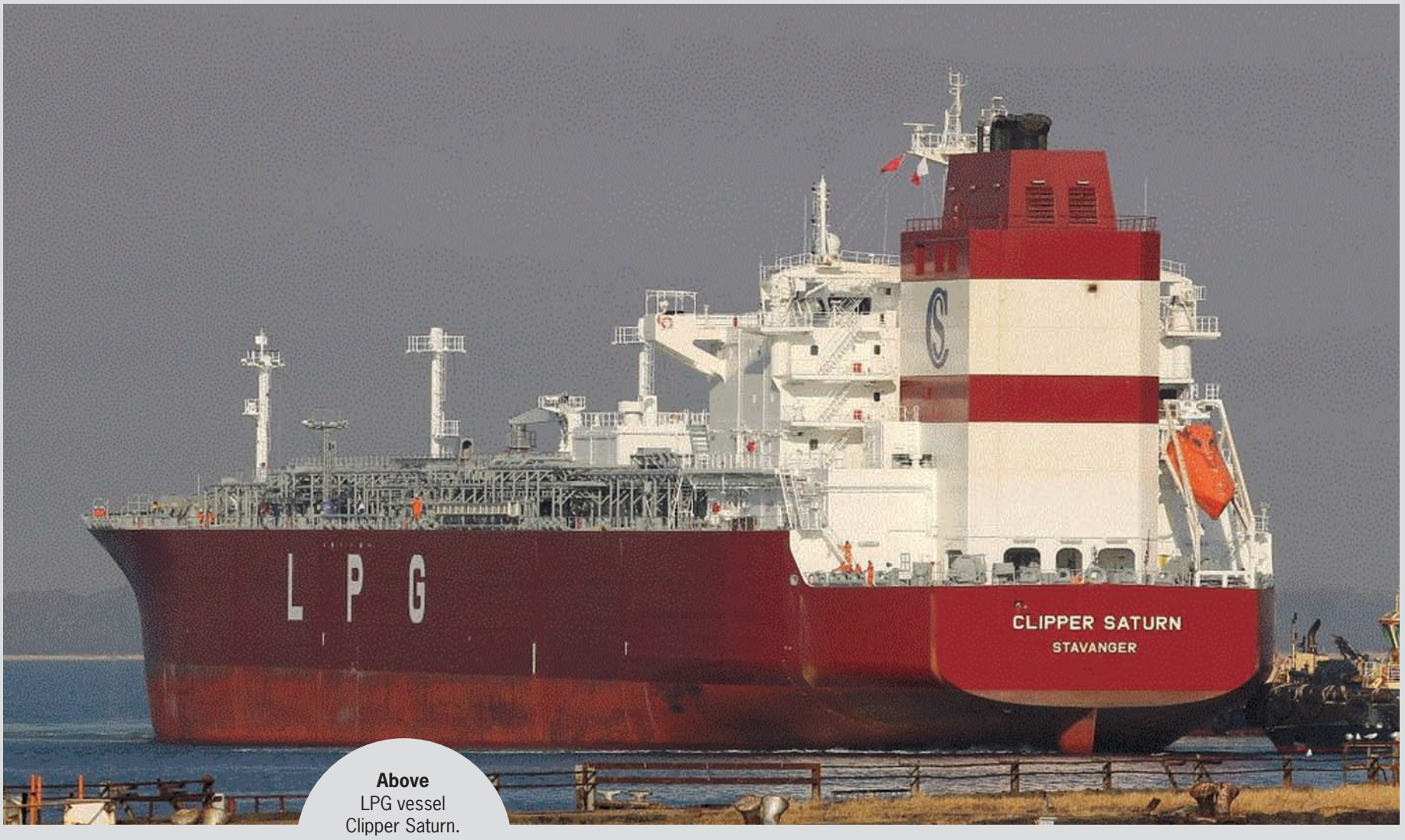
The Svalbard Case Study

Although still assessing different power production technologies, if the Norwegian government decides to move forward with supplying ammonia to Svalbard it will mark the first large-scale project to provide a community heat and electricity via ammonia. The conversation to consider ammonia as an energy carrier between Finnmark and Svalbard first began with the decision to close Svalbard's legacy coal-fired power plant in 2016. According to current estimates by Statkraft, one of the major corporate partners assisting the Norwegian government, current coal reserves will only last until 2025. After that point, coal will either need to be shipped into the island via bulk carrier or a new combined heat and power plant will be established.

Approximately 800 kilometers away in Norway's austere northern mainland, Statkraft recently secured licenses to further develop two large wind farms called the Raggivudda and Hamnefjell fields in Finnmark. With the mantle of being "one of the most efficient wind power plants in Norway", Statkraft is eager to develop additional capacity in the area to take advantage of ideal conditions for wind power generation. One challenge that Statkraft must overcome, however, is that the wind farms are isolated from the national electrical grid in Norway. This prevents the owners of the wind farm, Varanger Kraft, from selling excess energy to the rest of Norway and abroad. It is from these two interesting problem sets that renewable energy experts began considering ammonia as a method of transporting energy from production site to customers.

To solve these logistical issues and potentially generate additional business opportunities across multiple industrial sectors, Statkraft and a number of well know research and chemical companies went about assessing alternatives. Summarized in a translated report titled "Renewable Energy Supply to Svalbard – Longyearbyen", Statkraft explores different carbon neutral technologies which could transport the renewable energy created in Finnmark to the island of Svalbard.

As a starting point, the feasibility study considers the following requirements and assumption to service the community in Svalbard. The first assumption is that Statkraft will be able to scale up wind production in the Finnmark region to achieve an installed electrical capacity of between 40 and 50 MW. This installed capacity will be used to generate roughly 3800 tonnes of hydrogen annually for transportation to Svalbard by 2025. As an end-user, Longyearbyen which is the main city in Svalbard requires 40 Giga-watt hours (GW-hrs) of electricity and 70 GW-hrs of heat annually. Based on this requirement, Svalbard would re-



Above
LPG vessel
Clipper Saturn.

Below
LPG vessel
Clipper Odin.

Photos credit Solvang ASA

quire an installed production capacity of 12 MW of electrical power and 15 MW of heat power. Additionally, given the critical dependence of the inhabitants of Svalbard on fuel transportation, the proposed solutions must be able to supply a 30 days heat and electricity buffer.

Methods of Renewable Hydrogen Transport

To move "stranded" renewable energy from Finnmark to end users in Svalbard, Statkraft analyzed four alternatives mediums to transport the energy. These mediums, or "energy vectors", included compressed hydrogen, liquid hydrogen, hydrogen bound in methanol and hydrogen bound in ammonia. In order to narrow down these possibilities, Statkraft considered the total cost of ownership over 25 years. After thorough analysis, Statkraft concluded compressed hydrogen and hydrogen bound in ammonia had the lowest total cost of ownership and meets all requirements.

Critical to all four of the proposed solutions is the electrolysis process. During electrolysis, electrical current is passed through water which is split into hydrogen and oxygen. The idea is that excess wind energy from the wind farms in Finnmark would be sent through an electrolyzer to create hydrogen, and then hydrogen would be used as a feedstock for the four considered alternatives.

One alterative is that hydrogen can be compressed using a gas compressor and stored in special purpose pressurized containers and shipped to Svalbard directly. Statkraft proposed compressing pure hydrogen to 350 bar and storing the gas in International Standards Organization (ISO) tanks which would be loaded into TEUs and transported on traditional container vessels. High level calculations reveal that 4600 container loads would be required to achieve the 3800 tonnes of required hydrogen to provide the annual required heat and electricity to Svalbard.

Another method for transporting hydrogen is to cool the substance down to -253 degrees Celsius and transport it as a bulk cryogen liquid in a similar manner to Liquefied Natural Gas (LNG). As detailed in an earlier article from Maritime Report, a number of maritime companies including Moss Maritime, Wilhelmsen, and Kawasaki Heavy Industries are currently considering innovative method of transporting bulk liquid hydrogen. Statkraft's report concludes the liquid hydrogen option would have the highest total cost of ownership compared to other options considered.

The third method of transporting hydrogen discussed in Statkraft's feasibility study is by further processing the substance to form methanol. One of the major benefits of methanol is that it shares many of the same qualities with petroleum products like diesel and gasoline that can easily be transported by the existing fleet of chemical tankers. Unfortunately, the report ruled out this method of transport citing a lack of major carbon sources located in close proximity to be used as a feedstock to produce methanol.

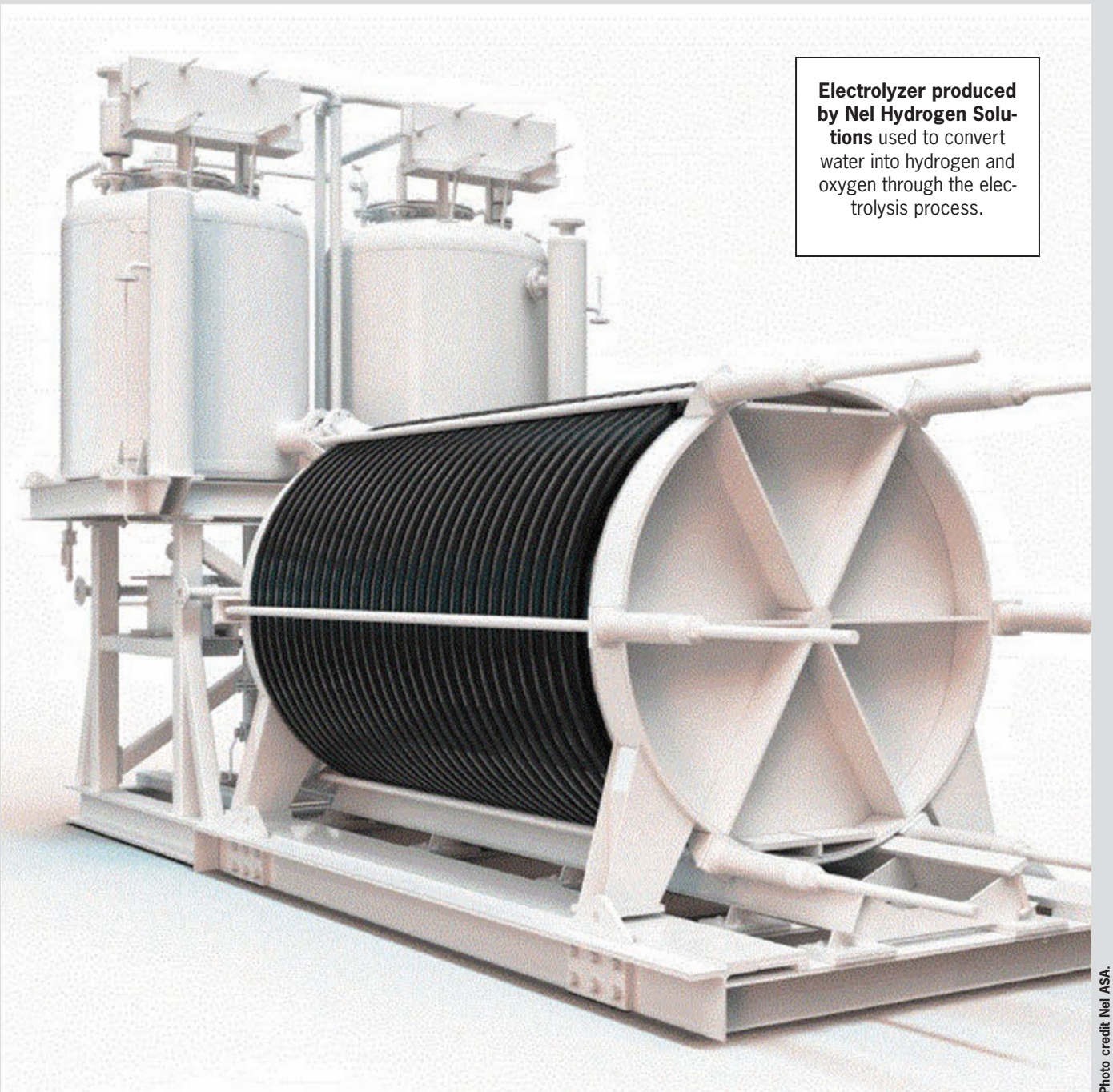
The final method suggested by Statkraft to transport wind energy from Finnmark to Svalbard is to combine hydrogen with nitrogen found in the air to form ammonia. Using a technique known as the Haber-Bosch synthesis process, hydrogen and nitrogen from air are heated and compressed to form ammonia. Alternatively, a reversible fuel cell may be used directly to produce ammonia.

Unlike hydrogen in its pure form, which exists as a gas at atmospheric temperature and pressure, ammonia can be stored and maintained as a liquid using substantially less energy to liquefy the substance than hydrogen. Noting that 26,500 tonnes of ammonia would be required annually to meet Svalbard's heat and power demands, Statkraft estimates that an ammonia LPG carrier would be required to transport ammonia either once or twice a year.

After considering both the technical feasibility and costs associated with these non-traditional forms of energy transport, the Statkraft feasibility study concluded that compressed hydrogen and ammonia appeared to be the two leading possibilities for the Svalbard case study.

Transporting Ammonia

Similar to other products used in the petro-chemical industry, ammonia has been transported by vessels for decades. Liquefied Petroleum Gas (LPG) carriers appear to be the most popular method of



Electrolyzer produced by Nel Hydrogen Solutions used to convert water into hydrogen and oxygen through the electrolysis process.

Photo credit Nel ASA.

transporting bulk ammonia over long distances. These vessels maintain their cargo in liquid form by using either fully-refrigerated, semi-refrigerated, or fully pressurized tanks.

In order to keep the ammonia in liquid form, the substance is generally stored onboard LPG carriers in self-supporting prismatic tanks which have a working temperature of at least negative 50 degrees Celsius. LPG carriers usually transport between 15,000 and 85,000 cubic meters of ammonia, with the most common sizes being 30, 52, and 80 thousand cubic meters by volume. Utilizing some of the same design principles as liquefied natural gas (LNG) carriers, LPG carriers have a primary and secondary barrier to ensure that the stored ammonia is contained if there is a failure of either the refrigeration system or the primary barrier.

In the context of the Svalbard case study and many other "green" ammonia projects throughout the world, ammonia is attractive for its relatively large energy density and lower energy input required to maintain the substance in liquid form. Ammonia may be stored as a chilled liquid at - 34 degrees Celsius at standard atmospheric pressure or at normal ambient temperatures at pressures around 10 bar. When compared with liquid hydrogen, ammonia has nearly double the energy density by volume and requires less energy and insulation to maintain the substance in liquid form while it's being transported by vessel from source to end-user. One of the main drawbacks of ammonia, however, is its high degree of toxicity. According to the US Department of Labor's Occupational Safety and Health Administration (OSHA), "ammonia is considered a high health hazard because it is corrosive to the skin, eyes, and lungs". Additionally, when

Photo credit Multiconsult

Left
The Raggividda wind farms in the northern county of Finnmark in Norway.

Center
Turbine installation at the Raggividda wind farms in the northern county of Finnmark in Norway.

Right
Cable trench at the Hamnefjell wind farm in the northern county of Finnmark in Norway.

mixed with air ammonia could become flammable at a 15 to 28 percent concentration by volume. Traditionally, ammonia feed stock for fertilizer operations is transported as "anhydrous ammonia" meaning that it can rapidly absorb into water and form strong alkaline solutions like ammonium hydroxide which is also highly toxic in high concentrations. To ensure public and crew safety, vessels carrying ammonia need to comply with the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) produced by the IMO. Interestingly, there are also a number of maritime engineering projects assessing the feasibility of using ammonia as a marine fuel. Examples of major projects include, the feasibility study being conducted by C-Job, a naval architecture firm in the Netherlands, and the announcement by MAN ES, a global supplier of marine engines and energy systems, to initiate a multi-million dollar research and development program to develop an ammonia two-stroke engine. In a perfect world, research efforts in the maritime and utility sectors may culminate to form an entirely new logistics supply chain where "green" ammonia is transported to a LPG vessel during bunkering and then a portion of the substance is used as marine fuel while transporting the product to customers. Regardless of the outcome of each individual project, it is clear based on the number and timing of various ammonia projects throughout the world that ammonia will likely become more common in ports and waterways. Based on these developments, both stakeholders in the utility industry and maritime industry should consider following developments closely to determine under what conditions these arrangement could be profitable.

Photo credit Bjarne Riesto

Photo credit Bjarne Riesto

Maritime Connection Speeds Ahead

Connectivity is the backbone of modern maritime operations as ships and boats at sea increasingly become connected. We recently met with ***Martin Kits van Heyningen****, CEO, KVH, to discuss the evolution of communication in the maritime sector.*

By Greg Trauthwein

To start, give us a "State of KVH" today.

We started originally in the leisure market, and we have about 85% market share for leisure and small craft, but over the last 10 years the business has been dominated by the commercial market. Most of our revenue now come the commercial maritime: merchant marine, offshore vessels, fishing vessels make up the bulk of our business today.

How about a "State-of-the-market." Specifically, where do you see growth opportunities?

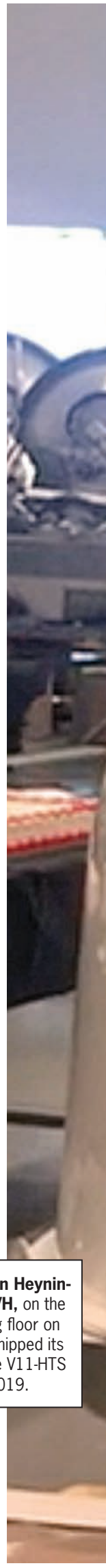
It's hard to generalize 'maritime' (because there are so many different facets); what we see is that merchant is very strong, offshore oil is still weak but it seems like its coming back a bit; fishing is strong and leisure is strong.

Within commercial maritime there are many different types of users. There are the requirements to run the ship … the communications, the phones, the data back and forth, actual operational portion of running the ship … then there's the crew welfare component where today's mariners don't want to be at sea for six months with no contact with friends and family. Every year these segments get stronger, and crews increasingly don't want to be onboard vessels that don't have a good internet connection. This is a driver, and it has become a cost of doing business for most of the professional companies in the business.

Another component is the IOT and the machines talking to each other. Machine to machine data transfer is a big driver for connectivity.

KVH's Agile Plans was launched not so long ago, but we understand it has become somewhat of a sensation from the KVH perspective. Give us a short overview of the Agile Plans.

We launched it two years ago and 70% of the equipment going out today is with Agile Plans. With Agile Plans, everything is bundled into a single monthly price and there is no commitment. It's an operating expense because you don't want to come up with any cash. We install it and you don't even pay for install, plus there is no commitment. (Bottom line)



Martin Kits van Heyningen, CEO, KVH, on the manufacturing floor on the day KVH shipped its first TracPhone V11-HTS in April 2019.

Photo KVH

"As far as the use of VSAT for running the business of maritime and keeping the crew connected, I think that part is really taking off. It's a trend that is finally moving by itself. **The other part is the IOT side, and it's here that the business of maritime is still behind other industries in terms of factory automation and analytics."**

Martin Kits van Heyningen, CEO, KVH

we want to earn your business every day, and if you don't like it or it's not performing, we'll just take it off the vessel and you're done. Interestingly, the 'churn' on this line is lower than on any other part of their business.

Why is the flexibility of the plan important to the commercial sector?

Ship managers move vessels; they're bought and sold, and sometime you lay them up. (Agile Plans) gives them flexibility and risk management. If they manage 50 vessels and sell five, they can simply return the equipment and keep the connectivity for the 45 remaining vessels.

Not only do we bundle in the hardware, the air time and the installation, but we also include some of our media content, so they get video news from home, a dozen TV channels of news, print news from 70 countries, crew welfare content, digital chart updates, etc.

The digitalization trend is ubiquitous, but in maritime, what's the 'reality on the street'? How quickly and comprehensively is commercial maritime adopting high speed communication solutions?

As far as the use of VSAT for running the business of maritime and keeping the crew connected, I think that part is really taking off. It's a trend that is finally moving by itself.

The other part is the IOT side, and it's here that the business of maritime is still behind other industries in terms of factory automation and analytics.

That's nice transition, as we understand that "KVH Watch" is now making inroads to some commercial sectors. What is KVH Watch?

Internally we call this KVH Watch 2.0 because we had a version that preceded this which we never launched. It's interesting (because it strikes at the matter of how ready this industry is for new technology.) The first version of Watch captured all of the data on the vessel, it stored it in the cloud and offered some incredible analytical tools, graphing and digital notebooks where different parameters could be compared. It was the ideal tool for analytics, and we beta tested it with a couple of our big fleets and said 'this is great for your data scientists so that they can go in and look at these analytics.' (In response) we just received a big blank stare back and got the question … 'what's a data scientist?'"

We learned something there.

Watch 2.0 is not targeted to the vessel owner, it's targeted to the equipment manufacturers – the MAN's, the Wärtsilä's, the Kongsbergs – they are the ones that can access and use the analytics immediately because they know inherently what a vibration in cylinder number two means for the health of the engine.

So essentially Watch 2.0 is for the equipment makers. Instead of KVH competing with them to provide onboard analytics, they are enabling them to bring their solution to scale, rapidly. If they get an order for analytics on 200 vessels, they can deliver rapidly.

It was a a similar value proposition targeted at a different user group, and we've gotten a much more positive response. Sometimes you have to simply pivot and realize that you're not as clever as you thought you were the first time!

Would this, then, put you in competition with OEMs and IOT providers in the supply of analytics?

We originally intended to sell the analytics package, which would have put KVH in competition with the OEMs and IOT companies. Instead, we're enabling these companies to launch their products at scale. So, if a Kongsberg goes out and sells it's solution to a fleet of 200, we'll be out there tomorrow installing 200 VSATs so they can sell their service. Each of these IOT companies needs to have their connectivity problem solved so that they can sell whatever they're selling, whether it's fuel savings or reduced maintenance or route planning … there are many applications for IOT, but the one (common) thing you need is connectivity.

So, bottom line, what's the advantage for the OEM?

It's kind of like Agile Plans with a different customer target. It's bundled and cared for (by KVH), a high speed (10MB/sec VSAT) which allows allowing companies to intervene when needed. If something goes wrong with a piece of equipment, a company can 'jump onboard' from the shore and try to fix the problem over the VSAT, either directly or through video conference, while the vessel is sailing. It can help to save money instead of sending repair crews to a ship around the world.

You can't discuss 'connectivity' without discussing 'cyber security.'

For cyber security purposes the owners want a separate network/antenna so it's air-gapped, it's not connected to the ship's other network, it's not connected to the internet.

You can't discuss connectivity without discussing autonomy. How does the overall KVH portfolio play into the push toward autonomy?

KVH has two parts to its business, navigation and communication. The navigation started in maritime, but it evolved to the land as we make precision fiber optic gyros that can be used for self-driving vehicles. We've been involved in autonomy for 10 years (and today) we're on about 30 different platforms for self-driving vehicles. The whole autonomy thing is interesting … on land, at sea and in the air. Today we're on a number of different pilot programs like U.S. Navy autonomous support vessels. I think the challenge is really getting the vessel to run itself; the navigation part is really easy compared to other items. Every ship in the world has an autopilot, and you have to add collision avoidance part. Technically that's very straight forward. The hard part is keeping the ship running … fixing things along the way.

In conclusion, please summarize how KVH is investing today?

We sold our maritime training business for $90 million last year and investments today are focused on three areas.

1. **KVH Watch:** IOT for maritime is going to be a huge business. You have a very expensive platform running in remote locations with an understaffed crew onboard who doesn't have the technical capability to maintain all of the equipment as it becomes more complicated. We're investing in software and technical development.
2. **Agile Plan:** We've had good success, and we're investing to promote that in marketing and in back-office, technical and installation support.
3. **Photonic Chip** to make fiber optic gyros for navigation very inexpensively. Today the fiber optic gyros are super accurate, literally measuring the spin rate of the planet Earth, but they're expensive. This new technology brings that cost down to the point of $150 to $200, something you need for autonomous vehicles.

"We feel that it's very important for us to control the entire ecosystem: **we build the product, we write the software, we run the network, we have the infrastructure, we do the rate plans and we do the installations** *… we control the customer experience, which we feel is unique to our offering."*

Martin Kits van Heyningen, CEO, KVH

Photos KVH

Cruising in the Cloud

Turning a necessary cost center into a revenue stream is the new normal for savvy and successful cruise operators.

By Joseph Keefe

As the flourishing expedition cruise market takes passengers on innovative itineraries to remote and untouched destinations, these well heeled guests want something else at the same time: a 24/7 quality internet connection. If Marlink gets its way, that sort of communications service will soon be the rule, and not the exception.

In April, Marlink revealed that the expedition cruise market is in full-on growth mode in terms of demand for connectivity in the most remote corners of the planet. As a satellite service provider and communications partner for more than a few luxury and adventure cruise ships and fleets, Marlink says that it is today contracting twice the satellite capacity specifically for the expedition sector as it was just 12 months ago and is now regularly providing megabit connectivity on a truly global scale. Marlink customers in the sector include Hapag-Lloyd Cruises as well as French luxury cruise specialist PONANT.

The expedition cruise vessel sector has been gaining pace over the last five or so years, driven by a market that wants to see and do new things on holiday. On that bucket list for many is the far north, where the reduction in sea ice is creating new opportunities. For its part, Marlink has kept pace with demand and in some cases enabled expedition vessels to go further afield by opening up new areas of coverage, for instance in the North West Passage, which is becoming quite a popular route.

Providing that coverage and delivering it in an affordable package is another thing altogether.

Tommy Konkol Dybvad, Director Cruise and Ferry at Marlink said, “We work closely with all major satellite network operators to ensure that we can deliver the highest quality of service in cost-effective packages for all customers. The challenges to ensure that guests can connect in remote areas on an expedition cruise are not easy to overcome compared to the traditional cruise markets closer to equator, however our customers [the cruise lines] know that they must deliver connectivity on board for passengers who expect to be connected at all times.

The 100% increase in capacity required to keep guests, crew and company connected as far afield as the Arctic and Antarctic is due to the surge in popularity of expedition cruising.

Photo Marlink

Marlink customers in the sector include Hapag-Lloyd Cruises fleet which is operating in remote locations using Marlink VSAT. New ‘expedition class’ ships, HANSEATIC nature and HANSEATIC inspiration, due to be delivered this year and HANSEATIC due in 2021, will have the same high-level connectivity for guests and crew. Marlink also renewed its contract to deliver multi-band services to French luxury cruise specialist PONANT late in 2017, a deal that included provision for four new PONANT Explorers yachts – Le Champlain and Le Laperouse, which joined the fleet in 2018, and Le Bougainville and Le Dumont-d’Urville, which will enter service in 2019. Another customer is MSC Cruises.

All In: Low Cost, High Quality

The practice of providing very low cost for passengers (on expedition ships, it is likely to be an all-in situation) is a remarkable development, and one which most will be able to afford.

Dybvad explained, “The idea that lower-cost connectivity would be popular is not ground-breaking of course. Cruising isn’t cheap so high bills for posting photos of your holiday to social media are particularly unwelcome. Guest satisfaction is any cruise company’s top priority and improvements in cost and quality of the connectivity on board is very important aspect. As an added driver, pictures and videos of a cruise on Facebook or Instagram are new marketing channels for a cruise company.”

It is the ability to throttle bandwidth per voyage and/or switch capacity from vessel to vessel, depending on demand for a particular voyage that is the key to keeping costs down and service high. This must involve close collaboration with the customer; MSC in this case. “We provide MSC Cruises with a cloud of bandwidth concept, where the huge amount of capacity they have can be distributed according to demand around the fleet. We ensure that capacity is available for vessels when and where it is needed, but our space segment team works at least 18 months ahead with access to future customer itineraries to support planning. Of course, the service can be reactive as well, should a short notice change be applied to a vessel’s routine for instance.”

A straightforward process handled by a simple script defines all available connectivity carriers. As soon as the primary system becomes unavailable, the script is defined to automatically jump to alternative carriers defined in a prioritized way to ensure least cost with highest throughout and lowest latency at any given time.

“Delivering global availability and reliability can really only be achieved through a multi-band and multi-orbital approach. Marlink customers essentially don’t need to choose a specific single service as we deliver their bandwidth using the best satellite networks for their needs,” said Dybvad.

The availability of relatively low cost bandwidth to cruise passengers is a great selling point for MSC, but it also benefits that operator in so many ways. These include (a.) the partial funding of business Internet/satellite coverage costs, (b.) providing more for less to cruise customers, and (c.) the transfer (and leveraging) of marketing costs through social media goodwill from happy cruising customers.

“It’s essentially a closed-loop,” said Dybvad, who added, “Hitting the right price point and service quality delivers more consumers on board, and this revenue goes towards funding the high levels of capacity that

‘Cruising in the Cloud’ continued on page 43

The Dawn of Digital

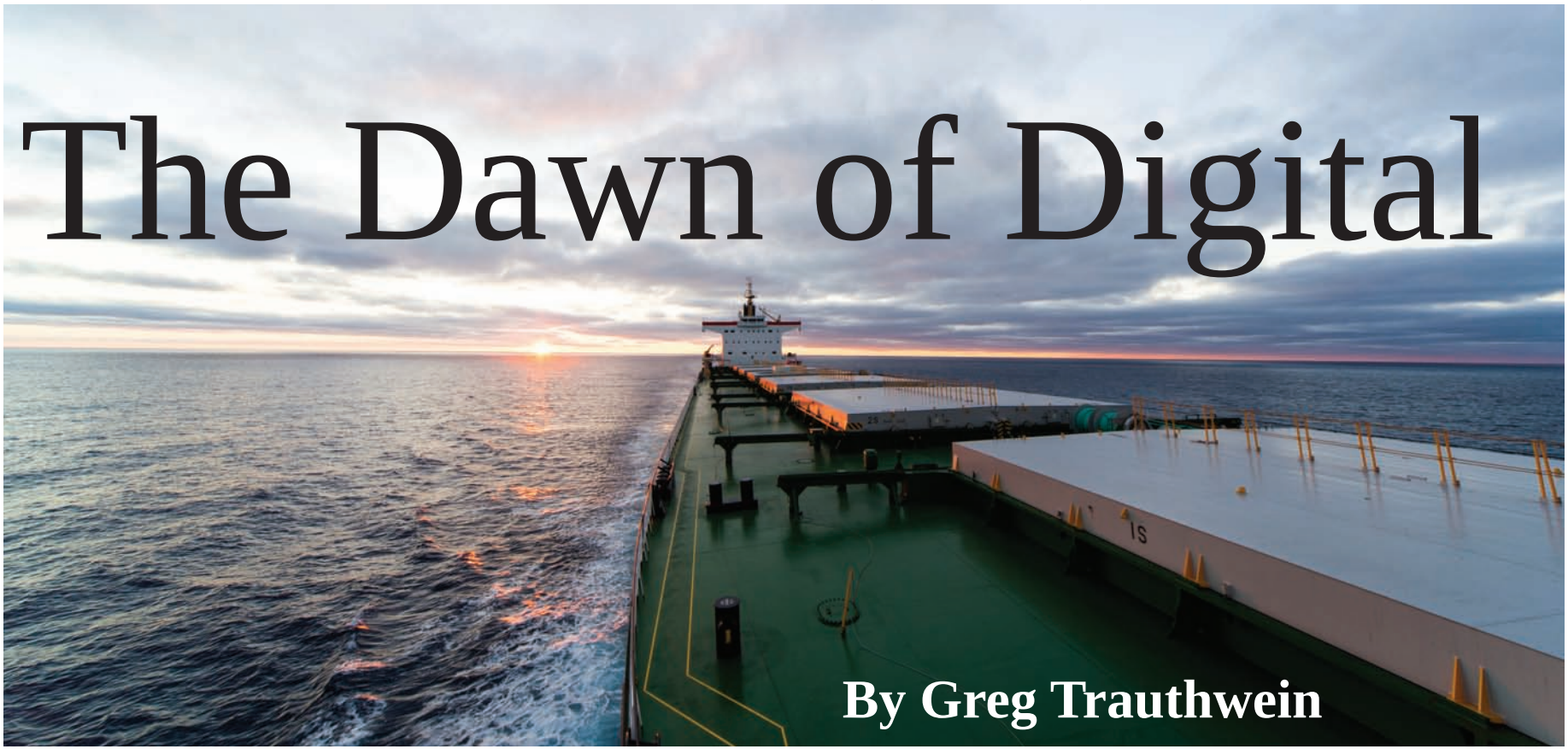


Photo Marlink

By Greg Trauthwein

Tore Morten Olsen, President Maritime, Marlink, discusses the pace and direction of high speed comms in maritime.

Using metrics of your choice, put in perspective where we are today in terms of getting shipowners to adopt high speed communication solutions.

The term broadband has been used in the maritime industry for at least a decade and if we are to follow the FCC's definition which was upgraded to 25mbps from 4mbps (download) in 2015, then those high speed internet services are nothing of the sort.

However, everything is relative. Receiving a steady 2mbps in the middle of the Atlantic is certainly high-speed internet in the context of the technical challenges and cost per packet of data sent, so in the context of maritime satcom, the term is valid. Considering the performance vs cost equation, we see that 512kbps up to about 4Mbps as the current sweet spot where the business case makes sense on the majority of merchant vessels. Even at the lower end of the scales, crew will be able to access social media and managers can apply smart shipping processes to improve operational efficiency.

The situation is different in the cruise and energy markets, where the demand is for services that can outstrip what is available for everyday users on land in some cases. A Marlink cruise customer consumes significantly more per vessel vs a merchant vessel to ensure its guests can access the internet and upload videos and pictures to social media. Likewise, the seismic survey sector is very bandwidth hungry as the benefits of transmitting live survey data to shore start to become tangible as services costs come down.

We discuss 'digitalization' more and more, but how fast is it moving toward continuous monitoring of shipboard machinery and operations?

Crew welfare has always been an important driver, but digitalization and smart shipping are certainly catalyzing investment in satcom and have been since the financial troubles of 2008/09. More ship owners and managers are connecting assets onboard and embracing new tools taking advantage of the data that their ships produce in an intelligent and effective way. This improves decision making and thus operational efficiency and helps in improving operational insight and decision support from shore. While new data-exchange focused regulations like EU MRV or amendments to MARPOL Annex VI on Data Collection system for fuel oil consumption of ships are part of the change, the drive for digitalization will also come from the inside, as technical staff and executives are exposed to more tangible benefits from the innovations that help with improving ship and fleet efficiency.

New digital platforms and LEAN-IT environments are offering new ways of working. Diverse and integrated applications, with cloud-based access and storage, are consolidating vendors and interfaces and we are today at a stage where the available satellite capacity, speed and reliability of service can allow ship owners to make this move to online cloud-based operations safe in the knowledge that their applications and data will always be accessible. With the combination of a visible ROI, improved efficiency and keeping crew safe and satisfied, we expect to see the digitalization trend continue to grow.

How about cyber security concerns?

The risk is real and to be taken very seriously, especially when you consider the cost of a successful cyber-attack. We have all seen the headline figure of $330 million that the Not Petya attack cost Maersk. But there have been hundreds of other incidents on ships and most likely thousands of unreported successful cyber-attacks. The problem is growing with more generic attacks getting through and an increase in malware targeted towards maritime operators specifically. Ships are using so much data due to digitalization and crew welfare that you simply cannot rely on security by obscurity in this hyper-connected world. Shipping companies have to establish a strategy with the tools to implement and sustain it, both from a technical and educational standpoint, in order to stand the best chance of detecting and responding to cyber-attacks.

Unfortunately, not all ship owners are taking the threat as seriously as it should be taken.

Marlink conducted a survey of clients with over 200 responding with information about their level of IT and cyber security compliance. Unsurprisingly, the larger, better-funded companies are responding to the reality and have been investing in technical solutions as well as developing new processes and procedures internally to minimise the cyber risk that comes from the human element. But there are many ship owners and operators that have not even started to move towards the level of IT security and compliance they need as the threat continues to grow. It's much harder to achieve without in-house IT resources that many of the larger companies enjoy, but with the stakes so high, security cannot be left to chance.

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MARITIME REPORTER AND ENGINEERING NEWS

"When the human element is considered, securing networks from cyber-attack is incredibly challenging. *Reducing human interaction with on board networks and computers by deploying a more standardized IT environment can minimize risks."*

Tore Morten Olsen,
President Maritime, Marlink

What is Marlink doing to address the concerns around cyber security?

When the human element is considered, securing networks from cyber-attack is incredibly challenging. That website may look safe, but is it really? The USB stick you bought from home with all those downloaded movies, can you be certain it is malware free? What about the email from an unknown source, are you really inline to inherent millions of dollars from a long lost uncle? Unfortunately, crew are a major attack vector for cyber criminals, so training them to ensure that they are completely aware of the risks and consequences is crucial to any cyber security strategy.

Reducing human interaction with on board networks and computers by deploying a more standardized IT environment can minimize risks. For instance, our ITLink portfolio delivers high level monitoring and automation which delivers efficiency and lowers IT management costs through i.e., automatic updating of operating systems and anti-virus definitions. The knock-on effect is that crew access to terminals is reduced. Also, with the Marlink Cyber Guard portfolio we offer advice and consultancy services alongside the standard protection layers (firewall, anti-virus, content filters, separated lans etc).

What do you see coming in regulation in terms of maritime cyber security?

IT security and compliance should be integral in all ship owners strategies in the context of an increasing global IT security threat, and also to ensure that our customers are ready for new regulations that focus on data exchange. As well as the EU MRV and amendments to MARPOL Annex VI on Data Collection system for fuel oil consumption of ships, new cyber security guidelines in TMSA version 3 and IMO 2021 will demand more IT compliance at sea. New regulations will continue to be developed by national and international bodies, but we believe that the commodity owners will play a part too. This is reflected with the involvement of oil majors in requiring compliance to TMSA to get business, but with digitalisation happening throughout the maritime industry, other major stakeholders are likely to demand certain standards from the shipping companies they use. So, securing a platform for IT security and compliance right now, will ensure readiness for a very different regulatory landscape in the future.

'Cruising in the Cloud' continued from page 40

a cruise ship needs. With a continuous revenue stream, cruise companies can continually improve the connectivity services they offer, providing an even more attractive offering which will attract even more users willing to pay for the experience."

In the end, Marlink helps to turn what has been historically an expensive cost center into a revenue stream that can defray at least a portion of these costs, while allowing passengers to do the work of (and augment) marketing through social media at the same time.

The Full Marlink Package

Network quality is key to meeting the demanding requirements of expedition cruising and while Marlink deploys state-of-the-art on-board systems and makes capacity available globally, it also focuses development efforts on ensuring that customers have improved support tools to optimize their communication services. In parallel, Marlink is also committed to ensuring its clients can minimize the risk of cyber-attack through inherent security at the network level and the fully integrated ship and shore-based Cyber Guard portfolio, offering harmonized solutions for detection, protection and recovery.With the cruise market in focus, the company has also introduced several new capabilities that can be accessed via an online portal, including an onboard internet Wi-Fi landing site or captive portal with capabilities to connect APIs to the clients own customized cruise management systems for more automated processes.

This in turn reduces manual labor. The new support tool also features a dashboard which provides information on best line of sight between the vessel and available satellites, which is especially relevant close to the poles with low elevation where obstructions such as icebergs or cliffs could affect link availability, and therefore the quality of service that guests experience.

The Marlink cruise offering is truly a 'win-win-win' situation; convenient and affordable for guests, easy to administer for cruise lines on board, and, of course, it represents another promising line of business for this innovative company. And now, no matter where the cruise lines go next, they'll always be cruising safely in the cloud.

Study: Ship Tech a $278B Market by 2030

New research into maritime startups concludes that higher bandwidth connecting ships to shore at lower costs is empowering a new breed of single-minded innovators to bring the true benefits of digitalization to the shipping and offshore sectors, according to a report conducted for **Inmarsat** by UK GovTech venture firm and research house, PUBLIC,

The report, *'Trade 2.0: How Start-ups are driving the next generation of maritime trade'*, co-authored by Nick Chubb and Leonardo Zangrando, locates the maritime sector at an inflection point; open to big data, blockchain, artificial intelligence (AI) and cloud computing, at a time when emissions regulations are pushing it away from the fossil fuels that have framed its business model.

Inmarsat

"Startups and investors should see maritime as offering significant market opportunities for the next 10 years," said Ronald Spithout, President Inmarsat Maritime.

Estimating that the ship tech market is worth $106B today, the report predicts its value rising to $278B by 2030, spurring growth for maritime startups serving the sector. The projection is based on direct input from 100 startups and two years of tracking 240 active startups by the authors' database of maritime innovation. The report says that, in 2018, $4.2B of digital spending went to startups and small innovators, with the rest going to corporations that also sell operational technology and hardware. However, as barriers to consume digital services at sea come down, the total spending on digital services from startups and small to medium sized enterprises (SME) will rise to over $111bn by 2030.

Download the report @ www2.inmarsat.com/trade-2.0

The Future of Navigation

An anniversary is a chance to look back, but shipping is moving forward faster than ever, writes Nick Hollaway, technical director, Northrop Grumman Sperry Marine.

Image: Sperry Marine

70 years since the launch of the first radar under the Decca brand and today's Sperry Marine is marking the anniversary by looking to a future that would have been hard to imagine in 1949 – or even as little as 10 years ago. Yet the changes of the last decade will be eclipsed by the transformation in the decades to come, which will accelerate as the shipping industry embraces greater digitalization and moves towards an era of smart and connected operations. In the course of 70 years, the Sperry Marine portfolio has evolved from standalone single function products, through smart products with feature rich software, better user interface and integrated sensor data, to smart and connected products combining remote monitoring, control and optimisation.

This vision reflects not just the advances in technology that can deliver data more widely and securely, but the influences on the industry, particularly from digital transformation and the need for sustainability.

The efficiency gains required to meet long term sustainability targets will require shipping to embrace vessel efficiency and voyage optimization on a completely new level and will place a stronger emphasis on connectivity to the wider transport and logistics supply chain. As a company rooted in the provision of products designed around safety and themselves regulated to the highest standards, we are thinking more and more about what the future will look like, what our customers will require and how to maintain our legacy of innovation. We also recognize that the trend towards enhanced connectivity and greater use of networks creates a further challenges that must be considered.

In the last decade, the integration of more and more sensors into bridge systems has become the industry standard, but it has also created problems, principally how to avoid users being overwhelmed with information and data that could distract them from their mission.

One of the next challenges will be to move beyond simply pulling and sharing data with navigators to simplifying the presentation of information in more intelligent ways that drive human decision-making. This creates the opportunity to share the information load with shoreside systems that can process the information and present specialist teams with options that can support navigators onboard. For some, this path leads inevitably to the era of autonomous or remote controlled ships but such an outcome – in mainstream shipping at least – is far from a foregone conclusion. What is likely is that crew numbers will be progressively reduced as technology advances and that a globally connected bridge system can enjoy remote operational and maintenance support. The critical lesson of the past is that things move faster than we expect and often develop in ways we can't predict. Shipping needs to think about how to absorb and understand these disruptive influences, embrace new thinking and continue to push the boundaries. For Sperry Marine this means that the regulated bridge stays at the heart of the vessel but how it integrates to the wider industry will change beyond all recognition.

The most recent phase of development has seen the company move into provision of a 'system of products', where navigation is integrated more deeply into vessel operations to enhance safety and efficiency. This concept, known as the Sperry Sphere, will grow from being vessel-centric to embrace the logistics and supply chain of the wider maritime industry. As a 'system of systems', the vessel's operational technology will in future be connected to port and terminal systems for monitoring and control and to shoreside vessel management for optimisation and maintenance. Data services designed to promote optimisation and efficiency will be seamlessly connected and the operator can share selected information with customers and partners.

Perhaps the key takeaway from 70 years in marine radar is that whatever products and services we deliver, we don't drive the market, our customers drive us to innovate and grow, and in doing so, continue our journey.

Slowing Discoloration of Ship Paint

A pigment package designed by the U.S. Naval Research Laboratory (NRL) to slow discoloration of the exterior coating on surface ships has started to make its way into the fleet and is producing early, positive results.

NRL researchers created the pigment combination to satisfy the fleet requirement for the Navy standard "haze gray" paint that will remain color stable for longer than current coatings. While many paint manufacturers had produced new coating technologies that solved a variety of other problems, such as corrosion and delamination, some ships still showed discoloration in as little as 18 months. Additionally, different coatings from different manufacturer's fade to different hues, resulting in an inconsistent appearance between the original coatings and any in-service touch-ups or repairs. "We had a good idea on how to solve the issue, and we leveled the playing field by providing the pigment combination to all companies at the same time," said Dr. Erick Iezzi, senior research chemist in the Center for Corrosion Science and Engineering at NRL.

NRL is currently working with Naval Sea Systems Command, Naval Systems Engineering Directorate, Ship Integrity & Performance Engineering (SEA 05P) to transition the new pigment combination into a military specification, which will become the standard for haze gray paint applied to surface ships. The first vessel to receive a coating with the pigment combination was USS Essex (LHD 2) in 2017. The most recent to vessel to receive it was USS George Washington (CVN 73).

While all paint manufacturers have access to the pigment technology, three companies have already started mass-producing the paint, generating an estimated tens of thousands of gallons thus far. Recently, Sherwin-Williams won the Society for Protective Coatings Military Coatings Project Award of Excellence for its new topcoat paint that incorporates the new pigment after it was used to overhaul USS George Washington.

"It was motivating to know that several companies were willing to lean on our expertise to provide a new technology that would produce the best product for the Navy," Iezzi said.

From 2012 to 2013, Iezzi worked with corrosion science researchers Jimmy Tagert and Candice Langaster to design five new pigment combinations and test them for color stability, solar reflectance and other coating properties. After testing all combinations, they provided the best performer to paint and coating manufacturers to begin integration in 2015.

The pigment combinations underwent testing at NRL's Key West facility for atmospheric exposure performance and accelerated weathering. Coatings that contained the new pigments proved to have excellent color stability, were five times harder than silicone alkyd, had improved gloss retention and chemical resistance, and provided greater barrier properties.

"It was great working with the manufacturers and demonstrating our ability to provide a product needed for the fleet," Tagert said.

By Sara Francis, U.S. Naval Research Laboratory Public Affairs

NRL is currently working with Naval Sea Systems Command, Naval Systems Engineering Directorate, Ship Integrity & Performance Engineering (SEA 05P) to transition the new pigment combination into a military specification. **The most recent vessel to receive it was USS George Washington (CVN 73).**

US Naval Research Lab

Protecting Ghost

The luxury Super Yacht "Ghost" is well known around Sydney Harbor, an 80 ft. vessel is capable of carrying 36 people including a cabin crew of six. To help keep the vessel well protected, an Aussie Sea Skipper has joined the crew. The Sea Skipper pump was selected by Ghost Elite Charters because of its ability to be able to provide both salvage and firefighting capability at sea using sea water.

Developed by Australian Pump Industries initially for the Royal Australian Navy, the Sea Skipper provides a maximum pressure of up to 100 psi but also can be used as a salvage pump moving water at the rate of 24,000 liters per hour.

The pump self-primes and has a capability of being able to draft water from depths of as low as 7.6m. Getting the pump primed and ready to operate is just a matter of throwing a suction hose over the side, filling the pump with water and starting the engine.

The Sea Skipper is lightweight and compact, with an impeller and volute manufactured from bronze, and a marine grade aluminium body coated inside and out with epoxy and all 316 stainless steel fasteners.

It offers a three-way head and can operate with either two one-inch hoses or with a 1.5-in. hose. A big two-in. suction port, flanged onto the pump's body enables fast self-priming and provides the capability of very high flows for salvage work.

Powered by a Yanmar, 4.8 hp recoil start engine, the pump comes in a heavy duty galvanized steel frame.

Aussie Pumps

Aussie's Sea Skipper joins the crew aboard the Ghost Elite Charter.

Unmanned, Rapid Response Fire Firefighting

Robert Allan Ltd.

A new 16-m uncrewed fire-fighting vessel in Robert Allan Ltd. RALamander series is designed to attack fires quickly and powerfully in busy ports without risking crews. With high speed capability and pumping capacity rivalling larger fireboats, RALamander 1600 can be brought into action quickly with water and foam to suppress a fire and establish a defensive line while fire crews remain safely outside the danger zone. Like its larger RALamander 2000 cousin, it can be operated from another vessel of opportunity or from a shore-based position. Automatic piloting and station-keeping features leave the operator free to focus on firefighting.

A helm station on board makes it possible to drive RALamander 1600 to an incident under direct manual control in busy waterways. Once on scene, the operator can transfer to shore or another vessel to conduct remote operations using a portable controller or shore-based console. This versatility means that RALamander 1600 can be operated in different ways to respond effectively to the port fire emergency. If necessary, control can be switched between multiple operators with different vantage points on the incident.

With self-rescue arrangements on both sides, RALamander 1600 can be sent into dangerous situations to serve as a life raft where an explosive or toxic environment prevents conventional rescue craft from reaching people in the water. The twin waterjet arrangement gives precise steering control and side-stepping capability.

Silver Ships Delivers for First Responders

Photos Silver Ships

Lake of Ozarks

Silver Ships, Inc. delivered its second fire boat to the Lake of the Ozarks community in central Missouri.

The fireboat's 34-foot frame is the perfect size for patrolling the Lake of the Ozarks and providing the community with fire suppression support, EMS services and rescue from hazardous conditions. Featured on the vessel are Triple Mercury Verado 350HP outboards to provide efficient cruise and response speeds in excess of 45 MPH. It also sports a Duramax Marine Diesel powering a Hale of 80FC pump and a Class 1 Total Pressure Governor Pump engine control system to ensure a fast and efficient response rate.

The fireboat includes a Forward 1250 GPM Monsoon Monitor on quick release that can be swapped out with a 5" Storz connection for supply and two Forward 2.5" Connections, along with a roof mounted remote controlled 2000 GPM Monsoon Monitor. In addition, there are two aft 2.5" Connections. Technology is up to date on this vessel with two Garmin GPSMP7612 displays, a Garmin 18 XHD radar and a Garmin GC 10 Standard Image Marine camera. A FLIR M324S provides visibility to assist in locating persons in the water in low light conditions.

Jefferson Township

Silver Ships continues to grow its fleet in the northeast United States with its latest fire boat delivery to Jefferson Township, NJ. The Explorer 28 landing craft will improve water safety in the area and be a great asset to the Jefferson Fire Department. The Explorer 28 features a Darley PSDE1500 Direct Mount Fire Pump which allows for 1500 gallons of water to be pumped per minute. This discharge pressure allows for quick extinguishing of dangerous fires. To keep this pump operating at its highest capacity, a PumpBoss controller monitors the intake as well as discharge pressure, which will prevent cavitations that would reduce effectiveness. This vessel will be utilized for law enforcement as well as fire/rescue missions. It includes a Twin Display Garmin electronics package with radar and marine VHF, and is equipped with the Whelen Law Enforcement lighting package.

The vessel's hydraulic actuated folding mast provides the ability to easily pass low clearance areas while putting off minimal impact to personnel. In addition, Twin Mercury Verado 250 HP outboards add high speed capabilities to the boat.

Marine Unit 217

Silver Ships also delivered its AM800 fire/rescue demonstration boat as a custom outfitted vessel for Marine Emergency Team 21. The team, a part of Bowleys Quarters Volunteer Fire Department, has been awaiting a new rescue vessel, as they have not had one in operation since September 2018. Marine Unit 217 has been named the Mrs. Linda II, and was officially commissioned on May 24, 2019. The vessel will be operating in Marine Emergency Team 21's 90-square mile service area and is equipped with state-of-the-art technology, including an on-board fire pump that can flow near 700 gallons of water per minute. Additionally, twin 250 horsepower Evinrude G2 outboard engines allow the boat to reach speeds of 51 miles per hour. This will improve the team's response time immensely from their previous vessel – a fishing boat that had been converted for rescue missions.

NYK Line

NYK to Build New Heavy Lift Ships

NYK Bulk & Projects Carriers Ltd., an NYK Group company and the only shipping company that owns and operates heavy-lift ships in Japan, signed a contract with Nanjing Jinling Shipyard Co. Ltd., part of the China Merchants Group, to build a pair of heavy-lift ships. The ships will be equipped with a pair of 400-ton cranes and be able to lift up to 800 tons of heavy cargo. The hold will be about 95 meters in length at its maximum without any bulkheads, i.e., upright walls within the hold. The ships will be hatch coverless, which will allow for navigation with the hatch cover open, and the bridge will be placed at the ship front, enabling the loading of tall and large cargo without worry of any disruption to forward visibility during navigation. A significant reduction in fuel consumption has been achieved compared to existing ships of the same type with the cooperation of Japanese marine equipment manufacturers. In addition, the vessels can reduce greenhouse gas emissions and meet in advance EEDI Phase 3 requirements that will become effective in 2025. The 12,470-ton Panama-flag ships will measure 138 x 23.6 x 8.3 m and will be delivered in August 2021 and January 2022.

LNG Shallow Draft Pushboat

Robert Allan Ltd.

Robert Allan Ltd. and MTU Friedrichshafen GmbH are developing the first natural gas fueled shallow draft pushboat design – the RApide 2800-G pushboat. This project is a preliminary design which used the shallow draft RApide 2800-Z2 pushboat that currently operates on the Amazon River system. The vessel design was modified to suit a complete LNG propulsion system with two 746 kW MTU 8V4000M55R-N Tier III gas safe main engines. Additional to the engines, MTU also acts as the system integrator, which means that MTU will also provide the complete LNG package, LNG tank system and an integrated ship monitoring, LNG control and safety systems. The design was reconfigured to allow the installation of the LNG tank while still providing adequate space for other machinery and a comfortable work environment for the crew. While challenging the project complies with the rules for the gas system hazardous zones of a compact 28 metertug. To ensure redundancy there are two independent tank connection spaces attached to the LNG tank, one for each engine.

To date the design vessel measures 28 x 10.5 m with a 2.5 m draft.

Fincantieri Cuts Steel on Great Lakes Bulk Carrier

The Interlake Steamship Company and Fincantieri Bay Shipbuilding finalized a deal to build a U.S.-flagged Great Lakes bulk carrier, the first to be built in more than 35 years. Dubbed the River-Class, the self-unloading bulk carrier is believed to be the first ship for U.S. Great Lakes service built on the Great Lakes since 1983. The ship, which will transport raw materials to support manufacturing throughout the Great Lakes region, also represents hundreds of good-paying jobs for U.S. Merchant Mariners and Wisconsin shipyard workers.

Measuring 639 x 78 x 45 ft., the 28,000 dwt the vessel will be built in Sturgeon Bay, Wisconsin and is expected to be delivered in 2022. The Interlake Steamship Company, headquartered in Middleburg Heights, Ohio, is the largest privately held U.S.-flag fleet on the Great Lakes, with nine vessels carrying

Major partners for the project include: American Bureau of Shipping (ABS); Bay Engineering (BEI); EMD Engines; Caterpillar; EMS- Tech, Inc.; Lufkin (a GE Company) and MacGregor.

Fincantieri Bay Shipbuilding

Waterfront Shipping takes two more Second-Gen Methanol Fueled Ships

While shipowners continue to actively debate the best means and method to meet stringent new international fuel and emission guidlines, one company, Waterfront Shipping Company Ltd., already has more than 60,000 hours of operating experience running ships on methanol, a clean marine fuel that hits IMO2020 emission targets with no exhaust after-treatment.

Waterfront Shipping, a wholly owned subsidiary of Methanex Corporation, and Marinvest/Skagerack Invest (Marinvest) last month welcomed two new clean-burning vessels, M/T Mari Couva and M/T Mari Kokako, to its fleet.

These two new 49,000 dwt vesselswere built in Korea at Hyundai Mipo Dockyard, powered by second-gen MAN B&W ME-LGIM two stroke dual-fuel engines that can run on both methanol and conventional marine fuels. The ships join seven existing methanol-fuelled vessels chartered by Waterfront.

The two new vessels – together with another two vessels that will be delivered by year-end – are also able to meet IMO Tier III emissions standards without the need for exhaust gas after treatment.

"We are excited by the performance of our first seven methanol-fuelled vessels that have proven the safety and reliability of the technology. With this second generation of vessels, we will benefit from innovative technological advances that will continue to optimize performance and efficiency," said Paul Hexter, President, Waterfront Shipping Ltd. "On an energy-equivalent basis, methanol is cost competitive over energy price cycles and we see significant value creation opportunities from using a methanol flex-fuel engine. We are proud that approximately 40 percent of our fleet will be powered by methanol-fuel technology by the end of the year."

Methanol is one of the world's most widely traded chemicals and is available globally at major ports, providing a cost-effective solution to meet the needs of shipowners today. Safe, biodegradable and clean-burning, methanol is a marine fuel that can meet the most stringent environmental regulations. In addition to IMO 2020-compliant SOx emissions and the ability to meet Tier III NOx regulations without exhaust aftertreatment, methanol can also provide a pathway to meeting future carbon emission reduction targets when it is produced from renewable sources.

"On an energy-equivalent basis, methanol is cost competitive over energy price cycles and we see significant value creation opportunities from using a methanol flex-fuel engine."

Paul Hexter, President, Waterfront Shipping

In the October 2019 edition of *Maritime Reporter* Waterfront Shipping shares its experience running ships on Methanol.

Maria Couva & Mari Kokako

Shipyard	Hyundai Mipo Dockyard Co., Ltd.
Delivery	16 AUG 2019
Ship Type	1A, Tanker for Oil Products and Chemicals, ESP, CSR, IMO Ship Type2, E0, TMON, ETC, CLEAN, VCS(2), LFL FUELLED, BWM(T)

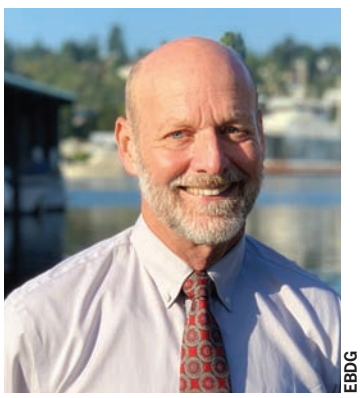
	Maria Couva	Mari Kokako
Class	DNV GL	DNV GL
Call Sign	LAVL5	LAUA5
IMO no	9848584	9848687
Flag	Norway	Norway
Port of registry	Oslo	Oslo
E-Mails	Mari.couva@relayship.net	Maki.kokako@thomeships.net

Deadweight	49,000 mts
Draft	13.3 m
L.O.A.	183.07 m
L.B.P.	175.15 m
Breadth Moulded	32.20 m
Depth Moulded	19.10 m
Keel to top of mast	46.75 m
Crane lifting capacity	10.00 mts SWL
Gross Tonnage	29,700
Net Tonnage	13,600
Lightweight	11,000 mts
Speed	14.5 knots

Waterfront Shipping Ltd.


Goltens

Sandeep Seth


EBDG

Brian King


C-Job

Edward Verweij and Mario Gitte.


StormGeo

Søren Andersen


PAO Sovcomflot

Sergey Frank

Naval Dome

Itai Sela


Hempel

Nigel Shewring


HII

Sabbatini

Goltens Appoints Seth as President

The Goltens Worldwide group of companies appointed Sandeep Seth as President. Seth first joined Goltens in 2002 and has steadily climbed the ranks, serving most recently served as the Vice President Asia Pacific and Vice President Finance of Goltens Worldwide. Seth will continue to be based in Singapore for Goltens.

EBDG Appoints King President

Elliott Bay Design Group (EBDG) appointed Brian King as President - Chief Engineer. King will have direct supervision of the business and affairs of the company. He will be responsible for advancing EBDG's major strategic objectives while leading the team on planning, business management, engineering, personnel development and sales. King joined the company in 1988.

C-Job Naval Architects Appoints Gitte, Verweij

C-Job Naval Architects said that Mario Gitte has been appointed Vice President Engineering and Edward Verweij has been named Vice President Sales. Together they will be the executive management team that will run the company's new branch office in Houston.

Andersen New CEO at StormGeo

StormGeo appointed Søren Andersen as the new CEO as of September 2, 2019. Most recently, he served as the CEO of 2020seaways, a modern shipowner focused on environmentally and economically superior container tonnage. He brings with him a vast, multi-segmented and multi-disciplinary network, a deep understanding of the challenges and opportunities facing traditional industries as well as how these can be solved via digitalization and the use of modern technology.

Pedersen, Duhn Join ME Production

Danish scrubber specialist ME Production has strengthened its sales team with new sales manager Lars Duhn, who joined the company in August. ME Production is not only expanding its sales organization but has also recently established a new scrubber service department.

Revenues Soar at PAO Sovcomflot

Russia's PAO Sovcomflot (SCF Group) reported in the first half of 2019 revenues rose 16.6% ($828m vs. $710.1m), TCE revenue rose 19.1% ($609m vs. $511.3m) and EBITDA rose 42.4% ($381.2m vs. $267.7m). 1H highlights included:

• Korolev Prospect, Vernadsky Prospect and Samuel Prospect LNG-fuelled 114,000 DWT Aframax tankers added to the fleet.

• In March 2019, the Group celebrated the 10th anniversary of the start of LNG shipments from the Sakhalin-2 project.

• In May 2019, Sovcomflot signed a new $297 million limited recourse credit facility, for up to 10 years, with ING Bank; KfW IPEX-Bank, and Crédit Agricole Corporate and Investment Bank. The funds will be used towards the financing of two new-generation 174,000-cubic metres Atlanticmax LNG carriers, which will operate under long-term charters to Shell. "The company achieved significant growth in the first half of 2019 compared to the same period in 2018, exceeding our budget plans," said Sergey Frank, President and CEO, PAO Sovcomflot.

Naval Dome CEO Calls out OEMs on Cyber Security

"Most companies are operating critical systems that are protected, at best, by only the most basic security solution," said Itai Sela, Naval Dome, CEO, at a conference in Singapore. As the world learns that the UK-flagged Stena Impero – seized by Iranian forces in July – was 'spoofed' and begins to accept the extent to which vessels unprepared for a cyber event can be affected, Itai Sela, CEO of Naval Dome, said that original equipment manufacturers (OEMs) are not doing enough to provide end users with the level of protection required to secure critical systems. "The obvious thing to do," said Sela, "is to ask your system provider what level of cyber security each of their systems are provided with and, if not SL4, request they upgrade or replace them."

Shewring to lead Hempel R&D

Hempel appointed Nigel Shewring as its new Group Director of Research & Development (R&D), responsible for managing the overall activities in Hempel's 15 R&D centers globally. Shewring has more than 23 years of R&D experience in a global industrial coatings environment. He holds a B.Sc. in Chemistry from the University of Durham and a PhD. in Material Science from Sheffield Hallam University, UK.

HII Promotes Sabbatini, Spaulding

Huntington Ingalls Industries announced leadership changes at its Ingalls Shipbuilding and Newport News Shipbuild-

ME Production

Kim Pedersen and Lars Duhn.

Cadmatic

CADMATIC CEO Jukka Rantala (left) and Kymdata CEO Jyrki Metsola.

ing divisions. Premo Sabbatini has been promoted to vice president of central planning and process excellence at Ingalls Shipbuilding. He succeeds Rick Spaulding, who has accepted a position as vice president of business process standardization at Newport News Shipbuilding.

CADMATIC Acquires Kymdata, CADS Software

CADMATIC has acquired Finnish software company Kymdata Ltd. including the entire share capital as well as IPRs to all Kymdata's CADS software and its business agreements. The acquisition increases CADMATIC's estimated turnover to EUR 28 million. With the addition of Kymdata's 43 employees, CADMATIC will employ over 200 people. Kymdata's CADS Electric software is a leader in electrical and automation design in Finland and Estonia.

S. Korea Plans Autonomous Ship Research Facility

UIPA, the South Korean Information and Communication Technology Promotion Agency, awarded Kongsberg Digital the contract to supply a fully-featured bridge simulator for a new autonomous ship research facility in Ulsan, South Korea. The Korean government has committed to invest $110 million in the project over the next three years, with a goal of starting operations in 2023. The simulation contract is being delivered through maritime ICT convergence specialists eMARINE Global.

The simulator will be used primarily for research and development of navigational equipment and display systems, and will facilitate testing of autonomous vessel technologies in a safe virtual environment before trials in a designated autonomous ship test bed.

Allweiler nets big pump order

Pumps to support Bilfinger Engineering & Technologies' (BET) Exhaust Gas Cleaning System for ships

BET Bilfinger was looking to expand into new sectors outside of its traditional power and industrial customers, and identified marine applications as a natural fit given the stringent new emission rules entering force with IMO 2020.

BET Bilfinger's industrial Exhaust Gas Cleaning Systems became a subject of focus, but it had to be modified to operate within the IMO requirements. Enter CIRCOR's German Allweiler entity.

Scrubber pump systems chemically facilitate the filtering of sulfur oxides, soot and larger particulates from exhaust emissions at high temperatures and varying pH levels. Standard water pumps cannot withstand this operation.

Over the span of two years, CIRCOR worked with BET Bilfinger to map out the specifics of the new pump application for sulfur emission control. It had to be suitable for specification by shipyards and ship owners in time for 2020's enforcement of the new IMO regulations.

For customers, the most critical criteria include vessel space limitations; material requirements according to fluid specification and temperature; and time from order to delivery. Two Allweiler centrifugal pump series – NIM and MA-S – were suitable candidates to fulfill such requirements.

Using CIRCOR's 3D modeling, Bilfinger pinpointed the optimal configuration of a scrubber system within an engine room, and planned its piping accordingly. Each scrubber system would be comprised of three seawater pumps and one quencher pump to cool the sulfur gases.

Once the solution had been established, BET Bilfinger placed an order for 168 pumps for 42 vessels to be delivered in quick-turn intervals over two years for the first ships by the required deadline.

MA-S is distinguished by having couplings that incorporate a spacer section. This eliminates the need to disassemble the motor and volute casing from the piping during maintenance activities such as replacing wear parts like a mechanical seal and bearings.

Photos courtesy CIRCOR Allweiler/BET Bilfinger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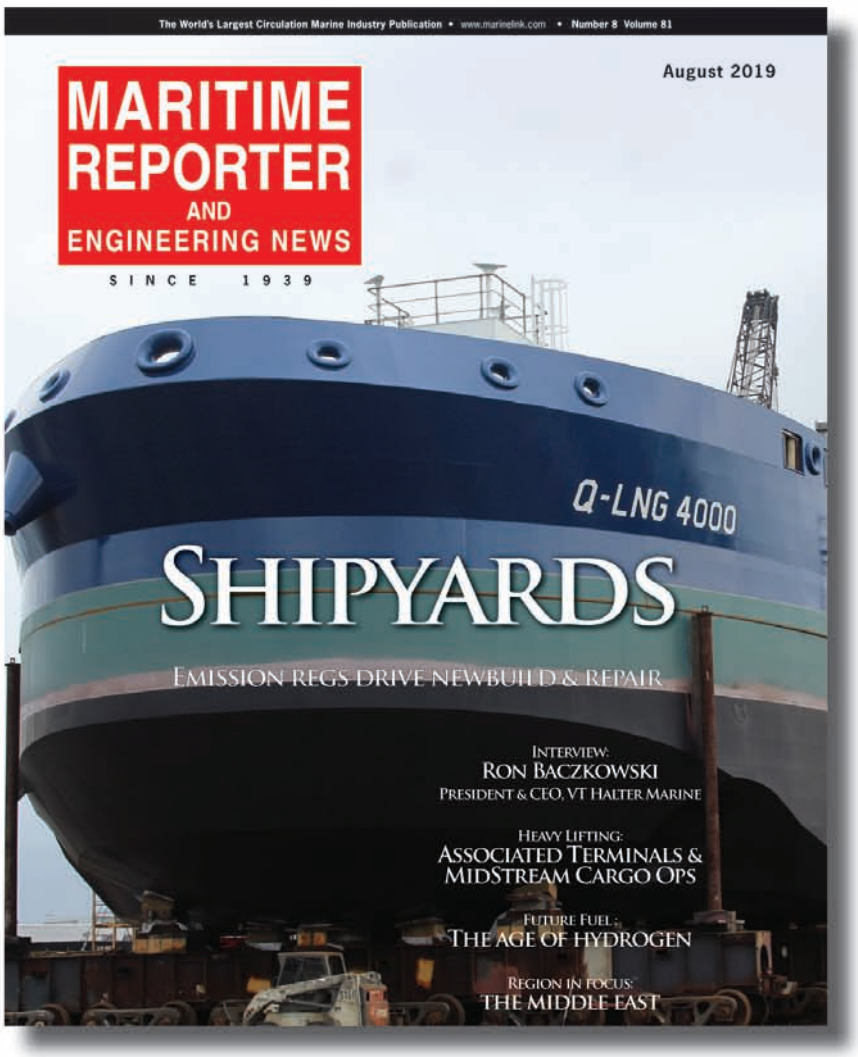

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EDITORIAL CALENDAR

JANUARY

Ad Close: Dec 31

Ship Repair & Conversion Annual

- Drydock & Shiplift Equipment
- Hull, Deck and Tank Coatings
- Sanitation / Wastewater Systems
- Welding & Cutting Equipment
- Engine Conversion & Repower

Event Distribution:

- EuroMaritime - Marseille
- FPSO Europe - London

FEBRUARY

Ad Close: Jan 27

Green Ship Technology

- Fuels & Lubricants
- HVAC & Compressors
- Emission Scrubbers
- Autonomous Ship Systems
- Coatings, Corrosion Control

Event Distribution:

- Sea Japan - Tokyo
- Asia Pacific Maritime - Singapore
- Green Ship Tech - Copenhagen
- NACE Corrosion - Houston, TX
- Intermodal Asia - Shanghai

MARCH

Ad Close: Feb 27

Cruise Shipping Annual

- Passenger Vessels / Ferries
- Bridge Electronics: Comms, Navigation & Controls
- Fluid Handling & Filtration
- Desalination & Reverse Osmosis Systems
- Interior Design and Finishes

Event Distribution:

- Seatrade Cruise Global - Miami, FL
- Ferry Safety - New York, NY
- CMA Shipping - Stamford, CT
- Sea-Air-Space- Baltimore, MD

APRIL

Ad Close: Mar 27

Offshore Energy Edition

- Offshore Wind Support Vessels
- Deck Machinery - Winches & Cranes
- Pumps & Valves
- Water Jets & Thrusters
- Surface Preparation - Water Jets & Scrapers

Event Distribution:

- OTC- Houston, TX
- MegaRust - San Diego, CA

MAY

Ad Close: Apr 24

Fleet Management

- Classification Societies
- Crew Training & Maritime Simulation
- Salvage
- Telemedicine
- Vessel Monitoring & Operation Software Solutions

Event Distribution:

- Posidonia - Athens
- Maritime Week Americas - Miami
- Marine Money Week - New York

JUNE

Ad Close: May 27

2020 Yearbook

- LNG & Hybrid Drives
- Luxury & Expedition Cruise Ship Building
- Navigation: Radar, ECDIS & Collision Avoidance
- Ballast Water Technology
- Lighting

Event Distribution:

- Electric & Hybrid Marine World Expo - Amsterdam
- Ballast Water Management - Houston, TX
- Cruise Ship Interiors Expo - Miami

JULY

Ad Close: Jun 16

Maritime Power Edition

- Piping, Valves & Fittings
- Emission Scrubbers
- Engine Room Ventilation
- Bearings, Seals and Couplings
- HVAC & Compressors

AUGUST

Ad Close: Jul 27

The Shipyard Edition

- Heavy Lifting: Cranes, Winches and Hoists
- Welding and Cutting Equipment
- Fuels and Lubricants
- Transmissions, Gears & Thrusters
- SMM 2020 New Technology Showcase

Event Distribution:

- SMM - Hamburg
- BWMTech North America - Ft Lauderdale, FL
- FMMS - VA Beach , VA

SEPTEMBER

Ad Close: Aug 28

Marine Design Annual

- Vessel Conversions
- Naval Architecture
- Design Software: CAD/CAM
- Anti-Vibration & Noise Control Equipment
- Ship Roll & Pitch Control Solutions

Event Distribution:

- SNAME- Houston, TX
- Interferry 2020 - Hobart, TS
- Seatrade Maritime Middle East - Dubai

OCTOBER

Ad Close: Sep 25

Shipping & Port Annual

- Satellite Communications
- Training and Simulation
- Cargo, Container & Material Handling Equipment
- Tank Gauging & Alarm Systems
- Rope, Wire & Cable

Event Distribution:

- Shipping Insight - Stamford, CT
- Commercial Marine Expo - Providence, RI
- Danish Maritime Days
- Breakbulk Americas

NOVEMBER

Ad Close: Oct 27

Workboat Edition

- ATBs
- Workboat Propulsion
- Deck Equipment - Winches & Cranes
- Fire Suppression and Safety Equipment
- Autonomous Workboats

Event Distribution:

- Int'l Workboat Show New Orleans, LA
- INMEX China - Guangzhou
- METS - Amsterdam

DECEMBER

Ad Close: Nov 25

Great Ships of 2020

- Fluid Filtration & Separation
- Gensets
- Surface Navy Shipbuilding
- Electrical Systems & Components
- Windows, Gaskets, Hatches & Doors

Event Distribution:

- Surface Navy Association 2021, Crystal City, MD

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The Shearer Group, Inc, 3118 Harrisburg Blvd., Suite 100, Houston, TX , USA , tel:(281) 532-2080, gbeers@bristolharborgroup.com

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BAE Systems - HybriDrive Solutions, 1098 Clark Street, Endicott, NY 13760 , tel:(607) 770-2083, carol.gorenflo@baesystems.com contact: Carol Gorenflo

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Description:
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Full Time , Senior Management / Corporate Officer
Category: Engineer / Naval Architect
Contact:Nova Scotia, Newfoundland & Labrador, Canada
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Administrative Assistant- Mariner Training & Travel

Full Time , Entry level
Category: Shoreside Operations
Job Location: Willow Pass Road Concord, California, 94520
Contact:
HR Manager
Email: arubin@hroptions.com
Willow Pass Road Concord, California, 94520
JobDescription: Support Marine Personnel Department in tracking, qualifying and vetting personnel and documentation primarily specific to training and travel necesities. Includes assistance to departmental personnel for all crewing related activities to include travel and training arrangements, report submission, correspondence and maintaining customer and company requirements.

Director of Marine Operations

Full Time , Senior Management / Corporate Officer
Category: Corporate / Senior Management
Job Location: 603 Channelside Drive Tampa, FL, 33602 United States
Contact:
Owner/CEO
Email: troym@yachtstarship.com
Work Phone : 813-223-7999
603 Channelside Drive Tampa, FL, 33602 United States
The Director of Marine Operations (DMO) is responsible for managing the day to day operations of the Marine Department. This includes but is not limited to repair, maintenance, and preventive maintenance of the fleet (currently 4 vessels), docks and barges; safety and compliance regarding vessels, crew and passengers; security; planning, budgeting and execution of dry-dock as well as large capital projects i.e. renovations, re-powers, etc.; and planning and execution of logistics pertaining to vessel charters, customer service and relocations. The DMO reports to the Owner/President. The DMO's direct reports are the Vessel Captains, Head Engineer and Dock Manager.

MR
Vessels, Barges & Real Estate for Sale/Rent

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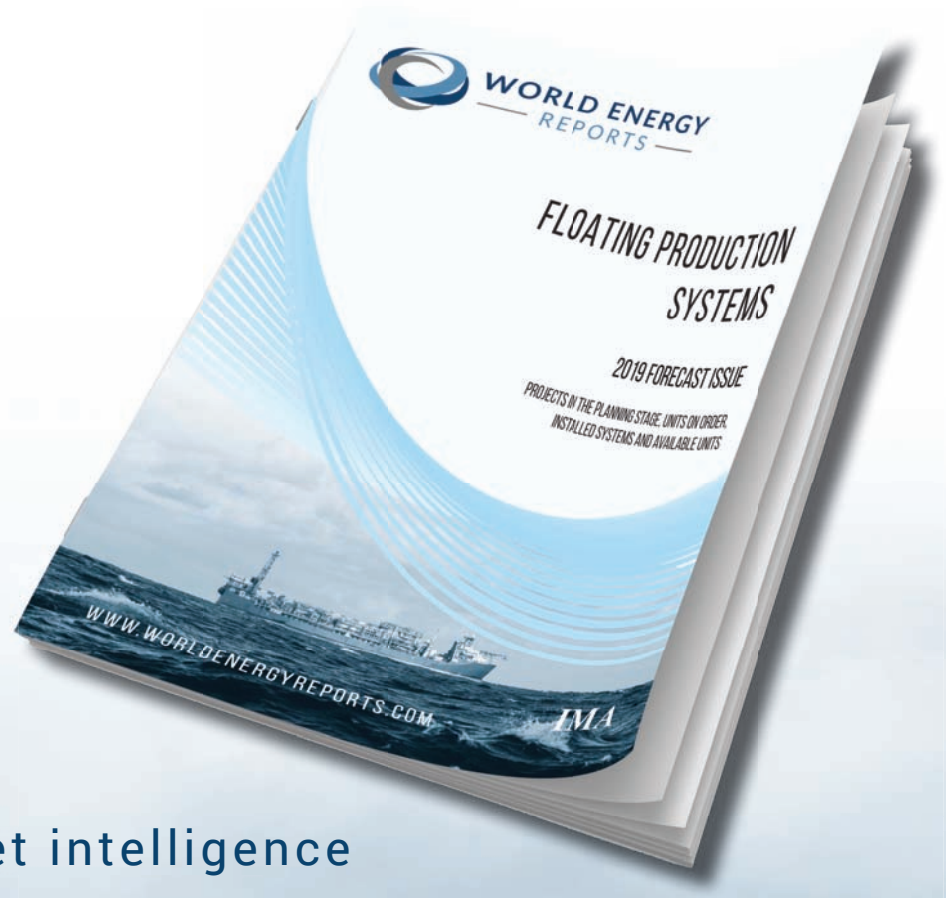

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- Passes U.S. EPA Acute Toxicity Test LC-50.
- Ultimately Biodegradable (Pw1) Base Fluid – 75.2%.
- For Use On Articulated Tug Barge (ATB) Notch Interface, Coupler Ram and Drive Screws, Above Deck Equipment, Rudder Shafts, Wire Rope, Port Equipment and Cranes, Barges and Oil Platforms.

BIO-SYNXTREME HF SERIES HYDRAULIC FLUIDS

- Meets U.S. EPA Vessel General Permit (VGP) Requirements.
- Advanced Synthetic Polyalkylene Glycol (PAG)-based formulas.
- Non-Sheening – Does not cause a sheen or discoloration on the surface of the water or adjoining shorelines.
- Provides long service life and operating reliability, lower maintenance costs, and reduced overall downtime.
- Excellent Anti-Wear Performance - Rated as anti-wear (AW) fluids according to ASTM D7043 testing and FZG testing.
- High flash and fire points provide safety in high temperature applications.
- All Season Performance – High viscosity indices and low pour points.
- Biodegradability – Readily biodegradable according to OECD 301F.
- "Practically Non-Toxic" to fish and other aquatic wildlife according to the U.S. Fish and Wildlife Service hazard classification.

VGP COMPLIANCE STATEMENT LUBRIPLATE ATB BIOBASED EP-2 GREASE and BIO-SYNXTREME HF SERIES HYDRAULIC FLUIDS are Environmentally Acceptable Lubricants (EAL)s according to the definitions and requirements of the US EPA 2013 Vessel General Permit, as described in VGP Section 2.2.9

Lubriplate® Lubricants

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