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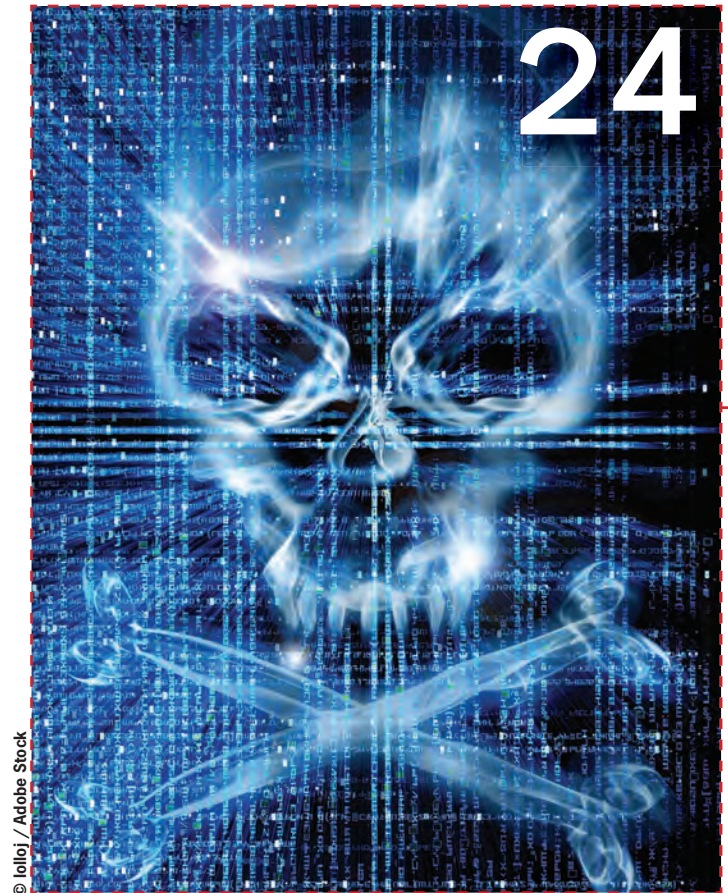
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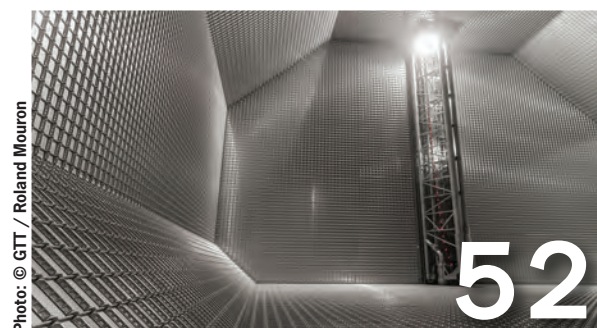


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Photo: Alfa Laval

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THE COVER

The Cyber Challenge

The global maritime industry is in the infancy of a substantial transformation, as it collectively digests the challenges and opportunities that come with the real time connection and digitization of its ship and shore operations. In this edition we offer our a Thought Leadership section on the matter, delivering five distinct points of view from five leaders in the space, starting on page 24.

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Norway Bound

All things maritime are a part of the Norwegian DNA. As industry leaders head to Oslo for Norshipping 2017, MR offers a broad perspective of insights on the local turf from our man in Oslo

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GREG TRAUTHWEIN, EDITOR & ASSOCIATE PUBLISHER

The rapidity with which all matters Digital and Cyber have swept the maritime industry is nothing short of stunning, but trust when I say the movement is still in its infancy in this conservative transport niche. **Frank Coles**, CEO of Transas, is a 'go-to' when it comes to discussing digitization trends in the shipping and maritime sectors, and this month I'm pleased to present Coles in our "Voices" section. One of the reasons I find Coles refreshing is he's not shy to share a blunt opinion, which I am afraid tends to be the exception rather than the norm. But being forthright is not his only calling card. He presents a compelling case, starting on page 62, for ship owners worldwide to mind their digital ways today, lest they be owned or put out of business by the Amazon's and Uber's of the world tomorrow.

In fact "Cyber" – rather unintentionally I might add – became the de facto cover feature of this edition courtesy of a quintet of Cyber Security thought leaders who came together in rapid fashion to supply individual 'Thought Leadership' pieces for this edition, starting on page 24. It seems that the majority of conversations that I have today always, in some form, find their way around to the Cyber or Digital connection.

This is of course our biennial NorShipping edition, and I'm particularly eager to make the trek to Oslo for what is now, unbelievably, my lucky 13th visit to the exhibition and conference. First and foremost, I'm look-

ing to see the overall feel for the exhibition given the continued difficult state of the global shipping markets. I'm not sure of the official numbers from the 2015 event, but it was noticeable that it was a more quiet than usual, though the Norwegian continually produce a world-class event attracting shipping leaders from around the globe. It is our good fortune to have one of our main contributors, **William Stoichevski**, seated in the heart of Oslo, as he provides a volume of unfettered insight into the important Norwegian sector starting on page 36. First and foremost, a visit with Sveinung JS Støhle, President & CEO of Hoegh LNG, provides some fascinating insight and market savvy from an acknowledged global leader. Stoichevski also used his locale to weigh in on the hybrid propulsion trend, "A Hybrid Drive's Digital Landscape" starting on page 42.

My favorite story in this edition has zero commercial maritime value, rather it is insightful look at a good friend on a worthy mission. **Mark Fuhrmann**, Partner in Blue-C, Oslo, is embarked on a 5400 km solo kayak paddle from Oslo to Athens to raise awareness and donations for his "Piece Prize" charity. The story starts on page 48, and you can track Mark's journey complete with his unique humor and wit via various Social Media channels, including updates on our **LinkedIn Maritime Network group**, with nearly 130,000 members the world's largest LinkedIn maritime industry group.

trauthwein@marinelink.com

MARITIME REPORTER AND ENGINEERING NEWS

MARINELINK.COM

HQ
118 E. 25th St., 2nd Floor
New York, NY 10010 USA
Tel +1 212 477 6700
Fax +1 212 254 6271
www.marinelink.com

FL Office
215 NW 3rd St
Boynton Beach, FL 33435-4009
Tel +1 561 732 4368
Fax +1 561 732 6984

Publishers
John E. O'Malley
John C. O'Malley
jomalley@marinelink.com

Associate Publisher/Editorial Director
Greg Trauthwein trauthwein@marinelink.com

Vice President, Sales
Rob Howard howard@marinelink.com

Web Editor
Eric Haun haun@marinelink.com

Web Contributor
Michelle Howard howard@marinelink.com

Editorial
Tom Mulligan - UK
Claudio Paschoa - Brazil
Peter Pospiech - Germany
William Stoichevski - Norway

Production
Irina Vasilets vasilets@marinelink.com
Nicole Ventimiglia nicole@marinelink.com

Corporate Staff
Mark O'Malley, Marketing Manager
Esther Rothenberger, Accounting

Information Technology
Vladimir Bibik
Emin Yuce

Subscription
Kathleen Hickey k.hickey@marinelink.com

Sales
Lucia Annunziata annunziata@marinelink.com
+1 212 477 6700 ext 6220

Terry Breese breese@marinelink.com
+1 561 732 1185

John Cagni cagni@marinelink.com
+1 631-472-2715

Frank Covella covella@marinelink.com
+1 561 732 1659

Mitch Engel engel@marinelink.com
+1 561 732 0312

Mike Kozlowski kozlowski@marinelink.com
+1 561 733 2477

Jean Vertucci vertucci@marinelink.com
+1 212 477 6700 ext 6210

International Sales
Scandinavia
Roland Persson roland@orn.nu
Orn Marketing AB, Box 184, S-271 24
Ystad, Sweden
t: +46 411-184 00 f: +46 411 105 31

Western Europe
Uwe Riemeyer riemeyer@intermediapartners.de
t: +49 202 27169 0 f: +49 202 27169 20

United Kingdom
Paul Barrett ieaco@aol.com
Hallmark House, 25 Downham Road, Ramsden
Health, Essex CM11 1PU UK
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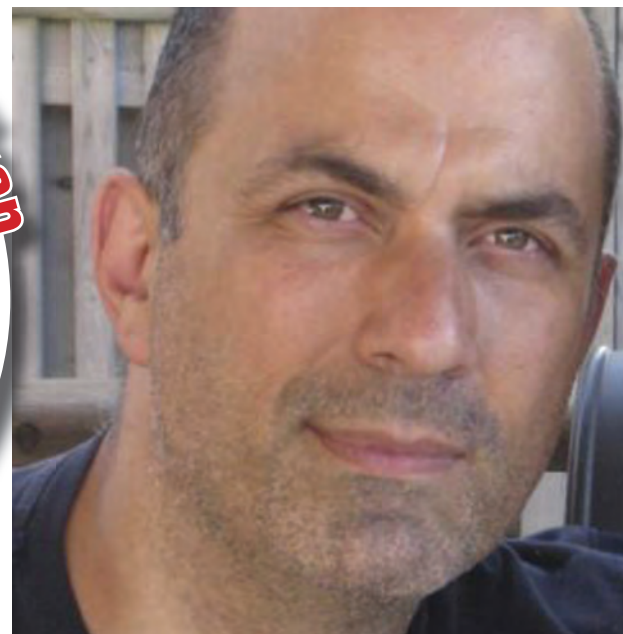
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Authors & Columnists

Keefe



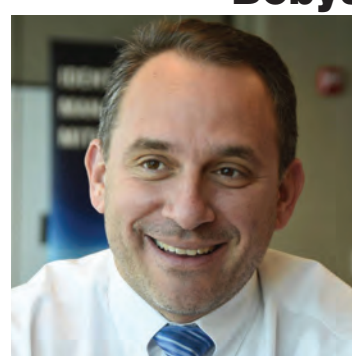
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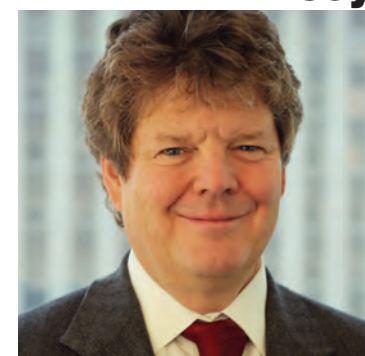
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Berge

As Director of Energy Products, SpeedCast, Rolf Berge oversees the overall technology strategy for the Energy market ensuring alignment with the company's product and service portfolio as well as with its global satellite, wireless and terrestrial network infrastructure.

Bjorndal

Bryan Bjorndal is the President and CEO of Assure Controls, and has been actively involved with ballast water management and compliance issues.

Bobys

Max Bobys is Vice President, Global Strategies at HudsonAnalytix / HA-Cyber. An entrepreneurial IT executive with extensive experience in the global enterprise security market. Industry experience includes: US Federal Government, maritime security compliance, IT integration, software development, software/e-commerce small business startups, classified turnkey security systems for US government installations, military vehicle/defense electronics, and environmental services.

Bryant

Dennis L. Bryant is with Maritime Regulatory Consulting, and a regular contributor to Maritime Reporter.

Haun

Eric Haun is a NYC-based journalist, web editor of MarineLink.com and contributor to Maritime Reporter & Engineering News and Marine Technology Reporter.

Jorgensen

John Jorgensen directs cybersecurity and software lifecycle engineering and assessment activities at ABS.

Keefe

Joseph Keefe is the lead commentator of MaritimeProfessional.com, and Editor of both Maritime Logistics Professional and MarineNews.

Kinsey

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

Mulligan

Tom Mulligan entered university at Trinity College Dublin in 1975, graduating in 1979 with a BA Hons Degree in Natural Sciences (Chemistry).

He now works as a freelance science and technology writer.

Stoichevski

William began working for the AP in Oslo. In 2003, he left the AP to oversee and write for a number of print and electronic energy industry publications in Oslo, where he lives and works. He started writing for Maritime Reporter in 2014.

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Gercke to Christen AIDAperla

Lena Gercke will christen AIDAperla, the 12th member of the AIDA fleet, in Palma de Mallorca on June 30, 2017. In Germany, Gercke is among the most famous and successful models and presenters. "With her natural charm and vitality, Lena Gercke is the ideal godmother of AIDAperla. I'm delighted that she will christen our new vessel. Lena Gercke is the perfect ambassador for the modern and unconventional attitude to life we stand for with our AIDA brand," said Felix Eichhorn, President of AIDA Cruises. <https://www.marinelink.com/news/aidaperla-christen-gercke424163>

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New Crane Gives Offshore Wind a Lift

Huisman has developed a new lightweight crane type for the maintenance of offshore wind turbines: the 'Foldable Offshore Crane'. The crane combines unparalleled lifting heights and more than sufficient lifting capacity with a foldable boom resulting in less required deck space and a low own weight of the crane, Huisman said. The selection of this crane for the maintenance of offshore wind turbines will therefore require a smaller, and thus more cost effective, jack-up vessel than currently required. <https://www.marinelink.com/news/offshore-turbine-repair424868>



Photo: Huisman



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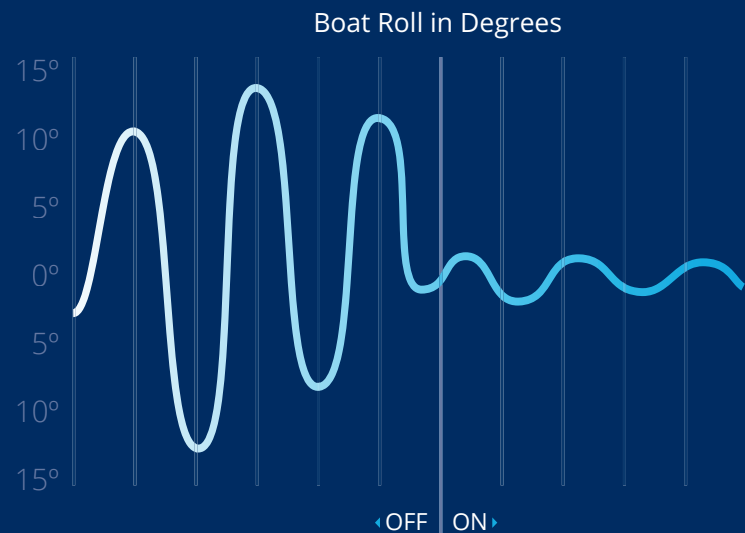
Record Lifeboat

The very first full scale boarding test of the world's largest lifeboat, Palfinger Marine's new flagship for the cruise industry. Shown here is a 15.5 x 5.5 m lifeboat, able to carry 440 people on two decks. The loading demonstration included 200 employees and 240 local volunteers, aged 18 to 88, inside Palfinger Marine's assembly hall in Seimsfoss, Norway. This is the world's largest lifeboat, and the world's first double-decker lifeboat. www.marinelink.com/news/lifeboat-boarding-record424534

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Biofouling Keep Out!

Biofouling was a backburner issue until 5 March 2017. On that day the Government of New Zealand ordered the bulk carrier DL MARIGOLD out of NZ waters after the vessel's hull was determined to be excessively fouled with potentially invasive organisms including barnacles and tube worms.

The bulker was not allowed back until it showed that the underwater surfaces had been thoroughly cleaned. This was the first known instance of a vessel expulsion due to biofouling. It was also significant because the NZ regulations – the Craft Risk Management Standard or CRMS – don't officially enter into effect until May 2018.

It was Charles Darwin, following the voyage of the HMS BEAGLE (1831-1836), who first posited that fouling of the ship's hull could be a means for the inadvertent transport of marine organisms from one location to another. The ramifications of this concept were not fully appreciated or studied until well into the twentieth century. Some studies now indicate that, at least in certain locations, the introduction of non-indigenous aquatic species has occurred more frequently from biofouling than from discharge of ballast water.

Efforts in Hawaii

The State of Hawaii may have been the first government to officially initiate action to address the issue of biofouling of ships' hulls when, in 2000, it designated the Hawaii Department of Land and Natural Resources as the lead state agency for preventing the introduction and carrying out the destruction of alien aquatic organisms through the regulation of ballast water discharges and hull fouling organisms. While the Department was authorized to adopt rules in accordance with this mandate and to enforce penalties for violation thereof, to date, little has been done other than public outreach and voluntary efforts due to a lack of funding.

IMO Guidelines

After years of study, the International



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Maritime Organization (IMO) adopted Guidelines for the Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species – Resolution MEPC.207(62) on 15 July 2011. The voluntary guidelines provide for development of ship-specific biofouling management plans and record books. The Resolution requested that Member States take urgent action in applying the Guidelines, taking the Guidelines into account when adopting measures to minimize the risk of introducing invasive aquatic species via biofouling.

US Coast Guard Requirement

In its 2012 final rule on ballast water management, the US Coast Guard included a requirement for regulated vessels to remove fouling organisms from the hull, piping, and tanks on a regular basis and dispose of any removed substances in accordance with applicable requirements. The vessel's ballast water management plan is required to include a detailed fouling maintenance procedure. Although the Coast Guard has promulgated no further requirements in this regard, it has issued guidance stating that

the biofouling management plan should include the vessel particulars; a description of the anti-fouling system and operational practices and treatments used; a description of vessel operations suitable for the anti-fouling system; a description of the operation and maintenance of the anti-fouling system; safety procedures for the vessel and crew; and recordkeeping requirements. A plan consistent with the IMO biofouling guidelines is considered acceptable.

US EPA Vessel General Permit

The US Environmental Protection Agency (EPA) implemented its Vessel General Permit (VGP) program in 2009 to minimize incidental discharges from vessels in US waters. Among other things, vessel owner/operators are required to take steps to minimize the transport of attached living organisms when the vessels travel into US waters from outside the US exclusive economic zone (EEZ) or when traveling between Captain of the Port (COTP) zones. A comprehensive annual inspection must be conducted of all areas of the vessel affected by the VGP requirement that can be inspected without forcing the vessel into drydock. Among the areas that must be examined is the vessel's hull. If portions of the vessel are not inspectable without the vessel entering drydock, these areas must be inspected during drydock and the results documented.

California Hull Husbandry

The State of California requires that covered ships calling at a California port submit an annual Hull Husbandry Reporting Form, addressing such things as hull coating, hull cleaning, and voyage history. California proposes to adopt in the near future regulations that will be aligned with but make mandatory

provisions of the 2011 IMO biofouling guidelines. Included among these requirements will be development and maintenance of a biofouling management plan and biofouling record book, as well as an annual reporting requirement. Covered vessels calling at a California port may be subjected to inspection to determine compliance.

Australia

Australia has adopted a Maritime Arrivals Reporting System (MARS). The system is intended to provide government officials with sufficient information that they can determine, prior to the vessel's arrival, the potential biosecurity threat presented by the vessel, including threats due to possible biofouling. This allows inspections to be targeted and potentially may provide a basis for banning a vessel from making a port call.

New Zealand

The New Zealand CRMS builds on the 2011 IMO biofouling guidelines, but is much more detailed. It provides that a vessel must arrive with a clean hull. The hull is considered to be clean

when no biofouling of live organisms is present other than that within defined thresholds. The CRMS provides for a stringent standard for long-stay vessels – those intending to remain in NZ waters for 21 days or more. Short-stay vessels are allowed a slime layer and goose barnacles on all hull surfaces, as well as green algae growth of unrestricted cover and not more than 50 mm in length and brown or red algae growth of unrestricted cover and of no more than 4 mm in length at the wind and water line. Algae growth on other portions of the hull and in niche areas may be no more than 4 mm in length. There are other conditions, but these are the primary ones.

There are three acceptable measures for meeting the CRMS standard. Cleaning of the hull within 30 days prior to arrival is listed first. Continual maintenance using best practices is also acceptable, with following of the IMO biofouling guidelines cited as an example. Finally, the vessel may utilize application of a NZ-approved treatment.

Prior to arrival in NZ, the vessel must submit an advance notice of arrival that includes specific biofouling informa-

tion. The vessel must also retain on-board relevant biofouling information for examination by port state control officers upon request. Vessels deemed to not be in compliance with the CRMS may be prevented from entering New Zealand waters or, if already in NZ waters, directed to depart immediately. Violations may result in a pecuniary penalty of up to \$10 million, with a lien against the vessel.

Prognosis

Now that New Zealand has crossed the Rubicon and taken direct enforcement action in the biofouling arena, it is likely that other jurisdictions will enter the fray. California is most likely to be next, since it has already proposed such a step. The US Coast Guard will probably examine the biofouling management plans of covered vessels more carefully than it has in the past. Pressure will probably be raised at the IMO to make its guidelines mandatory, although that would be a long-term project. Owners and operators should take steps now to ensure that their biofouling management plans are adequate and are actually being followed.



About the Author

Dennis L. Bryant is with Bryant's Maritime Consulting, and a regular contributor to Maritime Reporter & Engineering News as well as online at MaritimeProfessional.com. t: 1 352 692 5493 e: dennis.l.bryant@gmail.com

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A Tale of Three Ports



About the Author

Joseph Keefe is a 1980 (Deck) graduate of the Massachusetts Maritime Academy and the lead commentator of MaritimeProfessional.com. Additionally, he is Editor of both Maritime Logistics Professional and MarineNews. He can be reached at jkeefe@maritimeprofessional.com or at Keefe@marinelink.com.

On three coasts, three pilot disputes – like a bad penny that keeps turning up – refuse to go away. Domestic and international stakeholders from sea-to-shining-sea are watching very carefully from the cheap seats.

The U.S. system of marine pilot oversight is a familiar one to most of us. Individual states have the right to govern commerce on their own waterways as they see fit. When it comes to deciding who will be trusted to guide large, deep draft tonnage into their blue water ports, the standard business model calls for one association – typically described as ‘state pilots’ – to perform all of this work (at least the registered, foreign flag variety), without outside competition, governed by a local pilot board of one sort or another.

By and large, these state pilots do a good job and most of us would concede that – with rare exception – they keep our ports safe when it comes to supervising marine traffic. Also with rare exception, they are handsomely rewarded for their efforts. Today’s so-called ‘state pilot’ is among the highest compensated job descriptions on the planet. Outside, looking in, there are many other similarly qualified maritime professionals who would also like to do this work. That’s not surprising. By and large, however, and without the inside track to secure state pilotage jobs, they toil as federally licensed pilots, and are limited to guiding enrolled, U.S. flag or Navy vessels. And since there simply aren’t too many of these vessels left, it can be difficult to make a living doing so.

Occasionally, there comes a challenge to the status quo, which, in most cases, is easily brushed aside. State pilots have deep pockets, staying power when it comes to protracted disputes, friends in high places, and real incentives to ensure that nothing changes. And, when the question of whether the system might benefit from suitable competition that

would produce more palatable pricing for users comes up, the ‘safety’ card is always played. Simply stated, they say, “You can’t put a price on safety. Competition that is based on providing service at a lower price will ultimately also produce a situation that compromises safety.” It is, on its face, a compelling argument and one which rarely fails.

After a period of relative quiet on the collective waterfront, especially when it comes to the commonly accepted ‘state pilot’ formula, the last year or so has produced some interesting news. And, while no one is ready to concede that the system is about to come crashing down, the gray noise from the outside is starting to build. In three ports, the challenges have grown to be more than just an annoyance.

A Tale of Three Ports

Way out West on the Left Coast, the latest challenge to business as usual is pretty much all but settled. Or, is it? In 2016, a jury awarded a woman \$3.6 million in a gender discrimination lawsuit filed against the Puget Sound Pilot Commission. Later, appeals and negotiations subsequently pushed the award to more than \$6 million. Now, ocean carriers may end up having to fund the award. Port users and stakeholders, long held hostage to regular rate increases, have always (reluctantly but dutifully) anted up when it comes to operational costs. But this is something different. And, the users and stakeholders are pushing back.

Thousands of miles away, in Galveston, Texas, another drama is unfolding as a group of federally licensed pilots are petitioning for the right to pilot registered, deep draft tonnage on Galveston Bay. A secondary discussion to the more

widely-publicized rate increase requested by the Gal-Tex pilots, the effort involves maritime professionals who don’t necessarily want to join the local Gal-Tex group; instead, they want to form their own competing association. These federal pilot hopefuls base their argument for a State Issued license, in part, on the premise that “Perpetuities and monopolies are contrary to the genius of a free government, and shall never be allowed, nor shall the law of primogeniture or entailments ever be in force in this State.” That – apparently – is Texas state law. The Texas case could well be headed for court. The case is a unique one, bringing what the local attorney – working the case for free for his clients – says is the incongruity of a ‘state pilot’ system that appears to be in direct contradiction to state law. What happens next is anyone’s guess, but for now, this is one challenge which doesn’t hinge on who has the most money to pay for attorneys. Still another case – this time in Port Canaveral, Florida – involves a local federal pilot who (according to his attorney) has a contract with the U.S. Navy to pilot Navy vessels. That pilot now finds himself on the outside looking in as local federal officials, despite a contract with this federal pilot, are apparently using others. Ultimately, and unless the Navy comes around to the federal pilot’s way of thinking, the spat will possibly pit him against another state pilot organization. There is, of course, more to the story than that. And, who knows who is right or wrong or even how it will turn out? But, that’s actually not the point of this article.

Who Pays?

Without a doubt, the Seattle case is

an unusual one for no other reason than the decision gave the local pilot system a black eye. That doesn’t happen very often. But, with cases like this one and others in places like Florida and Texas; it is probably time to take a closer look at the consequences when it does. For his part, and in this very space not too long ago, John McLaurin, president of the Pacific Merchant Shipping Association, asked simply, “Who should pay for a \$6 million gender discrimination lawsuit involving a woman who was denied a pilot license in Puget Sound?”

The case in Seattle has nothing to do with the one in Texas, and perhaps has even less in common with the fracas in Florida. And, yet, both pending cases, at least on the surface, rely on reasonable interpretations of the law and are unlikely to go away any time soon. Moreover, it is a good bet that these three disagreements, rare as they might be, won’t be the last ones in the arena of U.S. marine pilot oversight. As we saw in Seattle, sometimes the system loses. Again, that doesn’t happen very often. What if that ‘constant’ changes? Perhaps it is time to figure out who is going to foot the (sometimes pricey) bill when it does. Is it you?

Read an update to the pilot saga via Joe Keefe’s blog *Constitutional Collision Course* at: <http://www.maritimeprofessional.com/blogs/post/constitutional-collision-course-15205>

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Ballast Water Compliance: More than a System, it is Knowledge

The soon to be enforced ballast water regulations are manageable – if you pay attention

The ratification of the IMO Ballast Water Management Convention date is fast approaching, and according to a survey we conducted with more than 35 port state control (PSC) personnel, many will

not be prepared come September. There is a lot of uncertainty in the shipping industry in general, with 70% of the survey respondents aware that ballast water regulations had been ratified, but 0% had a plan in place to address the duties of

ballast water compliance.

The messy way the IMO and USGC ballast water regulations have limped towards implementation has put major stress and fatigue on the entire industry. Because millions of dollars are spent

with each BWTS decision, that step has been center stage for longer than anything should be on center stage. This oversimplifies that BW compliance is merely the installation of a BWTS. This necessary but massive change is disrupt-

Port State Control inspection of BW records.



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While ship owners will need to consider the best treatment option for their ship, they should understand that there has been very little operational experience with Type Approved systems. It's probably not safe to assume that a BWTS will work as exactly and as effectively as advertised, and there are likely to be a few surprises when adding new technology

tive to the whole industry, but let's not forget the roles played by ports and crews, in addition to the regulations and treatment hardware.

While ship owners will need to consider the best treatment option for their ship, they should understand that there has been very little operational experience with Type Approved systems. It's probably not safe to assume that a BWTS will work as exactly and as effectively as advertised, and there are likely to be a few surprises when adding new technology (has anyone ever known new technology to be seamlessly integrated?). When a BWTS with Type Approval is installed on a ship, it will be operating in a different environment than the one under which it was tested. It's not that they won't work effectively, it's just that little is known about how these systems actually do work. Therefore, the baseline knowledge on which to build upon and provide guidance is very limited.

Even the BWTS manufacturers need hundreds of additional hours and hundreds of additional installations until failure mode effects analysis can be available. In the meantime, the crew and officer will develop this experience and expertise on how their system operates, and the officer signs the log each time there is a BW event. Additionally, few of the currently installed BWTS are actually turned on and operate on a daily basis; from a population of perhaps 4,500 ships with BWTS, installed, maybe 50 vessels turned them on today.

Because these systems have little or no track record, ballast water management records are going to be carefully reviewed by PSC, as PSC has a responsibility for assessing them. PSC may want to inspect the system simply for the novelty. Crew members will need to understand the underlying reason for these treatment systems and be aware of their operation, as these will likely be the first biological system they have had to deal with.

So, as vessels are choosing their BWTS and planning retrofits, Port officials will be reviewing what local and national laws should be included in their BW

Management Plans. These will affect the way they inspect and monitor incoming vessels under the new IMO regulations. This is a two-way responsibility, since vessels routinely call on new and different ports, there are port-specific changes ships will need to know about. BW operations will create new duties and procedures for the crew, the BWMP will not sit on a shelf, it will be pulled down on average every 3rd or 4th day.

It is also worth noting that PSC can implement additional requirements for their port.

This is not new, it has always been the case. In the U.S. for example, the Port of Long Beach has different inspection, monitoring and sampling methods for BW management than the Port of Seattle, or ports in the Gulf of Mexico or on the Atlantic coast. These ports may use the same BW forms, but they can protect their waters as they see fit, with additions to their compliance, monitoring and enforcement plans. They may also have different fee structures. When a ship visits a port the crew needs to understand their relationship is going to change and new, signed regulatory documents will be required.

In the control of invasive species, ports and harbors are the "ground zero" of this global plan, and everything planned thus far comes down to the discharge of ballast water. As the advance guard mandated for enforcement, PSC will be challenged with thousands of vessels to regulate. It has been proven at the world's top ports which have already implemented their BW regulations and procedures, that ships and crew pass inspections more quickly when they have their documents in order and relevant crew members can clearly explain their procedures.

Compliance priorities for PSC inspection are likely to follow the order below, only going on to the next step if the first steps are not met to their satisfaction:

1. BWM logs checked
2. Discern the knowledge of the officer and crew
3. Inspect the BWTS

4. Sample ballast water.

The feedback I get is that in 10 minutes an inspector can determine if the crew is compliant with regulations. Especially with new regulations, the crew must be trained and able to explain their BW actions. If they can document their actions, and document they have had training, its "thumbs up". Inspectors are likely to do random spot checks, and repeat offenders will likely be subject to full testing.

It's a different day. A knowledgeable and trained crew is a good investment, with a small upfront cost yielding a significant return. Understanding how to complete and maintain ballast water management plans and documents will save time and allow vessel officers and crew that operate BWTS to get up to speed quickly and be compliant, which results in cost savings. Also, consistent training provides a means to not just respond to changing requirements, but to understand them and optimize solutions that best meet a vessel and operator's specific requirements.

This will be evident in the documentation, and PSC inspections will then become routine. Initially, identifying non-compliance will be much easier than looking for full compliance. I would stress that this is FOREVER...all stakeholders will need to recognize that there are new players, new equipment, new maintenance, and therefore new costs associated with these new regulations. Every vessel will be impacted, every port will be impacted, as well as thousands of mariners, etc.

In a situation of dynamic change where the industry also depends on flexibility and low cost, with respect to BW regulations, it will be better to control one's destiny and anticipate change, and invest in telling their crews this is the future. Ports are new partners in a new documented and managed activity. The decision to prepare for new regulations and develop a compliance strategy allows vessel owners and operators to most effectively manage commercial and technical risks, and to minimize the impact on ship operations.



About the Author

Bryan Bjorndal is the President and CEO of Assure Controls, and has been actively involved with ballast water management and compliance issues. Assure Controls develops products and services for ports, ships, and crews to meet IMO requirements and USCG laws for ballast water compliance. Our goal is to prepare ships and their crews to be "discharge ready" on an ongoing basis, and to protect against costly mistakes or undue delays.

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Finite Element Strength Analysis for ATB Load Box

The loading and response dynamics of an Articulated Tug & Barge (ATB) load box are complex. They typically require advanced finite element analysis methods and procedures to design an efficient support structure to ensure a durable design and to facilitate meeting Class strength requirements.

To study the dynamic response of the loads imparted on the tug from the barge, a finite element analysis (FEA) is carried out. Loading conditions that include the static sea pressure, gravity loads, and reaction forces from the ATB Coupler are incorporated into the FEA analysis. The initial step in this process is to analyze a larger global model for initial assessment, followed by detailed fine mesh analysis of the support box interface or elsewhere on the vessel's structure. Results from the fine mesh analysis will allow for a detailed understanding of the stress concentrations and the changes required to make the design successful. Modifications are then designed to the load box interface and tug structure

itself, typically by scantling increases, material grade changes, addition of brackets and panel breakers.

The following editorial is based on a recent engineering project conducted by Viking Systems International to ensure the structure in way of the load box can properly withstand applied loads from an ATB coupler system while satisfying Class (ABS) rules. Particular focus is on the structure in way of the load box-to-tug connection, where the connection loads between load box and tug occur.

Typically load box structures are designed as a rectangular box structure that spans horizontally between frames in the bow region of a tug and vertically between the tug's main deck and a particular sub-deck. For this type of assessment

project, Viking employs a full breadth FE model including the original tug structure, new load box, and any transitional structure. A full breadth model is important to ensure that the torsional loading response between the tug and the barge is accounted for. The tug structure is modeled with as-built scantlings as required by "ABS Rules for Building and Classing Offshore Support Vessels". The mesh density is refined in way of the load box and surrounding structure, with transverse web frames and bulkhead stiffeners modeled with plate elements of 50 mm x 50 mm mesh density. The rolled tube that makes up the hydraulic cylinder and the internal ram section in way of the load box are both modeled using solid elements. All other structures

are modeled with a mesh size that corresponds to the two elements between transverse frames.

The tube and ram are designed by the manufacturer and are included in the support structure model to provide proper stiffness and accurate transfer of loads into the support structure. The rolled tube and internal ram structures are modeled with solid elements to more precisely distribute the reaction loads from the ram to the load box. Applied loads are developed using a combination of local interface, pressures, and acceleration load components correlating to a number of tug and barge design loading conditions.

The reaction loads simulating the interaction of the tug and barge are applied

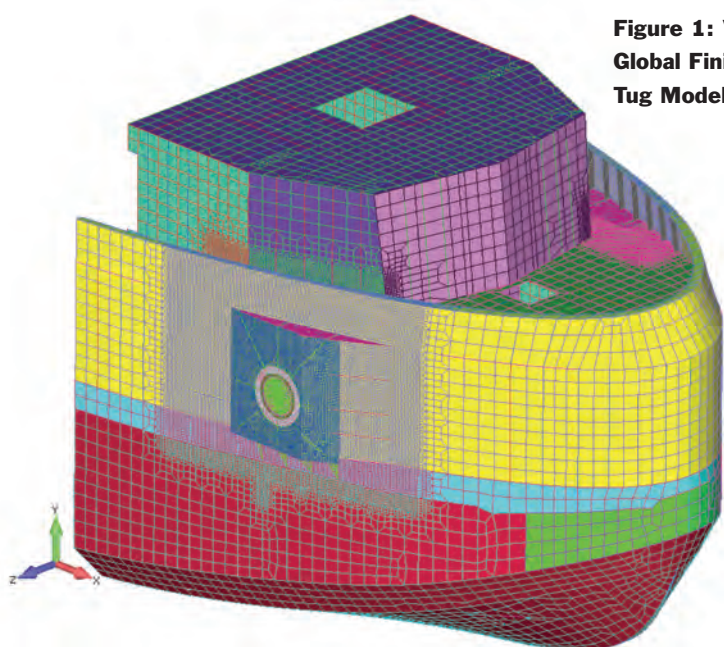


Figure 1: View of Global Finite Element Tug Model.

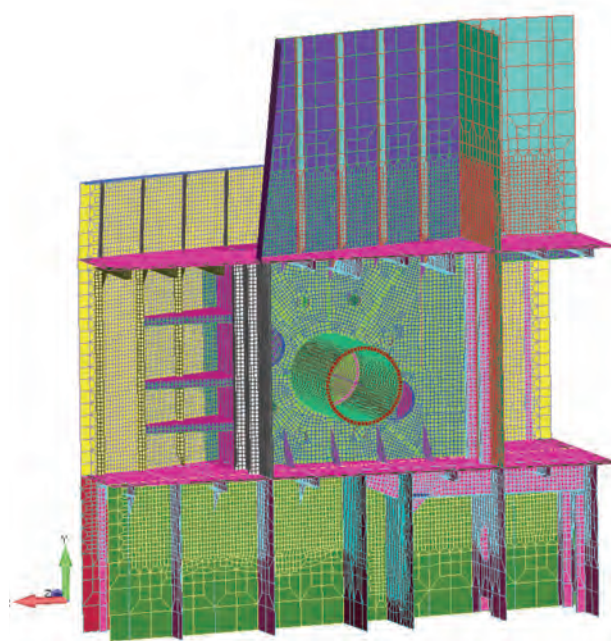


Figure 2: Refined Structure in Way of Load Box.



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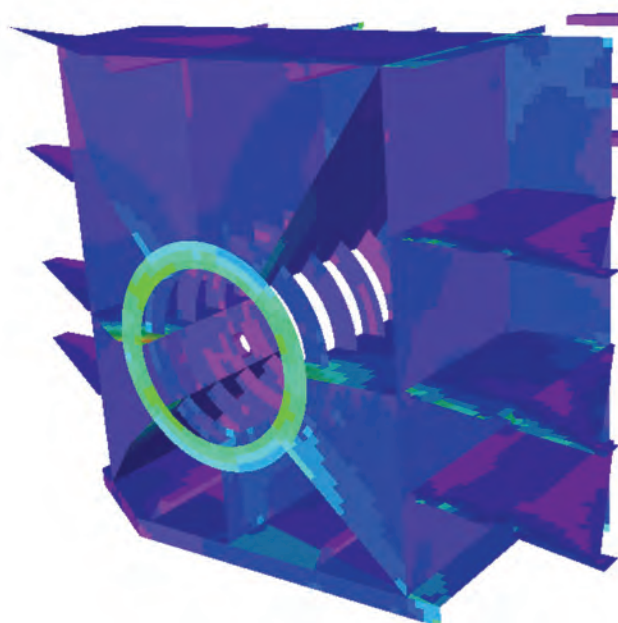
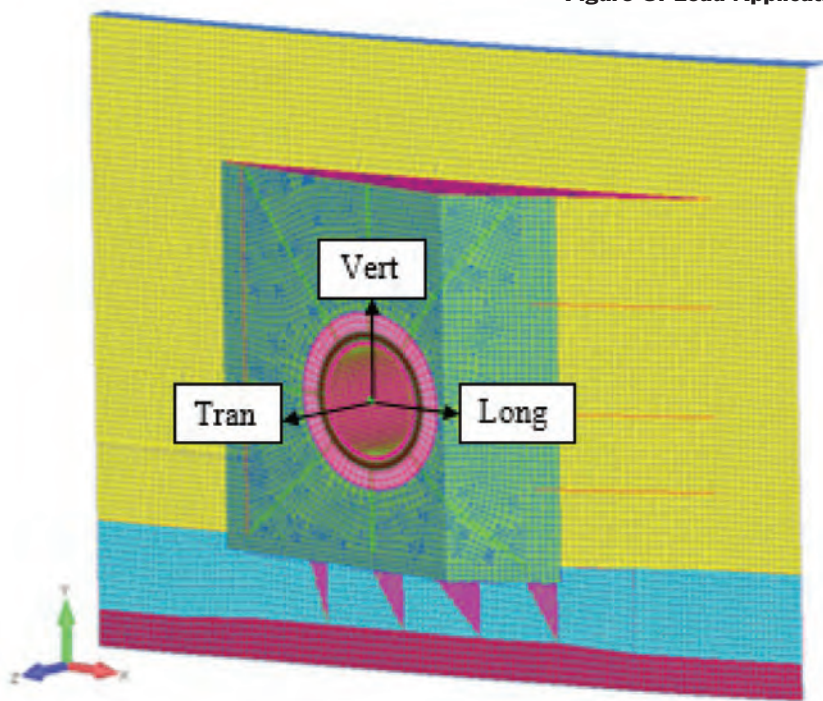


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Figure 3: Load Application.

Figure 4:
ABS Load Box
Yielding
Evaluation Plot.

About the Authors



Fritz Waldorf is Director of Sales and Marketing for Viking Systems International and based in Viking's Houston, TX office. Viking assists shipyards, ship designers and owner/operators with efficient implementation of advanced analysis tools for floating vessels and structures.



Matthew Schubert is a Senior Engineering Manager at Viking Systems based in Viking's Annapolis, MD office. He has managed the analysis of multiple ATB new build and conversion projects utilizing Viking's advanced analysis procedures for both tug and barge structures as implemented in SAGA.

Figure 5:
Color Coded Buckling Assessment Plot using ABS Rules for Multiple Load cases.

as a single point load to the center of the ram. A contact field of elements is created on the ram and cylinder to simulate the contact surfaces that transfer the load from the ram to the cylinder. A loading condition matrix is developed to combine the coupling system reaction load application directions (forward/aft, up/down, and port/starboard) with the dynamic motions and loads of the tug. A typical analysis uses approximately 50 to 75 load cases developed to adequately represent design load combinations.

Applied tug loads include static and dynamic accelerations as well as sea pressure correlating to both calm and heavy weather environments. Internal tank pressures are also applied as needed.

Once the loads are generated and the

stress results are available from the finite element solution, Viking's structural assessment software, SAGA, is used to evaluate the design against the resulting stresses and displacements for each load case. This is completed using Viking's SAGA database system enabling rapid assessment amongst all design load cases for structural yielding and buckling capacity. Yielding evaluation for the plated structure of the model is based upon membrane elemental mid plane stress. Assessment unity ratios are calculated by comparing resulting stress against the allowable stress limits published by ABS which are dependent upon the mesh size used in the analysis. The entire area of interest in way of the support structure for the load box are modeled with a nominal mesh size of

approximately 50 mm, followed by fine mesh models to verify the structure satisfies the ABS criteria. The processing of the response stress and structure material strength limits are automatically done using Viking's SAGA post processing module for different mesh sizes.

Similarly to the yielding evaluation, a buckling assessment is performed in accordance with the ABS Guide for 'Safe-hull – Dynamic Loading Approach' for vessels using SAGA's post processing module. The plate panel buckling assessment is calculated using the panel average stresses from the finite element analysis, by aligning the resulting stresses to be in the panel directions in order to allow the use of both the uniaxial buckling rules as well as biaxial and shear buckling rules using the equations from

Class (ABS) rules. A buckling assessment ratio is then obtained for all panel and design load cases by use of panel dimensions, thickness and stresses by comparison to the ABS critical buckling stresses for the panel.

In the case of this recent design assessment on a tug, a number of minor modifications and additional pieces of steel were easily designed using the same assessment process as described above, providing the owner and the shipyard with a simple solution prior to start of construction. However, for a conversion or a structure already built, the addition of new steel only, such as brackets, is typically used to mitigate issues of yielding, buckling and fatigue while obtaining an efficient structural solution for the owner and the shipyard.

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Cyber Attack: Are You Ready?

(are you sure?)

Cyber Vigilance at Sea: The New Norm

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

The risk of cyber attacks on vessels at sea continues to be significant, and it's not going away any time soon. Each year, it seems, there are more and more reports of hacks that have resulted in loss of critical data, financial loss, or problems with IT systems or shipborne systems functionality.

Shipowners have been reluctant to share information on actual or attempted breaches for fear of being identified. However, there's no shortage of examples of cyber attacks on vessels.

Last August, a French naval contractor was hacked, resulting in the leak of more than 22,000 documents detailing the design of a submarine under construction for the Union Navy. In October, Hewlett Packard Enterprise Services informed the Navy that an employee's company laptop was hacked, resulting in the opening of more than 134,000 personal records of sailors. In 2014, an investigation into the collision between the multi-purpose cargo ship Rickmers Dubai and an unmanned crane barge revealed that the USB thumb drive had been used to store a movie, an abuse which risked corrupting valuable data.

Hackers attacking a ship's operating system may be attempting to obtain several types of information. Some seek to obtain the cargo manifest and container numbers so they can locate valuable pieces of cargo. Others are after vessel IP addresses so they can breach corporate security. And, while less likely, it's also possible that some seek to spoof the ship.

Awareness is Growing

The good news is there's growing awareness about the risk of maritime cyber attacks. Several resources are now available to help mariners learn about common vulnerabilities to onboard computer-base networks and industrial control systems, including both operational and informational technologies. One good example is BeCyberAwareAt-Sea.com, a global maritime and offshore

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industry initiative that encourages the sharing of research data, best practice cyber guidelines and educational articles to help stakeholders understand the challenges that the digital era brings to shipping and offshore operations. The USMRC has also launched an e-learning course, which meets IMO interim draft guidelines on maritime cyber risk management.

Cyber awareness is also being driven by military and government contracts, which demand that attention be focused on marine loss control among operators and shipyards. In many cases, shipyards that bid on government contracts are required to demonstrate that they have a secure platform.

Get On Board

Addressing cyber security should be a priority for senior management rather than a concern that's delegated to the vessel security officer or the head of the IT department. Given that most cyber attacks have not been aimed on the vessel, per se, but are more an effort to breach corporate security, vigilance at the corporate level makes good sense.

The nature of data transmission on a

vessel, which often happens automatically, is such that the interconnected nature of information may lead to the system being compromised. Vessels typically share a connection with corporate security, so it's essentially a means to access corporate servers.

Senior management must also demonstrate a commitment to employees who live at sea so that the human element of cyber risk is appropriately addressed. For example, millennials going out to sea are accustomed to having access to email and online entertainment. It's essential that these needs be provided for so that the crew is not jeopardizing security by using the ship's operating systems for personal needs, thereby threatening the security of the corporate firewall.

Senior management needs to let the crew know that they're important, trusted stakeholders and that their own livelihood is affected by their safety, particularly as it relates to the risk of attempted hacks.

Practical Guidelines

There are standard practices that can be implemented to reduce cyber risk. Each crew member should be instructed

on proper cyber security procedures at sign-on when joining the vessel and periodically while onboard. It's especially important to review cyber security procedures when shipboard operations are subjected to outside impacts, shoreside tech reps or during a shipyard period.

It's critical that the vessel have a response plan that can be implemented and has been tested. Regular back-up of critical systems are an important part of any response plan. The IMO provides high-level recommendations for maritime cyber risk management while BIMCO recommends cyber security be tied in with a vessel security plan, which is a framework under the safety management systems that already exists.

The stipulations in the ISPS and ISM Codes enable a fast rollout of a framework for handling the management of information system security (ISS) on board ships. The principal advantage of this solution is that it is not necessary to create a new system; existing tools used in the maritime world can simply be adapted. The Maritime Safety Committee, under MSC 96/4/5, suggests specific steps that ships can follow to achieve ISS protection.

The Biggest Weakness: The Human Element

For all the talk about improving firewalls and ensuring that shipping and corporate platforms are secure, the biggest risk to cyber security is actually the human element. The IMB has reported that more than 80 percent of offshore cyber, information technology and operational technology security breaches were the direct result of human error. This reality needs to be conveyed and emphasized to all who work in the industry.

Tough Decisions

These are challenging times for the shipping industry. Budgets are tight and there's pressure to delay maintenance, reduce manning and decrease training. Unfortunately, the threat of a cyber attack is not seen as a traditional maritime hazard, and is therefore an area that's easily overlooked. Ultimately, it goes back to treating employees right, making sure they have the resources to do their jobs as efficiently as possible, making sure they have the knowledge they need, and making them feel vested as vital stakeholders in the effort to successfully defend against cyber attacks.



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A Case for Maritime Cybersecurity Capability

By Max Bobys,
Vice President,
HudsonAnalytix – Cyber

As I waited for my daughter's decision regarding the peanuts she was contemplating, an *Economist* magazine headline grabbed my attention: Why Computers Will Never be Safe. We were in one of those unexceptional airport newsstands waiting for our flight, returning to reality from vacation, and the subject was cybersecurity. It was April, and the subject had consumed me since the previous summer as our company developed a potentially disruptive cybersecurity management platform for the maritime industry. One's last vacation day is always a bit grim as the mind shifts from concerns of leisure to work. And mine was cybersecurity.

Of course, with my daughter's peanuts, I purchased the magazine. I hadn't thought much on the subject over the past week and figured it would ease my mind back into the digital. Though the iconic magazine rarely disappoints, little was offered that I didn't already know, but a few interesting tidbits about software code error estimates got me thinking about ships.

Commercial software is often released to the market riddled – like Swiss cheese – with flaws. While programmers average between 10 and 50 errors per 1,000 lines of code, and larger companies can reduce this to .5 per 1,000, such rates suggest the presence of thousands of exploitable vulnerabilities. To emphasize the point, Microsoft Windows operating system is estimated to require more than 50 million lines of code, Google overall manages 2 billion. As ship systems become more integrated, and as data is increasingly shared with shore-based systems, the likelihood of a successful cyber attack becomes almost certain.

Since early 2015, I have spoken regularly with shipowners and executives, along with individuals spanning the maritime spectrum from insurers (including P&I Club), lawyers and vendors, to representatives of classification societies, non-governmental bodies, as-

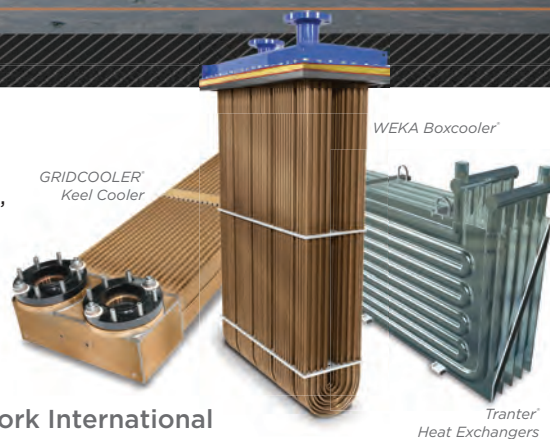
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To emphasize the point, Microsoft Windows operating system is estimated to require more than 50 million lines of code; Google overall manages 2 billion.

sociations, flag states, port state control authorities, and the International Maritime Organization. I've participated in cybersecurity assessments, presented at conferences and seminars, and sat in on cybersecurity roundtables on every continent except Australia and Antarctica. Without exception, and irrespective of language, culture, business, or dress, everyone whom I've spoken with agrees that cyber risks are real and must be addressed. While cyber risk mitigation efforts are becoming more widely acknowledged and implemented, such as awareness training, incident response planning, and assessments, the most common inquiry was: "Where do we start?"

I had faced this question before. It was in the wake of the 9/11 attacks and the subsequent promulgation of the IMO's International Ship and Port (ISPS) Code.

Even while broader objectives were being defined and a framework established, regulated vessels and facilities had to begin to implement preventative measures and comply with standards that were designed to support the detection / assessment of security threats.

Although ISPS Code language addresses the protection of electronic data, the threats originally contemplated were overwhelmingly of a physical nature. They relate to controlling physical access; to designing and establishing the processes and procedures for sustaining maritime security activities; and to ensuring security plans call out all the above. Of course, there is more to the ISPS Code, but the challenges shipowners faced after July 2004 were to implement security solutions in a manner both effective and compliant.

In this post 9/11-world, confusion

reigned as the universe of security system manufacturers, "solution" providers and "consultants" burgeoned. Countless companies over-spent on technical solutions that were too complex or over-engineered for the business; proved too expensive to sustain; or simply didn't work as promised. Globally, billions of dollars were wasted. In the maritime industry, investments in ISPS Code compliance efforts were similarly received, and for many the experience wasn't much different.

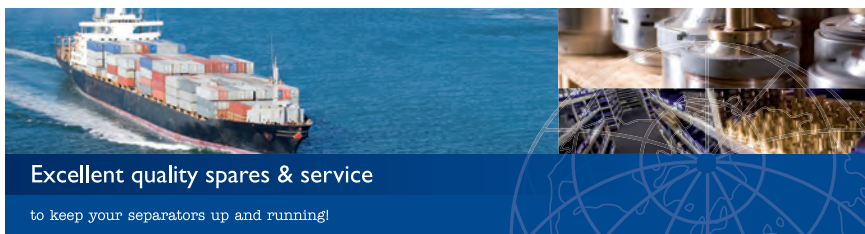
The current confusion over cybersecurity carries with it similar risks of over-investment, in particular because cyber risk context is so unfamiliar. Unlike the implementation of physical defensive measures, such as access control and electronic surveillance systems, which one can physically touch and see, cyber risk mitigation goes mostly unseen.

This is because cyber risk, as many have heard me remark, challenges one's sense of space, time, context, and attribution. Typically a non-"digital native", maritime transportation owners and executives commonly struggle to comprehend how to think about such questions as: Who's attacking my company? Why are they doing it? When did they attack? From where did they attack? In their minds cyber risk is intangible, which underpins the confusion surrounding the question about where to start.

Even though the challenge of cybersecurity remains universally acknowledged, it's perceived intangibilities risk prolonging a sense of defenselessness among many non-digital native decision-makers facing today's crop of cybersecurity 'solution providers'. Not surprisingly, market confusion is worse today with cyber risk than in the decade



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following 9/11.

So where does a shipowner start?

If a shipping company has not already done so, then my recommendation is to first perform a cybersecurity capability maturity assessment of their entire organization. Companies engaging experts to perform assessments of one office or a single vessel are, in my opinion, wasting money. Following this approach is like performing a baseline health checkup on one's arm or leg while ignoring the rest of the body. Cybersecurity technology vendors and consultants are expensive, and expending limited resources (e.g. money!) in today's economic climate on one office or vessel is not money well spent. Here's why I recommend this approach: cybersecurity capability maturity analysis provides a structure for assessing every functional area of a shipping company and a methodology for baselining its current capabilities vis-à-vis current cyber risks in order to support continuous improvement efforts. Properly executed, it enables shipowners to determine where within their business cybersecurity strengths or weaknesses may exist; to make well-informed decisions about how and where to invest limited funds and allocate precious resources; and to better understand why some capabilities may be more suitable for investing in than others. Employing cybersecurity capability maturity analysis defines an organization's "cyber enterprise" (e.g. the entire business), calibrates capability relevance or appropriateness, inaugurates a basis for recurring benchmarking, and becomes the ongoing mechanism for informing subsequent cybersecurity investments.

The benefits are extensive. Performing a cybersecurity capability assessment should not be overly expensive, does not (yet) commit the company to expensive capital investments, and establishes a standardized framework for sustaining cyber risk management over time through recurring analysis, due diligence, disciplined investment planning, and continuous improvements. Best of all, the approach is designed to enlighten decision-makers on how cyber risks can be managed in a responsible, sustainable fashion.

To operate in today's 'Cyberized,' Internet – of – Things global economy, shipping companies must seek to achieve and sustain a cyber mature posture. Though cybersecurity technologies continue to develop and adapt to persistent cyber threats, no 'magic bullet' ex-

ists for achieving a 100% cyber-secure environment. As regulations evolve (and they will), and the march towards ever-greater connectivity onboard ships continues, cyber risks will similarly develop. They are here to stay. They are

relentless, malicious, fast moving, and ubiquitous. Shipping executives must understand cyber risk is a chronic peril that can – and must – be managed.

Although answers to the who, what, where, when, and why may not always

be satisfactorily answered regarding cyber risk, shipping executives must advocate, fund, implement, and sustain a long-term holistic cybersecurity strategy. Though not easy in today's economic environment, it is achievable.



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Thought Leadership on Cyber Security

James Espino • President • Gnostech

The president of Gnostech weighs in on the trends in combating the plague of the industry.



Gnostech Inc.

Please tell us your background.

I was a career Coast Guard Officer until I retired in 2013. Upon retiring from the Coast Guard I joined Gnostech as the Chief Operating Officer and became President in late 2014. The majority of my career was spent in either maritime law enforcement and defense operations or as a specialist in the Coast Guard's technology community primarily working in and around command, control, communications, intelligence, surveillance, and reconnaissance systems development or procurement.

For our readers not familiar, please describe Gnostech in a sentence or two.

We've been in business since 1981, primarily as a Department of Defense technology company. Gnostech Inc. is an applied engineering and consulting company with capabilities in the following areas: cybersecurity and information assurance, secure software development, systems engineering, and GPS engineering. We serve customers in the maritime and defense industries, particularly the U.S. Navy, and we are headquartered in the Philadelphia, PA metro area with an office in San Diego, CA.

Cyber Security obviously tops many corporate agendas today. When I say "Cyber Security", what does that word mean to you?

Cyber security is a term being used today to cover a wide variety of functions, but in most communities it primarily means protecting information and systems from major cyber threats, both internal or external.

It is also an emerging issue for the maritime industry. Not only would a maritime cyberattack have serious economic repercussions, but also environmental and national security implications. Many ask why there is an increase. There are many factors, including outdated software, human error, lack of knowledge, increasing sophistication of global cyberattacks, and more highly interconnected systems and a greater reliance on automation.

When you look at the maritime industry, are there any peculiarities which make enacting Cyber Security more challenging than a land-based facility? Please be specific.

Maritime is diverse to say the least. Many companies in this industry have geographically dispersed facilities and assets in sometimes isolated areas with minimal technical support. These facilities and assets may also have legacy systems with crews that have a lack of cyber knowledge or training. At the other end of the spectrum, you have highly automated and more remotely monitored systems where a cyber breach could put mission critical operations at a standstill. The ultimate challenge is to mitigate risk while ensuring the security and integrity of these systems, assets, and facilities.

Gnostech recently introduced VulnX, "Cyber Security with Maritime in Mind". Can you provide a concise description of VulnX with insights on how it is uniquely capable in the maritime sector.

One of the most proactive steps any organization can take to prevent a cyber breach is to apply published software patches and updates. These patches fill vulnerability holes within systems that hackers would typically exploit. Almost 99% of all cybersecurity breaches are from known vulnerabilities and about 90% of these breaches have patches available containing the required security fixes. However, this can prove to be time consuming and labor intensive.

VulnX is an automated, cloud-based solution that deploys published patches and remediates software and system vulnerabilities. Most importantly, it secures systems against cyberattacks without interference to critical systems. You can approve updates for a particular system to be deployed at a certain time. VulnX applies select patches and upgrades to specific systems across an organization's assets and facilities. VulnX is designed for use in the maritime industry and environment, meaning it has the appropriate mechanisms to account for low bandwidth and connectivity loss. It can be customized to meet a maritime company's needs and requirements.

Put in perspective your thoughts for the trajectory of Cyber crime and hacking in the coming 5 to 10 years?

It is certainly going to increase and global cyberattacks will become more hostile and complex. At least in the next five years, there are estimates that cyber crime will double and reach \$6 trillion annually by 2021. Small businesses will be increasingly targeted, as well.

Ultimately, the demand for state-of-the-market cyber solutions will continue to grow.

What do you consider to be the biggest challenge to keep a step ahead of those with criminal intent in the Cyber space?

Awareness, at least within the maritime industry, is the biggest challenge and the understanding that cybersecurity is not just a buzzword. It is a real threat. Companies need to incorporate a cyber culture at all organizational levels and need to be trained accordingly. They also need to understand that a holistic ap-

proach is needed to tackle cybersecurity. No single application, tool, or methodology will adequately secure your systems, facilities, or assets. Automated solutions and third-party assessments are just a small part of a complete cyber risk mitigation plan.

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Thought Leadership on Cyber Security

Hyper Connectivity: The Risks and Rewards

By John Jorgensen,
Chief Scientist,
ABS CyberSafety

The maritime industry is becoming more connected – at sea, on land and in between. This trend has given rise to a cyber-enabled fleet that continues to adopt greater levels of automation and operational complexity.

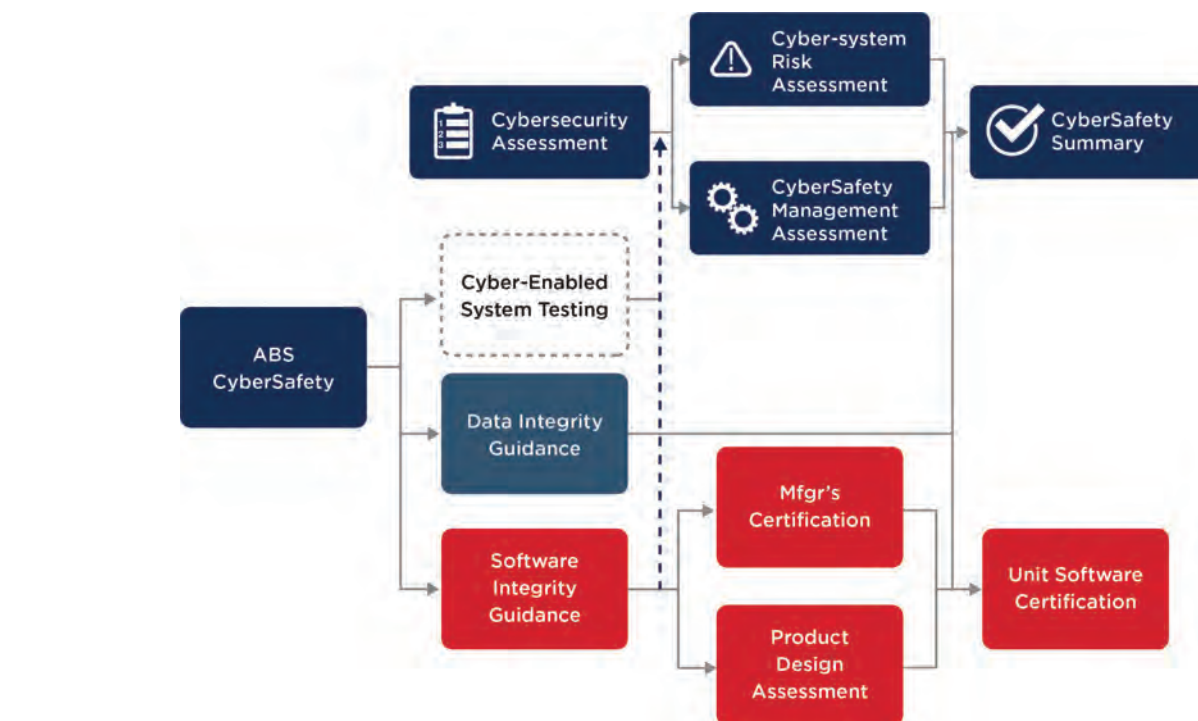
For the end user, the benefits of modern shipping are multiple. For the ship owner or operator, however, every incremental advance of technology creates new entry points for risk.

In this hyper-connected era, defending against the introduction of new risks as technology changes demands a recommitment to systems engineering and, more broadly, established risk-engineering techniques to embed processes that maintain cyber-resilience for all stakeholders.

Functional systems on marine assets are specialized to satisfy particular needs, and they are generally built in relative isolation from each other. Propulsion plant control systems, dynamic positioning systems, ballast and emissions control systems, and many other cyber-enabled, software-intensive components enable crews to work efficiently. These systems are often designed and built by separate manufacturers and, when they are installed, their interfaces and connections require integration.

Integrating hardware from varied manufacturers using multiple pieces of software can introduce a broad spectrum of risks, particularly if the process does not take an organization-wide view or follow established engineering and security principles. Adding to the complexity, the cyber-enabled components of control systems often include a mix of Internet Protocol (IP) communications and non-IP communications and protocols.

All this requires integration strategies to be custom built to the asset class and operational environment they are trying to protect. Tailoring helps operators to avoid failures that cascade beyond the individual system or asset into the wider stakeholder community.



The shipping community differs from other industries in that its main assets are designed and produced in short production runs. From a systems perspective, most ships differ from unit to unit, even between sister-vessels. One strategy does not fit all.

There are three fundamental categories of assets and activities that should concern cyber-conscious shipowners and operators:

1. *Operational control systems and technology;*
2. *Information technology and the networking that connects everything (such as public Internet or private intranets); and*
3. *Human processes (this is the area most frequently neglected).*

Integration Consequences

Understanding the operational consequences of integrating onboard systems is a considerable challenge, particularly when information technology and operational technology (OT) systems are combined.

IT-OT systems tend to require continuous upgrades as older software, components and methods are retired or improved. The updates may bring new operating efficiencies for asset owners, but they also offer new opportunities for errors, dysfunction and intrusion.

To maintain cyber resilience, any systems or software upgrade requires a complete reassessment of the organization's risk-engineering processes to determine if any new conditions and vulnerabilities have been introduced.

A new risk assessment rebuilds understanding of the operational implications of the new conditions, technologies or methods. As integrated systems become more complex, an organization's methods of risk assessment too require periodic updates to fully understand the consequences of failure for any element in the enlarged network.

When managing change within cyber-enabled OT-IT network it is important to remember two key points: any new condition can introduce vulnerabilities that have a far greater operational impact than intrusion; and failed or corrupted elements do not require a direct functional relationships with safety-critical control systems (or components) to disable them. They simply need to be connected to that network; risks often inherit upwards from an operating system's least safety-critical component to its most vital.

Both points can be discovered through a new risk assessment, assuming that it includes a human-factor component because change can also introduce human error.

Network Connectivity

Systems – such as those that control a ship's propulsion, navigation, ballast water, power, fire and gas alarms, scheduling and crew management – are frequently connected to ship-wide integrated networks. Any failure of those systems could have safety consequences for the asset and the environment, which puts at risk the wider marine community and the public it serves.

Rigorous systems engineering makes assets more operationally reliable. Understanding the consequences of change is not something that can be deferred in critical systems, or any networks to which they are connected. Established risk-engineering techniques provide the type of systems view helps an owner to understand and manage the factors that impact upon reliability, sustainability and cyber-resilience.

Most methodologies of risk management for technology systems use a tiered approach to determine risk. The U.S. National Institute of Standards and Technology, for example, requires organizations to assess risk in a very basic hierarchical arrangement.

Risks to systems and technology – those that could impact upon systems, machines, applications or data – create the foundational layer of the scheme

(see pyramid above). The intermediate level of the model addresses risks to the specific organization's critical processes. Understanding the risks at this level requires a comprehensive knowledge of systems, applications and organizational processes to identify their dependencies; the objective is to understand how a loss of specific systems or data may affect operating and safety-critical processes.

The top level contains the wider risks to the enterprise as a whole, which are informed by the analysis of the risks at the base and intermediate levels.

Back to Basics

The operational risks emerging from an increasingly cyber-enabled, automated marine industry can be managed by broadening established risk methodologies to account for technology-induced variable conditions.

Class societies such as ABS have the foundation in engineering knowledge to help asset owners navigate the 'smart ship' era.

The key to risk-management in a cyber-enabled world is to ensure that knowledge about any asset – including its interdependent systems and components – deepens each time new technology or processes are introduced. There are several ways to accomplish this, but it's probably most instructive to examine the one with which I am most familiar.

ABS CyberSafety

The ABS CyberSafety framework, highlights the most effective engineering and risk-management tools for cyber-enabled and automated systems. It encourages companies and organizations to develop knowledge about their systems while also building personnel and organizational maturity.

The methods are measurable, and they scale to the size of the organization in ways that identify risk profiles across assets, systems and people.

The program includes cyber security and the software and data integrity of each of the owner's assets, and it scales to the fleet to manage risk across a global IT infrastructure.

Rapid technological change, heightened connectivity and automation create a complex risk environment. For operational technology, rigorous engineering and assessment are required with each incremental advance of technology. In that environment, assessments must be structured to discover whether an asset is operating at risk levels that allow it to remain reliable.

A notional view of the ABS CyberSafety assessment process, encompass-

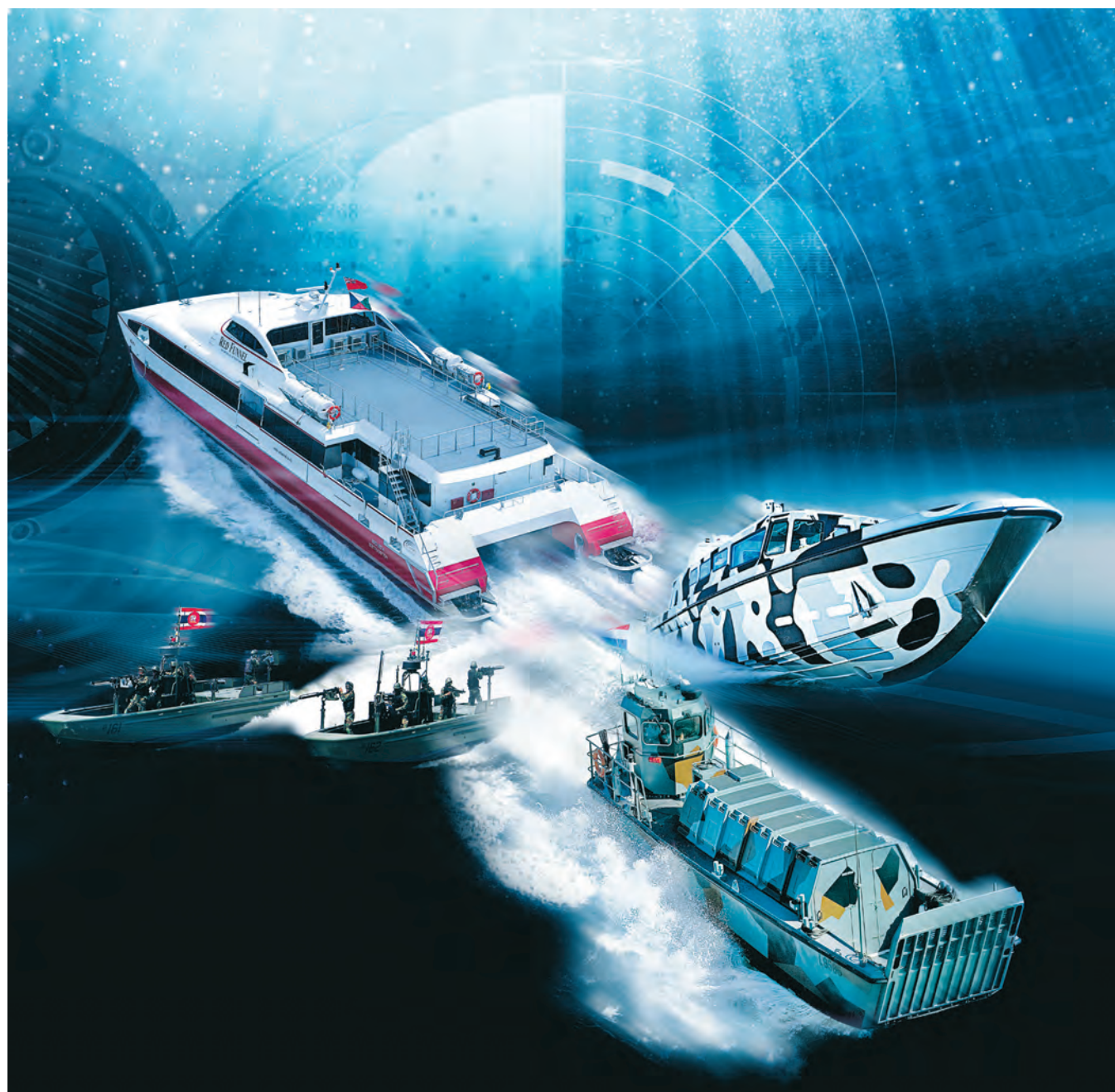
ing the engineering and risk-assessment activities, is below.

The broader process, showing the major components of the framework, includes cyber security, data integrity, software integrity and cyber-system testing (under development). The breakout portion of the diagram shows an as-

essment that starts with the security of cyber-enabled systems, including the organizational factors such as policies, procedures and processes. Subsequent stages add risk and management assessments, and the process completes with a summary report of risk conditions, system gaps and recommendations for pri-

ority actions.

As marine systems and assets become more complex and connected, a renewed dedication to established systems and risk engineering will help to manage the process of technological change, while keeping the safety of your people, assets and the environment at the forefront.



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Thought Leadership on Cyber Security

Maritime Cybersecurity: Good, Better & Best

Cybersecurity Tips

When evaluating cybersecurity needs, a company should ask the following questions:

- What data would be considered most valuable to a cybercriminal?
- What training and safeguards are in place to minimize employee threats?
- Is there a cybersecurity solution already in place?
- If so, is there a formal way to evaluate the effectiveness of the security?
- Is there a disaster recovery plan if things go wrong?

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By Rolf Berge,
Director of Energy Products,
Speedcast

As an industry that spends a great amount of its resources procuring and sending data in order to operate, the maritime industry is an attractive target for cyber criminals. Due to the remote locations of vessels and limited staff aboard ships and rigs, organizations and their offshore vessels and platforms are often ill equipped to ward off cyber threats.

The cost and repercussions of a breach can be extensive in terms of both money and crew safety. According to a recent study, the cost of cybercrime has even surpassed that of drug crime. While cyberbreaches are on the rise, they can be prevented with the proper preparation.

Be Prepared

Being prepared is the first step in securing your data against cybercrime. This includes ensuring all individuals within a company understand the importance of security, from top-level management to

base-level employees.

Top leadership needs to set an example and focus on requiring network safeguards while raising awareness of the importance of keeping systems and data secure. If management isn't concerned about it, then employees further down in the company will be relaxed about it as well and unconcerned about how they tend to the network. Cybersecurity should be on the agenda of the Company Board.

A lack of preparation can lead to dire consequences when the employees installing and maintaining network devices are too relaxed or unaware of potential threats to security. Often in these situations, network ports of these devices can inadvertently be left open, devices aren't properly configured, or software patches and updates are skipped, putting the company at risk. As 42 percent of cybersecurity risks are caused by careless insiders, proper training is essential to safeguarding a company's network.

When evaluating cybersecurity needs, a company should ask the following questions:

- What data would be considered

most valuable to a cybercriminal?

- What training and safeguards are in place to minimize employee threats?
- Is there a cybersecurity solution already in place?
- If so, is there a formal way to evaluate the effectiveness of the security?
- Is there a disaster recovery plan if things go wrong?

Answering these questions will help a company determine next steps, whether that means implementing new security solutions or simply enhancing those already in place. While there are many different levels of security a company can implement to safeguard their data, the best solutions involve defense, monitoring and prevention. Speedcast, the critical communication company, is a great example of a firm providing such capability.

Proactive Solution

Speedcast's SafePass Pro combines the best of content filtering and monitoring with threat management services, including vulnerability assessments. With this combination of solutions, clients can benefit from working with Speedcast cy-

bersecurity experts to pinpoint system vulnerabilities, monitor insider threats, proactively defend the network and respond to incidents.

SafePass Pro is broken down into three different levels to defend, monitor and prevent cybercrime within the client's system. Altogether, this solution improves network resources, minimizes malware and spyware, enables centralized control across all sites, enforces acceptable use and security policies (AUP) and provides an opportunity to assess and eliminate network weaknesses.

With that in mind, let's look at the good, better and best guidelines and options for protecting your system

Level 1 – Defend – Good

This first, basic level, is a firewall to keep unwanted visitors out. Most can filter traffic based on URLs, or classes of URLs, and single applications.

This can often be customized to customer needs or wants, with enhanced, granular blocking capacity to go deep into the types of classes of URLs to block – down to both geography and type of applications. With this level, the

client can block users from accessing any site or application at risk for malware or other cyber threats.

Level 2 – Monitor – Better

The second level would build on the basic firewall defence mentioned in level one. This would be a monitoring service that reviews traffic that goes in and out of a client's network – whether that is a tanker, cruise ship, oil rig, semi sub or a single offshore vessel. All traffic is monitored by an appliance onsite that checks for any anomalies, strange traffic or patterns of traffic that suggests it is unwanted or could present a risk. At the discovery of such a threat, an alert is sent to the security operations center, for further action.

Level 3 – Prevent – Best

The third and final level is the preventative level. This level allows the customer to work with experienced firms like Speedcast on more of a consulting basis to perform vulnerability assessments. This is done by assessing open source threat intelligence to find out what information is present on the deep web or darknet that could represent a threat for the customer. This could be anything from financial data, key intellectual property or plans as well as entryways into on-board monitoring and control systems. Chatrooms provide forums for bartering such information. Knowing that the information openly available on the internet is only 4 percent of the total Internet content and that the other 96 percent is hidden (i.e. deep web and darknet), there is a vast amount of data that can be assessed to find out what types of threats the client is vulnerable to. Navigating this gargantuan amount of information in clandestine places in the darknet and identifying data representing threats requires skill and experience.

Additionally, this level of engagement provides more than simply finding out what is out there, but also provides the client with variations of penetration testing. This means that cybersecurity experts conduct tests to see how well a customer's security system protects their network. Even though a client may have blocked sites and is monitoring all the traffic going in or out of their network, there can still be vulnerabilities in the network itself through open ports or unpatched software on devices. This testing helps dive into any remaining problems to tighten security solutions.

Finally, clients have the opportunity to sit with companies such as Speedcast to review their current security stance including everything from how executives view the threat of cybersecurity and how they train employees, to the types of policies they have in place. This ensures proper training and threat management procedures can be implemented to safeguard from cyber threats.

Maritime companies without a cybersecurity solution leave themselves open to critical risks to their operation, and while having a program in place helps prevent these risks, an installation or network that isn't properly maintained or updated can be just as vulnerable. Taking proactive measures to ensure a company has a system in place that defends the network, monitors traffic and prevents



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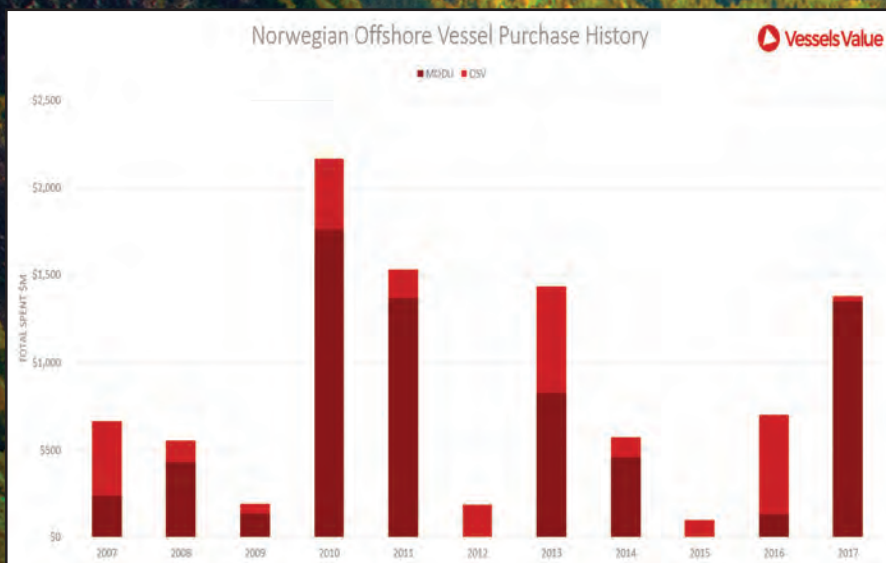
Country	Number of Vessels	Total Value USD bn
Greece	4,454	\$93.6
Japan	4,261	\$84.9
China	4,827	\$73.5
United States of America	2,388	\$44.6
Singapore	2,692	\$42.4
Norway	1,690	\$38.1
Germany	2,868	\$31.6
United Kingdom	912	\$23.7
Denmark	1,028	\$22.2
South Korea	1,479	\$21.4

Top OSV Owning Nations VesselsValue

Country	Number of Vessels	Total Value USD bn
United States of America	1,091	\$6.82
Norway	390	\$4.51
Singapore	587	\$3.68
Malaysia	361	\$2.12
Brazil	173	\$2.11

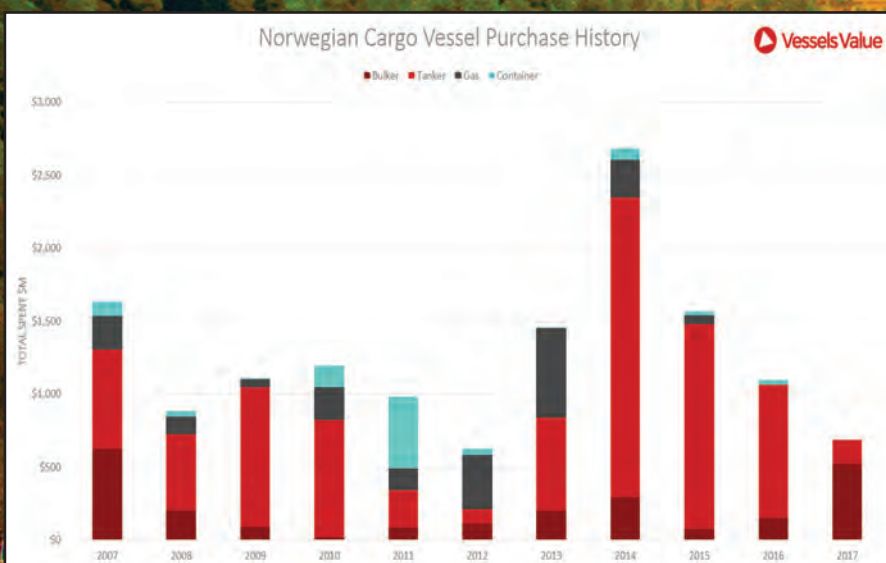
Top MODU Owning Nations

Country	Number of Vessels	Total Value USD bn
United States of America	199	\$10.87
Norway	86	\$10.03
Brazil	63	\$9.20
Switzerland	68	\$6.82
United Kingdom	85	\$6.61



Norwegian Fleet VesselsValue

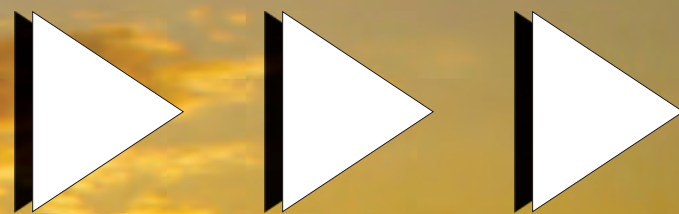
Vessel Status	Number of Vessels	Total Value USD bn
Live	1,573	\$30.0
On Order	117	\$8.1
Grand Total	1,690	\$38.1



Norwegian Fleet VesselsValue

Vessel Type	Number of Vessels	Average Age	Total Value USD bn
TANKER	500	11.0	\$10.2
MODU	86	8.7	\$10.0
BULKER	284	8.7	\$4.6
OSV	390	8.6	\$4.5
LNG	31	8.1	\$4.1
LPG	61	6.4	\$2.6
CONTAINER	50	8.1	\$1.4
SMALL DRY	281	21.7	\$0.5
COMBO	7	17.1	\$0.1
Grand Total	1,690	11.4	\$38.1

AY WWAY



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In Demand: **Hoegh LNG's** **Sveinung Støhle**

Turkish LNG
The Neptune FSRU.

Photo: handout

BY WILLIAM STOICHEVSKI

Satisfied with the recent opening of a new floating LNG import terminal in Turkey plus contract successes in Africa and Asia, Hoegh LNG CEO and president, Sveinung Støhle, cautiously lets us into his stylish Oslo offices for a bit of “disclosure”. The Hoegh business model is winning out, and now six floating storage and regasification units, or FSRUs, are in operation with four newbuilds on the way. The terminal in Turkey was built in just six months: “It would be years, not months, for a land-based gas terminal,” Mr. Støhle asserts. That risk argument has Hoegh LNG in just about every gas-trading discussion in the developing world, so we asked to hear more.

Given the not-so-buoyant gas market, why is there still interest in your FSRUs?

Well, you can move them to a new site if the market changes. Not so for land-based LNG import terminals. And FSRUs can trade as LNG carriers with no conversion required. They also take far less time to put into operation, from go-ahead to completion and gas sales, or from six months to three years. They're half the cost at \$0.30/MM Btu (per million British thermal units). You can lease an FSRU for the long-term, too, usually 20 years. Most importantly for some, FSRUs can spell the end for monopoly suppliers of natural gas using pipelines.

You're also finding markets elsewhere. There's Pakistan, for one, and Africa.

Yes, there's strong demand for LNG in Pakistan due to a shortfall of domestic gas production, and a rising popula-

Finally, we always have at least one FSRU on order without a contract. **Always.** This is the business model that's been successful for us (and) we're one of a very few companies placing orders these days.

tion, and that was our latest contract signing. FSRUs have grown from zero to 22 worldwide in short order. It's still a low number but a market growing quickly. There were six (floating LNG) contracts signed last year alone. There is no risk of overcapacity due to the \$300 million to \$400 million price tag.

Where's LNG demand coming from now?

Last year was the first year of strong demand growth since 2013, although in larger markets demand has been flat. Demand in 2016 increased 17 million tons, or 7.5 percent compared to 2015, mostly from China, India and Egypt. In those types of markets, for an FSRU, 1 million tons a year is sufficient demand. We can deliver anything from 1 MMt to 6 MMt on our FSRU units. The customer can increase capacity as they fit.

What of FSRU demand?

There are several tenders outstanding, includ-

ing the Ivory Coast. We see four to five contract awards a year for the next four to five years. People are really starting to appreciate how fast we can do a project.

So what's next for Hoegh?

Well, 2016 saw new contracts plus equity raising in New York and financing in Oslo. We need both the New York Stock Exchange and Oslo Stock Exchange to finance our projects. We always have the equity portion (\$100 million) in the bank when we're ordering a new FSRU. Right now, we have nine long-term charters. Our 2016 revenues were \$220 million, and we expect that to double in 2020. We could borrow more, but we do not want have to have a lot of debt on the balance sheet. Finally, we always have at least one FSRU on order without a contract. Always. This is the business model that's been successful for us (and) we're one of a very few companies placing orders these days.



Sveinung JS Støhle
President & CEO

Photo: handout



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The Norway Way

TechnipFMC's Andersen & the way forward now that

"Super-Profit Oil" is Over

BY WILLIAM STOICHEVSKI

Ann Kristen Andersen heads up oilfield projects as offshore services and equipment supplier TechnipFMC's managing director for Norway and Russia. She started her job on the first day of February 2017, a month after a merger that changed the company and has already partly changed an industry beginning to ramp up activity with the oil price buoyant at \$55 per barrel.

Photos

Above: TechnipFMC is revolutionizing the subsea industry from concept to delivery and beyond.

Above, right: Ann Kristin Andersen MD, Norway & Russia.

How has the merger that created TechnipFMC — which answered calls for lower offshore costs in tough times — changed the way you do things?

The merger is going to change our offering dramatically. We now have vessels in our toolbox. We're now a services and equipment provider, and (with those), we have set upon ourselves the task of leading change in the industry.

We've heard the sentiment that the industry was slow to respond to skyrocketing costs. What's your view?

The product we've been producing was a super-profit product (oil), so we hadn't really been thinking like (other commodity-based industries). Now with the change in oil price, we need to think differently. These mechanisms that apply to every other industry actually now apply to ours. I think the days of super-profit oil and gas are over, and rather than just talking about technology it's time to talk about the adoption of technology and how it's been the great enabler of an industry.

You said there's a re-industrialization underway in the industry. What do you mean?

We've looked at product cost reductions; simplifying our systems; standardization; integration and new contract models. What we've seen is that by reducing the number of parts; reducing weight; reducing variances that you get access to (order) volume and you can then standardize your product. It's what I call supplier-led solutions.

Why should the supply chain lead? Haven't operators been the ones ordering tailor-made solutions?

Take all the oil companies in the world (about 200) and then take the number of (offshore) equipment providers

with their Xmas trees (those complex, "hydrant-like" valves atop oil wells). On an annual basis, a system integrator makes 200 trees a year. The largest oil company buys 20 trees a year. Should you go to the operator that buys 20 trees or to the (supplier) for access to over 200. Why don't we standardize around the supplier-led solution. I think this is what's happening in the industry now. The operators are letting the suppliers lead through their standardizing and gaining significantly on cost and on lead time. That's interesting, especially when you want to tap into small pockets of oil and gas via tiebacks, etc.

How real are the new breakeven oil prices we hear for oil company projects?

The oil companies have really made a change in their breakeven cost. Statoil is talking about (oilfield project breakeven oil prices of) below \$30, not below-\$50. The average costs savings for the industry has reached 30 to 40%, helped by some standardization; contract changes and our own product integration, where you no longer make product A & B. You make 'C' that integrates both A & B (like heated TechnipFMC pipeline) ... I've been asked if the changes we're seeing in costs per barrel are sustainable. I would say that's not the case. All suppliers now are selling things at prices that are not sustainable. So, the speed of change is important. Having said that, a lot of it must be sustainable because there's no \$150 oil anymore, and there's a limit to how long you cannot maintain your vessels, not recruit new people, etc. We're hoping that when this wave of new projects at very low prices — when that hits us big-time and we've already flushed out all the higher-margin projects — that we're ready to make money



Photo: Stoichevski

The oil price shifted pretty fast. What sorts of effects has that had on contractor-operator order deliberations?

(Someone says) try to commit to a price that we can actually realize. (At the newly okayed 31-year-old discovery) Trestakk, we ended up having an integrated EPCI solution, subsea, all the way back to existing infrastructure. It was a different contract model (based on saying). It'll get to be a project if you hold to this price. When the oil price was very high, there was a rush to get projects out there (and the oil companies paid). Now, perhaps, projects have been examined a little too much.

What's the pace of recovery right now do you think. Are investment decisions being made in great enough volume? How many might be made in the coming months?

I won't say the number of (final investment decisions), but it's a multiplier of 10 (over last year's project count). It's amazing the activity level and oil company's wanting to launch projects these days. The trick is to try and do the right one, and we're happy to work with our customers on this. There's a minimum 30% cost savings if you do a (front-end-engineering, or FEED and integrated engineering procurement construction and installation, or iEPCI). FMC is now winning the industry's first iEPCI projects, and Statoil has chosen to do an iEPCI with the Trestakk field. We now have lots of these coming our way.

The years 2017, 2018 and 2019 were supposed to be when — first subsea services and then subsea equipment vendors — could start to see business as usual. Now you're both types of

company. Which segment will find its way out of the downturn first?

What you used to do is you stripped everything down, and you built it up again. It was a very expensive refurbishment. Now we're doing a lot more

condition-based (maintenance) and we offer lots more digital services to support decision-making about what we do with your asset.

So, yes, for us volume has significantly dropped but it still continues to grow. So

it's not like you're selling these (services only). Instead, what you're selling is sustainable (field maintenance contracts). We see a lot of interest in the aftermarket, just at a lower level than it used to be.

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A Hybrid Drive's DIGITAL LANDSCAPE

BY WILLIAM STOICHEVSKI

Hybrid drive and potential fuel savings are well known — from 10 to 30 percent, according to the sources we've written about over the years. Less known, is the potential need to purchase some sort of remote monitoring package to complement that diesel-electric or battery hybrid system from a system operator in order to secure the maximum safety benefits. As the count of system operators offering hybrid drives grows, so too, it seems, there's continuous need to look at who they are and what they're offering.

"We can get close to real-time data back to the center here," says ABB global technical support manager, Stian Braastad, as he shows us some of the back-up being offered live to ship owners and captains out there, somewhere, in the world's oceans. "If something happens on board, it will take from three to five minutes before that event is actually displayed on one of the dashboards here. The lights in the ceiling will go red, and our technical support engineers will be able to see the vessel specifications. They're available 24/7." Braastad is echoed by Kenneth Nakken, vice-president of ABB digital services, as both show us the finer points of ABB's new Ability remote diagnostics

support system. "It means captains are not alone anymore," Nakken adds.

Nor are the crew. A recent U.S. National Transportation Safety Board report on a how the cargo vessel El Faro sunk reveals the captain's voyage into dangerous weather exposed the ship to pounding waves that knocked out her boilers. Manual communication with shore was ineffective. Before it sunk, the second mate made a desperate call to company headquarters to inform of engine trouble and ask for emergency help. With Ability, in contrast, shore-based engineers — like the 30 percent of Ability's engineers that have been chief engineers aboard real vessels — are alerted to a tagged-up

FPSO client: in 2015, ABB was entrusted with automating the Bumi Armada floating producer (pictured), and that makes it a candidate for remote diagnostics help through Ability.

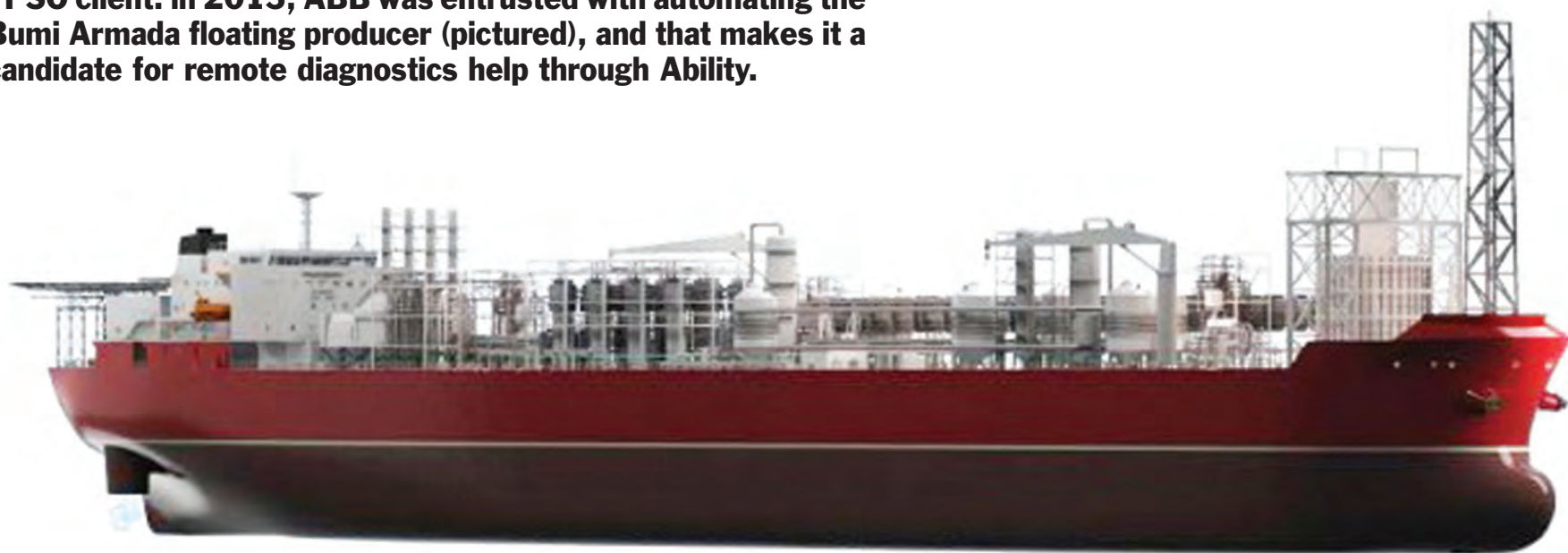


Illustration: handout

ship's engines taking in air or water or showing electrical faults. "We can monitor it in real-time or close to real-time, so if there are thresholds exceeded, then our customers can immediately know if, for example, there's water in oil or leakage."

Battery Babysitting

The few modern versions of diesel-electric hybrid drives that are fitted with

marine batteries must also be monitored, as evidenced by their battery-cabinet smart screens and the claims of those who battery cabinets. "We would know if anything's wrong (with a ship's lithium-ion batteries) long before the captain would," a battery solution provider recently told us. His batteries were all "Internet of things," meaning remotely monitored, and system integrators like

Siemens and ABB are very aware of the myriad reasons monitoring batteries will be necessary.

"We see the same things as the crew onboard, so we work together with them to trouble-shoot the case," says Braastad after pulling a vessel's particulars up on the screen. Presumably, he'll one day also be talking about hybrid drives with batteries. If problems with these arise,

like fire, then poisonous, explosive gases could form. Battery fires themselves are caused by so-called thermal runaway, a chemistry problem the battery module is engineered to solve. Still, while some battery solutions providers say their method "eliminates thermal runaway", others say theirs reduces the risk of "thermal runaway". It's a tough call, but again, remote monitoring would seem to



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The Norway Way



Photo: handout

Worldwide Support: The ABB Ability dashboard, where engineers provide remote diagnostics, maintenance support and monitoring for a variety of ship types on the high seas.

be necessary.

System Integrators

While Siemens offers the Internet of Things and monitors its own battery systems as part of the energy management system it offers, most diesel-electric hybrid propulsion systems installed by Siemens Marine are not fitted with large marine battery modules (a new thing) and are instead of a type where four to six diesel engines power electric generators that turn a ship's propellers via a frequency converter.

These hybrid drives are quiet, their diesel engines aren't yoked to the propeller, and they've now been around on offshore supply vessels since the mid-1990's. They're also more complicated with more automation and electrical circuitry to monitor. So, Siemens offers its own integrated automation of con-

verters, motors, couplings and gears and offers maintenance, management and big data decision support from services like SISHIP EcoMain or products like SISHIP EcoProp hybrid propulsion or all-electric BlueDrive PlusC frequency converters.

Importantly, however, maintenance courses on diesel-electric generators are offered ship technicians.

Prior to its 2011 launch of the IAS 400 and Web-based Teleservice centered on the popular SIMATEC S7 automation model, Siemens had also for years offered redundant automation and diagnostics for all ship's applications. Still, on-site service engineers have been de rigueur at Siemens Marine in Norway, and how much this will change in "the age of digitalization" or what reliance there'll be on electric generator training for crews isn't easy to foresee.

Hybrid Nwbie

Avoiding sending a service engineer has been accomplished by crew training, digital monitoring via interfaced electronic tags (by ship's crews) and by remote operations and maintenance support. Another system integrator that seems to have its own hybrid drive and marine battery solution and remote support is Norwegian Electric Systems AS, formerly Havyard Electric. The decade-old outfit offers a switchboard-free solution for ship's power and a hybrid diesel-electric drive solution that requires one switchboard for each liquid-cooled Quadro Drive frequency converter (to-thruster) solution. "The (trademark) Quadro Drive frequency converter is specially designed for ship installations and sets the standard of next generation propulsion converters," NES asserts, adding, "Quadro Drive requires no large

transformer, making installation much cheaper and simpler." An "active rectifier" might also allow the reclaiming to the ship's grid of energy from the propeller. A NES hybrid drive featuring a battery is understood to be open to condition-monitoring from shore using a system called RAS, or Remote Assistance System. While NES did not return our queries, a battery solution provider gave us the NES reference, a suggestion, perhaps, of another partnership akin to those Siemens and ABB have forged with their energy storage providers. NES marketing material says it offers solutions "you can afford" and "(remote) access to the ship's propulsion system in a matter of minutes". A photo shows a company man with a laptop "on location" and looking "remote" while servicing a client in Africa. While Siemens automation solution was (perhaps still

is) Web-based and ABB uses Office 365 and the Microsoft Azure cloud to access ship's power systems, NES says "a vessel's satellite communication system" will help solve problems anywhere in the world at any time".

Ability

Of course, ABB's claim is also global, and we did see the excellent oversight its engineers had of their clients via the Ability Solutions it launched in March 2017, when "all devices and sensors on everything went to the (MS Azure) cloud". Now, rather than sending out a service engineer over 48 hours to reach one ship, one engineer might manage 10 ships from operations centers in Houston (day help), Asker (offshore vessels, Nor-

way), Singapore (drilling) or Helsinki (passenger and cargo) with new centers understood to be opening in Shanghai, Miami and Genoa Italy later this year. A 10 percent fuel savings is said to be possible for using the advice, onboard software and fleet management Ability offers. All system integrators say "they dig into the real data" and they appear to be doing so, although, it would seem, marine batteries might require their own separate monitoring. Our email probes on the issues batteries might present for remote diagnostic tools went unanswered. Nor is it clear who, apart from ABB, offers remote alarm monitoring or which have "taken the expertise into an algorithm (as, say, Emerson)", or which integrators stop short of doing uncalled-

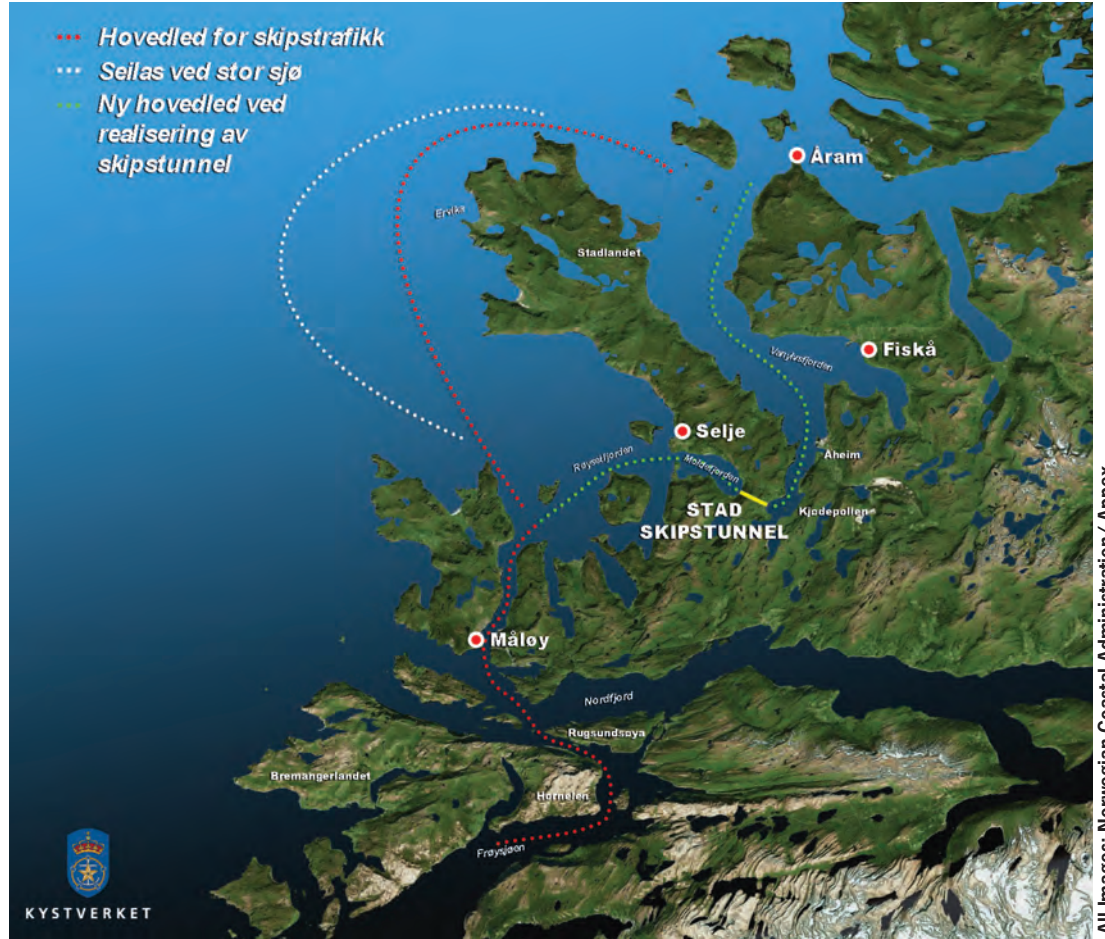
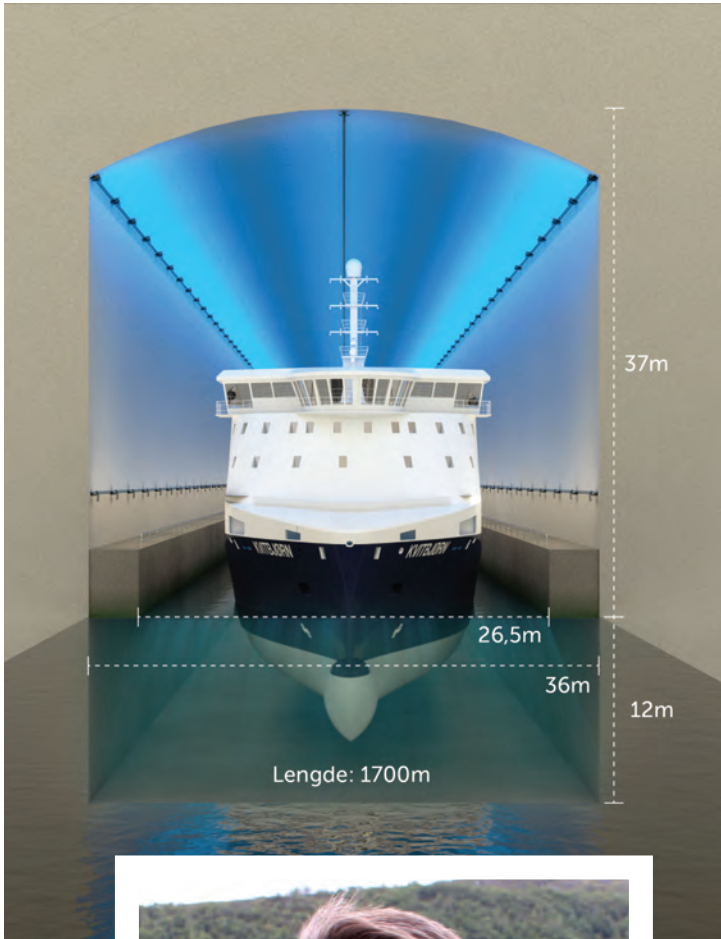
for maintenance when condition monitoring suggests you don't need it.

"I went to many digital ship conferences and everyone I met said we're not being taught this (condition-monitoring stuff)," says Nakken. "It needs to be simple even for an engineer or a chief engineer," he adds. Siemens in Norway, for their part, offer maintenance classes and likely much more. ABB seems to offer all the expertise needed to help crews fix problems remotely. NES is known to at least send a man to a remote location for service help. Perhaps much more.

ABB, meanwhile, has 3,000 vessels in its client group that appear to use ABB electrical kit and perhaps 150 of these are using Ability diagnostics via service centers across the globe. "If we pick up

a critical (system-stopping) fault we always contact the onboard crew and the (owner's) onshore vessel management to at least offer onboard assistance," says Braastad, as he pulls another vessel, a floating producer, onto the giant dashboard screen. Depending on the deal the customer's subscription, ABB can go beyond trouble-shooting to offer preventive feedback using data collected every three months on all from cooling systems and frequency converters to the effects of operations on electrical breakers. Even oil system particles in an azipod are monitored. That's a broad digitalized offering of support to ship owners owning highly automated hybrid drives. Broad digitalized offerings are all the rave right now.

The Norway Way



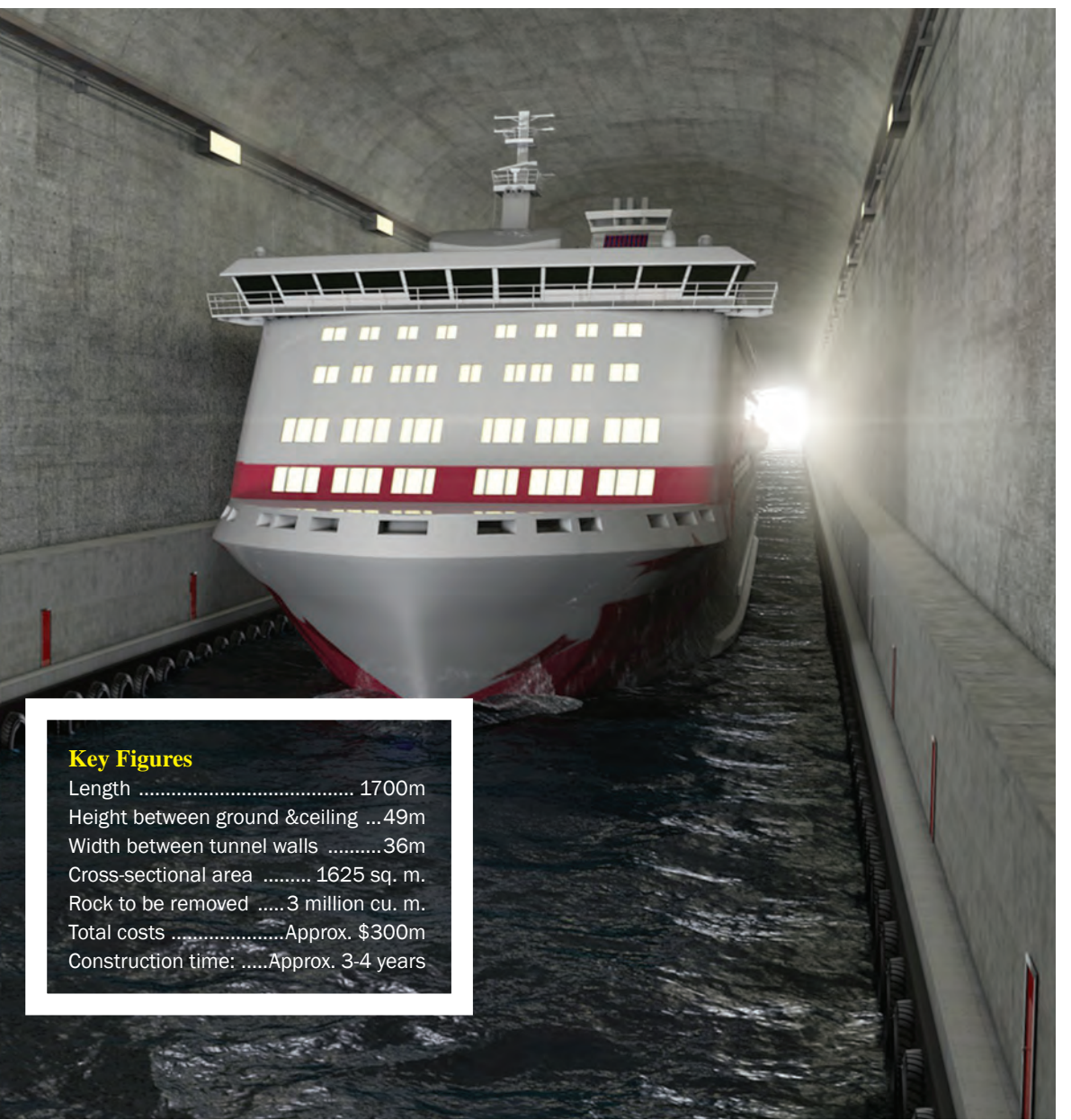
All Images: Norwegian Coastal Administration/ Appex



Project manager Terje Andreassen



Principal Engineer Jarle Strand



Stad Ship Tunnel: Norway to Build World First Ship Tunnel

Norway is planning to build the world's first tunnel for ships, a 1,700-m tunnel which will cost more than \$300m and allow cruise ships to bypass the most risky area along the coast of Norway. The Norwegian Coastal Administration (NCA) will spearhead the project which is expected to start in 2019. The passageway burrowed through a piece of rocky peninsula will allow vessels to avoid a treacherous part of sea. Construction of the Stad Ship Tunnel, which would be able to accommodate cruise and freight ships up to 16,000 tons, is expected to open in 2023.

"There are still many pieces of the puzzle that need to be put into place before construction can start, but we have previously stated that the actual construction could be at the earliest in 2019," said Terje Andreassen, project manager for Stad ship tunnel at NCA.

As per plans, the megastructure has a ground to ceiling height of 49 meters, a cross-sectional area of 1625 sq. m. and a width of 36m between tunnel walls. Passenger ships will be given priority but leisure boats and other vessels will also be able to use the tunnel. It will be free for vessels measuring less than 70 meters.

Why a Tunnel?

The Kråkenes lighthouse, just south of Stad, is the meteorological weather station with the most stormy days, which can be anything from 45 to 106 days per year. The combination of wind, currents and waves around this part of the coastline make this section a particularly demanding part of the Norwegian coast.

The combination of sea currents and subsea topography creates particularly complex and unpredictable navigational conditions. Very high waves come from different directions at the same time and can create critical situations. The conditions also cause heavy waves to continue for a number of days once the wind has died down, causing difficult sailing conditions even on less windy days.

Project Status

The project is embarking upon a feasibility study phase. When the feasibility study is complete it will undergo external quality assurance, phase 2. The Norwegian Coastal Administration has prepared a concept selection report (KVU 2010) which discusses the alternatives "Zero alternative" (with no new measures), "Small tunnel" and Large tunnel" (Hurtigruten).

The Project

NCA will deliver a pilot project to the Ministry of Transport and Communications in the spring of 2017. Further, the

project will undergo an external quality assurance process (KS2) before the project is presented to the Parliament, who then formally decides on project fund-

ing. Quality assurance has been carried out (KS1 report), which was commissioned by the Ministry of Fisheries and the Ministry of Finance for KPU 2010.

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The Norway Way



Paddle for “Piece”

By Greg Trauthwein

Mark Fuhrmann is Partner in Blue-C, an Oslo-based strategic marketing and communications firm that is a ubiquitous presence in the world of maritime. Fuhrmann recently embarked on a 5400 km solo kayak paddle from Oslo to Athens to raise money and awareness for "The Piece Prize" a charity he created, which, for lack of a better description, is aiming on making the world a better place.

Tell us a bit about yourself?

Well, that's a long story. I was born and raised Canadian and I studied communication and journalism in LA. I met a girl there, got married in Norway and had three lovely children. My wife died of brain cancer five years ago.

I'm always moving forward, and I've always thought I could do things, even though many were beyond my intellectual and personal ability. At the age of 12 I saw some guys jumping off a diving board and I thought 'I can do that.' I did, but then I quickly discovered that there was no bottom and I couldn't swim. (That would be Shasta Lake outside of Bellingham, Wash.). I guess jumping into the unknown has always been with me. I've started five businesses and just got on with it. I am not an analytical person; I'm a doer. I see something, I reach for it and I achieve it.

The real me: perhaps I always want the best and in wanting the best I sometimes fail to make decisions that need to be made. I hate firing people; I love hiring people. I strongly believe the world is one place, one people group, one humanity, one responsibility. Cultures and ignorance separate us, as well as wealth, opportunity and acceptance.

You are set to take a break from the daily routine and embark on a personal mission. What exactly is "The Piece Prize," and what inspired you to create it?

The Piece Prize is a humanitarian award to recognize individuals/organizations which are actively involved in making neighborhoods, communities and cities a peaceful place through acts of genuine kindness and caring. What inspired me? An old lady in a house. See: <https://youtu.be/Ab49oxEFuGA>

In short, what is the objective of this mission?

To inspire individuals to make a difference in their local communities and cities; To foster mutual respect for one another, regardless of faith, traditions and cultures; and to generate a 21st century mindset that a peaceful world starts with "me" and requires the effort of many individuals

Why now?

We live in a divided world, with complex political, cultural, ethnic and religious situations. I think that the shared sense of community is at risk, ultimately a threat to civil society. This requires action, not only by governments and global charitable organizations, but by individuals.

So what, exactly, is the journey you're preparing to take?

I will embark on The Silent Heroes Tour of 2017, a 5400 km solo kayak tour from Oslo to Athens. Along the way I will visit 10 to 15 cities, find silent heroes in each city and hand out individual Piece Prize laureates of €500 – €2000. Ultimately I hope to create significant social media awareness that "Together we are better."

How, exactly, have you trained for the physical and mental rigors of this journey?

Good question! I have paddled for 15 years, but my kayaking skills are intermediate, but I will not paddle more than 900 meters from shore, maybe further out if the waters are calmer. I started jogging, I row at a training center and I have done a bit of yoga. I am not a hardened explorer type. I have no idea what is ahead. I have no idea of what it is like to cross a channel of water or paddle alongside a barge on a canal, but I guess I will find out.

What advice would you give to others who might be planning similar endeavors?

Ask me when I am finished.

If our readers want to get involved, how can they do so?

Yes. There is a donation tag at www.thepieceprize.com. All international donations will in their entirety (less bank or visa costs) go to one of several causes.

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New Players: A Seadrill Jack-up



(Photo: Oyvind Hagen, Statoil)

As a mix of traditional heavyweights and start-ups fight to keep Norway's offshore industry afloat, collectively they assess

The New Reality OFFSHORE NORWAY

Swedbank's chief economist, Harald Andreassen, isn't "too hopeful" about the long-term prospects for the oil price, but then again, "I'm less certain of this than I've ever been as an economist," he told a floating production conference in Oslo. After two-and-half years of oil-price collapse followed by layoffs in the thousands; stacked oil rigs and order freezes for offshore shipping, price insecurity itself is a partial expression of confidence.

William Stoichevski

Beneath some palpable yet halting movements toward recovery in 2017, there's 2016's rigorous cost-cutting by, among others, Statoil and its sub-sea supply chain. Lower oilfield cost estimates have been proclaimed (and engineered), and this has fed assertions that pricy technology and extra engineering drove costs until operators backed out of "decision gate." Andreassen says he doesn't blame the technology companies. "It was the (oil) demand destruction when oil prices were high" that gutted the oil price and stacked rigs. After seeing companies operate "in debt hell" with inflation pinching, Andreassen now sees "the comeback from hell."

"If you've survived this far, then you'll come back next year." He then offered a long-term, ballpark "balance price" for oil at about \$60.

That's twice what oil was in January 2016 and enough for just about everyone. Rystad Energy partner, Lars Eirik Nikolaisen, said that when he headed up the number-crunching firm's New York office (until very recently), he heard the repeated refrain that shale's \$35 breakeven oil price so outpaced

deep-water oil and gas, that people kept saying, "Will offshore even be part of the future mix?"

Deepwater's assumed breakeven of \$65 made Norwegians ask, "Have we been priced out of the equation?" Nikolaisen says he's had to tell people that up until 2016, "Shale producers had only been drilling their best wells and spreads," and that has been shale's early price advantage. "We're seeing that the shale costs base increases over the next few years," although, "As (the industry) recovers, prices will inflate." Mergers between "SURFS and SPSs" — or subsea service companies and subsea vendors — have eliminated "PLEMS and PLETS," those costly pipeline end points. Nikolaisen has seen that the deepwater costs-curve was down 15% between third-quarter 2016 and Q1 2017. (North Sea rim) offshore projects are now competitive at about \$57 oil. At that price, "There are lots of breakeven tie-backs in the North Sea."

Near Oslo, a handful of offshore start-ups entered the fray just as the still-painful downturn was at its gloomiest. Part of an incubating program called

Techmakers, these start-ups are being carefully watched by operators Statoil and Lundin as well as supplier-contractors Aker, Kongsberg, TechnipFMC and Aramco Energy Ventures.

New rig entity Borr Drilling — formed by Tor Olav Troim, a former business associate of ship and rig mogul, billionaire John Fredriksen — is extra bullish on Onshore. Borr will pay \$1.35 billion to buy Transocean's 15 jack-up rigs, including associated debt, five newbuilds and their drilling order book. The new company will own 17 rigs. Earlier in 2016, Borr agreed to buy two Hercules Offshore jack-ups.

The Petoro document that confirms there's been lots of drilling off Norway lately also adds that much of it has been and will be from oil platforms. Fixed installations are fine for newbie Well Genetics' DNA-based tracer technology to help oil companies better track reservoirs for increased oil recovery and lower costs. Many oil companies have already reportedly signed with Well Genetics. Many are also cheering the use of Big Data monitoring to save cash. After so much automation and "smart fields" digitization, conditions are right for condition-based riser monitoring: enter Vinterfjord, the start-up baby of an industry veteran.

Riser installations and maintenance are set to continue apace in Norway, with pipelines — what risers connect to — the only type of investment that did not dip in 2017 over the previous year. Overall, the industry surveys of Statistics Norway put oilfield investments for 2017 at \$21.8 billion, 13 percent less than in 2016 on cancelled exploration wells but less a dip than expected. The numbers are seldom weighted against the boom-time 70 percent hike in investments off Norway between 2010 to 2014. Still, spending fell off 27 percent between 2014 and 2016 and we're on course for 13 percent less in 2017.

Massive Spend

The big dip between 2015 and now was mostly operator cost-cutting. Today, Statoil's travelling presenters report the average breakeven oil price for its projects has dropped from \$70 to below \$30, helped by the roughly \$20 oil-price breakeven made possible by economies of scale at the giant Johan Sverdrup field, where the first subsea infrastructure, a water-injection template, has just been installed, the first of many. Supplier fortunes are expected to rise in capital-intensive Norway on coming investments in the arctic floating producer, Johan Castberg; the heavily subsea Snorre Expansion project; another gas train at the arctic Snøhvit field and the Troll Phase

3, Part 1 of subsea frames and pipelines.

To help an operator like Statoil gain full oversight of all those projects, new outfit Avito Loops has an integrated cloud solution that lays it all out in plain, detailed view: projects, portfolios, campaigns, business.

Avito shows "your current state" and "your desired state" ... A bit like Google Maps, it says, by showing where you

are and where you need to go. For aging installations in mature areas, Western Norway newbie, Connector Subsea Solutions, has developed a technique to remotely do pipe repairs in deep water, and contracts with BP and Shell are already bringing in some earnings. While clamping a repair on a horizontal pipe is hard enough, Connector, or CSS, has managed to get its tool to remove the

coatings of and then repair a vertical pipe, or riser.

"We're bullish on offshore," affirms Rystad's Nikolaisen, emphasizing that, "That's different than Goldman. Deep-water, he notes, will see the benefits of the supply chain's efficiency work to date. There'll be a rising number of investment decisions by year-end 2017 and rig rates will rise.

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GTT has developed the Mark membrane system, a cryogenic liner for LNG tanks directly supported by the ship's hull. Pictured is an LNG tank based on the technology.

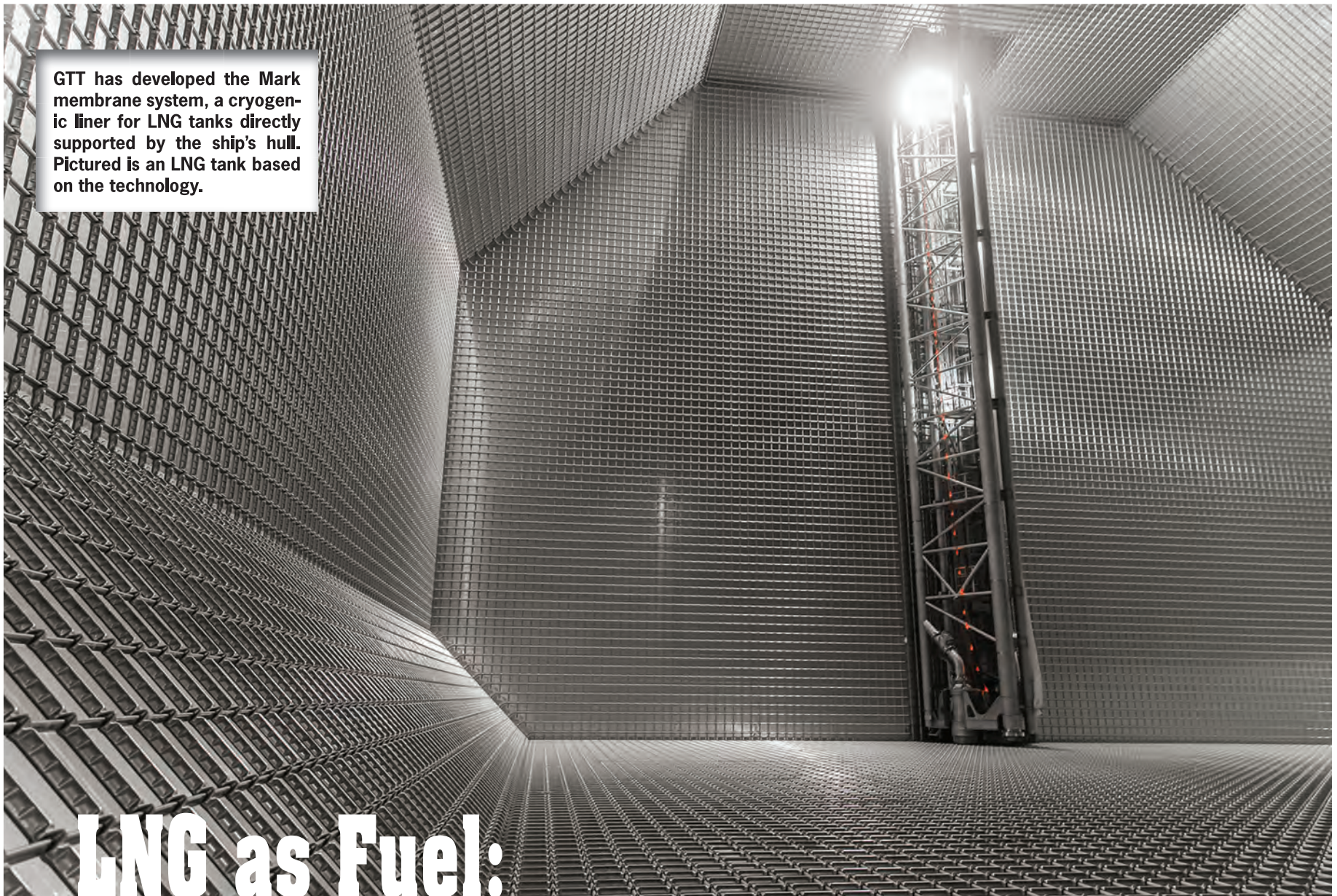


Photo: © GTT / Roland Mouron

LNG as Fuel: Challenges & Opportunities

BY TOM MULLIGAN

Here are some simple statistics about the shipping industry:

- It accounts for **90%** of world-wide transportation
- It produces **3.1%** of world-wide emissions
- It is the **least polluting method** of transportation

...But it still produces more than twice the emissions of the whole of France (yes, twice the emissions from all sources of a country as large as France!)

Environmental regulations are the main driver in reducing these emissions worldwide. Although until recently ECA zones were limited to a few areas, the IMO has now decided to limit SOx emissions worldwide and by 2020 all newbuilds will have to comply with its new regulations. The challenge for the shipping industry, however, is not only to comply with the IMO 2020 sulfur cap but also to catch up with the planning of the regulation by identifying and implementing the solutions that are available to enable regulation-compliant ships to be designed and built over the next three

years – and this needs to be achieved now, with the shipping industry currently in the middle of a crisis. Investment and operational costs are critical parameters that need to be considered.

The answer to the problem needs to be based on a long-term perspective – the industry needs to be two steps ahead of the regulations. There are several approaches that can be adopted to reduce emissions, one of the most promising being the use of liquefied natural gas (LNG) as fuel. This approach is compliant with existing and upcoming norms: SOx emissions can be reduced by 100

percent, Nox by 85 percent, particulates by 98 percent and carbon dioxide by 20 to 25 percent. Moreover, LNG is becoming increasingly available, with infrastructure being developed in all the major worldwide ports and international oil companies expanding and improving their product and service offerings in LNG fuel. The technology for the use of LNG is already established, with about 100 ships currently running on it and about another 90 LNG-fueled ships on order. And, of course, LNG has been used for years as a fuel by methane carrier vessels. It is also a cost-effective



GTT's N096 Max technology offers an optimized compromise between low boil-off and system strength for better thermomechanical efficiency: pictured is an LNG carrier equipped with the system.



Studying liquid movement for seakeeping analysis and sloshing effect in a GTT laboratory set-up.

Photo: © GTT / Patrick Sagnes

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The LNG Revolution

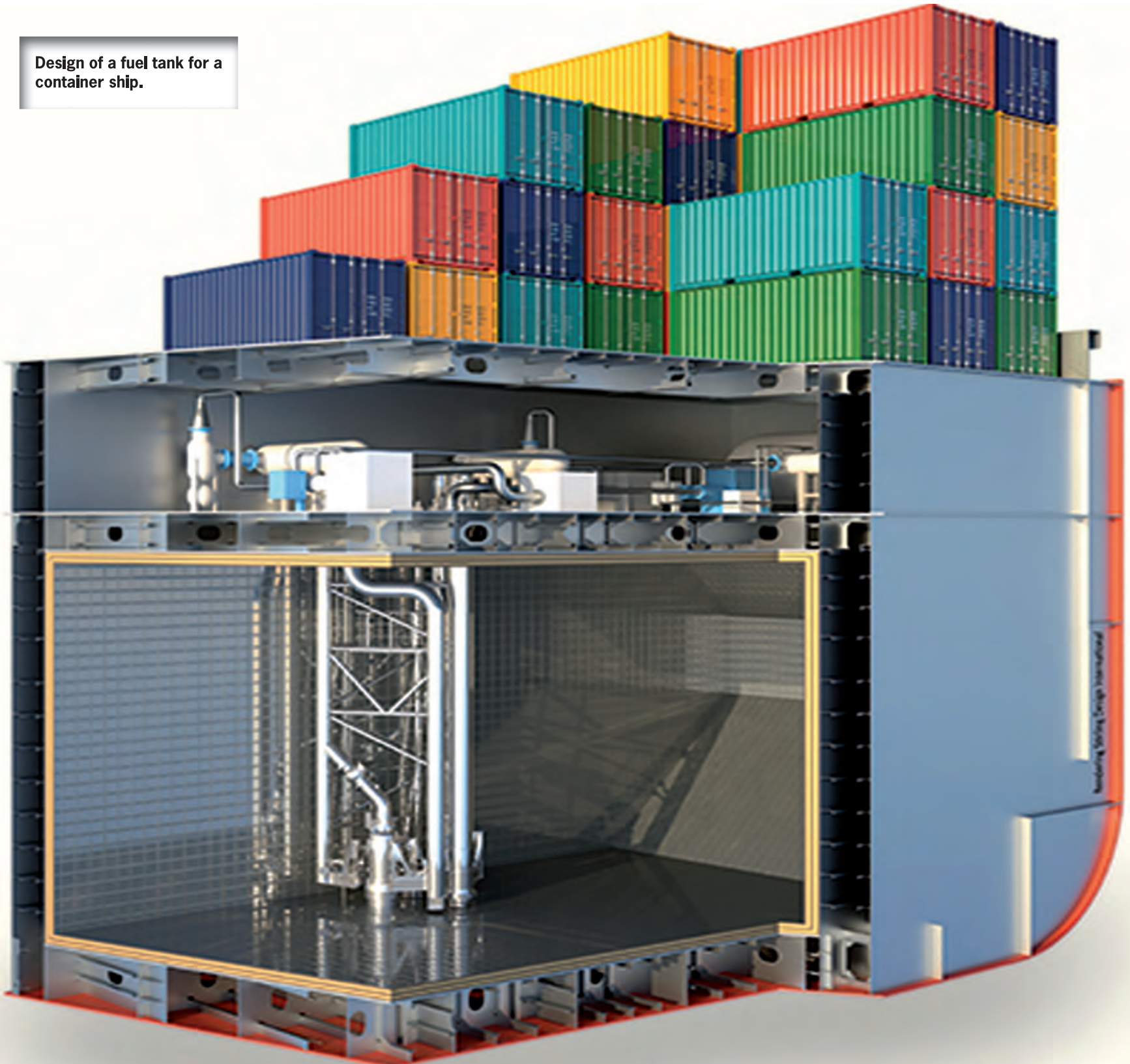
PERFECT

The PERFECT Piston Engine Room Free Efficient Containership has been jointly developed by GTT, CMA CGM and DNV GL. Its operation is based on combined gas and steam (COGAS) technology.



Graphic courtesy of DNV GL

Design of a fuel tank for a container ship.



Graphic: © GTT

alternative fuel: investment in the technology may be higher than in older oil technologies but the operation of LNG-fueled vessels results in considerable savings over the use of marine diesel oil, while further progress is being made in reducing LNG transformation and logistics costs compared with the cost of continuing to use heavy fuel oil (HFO).

GTT is now strongly established in the field of LNG fuel, based on the company's 50 years of history and its invention of membrane systems, and about 400 LNG carriers are equipped with GTT technology, typical tank capacities ranging from 100 cubic meters to 45,000 cubic meters. The company is pursuing a policy of assisting in the development of the links that are needed to make LNG as fuel a commodity product by concentrating on improving the required technology as well as developing the industry's infrastructure; and by increasing knowledge and awareness of LNG use practices and the safety issues involved.

GTT's strategy, therefore, as a 'technology pusher' is to reduce the cost of new investments and improve operational costs through the development of newbuild and retrofit solutions for container vessels; to optimize the space on board LNG-fueled cruise ships to enable more passengers to be carried; to develop cost-effective solutions for bulk carriers; and to develop a 'lean' bunker barge design to standardize the LNG bunkering market. The company is also focused on developing an industry scheme in which it is teaming up with technology providers, ship designers, shipbuilders and shipowners and operators to enable membranes to be manufactured in any geographic location and to establish a network that promotes and facilitates the installation of LNG fuel systems across the maritime sector. One example of this is its joint development project with ABS, Arista Shipping, Deltamarin and Wärtsilä to bring LNG-fueled vessels into shipping's mainstream; another is the PERFECT Piston Engine Room Free Efficient Containership based on either combined gas and steam (COGAS) technology as jointly developed by GTT, CMA CGM and DNV GL or on an electric engine system combined with LNG turbines. Finally, the third part of GTT's technology strategy is to validate in practice the theory of LNG as a fuel by developing industry knowledge around LNG and by being able to validate LNG behavior in marine applications, including determining holding times, boil-off gas (BOG) generation profiles, and operation in static and mobile modes. An example of how the company is moving its technology forward is its cooperation program with Hamburg University and

DNV GL to develop a membrane that can adapt to the very large deformations that occur during collision or grounding incidents without losing its tightness and performing poorly.

LNG is becoming an important fuel for maritime applications, and the shipping industry is now at a turning point where industry players are providing

technologies and solutions. Nevertheless, in a context where charter rates are historically low, shipowners are still reluctant to invest to retrofit their existing fleet or to order LNG-fueled newbuilds. However, with IMO regulations coming into effect in the near future, and further regulations to follow 2020, the regulatory scene will be even more restrictive

and will push the industry into choosing long-lasting solutions rather than short-term alternatives. Thus, the major players expect to see LNG-propelled ships comprising 20% of the global fleet in the following decade, making this fuel one of the most promising alternatives available to the marine sector in moving towards a greener shipping industry.

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USCGC Benjamin Dailey, the 23rd Fast Response Cutter (FRC) that Bollinger Shipyards has delivered to the U.S. Coast Guard.



Lockport, Louisiana is "Cutter Country"

All Photos: Bollinger Shipyards



Chris Remont, Bollinger Shipyards, Vice President, Government Programs, explains the importance of long-term relationship between the U.S. Coast Guard and Bollinger Shipyards.



As the offshore oil and gas bust drags into its third year, Bollinger Shipyards is holding its own courtesy of a long-running relationship in building for the United States Coast Guard (USCG). In Louisiana, a land where oil and gas, OSVs, workboats and fishing vessels traditionally rule the maritime landscape, Chris Remont ensures that shipyard workers and the locals know well the importance of the USCG business to the company and to the region, with its billboard exclaiming loud and proud, "Welcome to Cutter Country."

Today Bollinger has 38 Sentinel-class FRCs under contract, with the possibility for 20 more. Remont explains that the contract was split into two phases. "Phase 1 was vessel one through vessel 32; Phase 2 – which we competed for and were awarded – was vessel 33 through the potential of vessel 58," Remont summarized. "Currently we have through vessel 38 under contract," with additional contract expected in the coming quarter.

A Maritime Career

Remont entered the maritime industry in the early 1990s after graduating from Louisiana Tech University with a degree in Electrical Engineering. He worked at Bollinger during his summer breaks as an electrician, and in his mind a career in the maritime sector was a no brainer: "I grew up here. This is what we do here. When I started (in the early 1990s, during the last deep offshore energy slump)

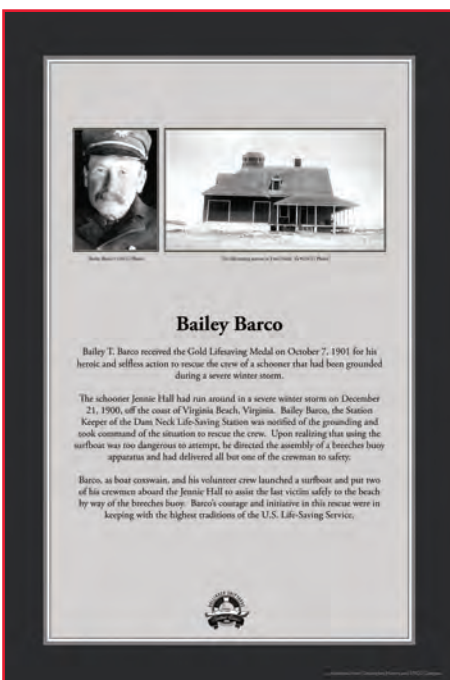
Bollinger had just been awarded the U.S. Navy PC contract and the only steady work in the area was Bollinger. Ironically, today, the only steady work in the area is Bollinger."

He has been with Bollinger for three years, having spent the last 25 years working for another big shipyard in the area, working on a succession of large military and commercial contracts, including TAO, DDG51, DDG1000, LHA, LHD and LPD, to name a few.

While the USCG contract is a major Bollinger Shipbuilding focus at the moment, the company historically builds government and commercial work seamlessly, which is no small feat for any yard of any size.

Remont concedes that there is a lot of "red tape" that comes to comparing government work versus commercial work, the biggest challenge he sees is internal. "We are lucky to have this steady work program, which is kind of like a bond; it doesn't really move a lot but it's steady. The challenge, as a shipbuilder, is to continuously step up our game."

When he joined Bollinger three years ago the path was set to deliver each vessel complete and to increase our efficiencies. This contract is repetitive, and the yard delivers a boat every 73 days. "We have 10 boats under construction right now, we recently went to Fourchon to prepare the next one for builders and acceptance trials, last week we delivered boat 23 (USCGC Benjamin Dailey). The biggest challenge I think we have is to not become complacent, to continually



The Name Board

Each of the FRCs is named for a hero in the Coast Guard. Bollinger creates a name board for each vessel which follows the vessel throughout its construction

strive to be better and more efficient.”

If recent performance is any indication, it would appear that the goal has been achieved.

“We’ve delivered the last five vessels with zero discrepancies, meaning the Coast Guard gets a boat that is 100% complete, there is no extra work later, and typically in a government contract that never happens,” said Remont. “We set our path toward 100% completion and we’ve achieved that now with the last five vessels, so it’s not a trend, it’s a norm.”

Making it Personal

To help combat complacency Bollinger came up with the Sentinel Program, to both incentivize its shipbuilders and to make each vessel more meaningful to them. “Each of these vessels is named for a hero in the Coast Guard,” Remont said. For every vessel Bollinger creates a name board, a 4 x 3 board that describes the ship’s namesake with details of their heroic act. “What we’re trying to do is personalize it for our shipbuilders. It’s not just some big hunk of metal with a bunch of cables, it (the ship) is there for a real reason. We erect these sign posts at each station where the vessel is getting created, and the name board follows the ship, traveling with the boat as it moves through the production line. “Every time our shipbuilders get on that vessel they can read about the person, and understand why we are building it.” When the vessel is delivered the name board is given to the CO of the boat so that they and the crew can be reminded of the namesake, too. Following the delivery ceremony, Bollinger selects one

employee from each department who exhibits the same characteristics of the vessel’s namesake, and they are publicly recognized and awarded.

Looking Ahead

Remont said that while there are several major government programs of record

out for review and for proposal; most of those would be to the Tier 1 yards, which Bollinger is not, or some of them are targeted toward smaller business entities. “What I have been seeing is a shift toward the smaller business arena,” said Remont. “Those are barriers to entry for the Tier 2 yards. Regardless; the current

administration recognizes the importance of national defense, and the vessels we produce here for the U.S. Coast Guard (are multi-function) but are essential in protecting our coast lines. Bottom line: The need for these vessels exist, and the capacity to build them lives in Lockport, La.”



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USCGC Benjamin Dailey

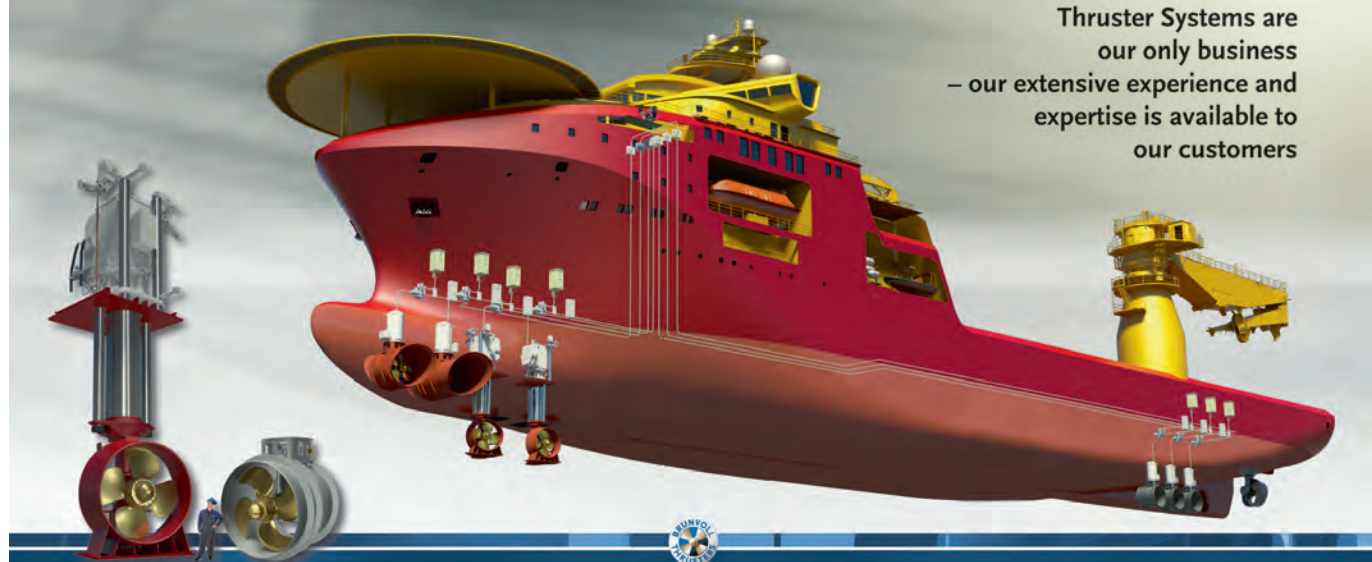
The Coast Guard took delivery of the 154-ft. patrol craft on April 20, 2017 in Key West, Fla., with its commissioning scheduled for July 4, 2017. The 23rd vessel in the Coast Guard’s Sentinel-class FRC program, USCGC Benjamin Dailey will be the first FRC to be stationed in the 8th Coast Guard District in Pascagoula, Miss.

To build the FRCs, Bollinger used an in-service parent craft design based on the Damen Stan Patrol Boat 4708, which features a flank speed of 28 knots.

Each FRC is named for an enlisted Coast Guard hero who distinguished him or herself in the line of duty. This vessel is named after Coast Guard Hero Benjamin Dailey. Dailey, Keeper of the Cape Hatteras Life-Saving Station, was awarded the Gold Lifesaving Medal on April 24, 1885 for his exceptional bravery in one of the most daring rescues by the Life-Saving Service.

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Kaity Arsoniadis-Stein
[Executive Director of the VIMC]

All Images: VIMC

Vancouver: *Maritime's New Home Address*

BY GREG TRAUTHWEIN

Kaity Arsoniadis-Stein with Peter Economides.



Kaity Arsoniadis-Stein with Yvonne Rankin Constantine, Director of International Business Development.



(Above) L to R: Yvonne Rankin Constantine, Kaity Arsoniadis-Stein, Gary Constantine, Steelhead LNG, Harry Theochari Norton Rose, Ali Karmali Royal Bank of Canada. **(Right)** Kaity Arsoniadis-Stein & George Giannakis, Greek Correspondent of VIMC



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All Images: VIMC

The Vancouver International Maritime Centre (VIMC) is on a mission to grow the city and port into one of the world's premiere maritime centers. *Maritime Reporter & Engineering News* recently spoke with Kaiti Arsoniadis-Stein, Executive Director of the newly re-established VIMC, for her insights on the pace and direction of the initiative.

Let's start out easily. Why Vancouver? Why now?

Why Vancouver? Projections and studies indicate that global trade will increase and shift to the Pacific due to the demand of resources by China and India. Canada is a resource rich trading nation that spends billions on infrastructure and corridor initiatives as well as global trade agreements. Why now? Updates made in 2014 to Canada's Income Tax Act provide additional benefits to international shipping companies based in Canada and companies can perform a wide range of activities in Canada without creating a taxable presence. These advantages are enshrined in federal legislation and have been there since the early 1990s.

Also, it should be noted that Port Vancouver is the largest port in Canada and the most diversified in North America with over 3,000 vessel calls in 2015 and 140 million throughput, with a strong cruise industry business, too.

So if the Vancouver International Maritime Centre (VIMC) is intent on driving this initiative, provide some insight on where you are today.

What we are doing is an ambitious initiative, and when you look at maritime centers around the world, it is a 10 to 20 year process to get them established. We are in year two. I believed in it before I started, and two years in I believe in it even more: the potential for Vancouver is enormous. To date I've met with (C-Suite executives at) more than 400 ship owners, and gener-

ally what the sentiment has been, 'you know, we didn't even think of Canada.' For me what is important is to raise that awareness. At the same time I'm sensitive to the other established maritime centers; we are not trying to disrupt the other maritime centers that are out there. What we want to do is offer yet another option for North America. If it makes business sense, Canada is a major player and they need to know that.

But you already have a good start, in terms of companies present, correct?

There are a number of international shipping companies and shipping lines in Vancouver including Teekay, Seaspan, Valles, Oak, Fairmont, Waterfront, Inter-Oceans, CSL, Gearbulk, GriegStar, Hanjin, China Ocean Shipping, CMA CGM, Evergreen, Seabridge, Oldendorff, MSC, etc. All of the Classification societies have a Vancouver presence and DNV GL is the largest. Furthermore, there are many agents including ACGI Shipping, Canpotex, Colley West, Compass Marine, Montship, Westward Shipping, Wilhelmsen, the list is extensive.

Some interesting facts:

- ☐ *Teekay Corporation, now one of the world's largest marine energy transportation, storage and production companies moved into Canada in the early 1990's and from its Vancouver base created five publicly traded companies and has expanded into other segments such as gas and offshore.*

- ☐ *Seaspan Ship Management, the largest independent container leasing company in the world can boast the largest IPO in the marine sector on the New York Stock Exchange, when it went public in 2005.*

- ☐ *Methanex, the world's largest producer and supplier of methanol to international markets is headquartered in Vancouver including its shipping arm (a wholly owned subsidiary), Waterfront Shipping. Six of their product tankers are dual fuel, capable of running on methanol.*

And there is more. Vancouver can boast its very own Arbitration Association, the Vancouver Maritime Arbitrators Association, with more than 50 arbitrators on the roster. And Vancouver is also home to several world leading engineering and technical companies,

including Robert Allen Naval Architects and VARD Marine.

Discuss a few recent successes since VIMC's re-establishment?

AAL shipping is a multi-purpose operator, opened a branch in Vancouver for business development opportunities and to bring the AAL brand closer to local shippers. Greystoke Marine Management, a company founded by ex-Teekay senior executives, established its start-up company in Vancouver, to provide commercial and technical expertise to financial investors in the shipping industries.

Norton Rose Fulbright, one of the world's largest maritime law firms established a significant presence in Vancouver in January 2017. Harry Theochari, senior partner with Norton Rose Fulbright in London attributes the decision to position into Vancouver to be based on the forecast of the high demands from Asia including South East Asia for Canada's resources where a young population will have high demands for resources and that Vancouver's maritime industry will be pivotal in helping Canadian businesses continue to meet this demand.

You are the 'tip of the VIMC spear.' Who fills out the VIMC team?

We have a dynamic and enthusiastic team that drives this initiative forward. I give exceptional mention to Yvonne Rankin Constantine, our Director of International Business Development and Marilena Kostakos our Director of Projects. Furthermore, we have a representative running our Greek Office, George Giannakis. We also work with incredible consultants including David Van Hemmen and Global Public Affairs.

VIMC is fully funded by government, with government funding our promotional activity for three years to get this off the ground. We're working now toward a five year extension of funding to give the initiative more time to gain support.

When and why did you personally get involved in the VIMC?

My previous position was as the President and Secretary-General of the International Ship-owners Alliance of Canada. In my role representing ship owners to gov-

ernment and internationally, I recognized the incredible advantages Canada offered. So I recommended – to the owners and to the government – that Canada’s advantages should be communicated globally.

What is the core value proposition to get maritime companies to move to Vancouver?

Canada has a strong banking system, political stability, universal healthcare system, world-class universities, a highly skilled educated work force with a strong social infrastructure providing a high quality of life. Canada is a western, strong, modern economy and provides a stable environment for companies wishing to be associated with the Canada brand.

How has VIMC/Canada has invested to attract maritime companies to the region?

We have a simple strategy that focuses on raising awareness of Canada’s advantages, and showcasing the strong Canada brand. VIMC provides advice, information and assistance to international shipping companies interested in establishing a presence on Canada’s west coast.

The maritime industry is obviously in a down cycle across several sectors. How has this impacted the trajectory and pace of your mission?

Certainly the down cycle has had an impact, but fol-

lowing Brexit and the U.S. elections, VIMC has received an increase in interest from various companies.

In comparing Vancouver to other established maritime hubs, realistically how does Vancouver stack up? Where are you strongest?

Canada’s system is very simple. There is no tonnage tax, no obligation to flag a percentage of your fleet into Canada, no minimum commitments, such as time or number of employees and the provisions allowing exclusion from tax in Canada on the foreign earned profits from international shipping companies are enshrined in federal tax legislation. Furthermore, the administration costs of running an entire corporate group is significantly reduced because of our simple rules.

Ultimately, how and when will you measure whether this push has been a success or a failure?

As you well know, establishing a global shipping hub probably takes a decade or two, and we are now only in our second year. From where I sit, I can talk about the incredible interest Vancouver has received from ship owners from around the globe

both in Europe and Asia. At the moment we are working with 10 companies that are establishing their branch offices in Vancouver, we are working with another 50 companies to provide them with information on tax, structures, immigration, banking, etc. This has, to date, been very successful.

Kaity Arsoniadis-Stein, Executive Director, VIMC

Kaity Arsoniadis-Stein is the Executive Director of the newly re-established Vancouver International Maritime Centre. A maritime lawyer by profession with a Masters in Maritime Law with merit from Kings College London, Kaity has over 15 years of experience in the global shipping industry having started her career with the Vancouver law firm Bull Houser & Tupper. Kaity has worked for various international firms such as Gard (UK) Ltd., the National Oil Refineries of Greece and international shipping companies such as Teekay Shipping Ltd. and Seaspan Ship Management in Vancouver, Canada. Kaity’s previous position was with the International Ship Owners Alliance of Canada (ISAC) as the President and Secretary-General. During her tenure there, she worked in close collaboration with ship-owners and all levels of government promoting the interests of ship-owners based in Canada. She is called upon by government as an industry advisor to Transport Canada and Environment Canada, as well as the House of Commons and the Senate of Canada. She was also appointed by the Premier of B.C. as the transportation lead for the British Columbia Jobs and Investment Board. Kaity’s global expertise in shipping has enabled her to participate in policymaking and business development through various high-level consultations within government forums and roundtables.

A prominent member of the shipping community, Kaity is a member of the Canadian Maritime Law Association and has been past President of the Vancouver Maritime Arbitrators Association, Trustee of the Insurance Dispute Resolution Services of BC and Trustee of the Vancouver Maritime Museum. In 2005, Kaity was appointed by the Government of Canada as a member of the Pacific Pilotage Authority. Kaity has been awarded Honourary Membership of the Company of Master Mariners of Canada and in 2012 she was awarded the Queen Elizabeth II Diamond Jubilee medal by the Governor General of Canada.

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Maritime Reporter & Engineering News caught up with Frank Coles, the ubiquitous leader of Transas, fresh from his company's user's conference in Malta. In typical candor, Coles paints his picture of maritime and shipping's future.

By Greg Trauthwein

With a captive audience of more than 400 clients in scenic Malta for several days earlier this year, one might be surprised when Frank Coles admits that the meeting was not all about Transas. “I wanted something completely different. I didn't want to talk about Transas, I wanted to talk about the industry and what we can learn from aviation. I wanted to talk about what we are we missing.”

And so starts another candid conversation with Coles, a corporate leader that speaks with a Steve Jobs-like vision and zeal when discussion turns to

the future of maritime.

“Everyone's talking about ships, ship technology and autonomous ships, but no one is talking about why we should be doing these things. What is the business model? We're all missing that point. If we are ever going to have unmanned ships, can you see the United States, can you see the Chinese allowing an unmanned ship to simply sail through territorial waters without some sort of ship traffic control?,” Coles questions. “It is unthinkable. So the whole world has to change. So you can have an unmanned ship, but you have to envision the structure that goes with it.”

Maritime vs. Shipping

Coles is clear from the start to differentiate between ‘shipping’ and ‘maritime.’

“I live in the United States. When we talk about ‘shipping’ something in America, we talk about using FedEx. When we talk about shipping something, we talk about moving it from the west coast to the east coast. That's shipping it, whether by truck, train, plane or ship. Shipping is the movement of the goods and anything economically associated with that. Maritime is the water transport piece,” said Coles.

Distinguishing the terms is important

according to Coles, as he said the economics of shipping and logistics is much more compelling for change than is the economics of the ‘floating truck.’

“You see the economics of shipping changing faster than the technology an innovation in the maritime part of shipping.”

But while Coles is looking big picture, make no mistake that he sees Transas firmly in the maritime realm. “Transas belongs in the maritime industry, so Transas' role is about the ecosystem of the new world; that being the ship talking to its operation center, the way that

The Future for Transas

“It will be ‘powered by Transas.’ Transas’ strength is the brains behind the decision support that goes on in the industry. Our ECDIS is about the capabilities for the user; our simulators are about the platform for training; our VTS is about decision support for operators; and our fleet operations and artificial intelligence routing that we are building is about enabling the operator to use the tools. The Transas vision is to join the dots so that all four of those work together in an ecosystem that’s not unlike the aviation industry.”

it is evolving in the container shipping and cruise sectors today. Transas is an enabler from a software perspective and from an artificial intelligence perspective. But Transas has two other key elements to its business: Vessel Traffic Systems which is, by another name, is ship traffic control. The other part is the simulation.”

Disruptive Disruption

When asked regarding his thoughts on “Disruptive Technology,” the term of the day in maritime circles, Coles is blunt: “It doesn’t mean anything. ‘Disruption’ means something to me.”

When talk turns to disruption in maritime circles, it often is technology centric, hand-in-hand with the ‘Big Data’ discussion. But Coles sees it differently. “Disruption means you don’t see it coming. It means it comes from outside, not from within. It comes from people who have no respect for the so-called special position that those that are traditional within maritime think they are. They have no respect for history and they will come in seeking an easier, better, simpler, smarter way to remove the middle man. This industry is full of middle men. Disruption will come from changing the process and changing the business model. It is not the technology, it is the model, it is the process that changes.”

Specifically, Coles envisions a world where the ecommerce giants, the Amazon’s and Alibaba’s of the world, increasingly gain control of the various transport segments to ensure that their supply chain is delivering to a greater degree of efficiency. “There could a time when they move into maritime shipping, and they’re not going to rely on the stevedores that go on strike every so often and screw up American trade,” said Coles. “They’re going to get their own port, or they’re going to get their own wharf and they are going to control their own port. It is inevitable. (In addition) the freight forwarder is dead in my view. It is inevitable that more cargo booking, cargo management and cargo control will be online.”

Think Global, Act Local

As the oft-characterized ‘conservative’ maritime market digests a historic change in operational direction, Coles offers some bold predictions regarding the direction:

☐ **Fleet Operations:** I see the largest transformation in terms of fleet operations centers where the ships will be managed in a much more scaled manner from the shore. It’s happening now.

☐ **Vendor Market:** There’s not enough room for all of the Satcom companies, there’s not enough room for all of the vendors that supply applications. Digitalization leads to commoditization; to survive commoditization, you need scale.

☐ **Consolidation:** I see ship management companies becoming large ship management companies. If they innovate, they could be the key components in the digitalized world.

☐ **The Human Factor:** If we can’t find enough people of the right skills, that will speed up automation, that will speed up the use of artificial intelligence and the use of other technologies.

While the younger generation is generally viewed as the hinge to driving change, a big wild card in the pace of change remains the regulators. “When a lot of the old guys are gone, change will start to happen much quicker. What I haven’t factored in is whether we can get so far ahead of the regulators, as regulators could be the anchor that drags it all down,” said Coles. “But if Uber and AirBNB can come in and challenge around regulation, there is no reason why the disruptors won’t come in (to maritime) and find a way to challenge the IMO, to challenge the regulators.”

And while Coles thinks and talks ‘big picture,’ inevitably the conversation comes back to Transas, the company he leads. When asked what Transas will look like in 10 years, he is clear.

“It will look like a software business, providing decision support tools; it

will be ‘powered by Transas.’ Transas’ strength is the brains behind the decision support that goes on in the industry. Our ECDIS is about the capabilities for the user; our simulators are about the platform for training; our VTS is about decision support for operators; and

our fleet operations and artificial intelligence routing that we are building is about enabling the operator to use the tools. The Transas vision is to join the dots so that all four of those work together in an ecosystem that’s not unlike the aviation industry.”

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Mark Darley

[President – Americas Marine, Lloyd's Register]

Maritime Grows in the Americas

As the global maritime market remains mired in a slump, Lloyd's Register continues to expand rapidly in the Americas market where it sees green fields of opportunity. Mark Darley, President—Americas Marine for LR, recently sat with Maritime Reporter & Engineering News to explain the strategy to conduct business over a broader range of segments and services and grow LR's presence in the Americas.

By Greg Trauthwein

Mark Darley, President—Americas Marine for Lloyd's Register is an industry veteran with nearly two decades of maritime experience under his belt, working with classification society Lloyd's Register around the world, from Europe to the Middle East to Asia. Eighteen months ago he landed in the United States to take up the challenge of expanding the scope of LR's offering across 14 nations in the Americas, a daunting challenge on any day made exponentially more challenging with the prolonged downturn in global maritime and energy markets.

"Having had roles in Asia, the Middle East and Europe, I am fortunate to have experience and understanding of global marine dynamics, as well internal dynamics within LR as to how we can position ourselves to be serve these markets better," said Darley. "The Americas, first and foremost, is a huge geographic region with 14 countries that vary vastly."

Historically Lloyd's Register has built and maintained a strong presence in the cruise industry, giving it a natural door to North America which dominates the global cruise market. But when Darley arrived his mandate was not simply to stand pat on existing business, rather expand LR's penetration into differing market sectors. "We have our historic core, the cruise segment.

But what I see is a great opportunity to protect our lead in the cruise sector, while growing into other parts of the market."

Make no mistake, LR is well established in the Americas with "the luxury of a good coverage with 26 offices across the Americas," said Darley. Moreover, LR has a workforce well regarded for its ability to "span a range of segments," said Darley. "Historically (we have been) strong with cruise in the Americas, but those same people can be productive and have conversations with customers in the LNG supply chain, for example, or Offshore Support Vessels. We have that broad reach."

Gas and Go

With the proliferation of gas in the global energy markets, LR sees gas in the generic as a green field of opportunity, though it is far from a new endeavor for LR, which already has a vibrant business as a certifying authority for a number of provinces across Canada. In addition, about six months ago Lloyds Register completed a restructuring of sorts, essentially the amalgamation of marine and offshore from within. "This means that we've grown our capability and are able to position ourselves in a much better place when we start talking about some of the gas projects, particu-

larly in the U.S.," said Darley.

While energy is hot, LR sees opportunity in the various navies across the Americas. Again, Lloyd's Register has a historically strong partner in the Canadian Navy, and outside of the U.K. market where it has a very strong relationship with the Ministry of Defense, Canada is its second largest naval client. LR supports a naval team in Ottawa, and it is the sole-source regulator, helping the Canadian Navy set up a safety regime within its own fleet (currently on the combatant fleet, aiming for the non-combatant side as well).

"One thing that was transparent when I came here was to foster and grow the Canadian relationship, but to also use the model to go to new navies in Peru, Chile, Argentina and Brazil," said Darley.

To strengthen its position in Canada LR set up a naval center of excellence in Ottawa – a literal brick and mortar facility – to support the naval client base across the Americas. "Clearly there are synergies when you see what we are doing with some of the more progressive navies in the U.K. and Canada, and you start looking at some of the future technology coming into the commercial shipping world, that's really played into a lot of what we've been developing with our cyber offering," said Darley. "Being able to leverage some of

the naval experience and thought into the commercial world has helped a lot."

Rolling on the River

Looking internally, Darley and his team see additional areas of growth in the U.S. market as well, particularly in helping inland water vessel owners navigate emerging, and often confusing regulations such as the evolving Subchapter M regulations. "We have spent the last six months understanding LR's place in SubM and the inland waterways (and to that end) we have set up a joint collaboration with MarineCFO, who already had an existing market to supply software to the inland waterway fleet," said Darley. "There are many smaller operators, one vessel shops, where having a classification come down to their vessel is a new thing, and arguably, a daunting thing as well." Darley and his team aim to be the partner of choice in this regard, leveraging the relationship with MarineCFO and becoming a more familiar entity in inland waterway circles, a journey that takes equal amounts of time and effort to build long-term relationships.

But the regulatory environment in the maritime sector is fluid and growing, with increasing regulatory burden in regards to emissions into the water and the air

leading the charge, namely what is happening at MEPC with the Ballast Water Convention. But Darley said that one that he and his team are monitoring particularly closely are in regards to cyber security, specifically conversations premised on what the U.S. Coast Guard is doing in regards to its cyber security regulations. “We’re trying to align ourselves with what we know is happening in the U.S. Coast Guard, what we know is happening from an IMO perspective to make sure our services are best prepared.”

The Evolution of Class

Without hesitation Darley identifies the digital revolution and all that it entails (ie. cyber security) as the defining topic driving the evolution of ‘class’ today. “This evolution is a digital evolution, as it is taking our knowledge and capability – to do physical inspections – and moving that to a digital future and regime.”

In March LR launched the next stream in its cyber and digitalization suite of services, an end-to-end set of solutions addresses the need to keep people, assets and systems secure within the constantly changing cyber security landscape.

“The world is moving rapidly, and for the last six months we’ve been developing our Cyber Security Value proposition,” said Darley. “When people think about cyber security, they tend look at it from an external point of view. But there are internal components too, and it doesn’t seem that companies are paying as close of attention to the internal component.”

“A ship is effectively a collection of components and systems that require interdependency,” he said in illustrating the point. “Multiple OEMs and competing products; that interdependency chain has not really been addressed (from a cyber security perspective).”

He cites a recent example where an OEM for HVAC went onboard a megayacht and installed an update to the HVAC system, an update which subsequently and without intention closed the fire dampers to the engine room. The engines were running, and with the fire dampers closed all of the air was sucked out of the engine room, causing a blackout on the ship. “Fortunately no one was in the engine room and no one was hurt, but it shows where something simple can cause a big problem,” said Darley. “He didn’t maliciously go to attack the vessel, and it’s not some terrorist organization ... it’s just an OEM doing his job which had unintended consequences. These things we are seeing are increasingly happening.”

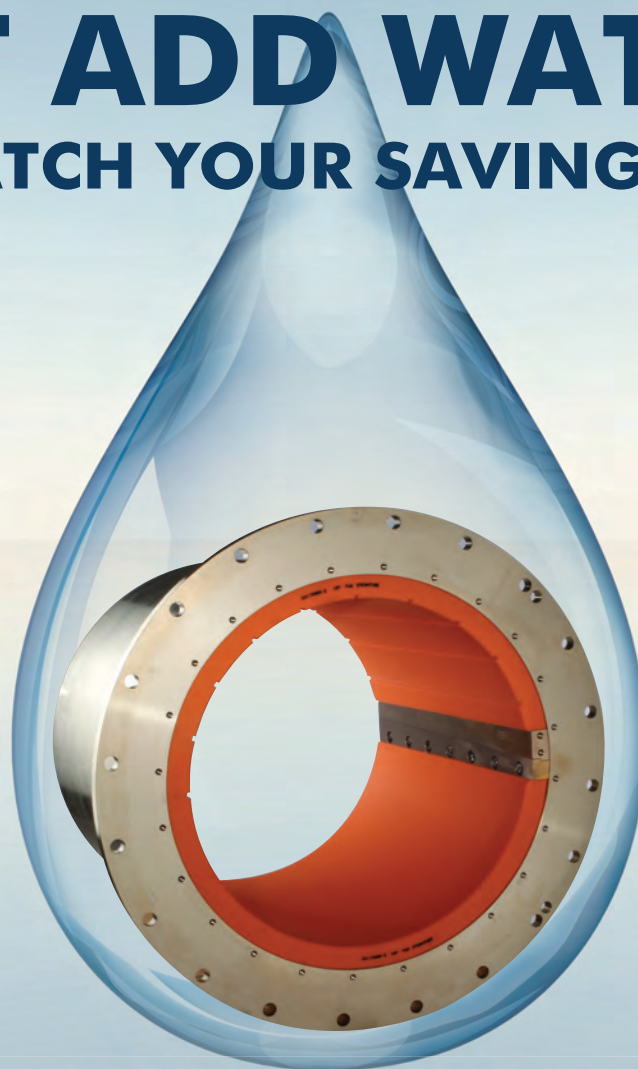
The new set of services from LR is built on a model that provides clarity and allows evolution in line with emerging

threat patterns and the changing regulatory environment, designed to help clients understand how cyber secure they are now and what level of security they want to achieve in the future. The new offer will deliver cyber security gap analysis

and other readiness services to owners, operators and other clients against the US Coast Guard Strategy on cyber security and forthcoming IMO regulations as well as the cyber security best practice already established in other industry

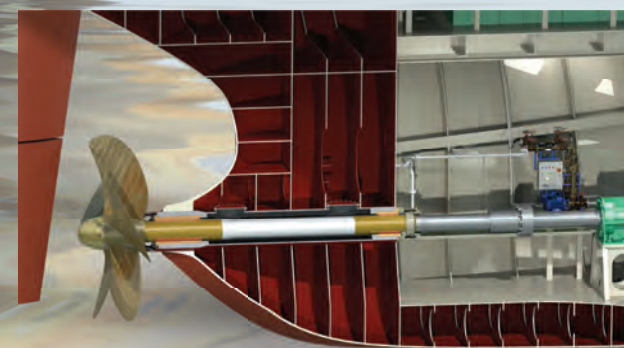
sectors, such as Naval. To this end, LR has chosen to work with QinetiQ, bringing the benefits of QinetiQ’s cyber security skills, knowledge and experience, to complement LR’s own expertise in marine and offshore risk management.

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Gas operations commence at the newly expanded Alfa Laval Test & Training Center in Aalborg, Denmark.

Alfa Laval:

New Test Facilities, New Technologies

Heat transfer, separation and fluid handling technology specialist, Alfa Laval, has expanded its Test & Training Center in Aalborg, Denmark with a new gas testing facility. At the same time it continues developing new technologies in the areas of ballast water treatment, sulfur oxide emission control, touchscreen boiler control, fuel efficiency automation for inert-gas systems and methanol booster systems.

BY TOM MULLIGAN

**All photos courtesy of Alfa Laval*

Alfa Laval, a global provider of specialized products and engineering solutions based on the key technologies of heat transfer, separation and fluid handling, has expanded its Test & Training Center in Aalborg, Denmark with the commissioning and operation of a new gas testing facility, increasing the company's test space to five times its original size and making it one of the most advanced test centers in the

world for environmental and combustion technology regardless of fuel type.

Since its inauguration in 2014, the Alfa Laval Test & Training Center has been a hub of the company's research and development in exhaust gas cleaning, ballast water treatment, steam production, fuel cleaning and other key marine technology areas. Its original 250 cubic meter test space is essentially a full-size machine room on land and is equipped

with Alfa Laval products that are installed and integrated into large process testing lines centered around a 2 MW marine engine. The company has now added a further 1100 cubic meters of test space to focus on combustion technologies for gas and other fuels including the installation of new burner and inert gas systems as well as the full-scale Alfa Laval Gas Combustion Unit (GCU).

"Our investment in the Alfa Laval

Test & Training Center reflects the extraordinary changes we see in the marine industry," said Peter Leifland, President of Alfa Laval's Marine Division. "Tightening emissions legislation is driving many customers from residual fuels towards LNG and other alternatives. As a comprehensive marine supplier, we must be at the cutting edge in supporting our customers, no matter what fuel they choose."

Alfa Laval already has a broad portfolio of technologies for employing gas as fuel and carrying gas as cargo, including dual-fuel boiler systems, the Alfa Laval FCM One Gas booster system, Alfa Laval Smit inert gas systems and the Alfa Laval GCU, as well as a range of heat exchangers for working gas at various pressures. The company will be adding more systems in the immediate future.

Technology development is already underway in the newly expanded Test & Training Center: Alfa Laval is currently testing a new dual-fuel burner for gas-diesel applications on smaller boilers, which will later be developed into a multi-fuel solution in partnership with the Technical University of Denmark. The Center is also running a development project for large burners and boilers, with in-depth testing using both gas and diesel flames. In addition, the GCU will be used to test flame and heat flow characteristics under different operating conditions and thereby identify possibilities for improving performance even further.

Ballast Water Treatment

With the IMO Ballast Water Management (BWM) Convention taking effect in September this year, Alfa Laval has reported increased customer interest in ballast water treatment systems and its Alfa Laval PureBallast technology, a chemical-free system based on the Enhanced UV Reactor, developed jointly by Alfa Laval and Wallenius Water.

The company has seen particular interest in PureBallast systems with high flow capacities: its IMO and U.S. Coast Guard (USCG) type-approved PureBallast 3.1 features a single-filter, small-footprint solution that enables higher capacities of ballast water to be processed (up to 6000 cubic meters per hour). The company recently completed an agreement to supply two Korean newbuild LNG carriers with installations comprised of two parallel 3000 cubic meter per hour systems.

Alfa Laval says the benefits of its PureBallast technology include reduced installation costs and lower operating costs, giving substantial savings over a vessel's life cycle during regulation-compliant operation.

"The high interest in Alfa Laval PureBallast provides clear evidence of growth in the retrofit market, and there are many reasons this is happening right now," said Anders Lindmark, Head of Alfa Laval PureBallast, Alfa Laval Marine Division. "We have received lots of interest directly tied to our recent USCG type approval, and we are also seeing greater numbers of shipowners preparing for the IMO Convention.



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“Clear evidence of growth for PureBallast systems in the retrofit market.”

**Anders Lindmark,
Head of Alfa Laval PureBallast,
Alfa Laval Marine Division**



The Alfa Laval PureBallast system is designed to comply with the requirements of the IMO Ballast Water Management System Convention which comes into effect in September this year.

“Alfa Laval is well prepared to guide customers who are only now entering the market,” he added. “We have developed a wealth of knowledge in more than a decade of experience with ballast water treatment, and we are providing resources to help shipowners understand their options.”

Scrubber Technology

Launched in 2012 to enable vessels to meet SOx limits while using heavy fuel oil, Alfa Laval’s PureSOx is a complete sulfur oxide scrubber platform, with multiple operating arrangements, two scrubber designs and a range of compliance profiles that meet the IMO 2020

global sulfur cap.

However, the company is continuing to develop the technology, both through ongoing optimization and the introduction of new options, the Alfa Laval Test & Training Center playing a particularly significant role in adapting the platform for new customer needs:

“Compliance is always in focus, but customers have a broad spectrum of other requirements,” said Erik Haveman, Sales Director, Exhaust Gas Cleaning. “Those can go well beyond open-loop, closed-loop and hybrid arrangements, or the choice between U- and I-designs. Today we can match a vessel’s sailing profile by optimizing PureSOx for different compli-

ance needs, and we offer many options to suit a vessel’s individual circumstances.”

Alfa Laval has developed technologies not only employed in the scrubber itself, but also in the patented separator technology of its water cleaning unit and in the heat exchangers used for cooling the circulation water. In addition, PureSOx has played a central role in much of the research work carried out at the company’s Aalborg facility, where the scrubber at the Test & Training Center has been used not only to develop the PureSOx platform, but also to solve individual customer challenges in exhaust gas cleaning. Designed for 1.5 MW operation, the scrubber can be operated at

its physical limits by the Center’s 2 MW engine, which would be an unsafe and impractical procedure on board ship.

Improvement of the PureSOx platform by Alfa Laval has mainly been focused on system size and resource use. A significant size reduction for the U-design scrubber was announced last year and tests have been performed with many different filling elements and sprayer arrangements to find the lowest possible water consumption. Minimizing pressure drop across the system, which reduces fuel consumption by the engine, is a further area of focus.

Similarly, new options are being introduced: “Recently we introduced an



Installation of the Alfa Laval AFEM for Smit Combustion inert gas systems results in significant fuel savings.

option for open-loop scrubbing that complies with the strict pH requirements of the US Vessel General Permit,” said Haveman. “For cruise ships and other high-profile vessels, we have also released an Exhaust Gas Reheater option, which warms the exhaust gas plume to reduce the chance of it being visible.”

Boiler Control

Alfa Laval Touch Control is a new system being rolled out by the company, the first units being for Alfa Laval Aalborg OL and OC-TCi boilers, enabling advanced boiler control with a simple touch.

With a graphical touchscreen display and intuitive two-touch navigation, the technology represents a significant advance in boiler control technology. Designed as a common control platform for all Alfa Laval Aalborg boilers, the company intends that the system will become a familiar interface for crews, regardless of which boiler they work with, and it has already been installed on board a range of newbuilds, with additional deliveries planned for the near future.

In addition to having been proven in the engine room on other marine systems



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An Alfa Laval Aalborg OS-TCi boiler fitted with a gas burner.

from Alfa Laval, Touch Control is in use at the Alfa Laval Test & Training Center, where it steers the Center's own boilers and aids the continuous development and improvement of systems for new boiler types, the Touch Control rig being used to show the many ways in which boiler operation can be optimized.

The system is PLC-based, which gives it plug-and-play simplicity and high durability in the engine room, and with coverage for all major bus interfaces it is easily connected to onboard communication systems. Similarly, it can be quickly retrofitted to an existing Alfa Laval Aalborg OL, OS-TCi or OC-TCi boiler, which has already been done on a number of tanker vessels. It also offers the flexibility of firmware upgrades, which will let the system adapt to new needs as they arise.

Smit Inert Gas Systems

The Alfa Laval Automatic Fuel Efficiency Module (AFEM) is a new modification for reducing the fuel consumption of Alfa Laval Smit Combustion inert gas systems by ensuring the inert gas that keeps cargo safe during offloading is only generated in the exact amounts required. In a two-year pilot project, the AFEM allowed Italian shipping company Navigazione Montanari S.p.A. to achieve average fuel savings of 30 per cent.

Based in Fano on the Adriatic Sea, Navigazione Montanari owns and manages a

fleet of 21 tankers operating worldwide, with a particular concentration throughout the Mediterranean region. In recent years, the company has been focused on improving environmental standards, especially with regard to minimizing CO₂ production and fuel waste and therefore taking part in a pilot project to evaluate the AFEM was a natural fit for it.

Valle di Navarra, a 40,000 DWT product carrier built in 2002, was selected as the test vessel. The ship sails primarily in the Mediterranean, with gasoil and gasoline cargo. Compared to similar vessels with Smit Combustion systems, the Valle di Navarra discharges frequently – up to three times a week – which provided Alfa Laval with ample statistical information on the AFEM's performance and reliability.

Data collection was one reason that Alfa Laval decided on a particularly long pilot program, but guaranteeing the cargo's safety and reliable availability was even more important:

"The AFEM modification is part of the inert gas generator's combustion control circuitry," said Mart Blankert, Manager Customer Support, Inert Gas Systems at Alfa Laval. "A failed module could prevent cargo from being discharged, meaning expensive delays in port. Working with potentially volatile cargo, we took our time with the pilot to ensure that everything functioned as intended."

Alfa Laval's engineers provided responsive assistance and support to en-

U- and I-designed PureSOx units used for desulfurization process development work at the Alfa Laval Test & Training Center in Aalborg, Denmark.



“Compliance is always in focus, but customers have a broad spectrum of other requirements.”

**Erik Haveman,
Sales Director,
Alfa Laval Exhaust Gas Cleaning**



sure the AFEM performed properly and that the inert gas system only produced the necessary amount of inert gas during offloading. This made it possible to greatly reduce the operational expenses related to inert gas production aboard the ship.

For vessels with Smit Combustion systems already installed, the AFEM will soon be available as a retrofit installed and commissioned by Alfa Laval. For new inert gas systems, the AFEM will be available as an added option at the time of the original installation.

Methanol Boosters

In 2013, Alfa Laval was selected by MAN Diesel & Turbo to deliver Low-Flashpoint Supply Systems (LFSS) for the world’s first methanol-fuelled tankers. The methanol booster systems performed extremely well on methanol-fuelled tankers with ME-LGI engines and now Alfa Laval is further supporting MAN Diesel & Turbo with methanol booster technology as the MAN engine series is further developed to work with LPG.

The two companies had been collaborating broadly on fuel conditioning for MAN Diesel & Turbo’s new two-stroke diesel engines with Liquefied Gas Injection (LGI) technology since 2012. However, when the engine maker was contracted to equip nine vessels with methanol-burning ME-LGI engines, methanol came quickly into focus:

“MAN Diesel & Turbo has worked closely with Alfa Laval in development projects like Exhaust Gas Recirculation, where Alfa Laval PureNOx technology cleans the circulation water,” said Søren H. Jensen, Vice President and Head of R&D, Two-Stroke Business at MAN Diesel & Turbo. “That, together with deep expertise in fuel conditioning, made Alfa Laval the natural choice to deliver the Low-Flashpoint Supply Systems for methanol.”

The finished booster technology, the Alfa Laval FCM One Low-Flashpoint

(LF), was installed on tankers built at Minaminippon in Japan and Hyundai Mipo Dockyard in Korea. The vessels’ three owners, MOL, Westfal-Larsen and Marininvest, have since logged more than 4500 running hours with the FCM One LF in the past three years.

New booster developments are already underway. MAN Diesel & Turbo is currently modifying the ME-LGI engine series to use LPG as an alternative fuel, and Alfa Laval is again preparing the booster system. After more than one year of development, the first Alfa Laval FCM One LPG will be tested at MAN Diesel & Turbo’s Copenhagen test site in Denmark.

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Photo courtesy of BAE Systems

A Traditional Ship with a Contemporary (HybriGen) Heart

Old photos show mid-nineteenth century sailing ships abandoned in the San Francisco Bay area by crews who caught gold fever. Some of these abandoned hulls lie under the modern day city of San Francisco. Over in Sausalito, just to the north of the famous Golden Gate Bridge, what may well be the spirit of one of those buried vessels has taken shape under the direction of Captain Alan Olson, who has several decades of experience building and restoring and sailing classic wooden ships. Olson also started a non-profit organization, Call of the Sea, which is dedicated to preserving maritime traditions while teaching the skills of seamanship and teamwork and marine ecology through the organization's sailing programs.

Named the Matthew Turner, after a celebrated 19th century Bay-Area ship builder, the two-masted brigantine is 100 feet long on her deck and 132-feet overall. Based on lines from the Galilee, one of her namesake's ships, the modification and details have been done by noted

tall ship designers, Tri-Coastal Marine of Richmond, California. <http://www.tricoastal.com/index.html>

While the hull, rigging and sail power may derive from late nineteenth century designs; the ship's auxiliary power is as up to date as today's newspaper. The propulsion system is a hybrid of diesel-powered generator, batteries and even an electrical power-generating propeller.

David Adamiak, of BAE Systems, supplier of the HybriGen, explained some of the features of the system that incorporates a pair of Cummins QSB6.7 diesel engines rated at 301 HP each. "In this application, there is no mechanical connection between the QSB6.7 engines and the prop shafts," he continued the explanation, "It is best to think of the architecture as two variable speed hybrid generators that deliver electrical power to where it is needed when it is needed. Essentially, they deliver power-on-demand for (a) electrical propulsion; or (b) hotel loads; or (c) any combination of the two. The system controller decides whether to pull the needed power from the En-

ergy Storage System (ESS), composed of Li-ion batteries, or the diesel engine, depending upon which is most efficient for the desired load. Thus, in this application, the speed of the diesel engine will not be constant, but rather will be dependent upon the electrical load, so that it is always running at its most efficient point to minimize fuel consumption and emissions."

The complex beauty of the system is remarkable in it-self, but gets even more exciting. When the Matthew Turner will be travelling under sail, the batteries will be charging. With the diesel engines stopped, the water flowing over the hull will continue to turn the electric motor via the propeller and its shaft. This will, similarly to a hybrid car going down hill, cause the electric propulsion motors to become generators to produce electricity to recharge the batteries. Wind power creates waterpower, which turns the prop, to create electrical power. Amazing.

As the propulsion components were being put together by BAE Systems, the

boat builders over at Sausalito were finishing the hull planking. As master shipwright Alan Olson explained to Chris Lo of Ship-technology.com in August of 2015, "...a big challenge is planking. We have 230 planks going on; they're three inches thick, they're between 14 and 27 feet long, and it just takes a lot to get those planks on."

With the planking completed in 2016, interior work continued. With a lot of the work being completed by dedicated volunteers the excitement of the launch finally arrived on April 1, 2017. The Matthew Turner web page shows more of the story, and is a good place to stay informed or donate to the project. <http://educationaltallship.org/index.php>. As of the launch date the ship's hull and interiors are largely finished. Additional plumbing and wiring will continue dockside. The final, and perhaps most exciting stage, is the placement of the masts and the completion of the complex rigging. Current plans will see the ship ready for sea trials sometime in October of this year. — Alan Haig-Brown

Ektank Chem Tankers to Sport Hybrid Propulsion

The Switch received an order from WE Tech to deliver its permanent magnet (PM) shaft generators to two 18,600 dwt chemical tankers currently under construction for Sweden's Ektank AB. Sweden's Ektank AB is family-owned with a modern fleet of five chemical tankers in size ranging from 13,700 DWT to 17,000 DWT.

The PM-based shaft generator is a powerful proposition for today's cost and environmentally conscious ship-owners. This deal is an example of how PM technology is set to revolutionize the maritime industry. "We see huge potential in marine, and the decision of respected ship owners such as Ektank to invest in PM machines demonstrates that our belief is well founded. We'll be looking to build on this momentum going forwards and raise awareness of the transformative effect of The Switch technology throughout the industry. We believe this is just the start of something akin to an on-board energy revolution," said Mika Koli, Business Development

Manager, The Switch. "We only entered the marine segment in 2013, but we have already received over 30 orders for our technology, most

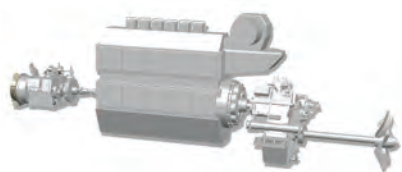
of them thanks to WE Tech," said Koli. WE Tech has also recently placed orders for The Switch PM shaft generators for two Toll Shipping 12,000 dwt RoRo

vessels and a series of four Stena RoRo ROPAX ferries. The Switch is now targeting growth of 200% within the marine segment in the next five years.

Reintjes BAE HybriGen Zero System

Reintjes continues to demo its hybrid competence with its new BAE HybriGen Zero system. The hybrid step-up gearbox for retrofit is designed to offer reduced operating costs, reduced emissions and reduced maintenance costs. The product line features a front-engine mounted gearbox combined with a permanent magnetic electric generator up to 300 kW. With its high torque, this electric motor / generator can also be used as a starter to substitute the air-starting system. In addition, the use of the PTO provides the possibility to switch off the on-board gen sets during operation. The system comes with an electric motor of BAE Systems as well as the gearbox with the following components by Reintjes

- integrated multi-disc clutch
- flexible coupling on input side
- bell housing for direct generator mount
- shaft for direct engine connection



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Shipbuilding

Highlights 2017

While saying the global shipbuilding market has been ‘challenging’ is a drastic understatement, there remain pockets of opportunity, and innovation in hybrid propulsion systems and alternative marine fuels continues in earnest.

GasChem Beluga

A new liquefied ethylene gas carrier (LEG) was named on Teesside. Operated by Germany’s Hartmann Reederei and GasChem Services, the new eco-friendly sea vessel GasChem Beluga will carry shipments of ethane gas from Houston to SABIC’s cracker at Wilton on Teesside under a long-term time charter. SABIC recently converted its Teesside cracker during a major investment to enable it to take ethane gas alongside other feedstocks, to make it one of the most flexible and competitive crackers in Europe.

Next to the modification of the cracker itself, the conversion project required the build of a new cryogenic ethane tank and purpose built ships to transfer the ethane from the U.S. Gulf Coast to the U.K. The first born of these ships is the GasChem Beluga. She made her maiden voyage from Shanghai through the Panama Canal to Houston in December to mark the official start of the contract-hiring period. Built in China, the state-of-the-art

ship was designed and developed specifically for SABIC by Hartmann Reederei, in cooperation with engineering consultants HB Hunte Engineering to take advantage of the emerging global ethane trade.

The ship’s design focused on building the Eco Star 36K with svelte bow design. The new vessel type differs fundamentally from conventional gas carriers, as its superstructures are located at the bow. This results in an optimized distribution of weight and, therefore, a reduced demand for ballast water – which again leads to a reduced fuel consumption and emissions at the same time. The bow design enables the vessel to improve seakeeping at higher transit speeds and improved fuel efficiency.

The latest generation of the MAN B&W dual fuel two-stroke engine has high reliability and low fuel consumption with low emissions meeting the requirements of IMO Tier II. The vessel is able to operate on HFO, MDO and

gas oil as well as LNG and is one of the world’s first to operate on ethane.

The design of the Star-Trilobe cargo tank presents another world innovation to allow an increase in cargo capacity by nearly 30 percent leading to reduced shipping costs through higher economies of scale.

The GasChem Beluga – which will be joined by a sister vessel the GasChem Orca in July – marks a new generation of semi-refrigerated ethylene/ethane carriers, designed for environmentally friendly operations with minimum emissions at a maximum of reliability and sea endurance.

The new ships with a cargo capacity of 36,000 cu. m. each for liquefied gas cargoes up to -104° C, will greatly reduce emissions of nitrogen oxides, sulfur oxides and soot particles too by running engines on clean gas.

Odette Claus, the wife of Frank Claus, Global Director Supply Chain Liquids, officially named the vessel, at a ceremony

in Teesport, which was attended by representatives and customers of SABIC and the Hartmann Group together with member of the Tees Shipping community.

“As a responsible global company, SABIC is committed to providing high-quality, competitively priced products to its customers whilst doing all it reasonably can in order to reduce the environmental impact of its operations,” said Frank Claus. “We would like to express our appreciation to all involved, especially the Hartmann and GasChem team for joining SABIC on the journey to deliver on a truly global supply chain. Not only have we managed to lever ethane as an advantaged cracker feedstock, we are proud to be one of the first chemical companies in the world to use it as a clean fuel for our highly efficient ships as well. Our U.K. site in Teesside is of strategic importance to SABIC and also from a global supply chain perspective. The flexible cracker project will secure

SABIC TECHNOLOGY DRIVES INNOVATION: Odette Claus, wife of SABIC’s Global Director Supply Chain Liquids Frank Claus (right) with Captain Alfred Hartmann, founder of the Hartmann Group, after Mrs. Claus officially named GasChem Beluga.



ECO Star 36 K (Gaschem Beluga)
 Length o.a.: 188.3 m
 Breadth, molded: 29 m
 Design draft (ethane): 9.5 m
 Main engine: MAN B&W
 7G50ME-GIE
 Power: 12,040 kW
 Speed: abt. 16.5 kn
 Classification: DNV GL
 Delivery: 11/2016, 7/2017

the future of the Teesside site to provide continued employment for the broader community for the next few decades ahead. These innovative ships illustrate the sustainable future that SABIC wants to help to create.”

Norwegian Joy

Norwegian Cruise Line took delivery of Norwegian Joy, the brand’s 15th ship and the first custom-designed for the Chinese cruise market, from Meyer Werft during an on board ceremony in Bremerhaven, Germany. The vessel is due to arrive in China in June. “As Norwegian Cruise Line continues our global growth, Norwegian Joy’s delivery marks a momentous occasion in our company’s history, signifying our official entry into the Chinese cruise market,” said Andy Stuart, president and chief executive officer for Norwegian Cruise Line.

At 167,725-gt and accommodating 3,883 guests, Norwegian Joy is the second ship in the line’s Breakaway-Plus class and is specifically designed with amenities tailored for Chinese guests.

“With this incredible ship, we have taken Norwegian’s signature on board experience and expanded and customized it with exciting features, services and amenities that combine the best of the East and the West,” said David Herrera, president of Norwegian Cruise Line

Holdings China.

In advance of the delivery, Herrera and executives from Norwegian’s offices in China gathered for a traditional blessing from the Chinese Goddess of the Sea, Mazu, to ask for safe and pleasant voyages for the ship and all its guests. The ceremony was held at the Mazu Temple in Shanghai where, one year ago, the Norwegian team held a ceremony to obtain a blessing for the coins that were used in Norwegian Joy’s Keel laying ceremony. During the visit, a ceramic statue of Mazu was gifted to the company by the temple representatives and brought to Germany for the ship’s delivery. The statue has been given a place of honor aboard Norwegian Joy and will carry the blessings of Mazu on the journey to China.

Following her delivery, Norwegian Joy will begin her journey to China, where she will be showcased through a grand inaugural port tour featuring one-day events at the ports of Singapore, Qingdao, Shenzhen, and Hong Kong, as well as VIP partner cruises from Norwegian Joy’s home-ports of Shanghai and Beijing (Tianjin). The ship will be christened in an exclusive event on June 27, led by her Godfather, the ‘King of Chinese Pop’, Wang Leehom.

Accommodating 3,883 guests and staffed by 1,800 crew members, Norwe-

gian Joy offers onboard amenities that cater to Chinese guests. Norwegian Joy’s VIP accommodations include NCL’s ship-within-a-ship luxury suite complex, which features an observation lounge with 180 degree views, a concierge level and larger balcony staterooms. Accommodations offerings also include staterooms for families with connecting staterooms for extended families traveling together, as well as an array of mini-suite, balcony, ocean view and interior staterooms, many with virtual balconies.

AIDAperla

AIDA Cruises took delivery of AIDAperla in Nagasaki (Japan) from Mitsubishi Heavy Industries (MHI). In the presence of Michael Thamm, CEO Costa Group, Felix Eichhorn, President AIDA Cruises, Shunichi Miyanaga, President and CEO MHI, and Kazuaki Kimura, President and CEO, Industry & Infrastructure MHI, the solemn commissioning of the 12th fleet member of AIDA Cruises took place in the course of a traditional Japanese ceremony.

AIDAperla will be christened by model and presenter Lena Gercke on June 30, 2017, in Palma de Mallorca.

Starting from June 1, 2017, before the official launch of the christening cruise on June 24, 2017, there will be the opportunity to familiarize with the young-

est fleet member on a number of introductory cruises. The five-day welcome cruise from June 1, to June 6, 2017, from Palma de Mallorca, leads to Marseille, Barcelona und Valencia. From July 1, 2017, AIDAperla will be traveling in the Western Mediterranean. Palma de Mallorca – the capital of the Germans’ favorite island – and Barcelona will be the start and end ports for the seven-day “Pearls of the Mediterranean” cruises which include destinations such as Rome (Civitavecchia), Corsica, and Florence (Livorno).

From March 2018 the Hanseatic City of Hamburg will be the home port of multiple seven-day round trips for AIDAperla to the most beautiful metropolises in Western Europe, such as London (Southampton), Paris (Le Havre), Brussels (Zeebrugge) and Rotterdam.

Express 3 Ferry

A new generation fast ferry left Tasmania on its delivery voyage to Denmark via the Panama Canal. The Express 3 is a 109 m long high speed vehicle/passenger ferry from Australian shipbuilder Incat Tasmania for Danish operator Molslinjen, becoming the fourth Hobart-built catamaran in the company’s current fleet.

A new generation fast ferry, the 109 meter wave piercing catamaran Ex-

NEW CRUISE SHIP TARGETING THE MAMMOTH CHINESE MARKET: NCL president & CEO Andy Stuart (left) and Meyer Werft managing partner Bernard Meyer (right) sign delivery documents for Norwegian Joy. Inset Right: Norwegian Joy has its own go kart track.



Photo: NCL

JAPAN DELIVERS FOR AIDA: AIDA Cruises took delivery of AIDAprera in Nagasaki, Japan from Mitsubishi Heavy Industries (MHI). Pictured is Felix Eichhorn, President AIDA Cruises and Shunichi Miyanaga, President and CEO MHI.



Technical Data AIDAprera:
 Shipyard: Mitsubishi Heavy Industries Ltd., Nagasaki
 Commissioning: April 27, 2017
 Length: 300 m
 Width: 37.6 m
 Max. draft: 8 m
 Gross tonnage: 124,100 GT
 Decks: 18
 Number of staterooms: 1,643
 32 suites
 1,101 veranda staterooms
 198 oceanview staterooms
 312 interior staterooms
 Restaurants: 12
 Bars: 18
 Crew members: over 900

Photo: AIDA/MHI

press 3 has evolved from Incat's 112 m catamaran range which first entered commercial service in mid-2007. "The design brief was simple. Ensure a consistent passenger experience and fleet commonality for Molslinjen, which already operate two Incat 112 meter catamarans, while delivering a minimum 10 percent fuel and emissions saving plus faster vehicle deck turnaround times," said Tim Burnell, Incat.

Building on the in-service experience of the Incat 112 meter, the concept was redesigned from the keel up by Incat's in-house naval architects, Revolution Design. The result is the 109 meter catamaran with a lightship weight saving of just over 100 metric tons.

The design refinement has also produced an improvement to vessel trim. Fuel, domestic fresh water and sullage tanks have all been moved forward but significantly, by repositioning the engine rooms six frames further forward, the vessel benefits from improved speed and fuel consumption performance. Adding a skeg to the keel has enhanced directional stability.

On sea trials, Express 3 achieved a speed of 43 knots with 600 metric tons deadweight on board, exceeding contractual speed and fuel consumption expectations.

"Incat's suppliers played their part in

the quest to redefine vessel design. LifeRaft Systems Australia for example, designed and gained regulatory approval for longer Marine Evacuation Systems (MES). This allows the MES bays to be moved one deck up into the passenger space, rather than on the tween (upper car) deck on earlier vessels, resulting in a reduction in weight as well as more overall space on the tween deck," Burnell said.

Vehicle deck capacity offers space for up to 411 cars, or up to 227 cars and 610 meters of truck space. Aside from the many proactive design and operating measures to reduce SOx, CO2, NOx and particulate matter, another important consideration was to install charging stations for electric vehicles, allowing motorists to charge their electric car as they travel across the Kattegat.

"The 109 meter catamaran is Incat's response to increasing demand for quality newbuild high speed craft that will provide reliable year round service," Burnell said. "We pioneered this mode of high speed transport in 1990 and our ferries have since operated over 2.5 million hours in intensive commercial service. By deconstructing already successful designs and operator experience Incat has produced a fast ferry that truly is of a new generation."

The new ferry will enter commercial

service on June 1, 2017. "Molslinjen offer up to 30 sailings per day and taking the ferry typically saves customers around 400km of driving while being faster and more relaxing," said Vice Chairman Søren Jespersen.

Stena Imagination

The MR tanker Stena Imagination was named in the Port Rashid Terminal in the heart of Dubai. According to Erik Hånell, President & CEO of Stena Bulk and CEO of Stena Weco, "Naming the Stena Imagination in Dubai is very much a strategic choice. Stena Bulk recently opened an office here together with Stena Weco and Golden Stena Weco. We already had a presence in the market in the region but wanted to get even closer to our customers. The naming ceremony gives us the opportunity to further reinforce our image and forge more contacts with customers, partners and suppliers in the region."

Stena's tanker business already has a presence in the area with contacts in the neighboring region. For Stena Bulk and Stena Weco, which, with their IMOIMAX fleet, are focusing increasingly on trade in chemicals, Dubai is an important hub. Here, the oil industry is building several refineries closer to the oil wells in the region.

Stena Weco is now wholly owned by

Stena Bulk while Golden Stena Weco is a joint venture between Stena Weco and Golden Agri Resources (GAR). With its new office in Dubai, Stena Bulk now does business in six countries. In addition to Dubai, it has offices in Houston, Copenhagen, Singapore and Shanghai while its head office is located in Gothenburg.

The Stena Imagination was built at the Chinese shipyard GSI (Guangzhou Shipbuilding International) like all the 13 IMOIMAX tankers ordered by Stena Bulk – both delivered and under construction. The vessel is jointly owned on a 50-50 basis by Stena Bulk and Indonesian Golden Agri Resources (GAR). The Stena Imagination is operated by Stena Weco and sails in the company's global logistics system, which currently employs more than 60 vessels.

Isuzu Maru

On April 14, newly built coal carrier Isuzu Maru was delivered at Oshima Shipbuilding Co. Ltd. in Saikai, Japan. The new vessel will be operated by NYK Bulkship (Asia) Pte. Ltd., an NYK group company located in Singapore, for the transport of coal for JERA Trading Singapore Pte. Ltd., a coal trading corporation owned by JERA Co., Inc. (67%) and EDF Trading Limited (33%). JERA Co., Inc. The delivery and nam-

CHARGE YOUR ELECTRIC CAR ALONG THE WAY: A new generation fast ferry, the 109 meter wave piercing catamaran Express 3 has evolved from Incat's 112 m catamaran range. It even includes charging stations for electric cars.



Photo: Tim Kingston / Incat Tasmania

Classification: DnV +1A1 HSLC R1
 Car Ferry "B" EO
 Gross Tonnage: 10842
 Length: 109.4 m
 Beam: 30.5 m
 Draft: 4.05 m
 Deadweight: 1,000 metric tons
 Passengers: 1,000
 Cars: 411 cars in car-only mode
 Engines: .. 4 x MAN Diesel & Turbo
 20V 28/33D
 Waterjets:4 x Wartsila Lips LJX
 1500SR
 Gearboxes:4 x ZF NR2H 60000
 Loaded Speed on SeaTrials: 4.3
 knots with in excess of 600 metric
 tons deadweight
 Service Speed:40 knots
 Lightship Speed: 47 knots

ing ceremony held at the shipyard was attended by Tomohiko Ono, Director of Chubu Electric Power Co., Inc., and Kazuo Ogasawara, NYK Managing Corporate Officer, among others. Isuzu Maru will be the first coal carrier for a NYK Group's overseas subsidiary to operate for a Japanese electric power company. The vessel will transport coal mainly from Australia and Indonesia to Chubu Electric Power's Hekinan thermal power station, which is located in Hekinan city, Aichi prefecture, in Japan. Compared to the standard 70,000-ton (DWT) Panamax bulk carrier, the new Isuzu Maru has a wider beam and a shallower draft to improve transportation efficiency.

Dredger Tommy Norton

The Trailing Suction Hopper Dredger (TSHD) 650 ordered by Gippsland Ports of Victoria, Australia, in December 2015 has recently been launched at Damen Yichang Shipyard in China. The vessel, named Tommy Norton, is now alongside the yard's new quay undergoing final commissioning, after which she will sail for Shanghai to undertake sea trials. Once those are completed she will sail for Australia on her own keel for dredging trials and delivery. The official delivery will take place in August. Among its various marine infrastructure responsibilities for the state of Victo-

ria, Gippsland Ports is the designated waterway manager of 1,431 sq. km. of some of the largest and most beautiful waterways in Australia, stretching from

Anderson Inlet to Mallacoota over 720 km of the south-eastern coastline of Victoria. The new dredger will be used to maintain entry to the port of Lakes En-

trance and the Gippsland Lakes system, which is used by recreational, fishing and supply vessels. To achieve this mission effectively the TSHD 650 has been



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STENA IMAGINATION: Carl-Johan Hagman, Chairman of the Board, Stena Bulk; Jin Lichao, Vice President, GCI; Godmother Lourdes Torgersen, Jan Torgersen, Zhang Dalei, Deputy Director of European Department, CSTC; Li Hongmei, Deputy Director of Business Development, GSI; Erik Hånell, President and CEO, Stena Bulk.



Photo: Silverbullet



NYK

Isuzu Maru

modified to increase the installed propulsion power, allowing her to manage the strong currents encountered in the harbor's entrance. To minimize disruption to the local ecosystem, an anti-turbidity valve has been fitted on the overflow to reduce air bubbles and visible plumage in the water. Additional features include an indication package to measure soil density. This allows the suction pipe to be angled precisely for accurate operations. The dredging process will be made even more efficient by the installation of the navigational dredging aid, Nav-Guard, indicating the area and quantity of substrate dredged.

Capable of dredging to depths of 15 m, the dredger has been built with self-emptying capabilities with bottom doors for dumping and the choice of either a bow connection or rainbow expulsion for beach reclamation work. In order to increase the vessel's payload capacity when dredging sand with a high specific density, Damen has reduced the free-board of the vessel and applied a dredge mark.

Vane Brothers Tug & Barge

Marine transportation provider Vane Brothers has added two newly constructed vessels to the company's growing fleet: the 4,200-hp tugboat Philadelphia and the purpose-built asphalt barge Dou-

ble Skin 510A. Primarily tasked with towing petroleum barges engaged in the North Atlantic coastwise trade, Philadelphia is the fifth of eight 4,200-hp, model bow tugboats contracted by Vane Brothers through St. Johns Ship Building in Palatka, Fla. The first in the series, the Elizabeth Anne, was delivered in January 2016, while the sixth in the series, the New York, is scheduled for completion this summer.

The DS-510A, with a 53,000-barrel cargo capacity, is the second new-build asphalt barge delivered to Vane Brothers by the Conrad Deepwater South shipyard in Amelia, La. The first was the DS-509A, which was put into service in July 2015.

Designed by Entech Designs, LLC, Philadelphia measures 100 x 34-ft. with a 13-ft. draft. It uses two Caterpillar 3516 Tier 3 ("A" Rated) engines, each generating 2,100 hp at 1,600 rpm. Two John Deere PowerTech 4045, 99 kW generators deliver service power to the boat; a third John Deere 4045 drives the Intercontinental DD200 towing winch. All Elizabeth Anne Class tugs feature the newest Simrad Electronics package installed by Rhodes Electronics. Comfortable accommodations are available for up to seven crewmembers.

With an overall length of 361 ft. and a 62-ft. beam, the DS-510A double-hull



Damen

Tommy Norton

tank barge uses a sophisticated thermal heating system that keeps asphalt at approximately 300 degrees Fahrenheit so that the highly viscous liquid flows more easily. The DS-510A operates at a pumping rate of 8,000 barrels per hour (bph) with a loading rate of 10,000 bph. Along with transporting asphalt, which is primarily used for road construction, roofing and other building applications, the barge is generally suited for moving heavy oil products.

Spanish-built SOV Launched

The first service operation vessel (SOV) built in Spain has been launched at shipbuilder GONDAN's facilities in Figueras. This 81.1 x 17-m vessel is the first of two new SOVs that GONDAN will deliver to Norwegian ship owner Østensjø Rederi, with whom GONDAN has signed 13 shipbuilding contracts in the last decade.

The launch event was attended by representatives from Østensjø Rederi as well as the charterer of the vessel, Dong Energy. Both vessels are being built according to UT 540 WP design by Rolls Royce Marine. They will be equipped with an UPTIME 23 meter length heave compensated walk-to-work gangway, a 3D compensated crane and a CTV landing system with bunkering facility. In addition to the gangway, the on-board-fitted 11 m daughter craft will allow the transfer of maintenance technicians to the offshore wind turbines.

New Light Dive Vessel

Tuco Marine presented its new vessel dedicated to the diving and subsea market, the ProZero 12m LDV Light Diving Vessel. The boat is designed and optimized to serve as a platform for subsea operations and support of up to three divers. Diving operations include underwater inspection, investigation, construction, repair and maintenance of machinery and structures and recovery of sunken assets.

In addition to the large driver and control cabin, the boat is equipped with a working deck and has room for up to three dive control stations in the cabin. Powerful light projectors on the aft deck provide ample light.



The 12-m ProZero vessel comes with double inboard diesel engines and waterjets. It can be equipped with single point lifting so that the boat can easily function as Daughter Craft for much larger dive vessels. Thus, it can serve as a mothership extension that allows precise operations closer to installations like structures or oil platforms.

Sturdy railing and the diver ladder is mounted on the aft deck, where there is also easy access to a built-in locker for diving hoses and equipment. An A-frame helps to ensure safe diving operations and can also serve in tasks that involve cargo handling.

The 12-meter ProZero Light Diving Vessel is designed with the further option of remote controlling. The Remote Command System allows additional types of operations and adds flexibility. It improves productivity and efficiency of certain non-diving operations because crew change can be avoided. At the same time, remote control allows operations in hazardous environments while keeping the crew/operator at a safe distance.

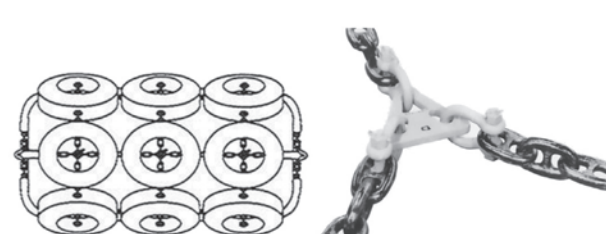


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PHILADELPHIA: Vane Brothers has added two newly constructed vessels to the company's growing fleet: the 4,200-hp tugboat Philadelphia and the purpose-built asphalt barge Double Skin 510A.



Photo: Vane Brothers

Iron Kestrel & Iron Corella

With the arrival of the Iron Kestrel and Iron Corella in Port Hedland, Western Australia, the first two of BHP Billiton Iron Ore's six boat order for Robert Allan Ltd.'s RAstar 85 Class escort tugs have now been delivered by ASL Shipyards Singapore.

The tugs will escort bulk carriers in and out of Port Hedland, custom designed and built to meet the environmental conditions and operational requirements of the world's busiest bulk commodity port by tonnage. Very high air and water temperatures, significant amounts of airborne ore dust, strong currents in a narrow channel and a requirement to operate up to the closing conditions of 3 meters significant wave height and 35 knot wind speed create a formidable design challenge. Adding to this are the long escort distances through exposed water and the high operational hours on the tugs.

In order to keep the main working deck as clear as possible to provide a safe working area, the anchoring equipment was fitted at the stern of the vessel. The aft deck also features a 300 metric ton SWL cyclone mooring bitt and fairlead in the aft bulwark.

The vessels are very heavily fendered for the expected high swells that are of-



Iron Corella

ten present. Bow fendering consists of a 1,000 mm diameter cylindrical fender secured by radial chains and extending well aft along with a lower course of 450 mm thick W-fender. Sheer fendering is 350 x 350 mm D-fender. Stern fendering is 450 mm thick W-fender.

Crew accommodations are arranged with the main deck featuring a generous sized mess and galley, a large office that can be used as a spare cabin, and a locker room with laundry facility. The lower deck includes five MLC compliant cabins able to accommodate eight crew in total. The wheelhouse features a single Alphantron control console with winch operator position. Visibility to the forward working deck is exceptional.

Due to the harsh environmental conditions, significant effort was placed on designing for durability and maintainability, the designer said. For example, extensive use of stainless steel was included on the exterior of the vessel including railings, stairs, louvres, etc.

The vessels have been constructed to Lloyd's Register Class requirements with the following notation: LR + 100A1 TUG, + LMC, UMS, IWS

USNS Yuma Delivered to US Navy

The United States Navy (USN) accepted delivery of USNS Yuma (EPF 8) during a ceremony held aboard the ship at Austal USA's shipyard in Mobile, Ala. USNS Yuma, named after the City of

Yuma, Arizona, is the eighth Expeditionary Fast Transport (EPF) vessel designed and constructed by Austal for the USN, under a contract for twelve vessels worth in excess of \$1.9 billion.

Announcing the vessel delivery, Austal Chief Executive Officer David Singleton said the EPF program is a clear demonstration of Austal's ability to design, construct and support innovative defense vessels.

"The EPF platform continues to impress both operators and end-users with its unique, multi-mission capabilities and is now leading U.S. Navy and other humanitarian missions, traditionally led by single-purpose logistics vessels," Singleton said.

"USNS Yuma is the latest addition to a growing fleet of 'smart ships' that Austal is delivering globally, on-time and on-budget," Singleton added.

The EPF platform provides the USN with a high-speed, intra-theatre transport capability. The 103 m long Yuma is an all-aluminum military catamaran capable of transporting troops, vehicles and cargo up to 1,200 nm at an average speed of 35 knots. With a shallow draft, the vessel is designed to operate in austere ports and waterways, providing added flexibility to the USN. The EPF's flight deck can also support flight operations for a wide variety of aircraft, including

AUSTAL DELIVERS FOR THE U.S. NAVY: The United States Navy (USN) accepted delivery of USNS Yuma (EPF 8) during a ceremony held aboard the ship at Austal USA's shipyard in Mobile, Ala.



Austal

a CH-53 Super Stallion.

Three Spearhead-class EPF vessels remain under construction at Austal USA, including the future USNS City of Bismarck (EPF 9), to be christened in May 2017. Modules for Burlington (EPF 10) and Puerto Rico (EPF 11) are under construction in Austal's module manufacturing facility (MMF).

FREMM Delivered

In early April DCNS delivered the

FREMM multi-mission frigate Auvergne to the French Navy, the fourth of the series ordered by OCCAR1 on behalf of the DGA (French armament procurement agency). Delivery of the FREMM multi-mission frigate Auvergne is the result of a design and construction process managed by DCNS in close cooperation with the French Navy, DGA and OCCAR teams. "The delivery of the FREMM Auvergne represents an opportunity to applaud the industrial and

technological prowess of DCNS and its subcontractors," said Nicolas Gaspard, director of the FREMM program at DCNS. "The frigate Auvergne illustrates our capacity to produce and deliver on time a series of front-line combat vessels to satisfy the needs of our client navies." On completion, the FREMM program will represent the construction of 10 vessels on the DCNS Lorient site, of which eight for the French Navy. Six FREMM would have been delivered to the French

Navy before end of 2019, in accordance with the 2014-2019 military programming law. DCNS is currently completing the FREMM Bretagne, which was floated on 16 September 2016, and is pursuing the assembly of the FREMM Normandie. Furthermore, work has already started on the ninth FREMM in the series, the Alsace, which will be one of the two FREMMs with strengthened anti-aircraft capacities, whose deliveries are scheduled before 2022.

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AgilePlans by KVH

KVH Industries announced the availability of AgilePlans by KVH, an all-inclusive Connectivity as a Service (CaaS) offering for maritime. For a single monthly fee, AgilePlans by KVH brings an advanced satellite communications solution onboard without a capital expenditure or long-term commitment. The subscription fee is as low as \$499/month for a complete package including hardware, connectivity, installation at select ports, entertainment and training content, and global support. The AgilePlans by KVH subscription model is designed to deliver everything a fleet needs for better communications and improved operational efficiency at sea.

AgilePlans by KVH is designed to enable customers to adjust quickly to changing market conditions and support fleet expansion or contraction as needed. For example, subscribers can end a subscription at any time without penalty. The AgilePlans subscriber need only notify KVH, return the onboard hardware, and the subscription will end.

The monthly subscription fee for AgilePlans by KVH includes all of the following:

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Be confident that your system installation is optimal, with complimentary field service and initial network design consultations.

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tenna system; the below decks Integrated CommBox Modem (ICM); and required cables

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- **Crew Welfare:** NEWSlink Print and NEWSlink TV delivered and updated daily via KVH's IP-MobileCast content delivery service

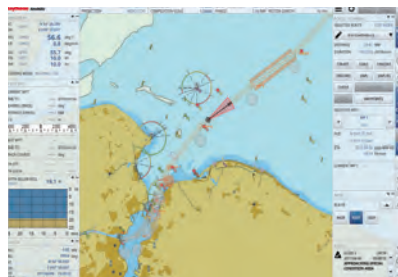
- **Training Content:** TRAINING-link Videotel Basic Training Package of videos covering Standards of Training, Certification, and Watchkeeping for Seafarers (STCW)-related material for one of three categories: tankers, dry cargo, or offshore
- **Operations Data Delivery:** CHARTlink and FORECASTlink multicast delivery of third-party chart and weather data.



AlphaBridge delivers for RT Trident

Alphatron Marine has handed over the turnkey AlphaBridge tugboat console solution onboard the RT Trident to Seabulk Towing Inc. This tug bridge concept has been fully equipped with a JRC/Alphatron Marine navigation and communication package. The bridge is comprised of two ergonomically designed consoles with a central, rotatable, captain's chair mounted on sliding rails. The layout of the consoles was designed in cooperation with the intended users. The radars onboard include the JRC JMA-5200 sea radar, with the patented JRC Constaview, and the Alphatron JMA-610 river radar, especially designed for inland and maneuvering applications in enclosed waters.

www.alphatronmarine.com



First User-Defined ECDIS

Raytheon Anschütz introduces what it claims is the world's first user-defined Electronic Chart Display and Information System. Raytheon Anschütz designed the new Synapsis ECDIS NX software based on direct input from customers. The software features a state-of-the-art design and stands out with an intuitive user interface, a clearly structured display, consistent operational concepts and modern interaction patterns such as touch operation, 'drag and drop,' pins and handles, and context-sensitive help dialogue.

It is flexible and can adapt to new use cases or integrate new functions, without overloading the display or overwhelming the user.

www.raytheon-anschuetz.com

Western Signs with MobileOps

MobileOps, Inc., a Redmond, Wash., software company that specializes in the design and development of maritime software applications (dispatch, safety, compliance, vessel maintenance, timecards, analytics) signed a contract with Western Towboat Company of Seattle. Western Towboat will use MobileOps Platform across its fleet and within several shoreside departments. MobileOps Platform's offline-capable application, Voyager, will be used on tugs transiting the ocean out of cellular range.

www.mobileops.co



Vessel Monitoring Services

ASCO has joined forces with Ultra Electronics to deliver an important step forward in vessel monitoring services. Working in collaboration with Ultra Electronics Surveillance & Security Systems (ULTRA), ASCO has been awarded a major, long-term contract by an international operator for the provision of integrated collision avoidance monitoring which improves marine safety. Thanks to the alliance, Ultra Electronics will use multiple platform-based radar early warning systems (REWS) to detect and gather vessel data to address the risks posed to offshore installations by marine traffic. This data will then be sent onshore to be centrally monitored and co-ordinated.

www.ascoworld.com

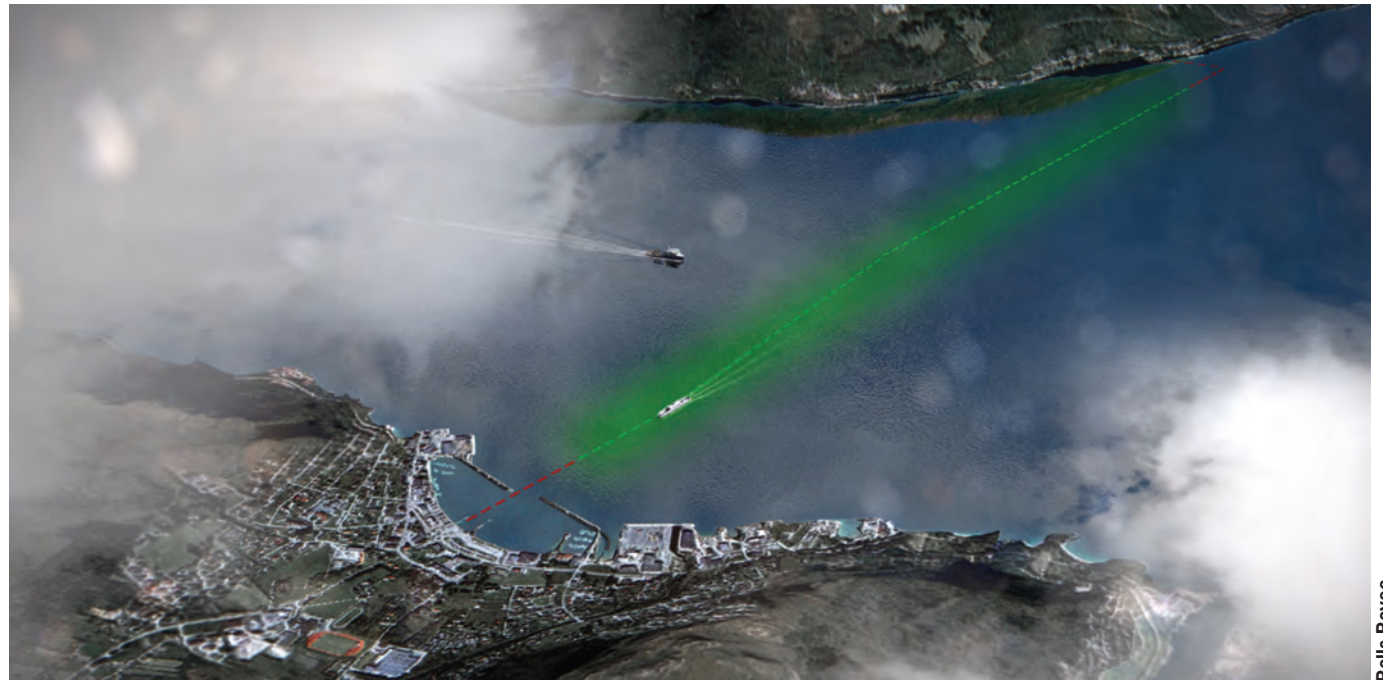
Ferry Crossing System for FosenNamsos Sjø

Rolls-Royce signed a deal with Norwegian shipbuilder Kleven to supply its automatic crossing system, for two new double-ended plug-in battery-hybrid ferries being built for Norwegian ferry company FosenNamsos Sjø. The system controls the vessel's acceleration, deceleration, speed and track. The system will control the ferries as they cross the fjord between Flakk and Rørvik connecting the peninsula of Fosen with Trondheim.

New ferry contracts in Norway have strict yearly limits on energy consumption as part of the commercial agreement between the ferry operator and the customer, in this case the county authority Sør-Trøndelag Fylkeskommune. Automatic are designed to ensure consistent behaviour -- hence predictable energy consumption -- during the journey.

The Captain will supervise the automatic system and intervene using traditional maneuvering systems if needed. In the first deliveries the Captain will manoeuvre the ferry manually the last few meters to the dock.

If the Captain is not, for some reason, able to take manual control, the system stops the vessel at a safe distance from the quayside and keeps it safely posi-



Rolls-Royce

tioned automatically until further action can be taken. Rolls-Royce expects shortly to be able to integrate the system into a variant of its award winning Unified Bridge. The company is also looking to test an extension of the product allowing automatic berthing in the near future. Construction of the Multi Mari-

time designed vessels will take place at the Kleven owned Myklebust Verft Shipyard in Norway, starting in May.

The vessels are due for delivery in late 2018 and will begin operation on 1 January 2019.

The order follows Rolls-Royce's announcement of the sale of its first auto-

matic crossing system to Norwegian ferry company Fjord 1, which will use the system to control two new double-ended battery ferries as they cross between Anda and Lote on the 1330 km long E39 which connects communities along the west coast of Norway.

www.rolls-royce.com



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Jotun Offshore Maintenance

Jotun has developed a maintenance coating system offering offshore operators the optimum in protection, durability and ease of application, while reducing costs, the manufacturer said. The new range – which consists of the Barrier Smart Pack, Jotamastic Smart Pack HB and Hardtop One – will reportedly be the world's first Norsok approved solution for brush and roller application on power tooled and water jetted surfaces. "Until now, offshore maintenance solutions were typically designed and tested in accordance with standards for new constructions," said Lasse Isaksen, Global Concept Director - Offshore, Jotun. "This simply does not reflect the challenges that our customers experience when maintaining existing assets.

"For example, preparing a surface for coating application offshore is far more demanding than doing so in a yard. Poor preparation can lead to premature coating breakdown and shorter lifetimes than for standard products, resulting in an increased frequency of maintenance.



With offshore maintenance being up to 10-15 times more expensive per m2 than it is in a yard, this is an added cost our customers can do without.

"That's why this system, designed specifically for brush or roller application and passing the industry's most stringent standards (NORSOK and ISO 20340), is so important. It delivers better coating integrity, longer maintenance intervals, enhanced efficiency, and, of course, real cost savings."

The three individual products have a range of key benefits: Barrier Smart Pack, a ceramically reinforced zinc rich epoxy primer, extends system lifetime while reducing surface preparation and application cost; Jotamastic Smart Pack HB delivers high build, even thickness finish, is easy to apply and gives long-lasting protection in the harshest environments; and Hardtop One offers all the benefits of a two-component high quality polysiloxane coating, in a single component polysiloxane coating.

www.jotun.com



Halo Fenders for STS Transfers

Trelleborg's marine systems operation and Teekay Marine Solutions are launching HALO Fenders, a new premium pneumatic fender offering focused on meeting the demands of the Ship to Ship (STS) transfer market and the wider marine industry. The offering combines the strength and experience of two industry leaders, bringing together Trelleborg's manufacturing capability and Teekay's operations expertise. The HALO offering will provide customers with a single point of contact from product specification, to delivery, through to comprehensive field services, including fitting of chain tire nets, maintenance of fenders and provision of all required certification and documentation to meet major oil company requirements.

www.trelleborg.com



Handheld Plasma Cutter

Thermal Dynamics, an ESAB brand, said its new Cutmaster 60i handheld air plasma cutting system is now available for purchase through traditional and online welding distribution outlets. Cutmaster 60i weighs 37 lbs. and provides a rated output of 7.6 kW at 50 percent duty cycle at 60A. It produces a recommended cut of 5/8 in., has a maximum sever thickness of 1-1/2 in., and provides the fastest cut speed at any thickness material for its class.

Cutmaster 60i system includes the new SL60QD 1Torch, which offers a quick disconnect feature enabling selective replacement of either the torch handle assembly or torch leads at a lower cost than replacing both together, a necessity with one-piece torch/lead assemblies.

www.esabna.com



Watermaker: Installation Flexibility

Even on large vessels, machinery spaces tend to be cramped and have reduced accessibility. Knowing this, FCI Watermakers offers its high-efficiency Neptune+ Series in a convenient, modular configuration for a wide variety of flexible installations. It delivers 1,275-9,500 gallons of pure, fresh water every day. Refitting large framed or skid-mounted watermakers commonly requires cutting the deck—an enormous added expense. With FCI's Neptune+ Modular, individual components are easily brought into the engine room through a door or hatch. Once inside, they can be installed wherever access needs and the space dictate. The Neptune+ Series is the industry standard for a large, commercial-grade watermaker.

www.fcwatermakers.com



(Image: Multi-Maritime)

MAN Cryo to Supply FGSS

MAN Cryo, MAN Diesel & Turbo's marine-LNG fuel-gas-system manufacturer, signed a contract with the Vard Shipyard Group in Norway to deliver a fuel-gas supply system (FGSS) to two ferries for shipowner and ferry operator Torghatten Nord. Each ferry will be equipped with a gas-electric, hybrid-propulsion system that features optional fast-charging from shore. Major efforts have been put into the design to deliver an energy-efficient propulsion and hull shape that offer a state-of-the-art environmental performance, comfort and reliability. The ferries are designed by Norwegian ship designer Multi-Maritime. The LNG supply system consists of a 175 cu. m. vacuum-insulated storage tank, with auxiliary equipment.

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Kartsonas Joins Seanergy Board

Dry bulk vessels owner and operator Seanergy Maritime Holdings Corp. has appointed Ioannis “John” Kartsonas as a member of its board of directors, effective May 4, 2017. Kartsonas has more than 18 years of experience in finance and commodities trading. He is currently the Principal and Managing Partner of Breakwave Advisors LLC., a commodity-focused advisory firm based in New York.

Petterson Named CEO of Great Lakes

Lasse Petterson has assumed the role of Chief Executive Officer of Great Lakes Dredge & Dock Corporation on May 1, 2017. In his 35-year career, Petterson has extensive experience in the engineering, construction and maritime industries. Most recently Petterson served as a private consultant to clients in the Oil & Gas sector.

Nisomar: Hyldager Challenges ‘Unsatisfactory’ Shipping Status Quo

With a belief that innovation in shipping has fallen well behind other sectors, Nisomar, a new entrant into maritime services, launched a unique range of services for ship owners, operators, brokers and charterers, and financial institutions. With insights derived from big data, Nisomar will offer analytics that support business decisions, transformational management consultancy, and port call services covering all key regions. Captain Claus Hyldager, Nisomar CEO, said: “We’ve assembled a formidable team of highly experienced maritime, supply chain management and technology professionals. Based on our personal experiences and feedback from large and small companies, it is our collective belief that shipping is overly inward-looking, and ripe for change. Unsatisfactory margins and many organisations’ inability to respond quickly enough to an ever-changing world is for everyone an unsatisfactory status quo.”

Volvo Penta Names Bjuve VP

Volvo Penta of the Americas has appointed Martin Bjuve as vice president for customer support and training. In

this position, he will provide strategic direction and management for support and product training for dealers and customers across the U.S., Canada, Mexico, Central America and the Caribbean.

BV Appoints Leaders

Philippe Donche-Gay, President of Bureau Veritas, has been promoted to the role of Senior Executive Vice President of Bureau Veritas, reporting to the group’s CEO, Didier Michaud-Daniel. His new role sees him lead the implementation of Bureau Veritas’ strategic plans in parallel with his position as President of the Marine & Offshore Division. To further strengthen the Marine and Offshore Division leadership, Donche-Gay has appointed Matthieu de Tugny Chief Operations Officer (COO) of the Marine & Offshore Division. Under him will be the central departments of Marine Operations, Marine Technical Management and Marine Marketing & Sales.

Wilhelmsen Acquires Drew

The Wilhelmsen group has signed an agreement to acquire the technical solutions business from Drew Marine. “This acquisition offers a unique opportunity to enhance the scale and geographic reach of our marine products division,” said Wilhelmsen group CEO, Thomas Wilhelmsen. The acquired business will be brought into Wilhelmsen Ships Service. As part of the transaction, the business, people and competence in Drew Marine Technical Solutions will be transferred to Wilhelmsen. Approximately 400 Drew Marine employees will join Wilhelmsen Ships Service upon completion of the transaction. “This acquisition is among the largest investments in our history,” said Thomas Wilhelmsen about the deal with a purchase price of around \$400 million.

Cox New Matson Board Chairman

Matson, Inc. president and CEO Matthew J. Cox will succeed retiring chairman of the board Walter A. Dods. Additionally, the board of directors designated Jeffrey N. Watanabe to serve as the lead independent director of the Matson board.

Concurrent with his appointment as chairman of the board, Cox announced the promotion of two other senior Matson executives: Ronald J. Forest and John P. Lauer. Forest, senior vice president, operations, has been promoted to president of Matson with continued responsibility for all of the company’s operations, including vessels, terminals, equipment, labor relations, purchasing and engineering as well as overseeing Matson’s investment in SSAT, a West Coast stevedoring joint venture with SSA Marine. Lauer, senior vice president, ocean services, has been promoted to chief commercial officer of Matson with continued

Reed Joins WSP | Parsons Brinckerhoff

James Reed has been named maritime manager for the Pacific Northwest at WSP | Parsons Brinckerhoff, a global engineering and professional services organization. In his new position, Reed will be responsible for business development, client relations and management of projects within the firm’s Pacific Northwest maritime business sector. He will be based in the Seattle office.

New England Ropes Hires Rekrut

New England Ropes hired Andrea Rekrut as Marketing Communications Manager. Rekrut comes to New England with 16 years of marketing experience.

Viking Line Inks Deal with Xiamen

Viking Line said it has signed a conditional contract with Chinese shipyard Xiamen Shipbuilding Industry Co. for the construction of a new passenger cruise ship for delivery in 2020. A final agreement is subject to the approval of the board of directors of both parties, as well as financial arrangements entered. The total contract amount is about \$211 million and includes an option on another vessel. The new 218-meter-long



Viking Line

vessel with a gross registered tonnage of 63,000 metric tons would enter service on the Turku, Finland – Åland Islands–Stockholm, Sweden route. Passenger capacity will be 2,800 people, and the length of its cargo lanes will be 1,500 meters. Viking Line said it plans to engage several Finnish and other European suppliers, as well as Scandinavian architects for the interior design.

Navios Buys’ Containership Fleet



Rickmers Maritime

Navios Maritime Partners L.P. reached an agreement to acquire Rickmers Maritime’s entire containership fleet. The deal, worth about \$113 million, will see Navios Partners acquire 14 container vessels from Rickmers Maritime through a wholly owned subsidiary, Navios Partners Containers Inc. Three of the container vessels are 3,450 TEU, and 11 are 4,250 TEU, combining for a total 57,100 TEU. The average age is 9.5 years.

Minerva Selects Ecochlor



Ecochlor

Ecochlor signed an agreement with Minerva Marine, Inc. for the potential supply of ballast water treatment systems (BWTS) for up to 30 vessels under its management for installations in accordance to the International Maritime Organization (IMO) and U.S. Coast Guard (USCG) implementation plan. The Ecochlor technology was selected for retrofit in Minerva’s managed bulkers and tankers varying in size from medium range (MR) to very large crude carriers.



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Metal Shark: Stock Boats Program

Louisiana-based boat builder Metal Shark is ramping up production to build an inventory of stock vessels. Models currently included in the new program include Metal Shark's Defiant-class pilothouse models in 29, 38 and 45 ft., 28-ft. Relentless center console patrol boats and 7-m rigid inflatable boats (RIBs) with diesel stern drives, waterjets or twin outboard engines.

ABS Gets SubM Win

ABS said it has been awarded a Third Party Organization (TPO) contract by The Great Lakes Towing Company (GLT) to support compliance with the United States Coast Guard (USCG) Subchapter M regulations.

Global Opens New Alaska Office

Global Diving & Salvage, Inc. has expanded its regional operations with the addition of a new office in Juneau, Alaska. The new Juneau office will support southeast Alaska through several of Global's primary service lines: marine construction, marine salvage and emergency response, diving operations and more.

Louisiana Cat Expands in New Iberia

Louisiana Gov. John Bel Edwards and

General Product Support Manager Troy Matherne of Louisiana Machinery Company announced the company will add 60 jobs and expand its New Iberia operations. Known as Louisiana Cat, the company rebuilds and services engines and related equipment for marine, oil and gas, industrial and utility companies at the Port of Iberia. Louisiana Cat's expansion calls for the addition of 60 new direct jobs over the next five years, with the jobs carrying an average annual salary of \$60,000, plus benefits.

Vigor to Add Third Drydock in Seattle

Vigor said it has entered into an agreement to purchase a drydock from a Korean seller, continuing the shipbuilder's ongoing infrastructure investments and expansion of U.S. West Coast drydock capacity. At 640 feet long with a clear width of 116 feet, the new dock will be the third, and largest, at Vigor's Harbor Island shipyard.

ABS Breaks Ground on New HQ

ABS has broken ground on its new global headquarters. Anchoring the CityPlace 2 development, the new headquarters will be located near the intersection of I-45 and the Grand Parkway in the Houston area. "This is an important milestone in our 155-year-young history and re-

affirms our commitment to Houston," said ABS Chairman, President and CEO Christopher J. Wiernicki. "Working with our project partners, we have designed this building to create a collaborative environment that will facilitate communication and promote innovation in direct support of our safety-focused mission." The new world HQ will be a 10-story, 326,800-sq.-ft. building that will house employees from ABS and its affiliated companies.

'K' Line Partners for LNG Crewing

In a meeting in Manila on April 18, OSM signed a joint venture agreement with "K" Line's crewing agency Ventis to provide Filipino crew to "K" Line's entire fleet of liquefied natural gas (LNG) carriers. When the two companies signed the strategic manning partnership agreement, Managing Director of "K" Line LNG Shipping (UK) Ltd., Yuzuru Goto, said, "We believe this to be an excellent partnership, from a supplier with a genuine maritime heritage, understanding of industry operations and aspirations and understanding of our corporate values and organizational culture. This gives us complete peace of mind for future compliance, dependability and importantly for 'K' Line's safe and environmentally responsible operations."

AEGIR-Marine Adds Stabilizer Repair

AEGIR-Marine, full service provider for stern tube seals and propulsion systems for the maritime industry, said it has added stabilizer and steering gear repair services to its portfolio of maritime services. The Dutch company works with brand independent parts and provides service and parts for all major propulsion systems. AEGIR-Marine is now able to offer its ship owning customers a complete and integrated overhaul service.

LR Launches Marine Analytics Service

Lloyd's Register (LR) launched its Marine Analytics service with a methodology that will enable companies to obtain value from operational data and connected assets. According to LR, the biggest challenge associated with data from multiple systems and connected assets, once security has been assured, is knowing how to turn the possibilities into actual commercial and operational value. It is now possible to amass more data more easily but with so much data available, extracting useful and actionable information and insights is a challenge. LR said it is focused on working to co-create solutions, enabling companies to optimize efficiency in operations, asset performance and maintenance, reduce risk and improve safety.

Damen Celebrates "90"

Damen is celebrating nine decades of operations in the shipbuilding industry. From small beginnings in the 1920s, the company has grown into a maritime service provider that employs 9,000. With Dutch roots, Damen's expansion has been global. This growth can be viewed in terms of its yards, service hubs and other subsidiary companies as well as a globally-operating client base. Damen was originally established by two brothers, Jan and Rien Damen, in 1927. From facilities located on the banks of the River Merwede in Hardinxveld, the Netherlands, they managed the growing firm into a well-respected business.

When Kommer Damen took over in 1969, he introduced numerous changes to the ship fabrication process. Advances such as modular construction techniques and series production of standard designs resulted in considerable increases in efficiency. Damen's clients could benefit from shortened delivery times and flexible vessel configurations. The subsequent growth since the late 1960s has been as swift as it was broad. The company's worldwide coverage developed with the acquisition of foreign yards and the establishment of dedicated service centres. The vessel portfolio has grown too – today the company's vessels serve an ever-evolving range of maritime sectors.

Looking ahead, the family roots still drive the business. Kommer Damen's four children all play significant roles in operations: Arnout Damen is Chief Commercial Officer, Rose Damen is Commercial Director at Amels, Annelies Damen manages the corporate properties portfolio, and Bear Damen recently directed the company's corporate film.



Bear Damen, Annelies Damen, Rose Damen, Arnout Damen, Kommer Damen.

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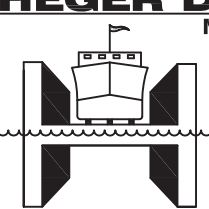
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