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MARITIME REPORTER AND ENGINEERING NEWS

SINCE 1939

FEBRUARY 2019

FUTURE FERRY

Trendsetters blaze the trail

Rebel with a Cause

Cruise designer Tomas Tillberg

Mixed Reality

Holographic tech advances

Offshore Wind Power

The U.S. east coast gains strength

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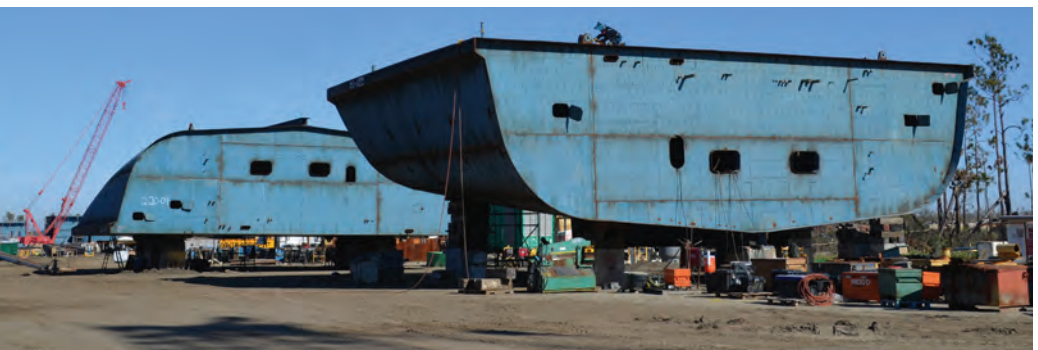

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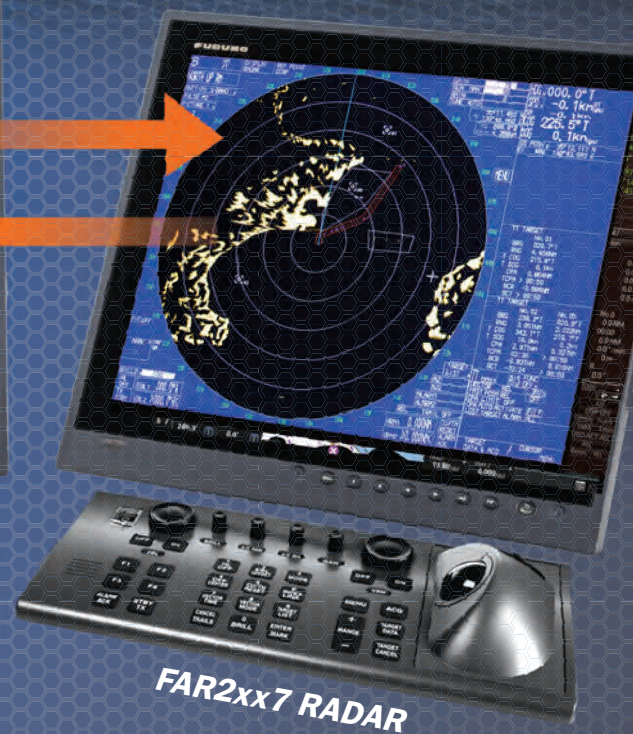

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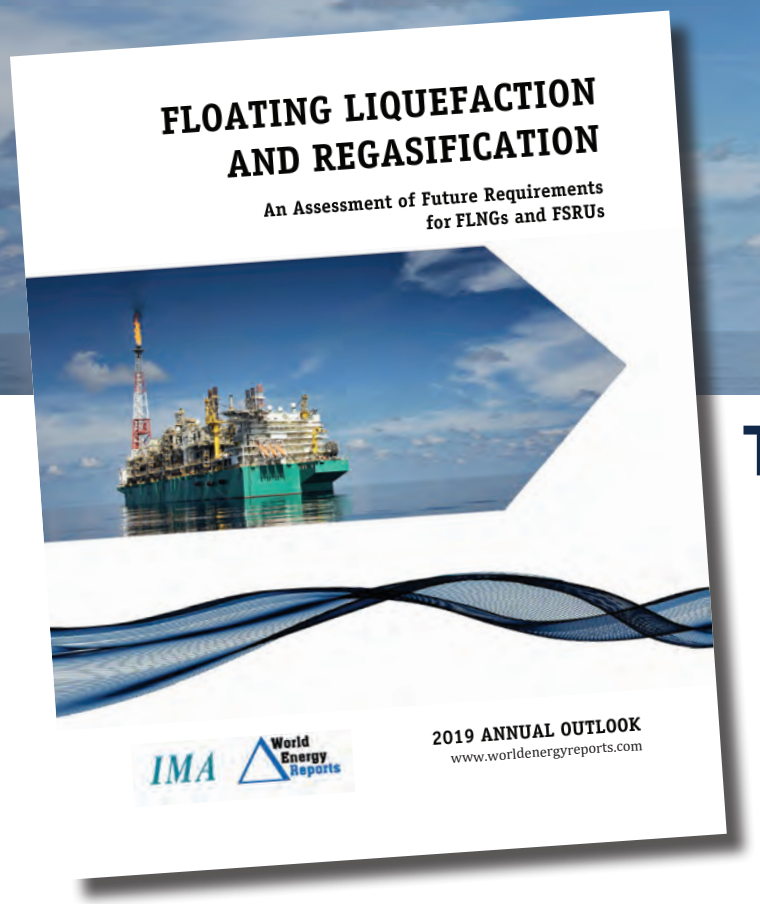

THE 2019 ANNUAL OUTLOOK

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Editorial

Ferry Good

As this is our 'Ferry Annual,' the original intent was to 'rank and report' on the Top 10 ferry companies globally. While nothing is impossible, the self-imposed task at hand proved to be improbable, as simply put the industry is too fragmented with no common measuring stick.

Of course there are some common denominators such as passenger and freight volumes, but is the biggest necessarily the best? There are financial considerations of course, and in a perfect world each company would be publicly listed so that comparison and contrast would be readily available. The are not.

With that, the mandate was posed to one of our regular contributors, Barry Parker, who if you know him well is quite comfortable digging for numerical data across various platforms. After much consideration and discussion, we decided that a hybrid approach – pun intended – was the best course forward, and in this edition, starting on page 26 we look at the true trend setters in the segment, companies that are ahead of the curve and leading the pack in terms of efficiency, creative expansion and environmental stewardship. Many of the names are familiar, some perhaps not, but I invite you to read our report and let the debate begin.

Continuing with the ferry/passenger vessel theme, I am particularly pleased to offer a unique insight into the life and business of **Tomas Tillberg**. I have known Tomas for nearly all of my 25+ years in this position, and simply put he is the definition of 'a gentleman and a scholar.'

Tomas Tillberg is one of those rare people that can engage you in conversation and makes hours seem like minutes, and, as a side, he has a knack for some outstanding passenger vessel design, too! Since I have covered his business and projects innumerable times, I wanted a fresh perspective, and I surely got one. Lisa Overing, our writer in South Florida, spent several hours with this dynamic 74-year-old, and she provides both and business and personal perspective that is truly unique. Her *"Rebel with a Cause"* feature starts on page 20.

While we often cover 'digitalization' trends and focus on technology and technique that is designed to make many facets of the ship design, construction and operation more efficient, I am very pleased to offer a two feature section on Artificial Intelligence.

In the first piece, *"The Amazing World of Mixed Reality"* starting on page 36, our science and technology writer Tom Mulligan goes deep with a Norwegian team that is taking the next step with holographic technology, a system which can tangibly benefit everything from vessel design to crew training in advance of the first cut of steel.

The second feature, *"The Virtual Walk-Through,"* starting on page 40, looks at Elliot Bay Design Group's use of virtual reality as a valuable tool in vessel design, giving owner the ability to experience the space well in advance of final design.

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LNG, Energy, and the Jones Act

Three topics that don't belong in the same sentence. Together, however, they represent finely crafted plan to insert a hairline crack in U.S. cabotage laws. That effort has much bigger designs than just facilitating a few LNG deliveries to the island commonwealth of Puerto Rico.

Remember the time that you caught a stone on your windshield while driving at 65 MPH on a major highway? Remember the hairline crack that developed? Remember how that crack never got any bigger? Yeah, me, neither.

A recent announcement that a New Jersey law firm representing the Commonwealth of Puerto Rico had assisted in preparing and filing an application for a limited Jones Act waiver isn't necessarily earthshaking news. Attacks on the Merchant Marine Act of 1920 – the Jones Act – have come regularly, and in increasing volumes in the past two years. On the other hand, the plea for the waiver predictably preys upon base emotions and little else in substance. In that way, it is perfectly aligned with virtually every other request that comes before it.

In a nutshell, the waiver request relies primarily on the premise that Puerto Rico has some of the most expensive energy costs in the nation, but also leverages the 2017 Hurricane Maria which blew through the island Commonwealth, and notes that repaired electrical infrastructure is being converted from diesel fuel to natural gas. And, it may be of interest to readers that the island is intent on realizing substantial costs savings in that way, as well as being the necessary first step in a larger plan for the island to rely more heavily upon renewable energy sources, such as solar and wind power. That's nice, but it has absolutely nothing to do with the Jones Act.

The law firm also correctly notes that, of the 478 LNG carriers that currently exist in the world, none are Jones Act eligible vessels, and none are owned by U.S. citizens or registered in the United States. Hence, any LNG exported from the U.S. mainland could not be shipped directly to the island on any foreign flag, registered tonnage. But, they aren't unreasonable people. If and when a Jones Act eligible LNG carrier becomes available, the limited waiver simply would expire. Sure. Let's go with that.

Our petitioners also lament, "Absent a waiver, PREPA and Puerto Rico could not purchase U.S.-produced natural gas and would be forced to enter into long-term purchasing contracts with foreign sources of supply." And, they characterize their waiver, if granted, "… a win-win situation for everyone involved."

It's a tired, old playbook one that says that the so-called "Porzio" application for a limited waiver of the Jones Act would be in the United States' economic security and national defense interests. They cite a temporary shortage of saline intravenous bags in the lower 48 in the aftermath of Maria as proof of this national security crisis. That's it. That's the argument. Nevertheless, there are a lot of moving parts to this latest assault on settled, U.S. law.

Puerto Rico Lacks the Infrastructure to Accept LNG (and probably always will)

Actually, a single generating facility on the south side of the island currently receives a supply of LNG from international sources. That should make island lawmakers and residents happy, since it arrives on a foreign hull, from relatively local sources. So, why is it so expensive?

Looking to what the island hopes to accomplish in way of upgrading (and finally cleaning up) their miserably dirty power generating infrastructure, that effort hasn't even started. So, it's a little premature to ask for something that isn't even yet required.

And, what if Puerto Rico does build a marine facility to accept LNG shipments? The business model for LNG involves a lot of things, including but not limited to 'cargo swaps' which might entail a U.S. LNG export cargo headed to one place, in exchange for another coming in from across the big pond. That's how these things work. Gas from international locations is ready and available. Actually, the closest LNG export facility to Puerto Rico is not in the continental United States but is in nearby Trinidad and Tobago.

In the Interest of National Defense

The CBP has repeatedly held in their rulings that a Jones Act waiver cannot be issued solely for economic reasons or economic benefit. The Defense Department has historically analyzed waivers by asking if there would be an "immediate adverse impact on defense operations" absent the waiver. Puerto Rico government officials repeatedly couch their pursuit of in LNG in purely economic terms, like everything else. And, yet, virtually every (credible) study or examination of the matter shows that the Jones Act has little to do with the price of anything on the island. The economic discussion is a non-starter for many reasons, but beyond that alone, it has nothing to do with why a waiver might be granted in the first place.

The American Maritime Partnership responds

In a letter addressed to DHS Secretary Nielsen, the AMP maintains correctly that the granting of this 10-year administrative waiver of the Jones Act for the coastwise movement of liquefied natural gas (LNG) to Puerto Rico is contrary to the letter and spirit of 46 U.S.C. § 501 ("§ 501") on virtually every level and is uniquely unsuitable for a waiver. The letter goes on to say, "In addition, this waiver request is flatly contrary to the 'Buy American, Hire American' policies of the Trump administration and would undermine U.S. national, homeland, and economic security. Finally, approval of a waiver like this would establish a precedent that would severely harm the American maritime industry in Puerto Rico and beyond, and would undermine ongoing efforts to develop a coastwise-qualified domestic LNG fleet." Spot on.

It's a long letter and a good one, but I see little point in rehashing the rest of

it here. When it comes to the Jones Act, the reasons for its requirement – and for its very existence today – go far beyond the letter of the law. That said; it is instructive to recap a few points I've made many times in the past:

The Jones Act and Energy

The long and circuitous course line to legalizing U.S. crude oil and LNG exports has finally come to fruition, producing the results that sane, rational people knew that it would. Greatly benefiting the U.S. economy in so many different ways, some of that being realized in the form of maritime-related jobs and infrastructure spending. Just look at what is happening in the port of Corpus Christi, Texas. The decision to export crude oil and related energy products was a good one.

For the first time in memory, America became a net exporter of energy a couple of months ago. And, if you don't think that's important, just imagine what the trade deficit might now be had this not come about. Sadly, and at the same time it was evolving, domestic interests argued (indeed, demanded) that that U.S. built and flagged LNG carriers and tankers be part of the mix. Fortunately, that never happened.

Energy today ceases to be a geopolitical weapon because we've got plenty, we're free to export it (or not) at will, and we can do so at market prices. But, with naysayer's eyes on the low hanging fruit represented by as many as 5,000 mariner positions and the boon to U.S. shipbuilding, it is understandable that Jones Act stakeholders would embrace the concept. Even GAO says that as many as 100 LNG carriers might be needed to fully satisfy that mandate. Beyond this, the estimated cost of a typical Jones Act compliant, oceangoing LNG carrier would likely be three times as much as it would cost in other places – something that will have to be amortized over time, as a function of the cost of transportation. And, says GAO, it would take 30 years based on current domestic shipbuilding capabilities and infrastructure.

The bigger picture is even more daunting. That's because, based on GAO analysis, these vessels and their associated operating expenses would increase the cost of transporting LNG from the United States, decrease the competitiveness of U.S. LNG in the world market, and may, in turn, reduce demand for U.S. LNG or other forms of energy. And, at this point, you probably think I'm arguing from the position of Puerto Rico. I'm not.

THE LAW FIRM ALSO CORRECTLY NOTES THAT, OF THE 478 LNG CARRIERS THAT CURRENTLY EXIST IN THE WORLD, NONE ARE JONES ACT ELIGIBLE VESSELS, AND NONE ARE OWNED BY U.S. CITIZENS OR REGISTERED IN THE UNITED STATES. HENCE, ANY LNG EXPORTED FROM THE U.S. MAINLAND COULD NOT BE SHIPPED DIRECTLY TO THE ISLAND ON ANY FOREIGN FLAG, REGISTERED TONNAGE. BUT, THEY AREN'T UNREASONABLE PEOPLE. IF AND WHEN A JONES ACT ELIGIBLE LNG CARRIER BECOMES AVAILABLE, THE LIMITED WAIVER SIMPLY WOULD EXPIRE. SURE. LET'S GO WITH THAT.

The Jones Act has its place. That place has nothing to do with commerce coming to or from our shores; from and to other places. Puerto Rico today receives 75% (or more) of its goods and services from foreign sources, at market prices. They could get their toothpaste from Belgium or their lumber from South America. Island trade with the U.S. mainland is robust and it is robust because it makes good economic sense. If it didn't, they'd be getting their goods from somewhere else. You could argue that Puerto Rico actually has the best of both worlds. And yet, they want it both ways: to be a part of world's greatest economy, to sleep under the blanket of freedom, but only obey commerce laws when and if it suits them.

Never Let a Good Crisis Go to Waste

The most recent assault on the Jones Act – that is, until this ludicrous proposal arose in the past week – came in the choppy wake of Hurricane Maria. The line (then) from Jones Act opponents is that the Jones Act was solely responsible for the slow and painful recovery there. Taking a page from Winston Churchill, these folks 'never let a good crisis go to waste.'

Without discounting the horrible tragedy that the storm represents, it is also true that the Jones Act has absolutely nothing to do with whether the needed aid and supplies got inland to those who needed this help the most. Nevertheless, President Trump waived Jones Act shipping restrictions for Puerto Rico at the request of the island's governor, Ricardo Rosselló and after an outcry from Congress about the scarcity of fuel, food and emergency supplies following Hurricane Maria. The move briefly placated local residents and responders who felt that the U.S. flag operators were the cause of not only this crisis, but indeed, all of their problems. Ultimately, when recovery does come, it won't have anything to do with who delivered the goods in the first place.

Local Efforts, Global Implications

More than U.S. flag vessels, a local commitment – and an environmentally correct one at that – are also important. They also have nothing to do with national defense, but since anti-Jones Act activists can make peripheral arguments, so too can we. U.S. flag shipping has provided reliable and regular service to the island for many years. That's not going to change, and, in reality, it may be one of the things that help the island to recover.

Within the last three years, Crowley Puerto Rico Services executed a $48.5 million construction contract for a new pier at its Isla Grande Terminal in San Juan, Puerto Rico, further solidifying its commitment to the region. They now operate some of the cleanest tonnage on the planet, all it servicing Puerto Rico. They are not the only U.S. flag operators to do so. In conjunction with the investment, the company and the Puerto Rico Ports Authority (PRPA) also concluded a 30-year lease extension for the Isla Grande property. That kind of investment – and local commitment – is exactly what is likely to create jobs and prosperity, with associated tax revenues. What about simple, one-off port calls from a low cost flag of convenience carrier? Not so much.

A Hairline Crack

Even a very small crack in the law which will provide the necessary sealift capacity to defend our very shores in the next overseas conflict – and it is coming in this dangerous time that we live in – will endanger our ability to respond. Make no mistake about it. And, a 10-year waiver for the transport of energy to the island of Puerto Rico will eventually be the beginning of the end to the Jones Act. That's because; you are either pregnant, or you are not. There's no middle ground.

This request for a limited waiver to satisfy local LNG demand is nothing more than a head fake. Puerto Rico, should it ever even get to the point where it can import LNG in large volumes, will choose to get that LNG from foreign sources. That's just economics. What they really want is to insert a tiny crack in the Jones Act. It didn't work in the immediate aftermath of Maria, and if common sense prevails, it won't happen now. Next month, it'll be something else.

A tiny crack will eventually grow into something bigger. Eventually, your damaged windshield had to be replaced. Similarly, regional exclusions to Jones Act laws will evolve into the end of the U.S. flag fleet and what's left of our already inadequate sealift capacity.

All that said; there are options for the Commonwealth. They can, for example, go their own way with independence. Deep down inside, however, they know that won't go well. So, they want to have it both ways. We can't let that happen.

Dennis L. Bryant
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U.S. ***Legislative*** *Update*

The recently-enacted Frank LoBiondo Coast Guard Authorization Act of 2018 included a number of provisions impacting the maritime community. The most comprehensive impact involved major changes to the ballast water management system (BWMS) requirements, which I addressed in a previous article. This article will address other provisions of interest in the Act.

A provision (46 USC § 3305(d)) was enacted to improve the consistency in marine inspections between Officers in Charge, Marine Inspections (OCMIs) and deduce disparities between USCG Sectors. It would also require the Coast Guard to provide persons affected by a decision or action by an OCMI or the Marine Safety Center all information necessary for such person to exercise any right to appeal such decision or action. It is unclear how this provision interacts with the Freedom of Information Act (FOIA).

A manufacturer, distribution, or dealer that installs propulsion machinery and associated starting controls on a covered recreational vessel is required to equip such vessel with an engine cut-off switch and engine cut-off switch link that meet American Boat and Yacht Council Standard A-33 as in effect on the date of enactment of this Act (4 December 2018). The requirement enters into effect on 4 December 2019. Unfortunately, the provision (46 USC § 4312) does not provide for later amendments to the engine cut-off switch standard.

The statute relating to logbook entries (46 USC §11304) was amended to clarify that logbooks may be kept in electronic form and to clarify the requirement for entries regarding illness of or injury to a seaman, including the nature of the illness or injury and the medical treatment provided.

The period of validity of certificates of documentation for recreational vessels and for renewal thereof has been extended to five years (46 USC § 12105(e)).

The Secretary of Transportation has been charged with responsibility to provide for the establishment, sustainment, and operation of a land-based, resilient, and reliable alternative timing system to that currently provided by GPS (49 USC 312). The system must provide wide-area coverage and be synchronized with coordinated universal time (UTC), be extremely difficult to disrupt or degrade, and work in concert with and complement any other similar positioning, navigation, and timing systems, including enhanced long-range navigation systems. This long-overdue provision effectively requires the restarting of the eLORAN system, but will require time to fully implement.

Section 515 of the Act amends 46 USC § 2102(41), but it clearly meant to amend 46 USC § 2102(31) relating to scientific personnel on board oceanographic research vessels so as to include individuals receiving instruction in oceanography or limnology. This error should be addressed in a later technical amendment.

Section 516 of the Act is intended to enhance the transparency of the vessel documentation process by requiring prompt publication of any letter of determination issued by the USCG National Vessel Documentation Center (NVDC). It also requires to Comptroller General to conduct an audit to the USCG process for issuance of letter of determination and the coordination with the US Customs and Border Protection (CBP) and the Maritime Administration (MARAD).

Section 824 of the Act directs the Comptroller General to conduct a comprehensive review of the processes and resources used by the Coast Guard to implement vessel response plan (VRP) requirements of OPA 90. The review must include those processes used by the Coast Guard to approve VRPs; to approve alternate planning criteria used in approving such plans; to verify compliance with such plans; and to act in the event of a failure to comply with the requirements of such plans. The review must also include an examination of all federal and state agency resources used by the Coast Guard in carrying out those processes; an analysis of how those processes ensure compliance with applicable law and are implemented in the field; a determination regarding whether asset and equipment mobilization time requirements under approved VRPs can be met by the vessels to which they apply; and recommendations for improving those processes.

This provision could constitute the first in-depth third-party analysis of the VRP program since its implementation in 1993. That program has greatly enhanced the response to oil spills from vessels and reduced the volume of oil entering the water from vessels, but there is always room for improvement, particularly after 25 years.

The Coast Guard is directed to prescribe regulations that treat marine throw bags as a type of lifesaving equipment and allow carriage of such throw bag as an alternative for one additional throwable personal flotation devise on rafts that are 16 feet or more overall in length (Section 827).

The Coast Guard is directed to develop a performance standard for the alternative use and possession of visual distress alerting and locating signals for recreational vessels (Section 828). It should be noted that a recent USCG policy letter provides guidance for acceptance of electronic visual distress signal devices (eVDSDs) that are evaluated as meeting the design and performance requirements of RTCM Standard 13200.0 as equivalent to electric distress lights certified to 46 CFR § 161.013.

The Coast Guard is directed to amend its regulations to eliminate the requirement that a mariner actively using the mariner's credential complete an approved refresher or recertification course to maintain a radar observer endorsement.

This rulemaking is exempted from the requirements of the Administrative Procedure Act, thus requiring no advance notice and comment (Section 829). There are a number of provisions relating to commercial fishing and re-

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lated vessels, which will not be addressed here. The Act makes a number of technical amendments regarding the Coast Guard. It reorganizes Chapter 14, United States Code, relating to the organization and responsibilities of the Coast Guard. It codifies the Ports and Waterways Safety Act (PWSA) and transfers those provisions into Title 46. It moves the provision regarding regattas and marine parades from Title 33 to Title 46. The provisions relating to the regulation of vessels in the territorial waters of the United States (sometimes referred to as the 'Super 6' provisions) are updated so as to make clear that such provisions are enforced by the Coast Guard. Last but not least, the establishment, function, and membership of the various National Maritime Transportation Advisory Committees have been codified.

THE COAST GUARD IS DIRECTED TO AMEND ITS REGULATIONS TO ELIMINATE THE REQUIREMENT THAT A MARINER ACTIVELY USING THE MARINER'S CREDENTIAL COMPLETE AN APPROVED REFRESHER OR RECERTIFICATION COURSE TO MAINTAIN A RADAR OBSERVER ENDORSEMENT. THIS RULEMAKING IS EXEMPTED FROM THE REQUIREMENTS OF THE ADMINISTRATIVE PROCEDURE ACT, THUS REQUIRING NO ADVANCE NOTICE AND COMMENT (SECTION 829).

FMC Provisions

Title VII of the Act adopted provisions relating to the Federal Maritime Commission (FMC). The FMC is tasked with conducting analyses of the impacts on competition for the purchase of certain covered services by alliances of ocean common carriers acting pursuant to an agreement. At the same time, the definition of 'certain covered services' has been amended to include the berthing or bunkering of vessels; the loading or unloading of cargo to or from a vessel to or from a point on a wharf or terminal; the positioning, removal, or replacement of buoys related to the movement of the vessel; and, with respect to injunctive relief, towing vessel services provided to such a vessel. The agency is authorized to require a common carrier or marine terminal operator to file a periodical or special report related to the entity's business. The public is now allowed to submit relevant information following the publication in the Federal Register of the notice of filing with the FMC of agreements. Ocean transportation intermediary (OTI) provisions have been tightened to reduce abuses. Ocean common carriers are prohibited from knowingly and willfully accepting cargo from or transporting cargo for the account of a NVOCC that does not have an FMC tariff or an OTI that does not have a bond, insurance, or other surety as required by the FMC. A conference or group of two or more ocean common carriers is prohibited from negotiating with a tug or towing vessel service provider on any matter relating to rates or services provided within the United States by those tugs or towing vessels. The FMC is required to submit biannual reports to Congress describing the Commission's progress toward addressing the issues raised in each unfinished regulatory proceeding. The Comptroller General is directed to conduct a study that examines the immediate aftermath of a major ocean carrier bankruptcy and its impact through the supply chain.

NOAA Provisions

Title X of the Act adopted several provisions impacting the National Oceanic and Atmospheric Administration (NOAA). Expenditures through 2013 are authorized for hydrographic surveys and related duties, as well as for the agency's Arctic programs. NOAA is directed to develop and implement a system to track and report the full cost of hydrographic data collection, including costs relating to vessel acquisition, vessel repair, and administration of contracts to procure data and to develop a strategy for increased contracting with nongovernmental entities for hydrographic data collection. Provisions were also adopted for possible changes in homeports of some NOAA research vessels.

Summary

The above discussion addresses provisions in the Act that I feel have the most impact on large segments of the maritime community and that have received minimal analysis elsewhere. There are numerous other provisions that are of equal or greater importance to smaller segments of the community, but space does not allow for their inclusion here.

Chad Fuhrmann
Fuhrmann graduated from the U.S. Merchant Marine Academy in 1998 and sailed internationally for 10 years as a licensed engineering officer. In 2008, he shifted focus shoreside consulting in dynamic positioning and marine operations, taking his current position with MAC as North American Operations Manager for Maritime Assurance & Consulting in 2014.

Keel-to-Keel Precycling

A modest proposal that, during inevitable future market downturns, would help to give quality hulls a second life.

It would be an understatement to say that the offshore oil and gas industry experienced an oversupply of marine assets during the recent downturn. Much like industrial landfills, forsaken land plots piled high with the unusable remains of human consumption, "slipfills" located in hidden bayous and backwaters around the Gulf of Mexico and elsewhere are overflowing with the remains of the boom market of the pre-2014 oil and gas sector.

Having apparently outlived their usefulness, these assets are left to the effects of rot and rust, unceremoniously stacked and hidden from view like so much unusable junk. But this is not junk. These vessels and rigs are multi-million dollar, technologically advanced marvels of industry designed for the safe and efficient support of some of the most complex feats of engineering humanity is – so far – capable of undertaking.

In the general consumer market, the concept of precycling has been introduced in an effort to cut down the everyday trash humans produce. Briefly speaking, this concept espouses the avoidance of unnecessary material which cannot be eventually reused for an additional function outside of its original intended purpose.

The precycling concept attempts to effectively eliminate the need for recycling or outright disposal by addressing end-of-service-life concerns at the product design stage.

Unfortunately, marine assets such as drill ships, rigs, and Offshore Support Vessels (OSV) were designed with little more than single functions in mind. With narrowly focused industrial missions and limited flexibility in design these advanced platforms are considered useless in lean markets or when the next generation of technology is introduced. It is perhaps time that the same precycling philosophy is considered for application on a larger scale to marine assets.

Past to Present – Recycling by Any Other Name ...

Vessels and rigs are generally not "recycled" until the end of their service life, at which point they are broken down in a resource heavy, labor intensive and environmentally detrimental manner. The remaining materials are then disposed of permanently or sold as scrap. Vessels Value Ltd. has stated that as of March 2018, 43 vessels had been sold for scrap. That number is up a total of 153% from the same period in 2017. This is a small percentage of the 3,500 OSVs in the global market. Bearing in mind that approximately 1,200 vessels remain in layup and the market is not yet stabilized, that number is likely to increase.

This begs a question, that if a laid-up asset is deemed to have some useful service life remaining could many of these idle assets be repurposed for other applications outside of their original design missions?

This is not an entirely new concept in the maritime industry. Far from it. Throughout history, merchant vessels have repeatedly been modified to serve functions in support of military sealift and national defense operations. The reverse is likewise true of military to civilian conversions. Civilian and military assets have also been modified to serve alternate purposes as deemed necessary by market, political, or even social environments including disaster response activities and other missions with humanitarian objectives.

This trend continues with current efforts at repurposing available assets for unique applications in a changing industry. Offshore wind and fishing industries serve as two examples. As demand for offshore wind energy gains momentum here in North America organizations are looking to existing assets to provide the project support needed for various stages of installation and maintenance including drill ship conversion projects for wind farm installation functions. Likewise, companies are looking to fulfil the needs of the fishing industry with the conversion of existing OSVs into fishing trawlers and processing vessels. More recently, industry organizations such as the National Offshore Safety Advisory Committee (NOSAC) have been tasked with addressing the needs for response and recovery activities using assets that are already available, specifically OSVs.

Indeed, numerous entities and industry sectors have demonstrated some innovative approaches of late as alternatives to scrapping. Nevertheless, the industry in general has exhibited a remarkable lack of imagination.

The National Science Foundation recently awarded a $121.88 million grant to Oregon State University for a new research vessel. This vessel would be the first of three vessels with potential further funding to increase to $365 million. Likewise, with the support of local government representatives the U.S. State Maritime Academies have increased efforts pushing for the funding of much needed training vessels.

A comparison between idle OSVs and the specifications for these new vessels might indicate that, while additional work and redesign would be required (along with innovative thinking), existing assets could be converted for comparable functions more economically and with less environmental impact than undertaking a newbuild approach. While this may very well be an arguable point, the potential economic benefits certainly justify consideration.

Unfortunately, it is accepted with little dispute that a singular purpose in design limits the service functions to which existing assets may be applied. Ignoring a vast supply of relatively new vessels, commercial and academic organizations are continuing to choose much more expensive newbuild options over repurposing existing assets.

Keel-to-Keel vs. Keel-to-Scrap

All of this leads to the consideration of a potentially new philosophy in vessel design and industrial mission. As was too often the case in the past, the maritime industry continues to be very narrowly focused when considering the design and mission of its floating assets. Assets are built with a "keel-to-scrap" philosophy in which they are designed with a single industrial mission in mind. This leaves them with (apparently) limited opportunities if the asset's intended market unexpectedly loses its profitability or new technology becomes commercially viable sooner than anticipated.

If existing assets are considered to be too limited in their design and intended function, even with additional years and potentially decades of service life available, the maritime industry needs to start at the beginning by designing assets with features and capabilities that allow them to adapt and function across industry sectors and in varying market environments.

In short, the industry needs to consider precycling its assets.

As it is applied to the marine industry, precycling begins in the design phase of an asset such as a rig or vessel. Applying a Keel-to-Keel philosophy the evolution of a precycled asset follows the form and substance of its primary market as well as its potential markets and is not restricted to its original mission. Precycling enables a relatively simple repurposing of an asset through varying market conditions, extending its useful service life, and mitigating the end-of-life environmental impact even before the build stage.

Precycling also creates opportunities for flexible maritime assets to be utilized in training future maritime professionals on practical platforms. As the maritime industry becomes increasingly homogenized, technologies once exclusive to specific sectors are now ubiquitous across the industry. Precycled assets that can be more easily modified can serve as pragmatic testing facilities for advanced technologies and simultaneously serve as training platforms that can continuously evolve along with the demands and requirements of a quickly changing industry.

Conclusion – "Cold Iron Ready"

Even if an asset is determined to be so unique in its industrial mission that it cannot be easily repurposed, precycling can still serve to mitigate the effects of fluctuating markets. In a manner of speaking, assets may be "designed for stacking" with considerations in place to allow for easier stacking, maintenance, and reactivation. This would be particularly applicable in view of the recent downturn during which many assets were delivered directly from the builder into a laid-up status. Innovations such as cold ironing, normally used for larger deep-sea vessels, can be applied to other maritime assets better equipping them for short- or long-term layup periods and allowing for more efficient reactivation.

Precycling marine assets involves determining the varied industrial missions that a rig or vessel's design may accommodate and other purposes it can serve outside of its primary industry sector. As markets and industry demands change, vessels designed for evolving service functions will continue to be competitive in varied applications and industry sectors.

While there is little appetite for added complexity in the current market environment, a long-term vision is critical for weathering the ebbs and flows of the maritime industry.

Mike Corrigan
A former energy industry executive, Mike Corrigan has been CEO of Interferry since April 2017. Previously he spent 14 years in leadership positions at BC Ferries - one of the world's largest ferry operators - in his native Canada, the last five as president and CEO.

*A **Sustainable** Future*

Interferry CEO Mike Corrigan explains how the global trade association's networking and lobbying support has helped position the ferry industry as a visionary force in the ever-changing world of shipping

In every walk of modern life, the relentless pace of change serves as a reminder that 'necessity is the mother of invention'. Faced with a constant tide of commercial, technical and regulatory pressures, the ferry industry typifies this motivational spirit. Furthermore, it is leading by example in taking a proactive rather than purely reactive stance in order to stay ahead of the fit-for-purpose game.

Ferry companies are increasingly emerging as the trendsetters on issues relevant to the entire shipping world. By anticipating and not just responding to the need for change, they have a long-term mindset that views challenges not merely as potential problems but as future-proofing opportunities.

Many of Interferry's members – more than 240 operators and suppliers in 37 countries – are in the vanguard of operational and technological innovations. The roots of the operators' progressive outlook can be traced in part to a long track record of overcoming major commercial threats such as competition from budget airlines or fixed-link bridges and tunnels. Added to the imperative to foresee shifts in market forces, an ever-changing political and regulatory regime has imposed huge demands regarding the efficiency and safety of vessels.

The most forward-looking operators constantly plan for such factors affecting their business climate and invest in solutions that will protect and grow their viability way into the future. At customer-facing level, they research evolving requirements and positively shape the market by introducing new products - not only extending their A to B transport offering, but also providing a genuine leisure experience both onboard and through extensive excursion, mini-cruise and vacation programs. The resulting consumer demand, coupled with the financial and regulatory compulsion for ultra-efficient vessel performance, has prompted a notable boost in newbuild orders, with the latest ferries setting an industry-leading benchmark in ship design and operation.

Image courtesy Interferry

A packed house at a recent Interferry conference.

The role of Interferry

With U.S. origins dating from 1976, Interferry is the only association representing the ferry community worldwide and is now recognized as the industry's global voice. The founding aim of networking is epitomized by our annual October conferences, which attract hundreds of delegates at venues all over the world. The 2018 conference – our 43rd – was held in Cancun, Mexico, and this year we are heading to London, which is very familiar to us as home of the all-important United Nations agency the International Maritime Organization (IMO).

Over the years, Interferry has developed a crucial lobbying mission, notably through consultative status at the IMO. As such, we have the vital ability to help shape – not simply respond to – the IMO's safety and environmental regulations. Similar access to national authorities also gives us major input on these and other key issues such as security.

Safety, security and the environment are at the core of our activity, which is largely conducted through specially-formed committees. The past year or so has seen particular progress in these areas, which we believe will benefit not only our members but the shipping industry and society at large.

The most recent example relates to our Domestic Ferry Safety Committee, formed to help reduce an estimated toll of at least 1,200 deaths per year in developing nations. Two-thirds of these fatalities stem from seven countries, topped by the Philippines, Bangladesh and Indonesia. Having identified drivers for change, the committee was tasked with finding potential collaborators and sought a grant from UK charity the Lloyd's Register Foundation, which supports safety-enhancing education and research in transport and engineering. In January, we were delighted to win Foundation funding to study the dramatic improvement in Philippines ferry safety over the past decade. The project is designed to help other developing nations by producing a 'lessons learned' report.

Committee members have already taken part in various safety summits in Asia. The latest of these took place in China in November. The following month, China persuaded the IMO to consider launching a widespread study of domestic passenger vessel safety after citing Interferry's long-established interest in the subject.

Elsewhere, Interferry is closely involved in European Maritime Safety Agency studies on fire protection, initially focused on vehicle deck electrical connections and detection/extinguishing systems. We have voiced concerns over certain proposals that might suit newbuilds but seem less practicable for retrofitting on existing ships. Findings will be presented at the IMO later this year.

In another highly topical initiative, Interferry has formed a knowledge-sharing security committee. Comprised of specialists from 12 operators, the members have concluded that security should be tailored to the varying needs of specific operators and routes, rather than adopting blanket measures. Guidance on 'possible measures' is now being developed to help operators identify appropriate solutions.

Last summer we lobbied in favor of the bespoke approach after France proposed screening all ferry passengers on vehicle decks. Alarmed at the potential for accident or terrorist action in confined spaces, Interferry helped to persuade a rethink allowing local authorities and individual ferry companies to determine measures based on a terminal-by-terminal risk assessment.

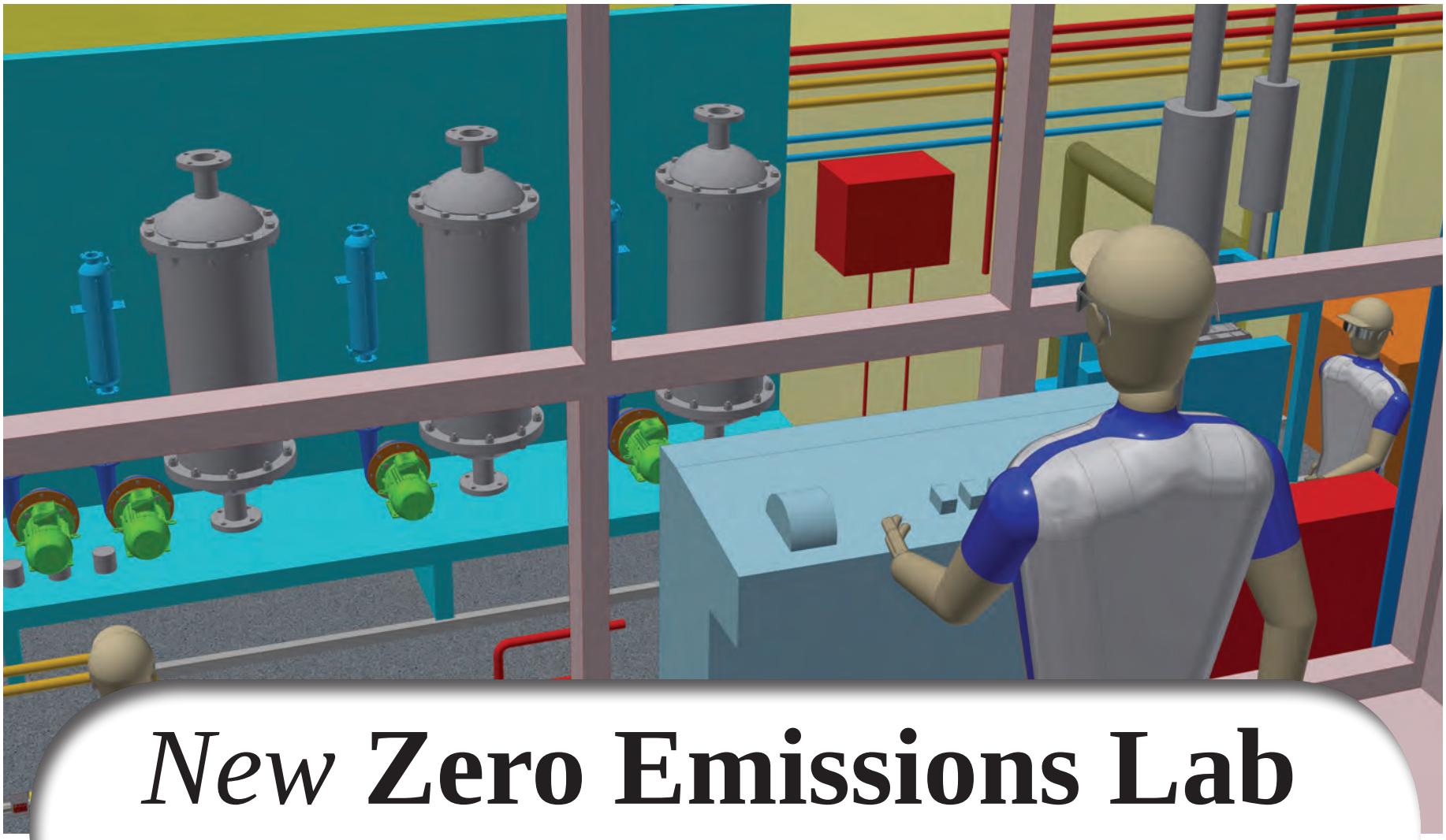
More recently the committee has been looking at stowaway issues, a particular problem in the Mediterranean region. Interferry has also engaged with the CSO Alliance of maritime company security officers – a support network of some 700 members in more than 40 countries – regarding a cyberattack initiative and plans for a dedicated partnership linking ferry ports and operators.

Last but far from least, the influence of our Regulatory Committee has had a truly astounding impact in protecting the viability of the ferry industry. Much of this work derives from government and maritime authority proposals on environmental protection, where the main focus is on reducing emissions. Interferry utterly supports the drive towards a greener planet, but equally we argue that any measures must take account of the sector-specific design and operational requirements of ferries.

Last year, the IMO accepted our case for a critical 20% correction to the Energy Efficiency Design Index calculation formula for RoPax and RoRo vessels. Our 'one size does not fit all' lobbying also won confirmation that, in contrast to tightened requirement for some other ship types, the original improvement targets – set at 10% by 2015, 20% by 2020 and 30% by 2025 – would remain in force for ferries.

We respect the IMO's aim to halve shipping's absolute carbon footprint by 2050, but relevant interventions remain a priority. Moves to mandate speed reductions are a current concern, because slow steaming is less feasible for short-sea timetables as opposed to deepsea schedules. Meanwhile the quest to reduce shipping emissions largely centers on adopting alternatives to heavy diesel fuel. Ferry operators are showing the way with solutions ranging from low-sulfur diesel to LNG, electrification and hybrid technology. Looking further ahead, Interferry itself is part of the six-nation, European Union-backed Hyseas III project launched last summer to develop the world's first seagoing, zero emissions ro-ro ferry powered by hydrogen from renewable sources.

The initiative amply demonstrates Interferry's belief in a 'Stronger Together' work ethic. Last year we welcomed 34 new members to the association, including a surge from Central and South America thanks to our Cancun conference venue. Sharing our vision of strength from unity will ensure that the ferry industry remains supremely progressive when facing the challenges and opportunities that lie ahead.



New Zero Emissions Lab *for Pioneering Research*

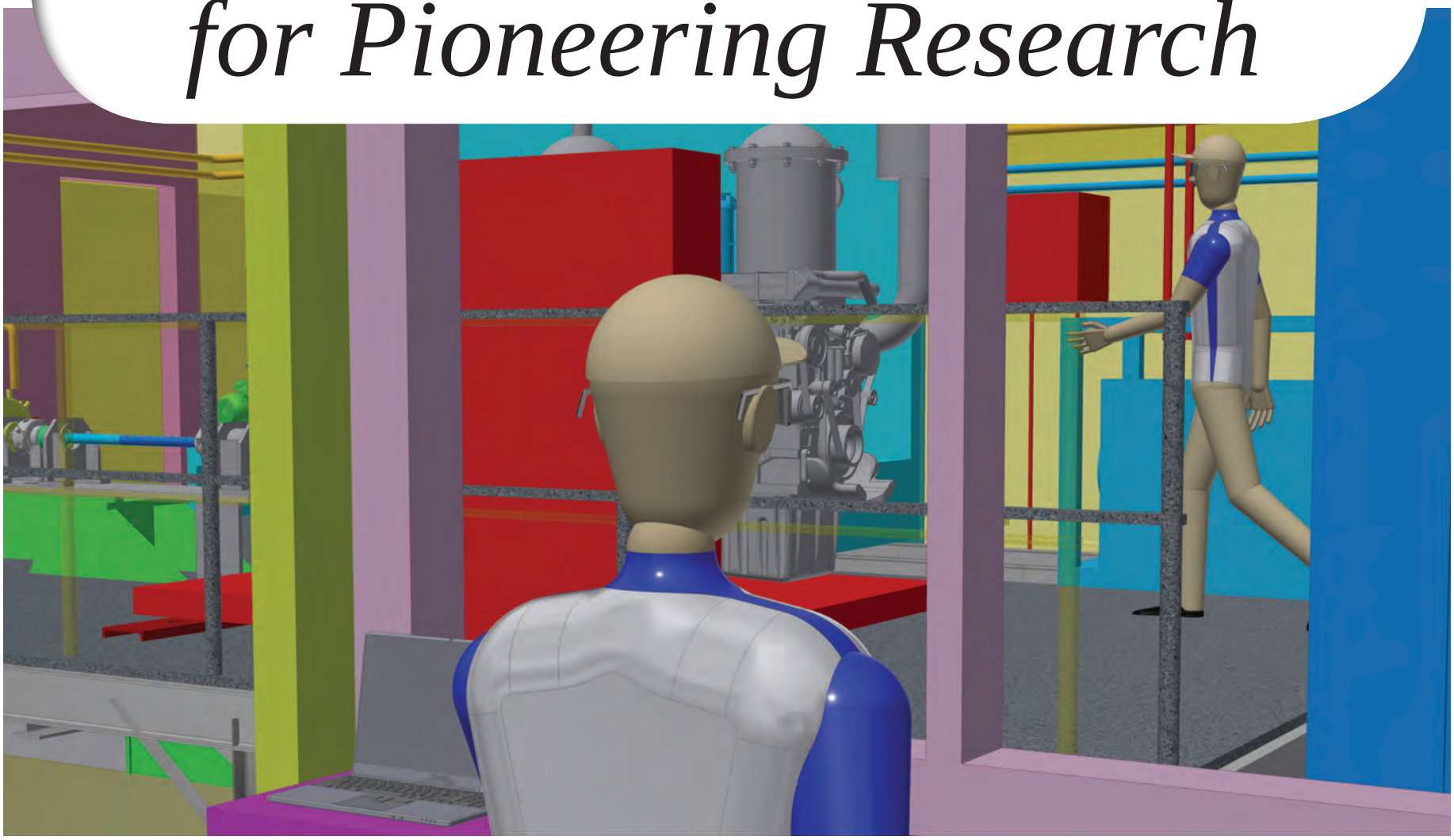


Image courtesy MARIN

Moritz Krijgsman
Moritz Krijgsman is senior project manager at MARIN. MARIN offers simulation, model testing, sea trials and training to the shipbuilding and offshore industry and governments. **m.krijgsman@marin.nl**

MARIN has developed a research and configuration test environment: the Zero Emission Lab (ZEL), uniting hydrodynamics with future ships' propulsion and power systems. The transition from conventional propulsion and power systems, based on burning fossil fuels, to future systems that do not produce any harmful emissions requires a digital and physical research and test environment to be utilized by the whole maritime sector.

Therefore MARIN is working on 'Hydro Systems Integration' to support the transition towards vessels that have no harmful exhaust emissions. A major initiative involves the extension of the existing cavitation tunnel facility to develop the new Zero Emission Lab. This engine room of the future integrates power and the hydro propulsion system and enables the representative coupling of the propulsion hydrodynamics with the power supply. ZEL is a test facility for the research and testing of future marine propulsion and power systems, applying realistic, dynamic operating profiles. On the one hand, ZEL will contain the physical hardware of the future engine room. Typical power components are fuels cells, batteries, super capacitors, electric machines, advanced internal combustion engines and a gearbox for hybrid solutions. Supporting components are storage for energy carriers, electrical infrastructure in DC and AC, advanced automation and control systems and integrated cooling and HVAC systems.

On the other hand, the engine room hardware connects to the hydrodynamics through a real propeller in the cavitation tunnel and an additional electric machine which is controlled by sophisticated hydrodynamic algorithms. These simulate the dynamical behaviour including acceleration and deceleration, cavitation and ventilation, behaviour in waves and manoeuvring, etc. With simulation, monitoring and big data technology, a so-called digital twin of the ZEL will be developed as well. The digital building blocks enables us to build and operate ships in virtual reality. The digital twin accounts for scaling (effects) and effective system integration. This concept fits well with the focus on the complete lifecycle of ships and the ambition to make them smarter and cleaner. With the help of these facilities, risk and costs will be substantially reduced.

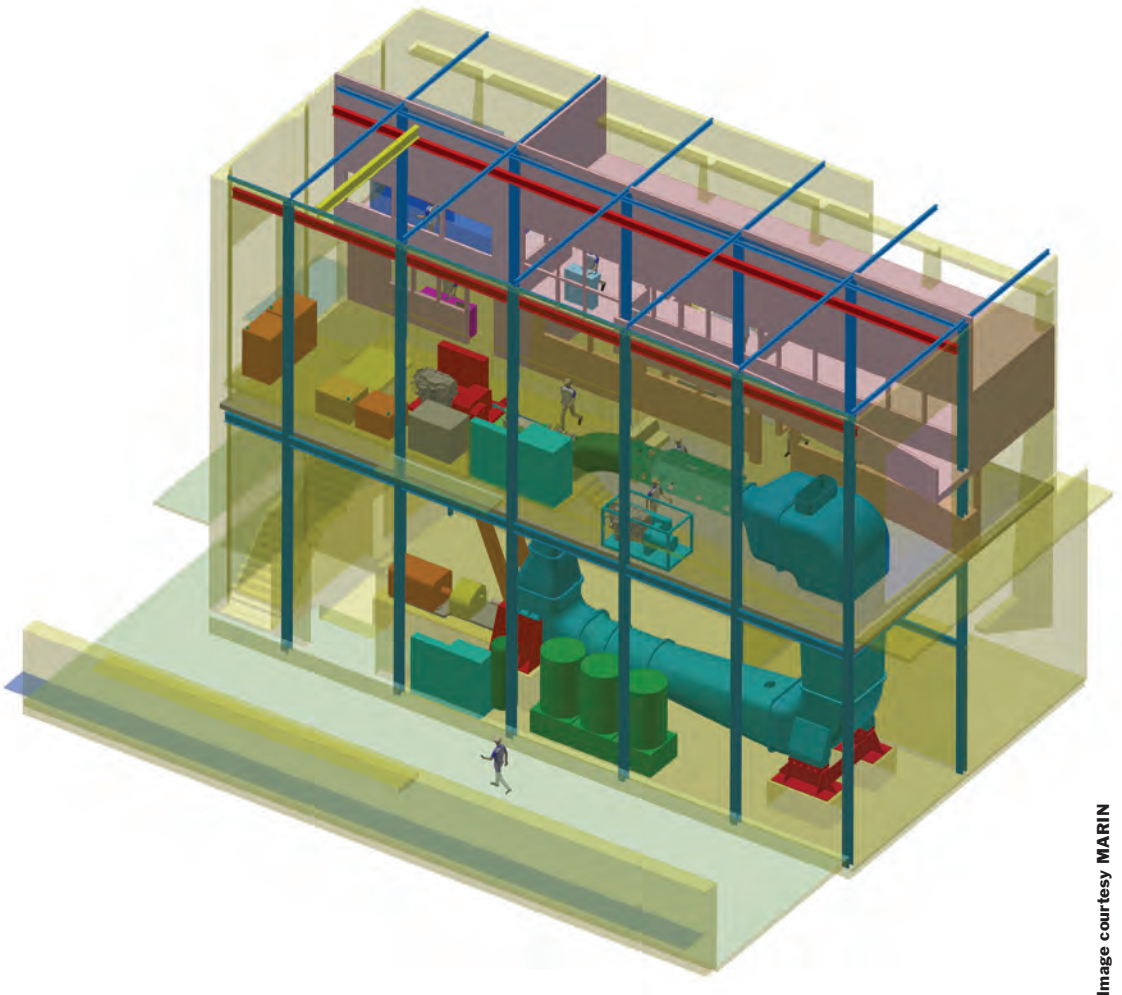


Image courtesy MARIN

Wind Energy Markets:
Plenty of Supply, Growing Demand

By Tom Ewing

This is an honor: getting to start Maritime Reporter's new column on renewable offshore energy. In the coming months, this column will home in on technological, market, and policy related issues impacting offshore renewable energy. The goal: to provide insight on the size, shape, direction and speed of developments within this energy sector. And a big related goal: information helpful to companies who will construct energy facilities, sail and operate project vessels, and invest in offshore energy ventures.

The focus is timely. In its 2019 "Annual Energy Outlook" the US Energy Information Administration (EIA) projects that electric generation from renewables (wind, solar, hydro) will go from 500 billion KWh in 2018 to 1500 billion KWh in 2050, just 30 years from now. "The AEO highlights the increasing role of renewable energy in the U.S. generation mix," said EIA Administrator Linda Capuano. "Solar and wind generation are driving much of the growth. In fact, our reference case projects that renewables will grow to become a larger share of U.S. electric generation than nuclear and coal in less than a decade."

In this new iteration of renewable energy, politics is hardly the singular driver. Rather, it's economists crunching generation cost numbers.

With gas, discoveries of vast, new recoverable supplies slashed prices to the extent that gas could replace coal for base-load generation. With wind, technology is driving down prices (after all, the fuel – wind – is free, can't get much cheaper). Consider: according to Berkeley Labs, national wind power purchase agreements (PPA) in 2009 were as high as 7¢/kWh. In 2017, the average was around 2¢/kWh. True, that price includes federal tax credits and it's based on the cheapest generation areas – not offshore.But the price trend is the lesson. And that trend will never stop because it is linked to the most valuable resource there is: human intelligence, ingenuity, imagination, the ultimate resource now at its most rich and productive because every Thomas Edison in the world can be working on the same problem at the same time.

THE US ENERGY INFORMATION ADMINISTRATION (EIA) PROJECTS THAT ELECTRIC GENERATION FROM RENEWABLES (WIND, SOLAR, HYDRO) **WILL GROW FROM 500 BILLION KWH IN 2018 TO 1500 BILLION KWH IN 2050.**

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Of course, if you live in Boston or Baltimore or Norfolk inexpensive wind power from Wyoming or Nebraska can't form the core of your region's energy portfolio. You need generation closer to home – ocean-based wind. Today, leadership in coastal cities and states want offshore wind to become an increasingly larger portion of their generation mix. How to do that – how to build an entirely new generation fleet from the ground up, so to speak – that is the inquiry behind this column.

A great place to start: the Bureau of Ocean Energy Management, i.e., BOEM's website, of course, not a DC road trip. As a resource, BOEM's site is rich and dynamic and national in scope. It is not a research site. It provides the who, why, what, where and when of real work and real projects drawing real money.

Likely, you are familiar with BOEM's site. However, if you are newly researching projects and project development, if you're wondering how to best engage in a specific project, if you're looking for names and contacts, at federal and state levels, place BOEM/Renewable-Energy at the top of your favorites. (Unfortunately, BOEM's website was not updated during the federal government shutdown.)

Wind is not the only energy source under BOEM's purview. Note that hydrokinetic energy – energy from waves and currents – is an emerging technology, also overseen by BOEM. (Those projects are on the radar for future columns, particularly one in Massachusetts that got a strong push-back from state and federal reviewers.)

For a test-drive, click on the New York Bight link to review the extensive levels of information available. Couldn't make the November 28 NY Bight Task Force meeting in Midtown Manhattan? BOEM's site makes you an insider, minus the off-line networking. As might be expected, documents and presentations are posted. But so is a meeting summary, including the sign-in list; a nice way to build up your contacts, and have the right questions ready (or better yet, the right answers!) when you need to contact the right person.

Many East Coast states have initiated off-shore wind plans, or at least planning. In addition to New York's efforts -

- **New Jersey has committed to 3,500 MW of offshore wind by 2030.** And NJ, of course, is part of the planning for NY Bight developments.
- **In 2018, MA passed the "Act to**

Advance Clean Energy" (H.4857), directing the Department of Energy Resources to investigate "the necessity, benefits and costs" of procuring of up to approximately 1,600 megawatts of wind generation. Perhaps even more noteworthy is that in December BOEM announced the nation's highest grossing competitive lease sale for renewable energy in federal waters, approximately 390,000 acres offshore Massachusetts. Competitive bids from three companies totaled approximately $405 million.

- **VA has a proposed ocean-based wind energy block about 20 miles from Virginia Beach.** In December, VA was advised by BVG Associates, an energy consultancy, to "create a 'Virginia Office for Offshore Wind' to provide a clearinghouse and facilitator to advance offshore wind." Another recommendation: "Work toward a multi-state regional supply chain cluster, offering the industry a wide network and the best of what each state has to offer." In other words, get busy lining up the business prowess that can get this work done.
- **In 2016 and 2018 BOEM approved** leases for two project sites off Delaware's coast.

In 2017, the US Department of Energy (DOE) released a study titled "An Assessment of the Economic Potential of Offshore Wind in the United States from 2015 to 2030." Lead authors are Philipp Beiter and Walter Musial from DOE's NREL – National Renewable Energy Laboratory.

This Assessment is a hard-nosed, green eyeshade analysis. It builds on two important metrics: (1) The "levelized cost of energy" and (2) The "levelized avoided cost of energy." The first is straightforward, referencing a competitive market price expressed in dollars per megawatt-hour. The second, the avoided cost, presents value in an energy market. After all, if power isn't needed within a particular market, or can't meet certain operating conditions, such as time-of-day or peak-load demands, or can't replace stand-by capacity, even a very low price may not have value in system operations.

Using these metrics, the NREL team assessed the economic potential of offshore wind at more than 7000 US coastal sites between 2015 and 2027. Importantly, this assessment did NOT include policy driven incentives and subsidies; it did not include "carbon pricing" or tax credits or favorable state policies. It just focused on the declining cost of wind power. Some important conclusions:

- Even a small change in levelized cost or avoided cost has the potential to trigger significant changes in the amount of a wind project's economic potential.
- Offshore wind sites with economic potential (at least in the Atlantic) are located predominantly in the Northeast and Eastern shore of Virginia.
- Technology drives price. Consider these modeled estimates:
- In 2015, at $150/MWh or below, 40 gigawats (GW) of capacity were available, all for fixed bottom turbines and zero for floating turbines (likely needed in the Pacific).
- In 2022, at $150/MWh or below, a total of 870 GW could be available – 480 from fixed bottom turbines and 390 for floating. But critically, a total of 290 GW would be available below $125/MWh and 4 GW (fixed bottom) below $100.
- In 2027, a total of 1790 GW would be available below $150 (600 fixed; 1190 floating); 1280 below $125 (520 fixed; 760 floating) and 450 GW available under $100/MWh (240 fixed; 210 floating).

This is theoretical progress, of course; something that's promising shouldn't imply promises. NREL cites several critical factors necessary to foster and advance US offshore wind. These include:

- Continued investments in technology innovation;
- Developing a domestic supply chain commensurate with European offshore wind supply chains;
- That European cost reductions are relevant to US conditions;
- Policy decisions that may support prices: e.g., tax credits, carbon pricing, loan guarantees. Or, decisions that can decrease "net value," e.g., regulatory uncertainty and market barriers.

New offshore wind will be difficult and expensive, at every stage. But people aren't going to do without electricity and renewables are the only game in town right now. Coal and nuclear – new or expanded – are off the table, just about everywhere. Natural gas is supposed to be a "bridge fuel," something to get us to 100% renewables, and people are increasingly insistent about that bridge notion – consider the extensive and vehement opposition to critical gas projects from Pennsylvania to New Jersey to Massachusetts to Maine. People want may cheap energy but what they really want is cheap clean energy.

That's where offshore wind has a lot of potential. Time to get started.

Next month: A closer look at Virginia's plans to build a regional supply chain.

VOICES: Tomas Tillberg

Rebel With a Ca

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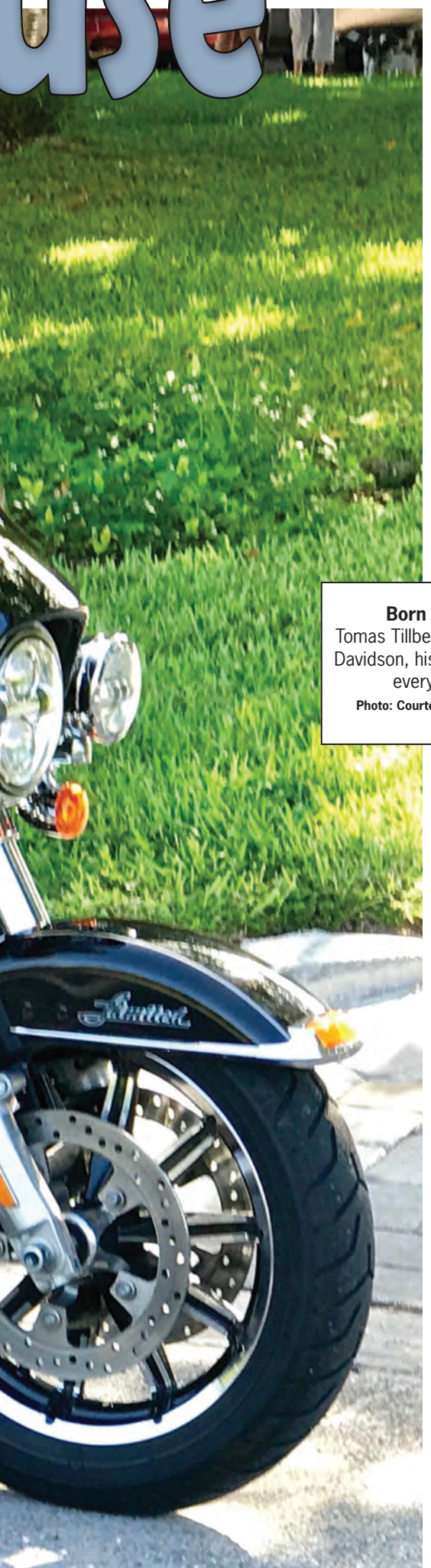

Born to be wild.
Tomas Tillberg rides his Harley Davidson, his third motorcycle, every weekend.
Photo: Courtesy of Tomas Tillberg

Designer Tomas Tillberg's quest for freedom breaks down barriers and expands to China, where his team builds China's first expedition cruise ships putting Antarctica - and the most remote, mysterious parts of the world - within reach.

By Lisa Overing

All for freedom. Freedom for all. Tomas Tillberg could be Harley Davidson's new poster boy. As he views the open road from behind his handle bars, he's filled with an amazing feeling of personal freedom.

With formal training from Royal Academy of Arts in Stockholm, Tillberg's artistry expresses his aspiration for independence. A jellyfish ascending like a sunrise into a sky of fair weather clouds, a gallery-worthy effort, adorns his office. Artists think about the world and share their vision by brushstroke. Mental easels abound for Tillberg, 74, especially Antarctica, itself, where the company's new line of expedition ships will take travelers to vast, huge slates of ice creating a white, continental canvas.

On the wide, open road around Lake Okeechobee, the roar of the Rolling Stones in surround sound provide Tillberg's soundtrack to cruise a highway of possibilities on his touring edition motorcycle in solitude, unless his new, Argentinian wife is saddled up behind him.

"This motorcycle is made for two," he said, smiling. "Most people will be surprised to know I am remarried. I am so lucky to have her," said Tillberg, 74, of his second wife. Married the first time for 43 years, the mother of his two children passed away about four years ago.

His father, Robert, founded Tillberg Design, but the second generation doesn't foresee a third at the helm. With two capable partners, Carlos Reyes and Nedgé Louis-Jacques, and a team of stars, Tillberg enjoys making deals, matching clients with the right partners and smart financing, logical associations derived from a lifetime of successful, global networking. An example of such is Tillberg's partnership with SunStone Ships, which launches China's first expedition cruise ship in August, with 10 hulls delivered in the next five years.

"The costs are very favorable," said Tillberg. "Both

VOICES: Tomas Tillberg

Colonies of confident penguins, evidencing no fear of humans, approached Tillberg in Antarctica.

Photo: Courtesy of Tomas Tillberg

Majestic mountains of ice form natural sculptures in Antarctica.

Photo: Courtesy of Tomas Tillberg

At the English station of Port Lockroy in Antarctica, Tillberg's party went ashore and enjoyed displaying a directional cone to avoid a potential traffic jam.

Photo: Courtesy of Tomas Tillberg

Tillberg's team designed the interior for M/V Ocean Atlantic for Albatros Expeditions, photographed in Antarctica.

Photo: Courtesy of Tomas Tillberg

financing and building cost. China is very interested in getting in the cruise ship market and there are more ships built now than ever in history."

Originating in Sweden, Tomas Tillberg Design & Associates is headquartered in Fort Lauderdale with offices in Hong Kong and Bogota. In delivering the ultimate cruise ship passenger experience, his firm designs all passenger spaces: all interiors; suites; bars; lounges; crew areas; cabins; and decks; sometimes, signage and art.

"It has all changed," he said of the cruise ship industry, from project build sizes to interior materials to itineraries.

"There are new materials, not just linen, wool and cotton and teak decks. Now there are synthetic decks. One relatively new, really cool material comes from husks of rice compressed to look almost like teak."

Staying apprised of the latest maintenance-free materials for cruise ships is a constant evolution, as is managing 400 suppliers. Ships get bigger and bigger with more players and offerings.

An aging fleet of smaller cruise ships over 30 years old presents opportunity with Tillberg's near-encyclopedic knowledge of cruise ship evolution and niche markets.

"The yards were there and began building specialized ships which evolved to cruise ships. The European yards are booked out four to five years. It's another reason why we were interested in China. Just around Shanghai there are 200 shipyards, but only a few are really big and capable of building cruise ships. There is a lot of capacity for cruise ship building in China today."

Ocean liners from Europe to America became the world's first cruise ships which evolved into Finland, Germany, France and Italy producing the majority of cruise ships today. Converted ferries were Miami's first offerings to the Caribbean. Then routes sprung up through the Mediterranean, and to Asia. Today, passenger options are virtually unlimited with expeditions to the Polar regions, Amazon and practically anywhere on the globe.

"Expedition cruising is an active lifestyle," he said, "but there is no ice rink or Las Vegas show, the main attraction is nature."

The expedition passenger experience is the polar opposite of the typical booze-cruise, sun-worshiping, singles scene on many cruise ships. There is a lecture lounge, not a show lounge. An expedition ship's purpose is engaging the destination, not lazing inside. The layout includes mudrooms for passengers to wash and sanitize their boots pre and post voyage ashore, and change into warm clothes and life vests. There's no palm-lined gangway to disembark in Antarctica.

Tillberg's face lights up with fascination discussing Antarctica, his mind filled with fantastic images of nature. He urges all travelers to become explorers on expedition cruise ships to experience this continent's pure and innocent splendor.

"Just approaching Antarctica is as if one is approaching another planet," he

Inspired by his travels, **Tillberg created Cosmic Whale** (left, above) on his iPad, where he can realize ideas quickly. The electronic image is more like a photo he would paint, such as his original oil rendition of **The Whale and The Cloud** (left, below).

Art by Tomas Tillberg

said. “It’s remote and vast and a bit mysterious, too. There are high mountains, active volcanoes and ice. Yet the wildlife around its shores is just astonishingly vibrant. Once you’ve visited on an expedition ship, you also become an ambassador for Antarctica, if only because it’s such an awe-inspiring place. Pods of whales and colonies of penguins are amazing, and so different from a cruise to Mexico. These colonies of penguins come ashore once a year and nest. They are not afraid; they walk up to you.”

On ship checks, Tillberg gets to Antartica about twice a year. The air is clean; the mood as majestic as the mountains of ice above and below the surface.

“A whale dove under the Zodiac,” he mused. “You could almost touch it. It is hard to convey that experience. You expect that feeling with a horse or dog but don’t expect to connect with a whale. It happened so fast, just this gentle giant.”Expedition ship cabins are not huge, but they are comfortable, designed with minimalist, warm colors using soft natural materials. There are storage areas for cameras, boots, and cold weather gear, sans the panache. The average expedition ship’s capacity is 160 - 200 passengers. The cabin arrangement views the deck and beyond for passengers to enjoy a singular, emotional experience of this remote, pristine frontier.

Perhaps the expedition cruise ship passenger manifest is its own kind of brotherhood, akin to Harley culture.

“Some bikers look dangerous,” he said of the often superficial, first impression of Harley riders. “But you find the nicest people. You think you wouldn’t want to meet some in a dark alley. Then you find out this guy’s a surgeon. You tell ‘em what you ride and you’re part of the gang. It’s unpretentious. A unique experience.”

Photo: Zenitel

Photo: Greg Trauthwein

Dastol

Zenitel Group is a growing force in the world of maritime and offshore communications, as Kenneth Dastol, CEO & President, Zenitel Group, explained.

By Greg Trauthwein

Please give an overview of Zenitel Group today.
The Zenitel Group is the leader of intelligent communication systems. We are located in 18 countries around the world with more than 300 employees after the acquisition of Phontech. Approximately half of the staff is working out of Norway, the rest is spread out with about 30 employees in U.S., 25 in Singapore, 25 in France 25 in Croatia and the remaining employees in Denmark, Sweden, India, China, Middle East, Brazil, Columbia etc.

We realize Zenitel is diverse in the markets it serves. Put in perspective the size, shape and direction of the maritime and offshore businesses to your overall?
Zenitel is organized around five segments being, maritime, oil & gas, security & safety, industry and transportation. The maritime and oil & gas is representing 60% of the overall business after the acquisition. We believed all segments will grow, as maritime and oil & gas are turning back on investments.

Looking back at the year and considering only the maritime and offshore markets, what are the business highlights?
The business highlight is that we are beating the market by taking market share in maritime and oil & gas. We are adding new nice references to our already important history. This on top of finalizing the Phontech acquisition. This acquisition is adding technology, products and capabilities to the Norwegian entity. But as previously said, we have now added #2 to #1 in this market.

And the technical highlights?
We continue to invest largely in R&D and technology and have released new products and solutions over the past 12 months as we have done the years before. All the profit generated in Zenitel is kept and invested in people and technology.

Where do you see opportunity?
We have seen that it has started to be invested in oil & gas worldwide. There are not many new builds, but as the activity is increasing, there is more activity in the retrofit market. This is good for us as we have a huge installed base both on the Norwegian continental shelf as well as in the Gulf and outside Brazil. For maritime we see an increased demand in smaller vessels, workboats where we have products that fit very well. We have also seen more activity in the cruise market, exploration cruises and the fishery fleet.

What are the major drivers for your business today in the maritime and offshore markets?
Products that brings intelligibility, interoperability and "ilities. Crew welfare and operational efficiency

How is Zenitel investing today?
We invest the majority of our funds in internal growth activities, mainly increasing staff in sales and the technology development. We are also always looking for external growth opportunities, acquiring three companies in the last five years. This will be a big focus for me also in the coming years.

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Ferries to the F

Shipbuilding Metal Shark has found strong business in the domestic ferry market as conjested cities look to the waterways for relief.
Photo Credit: NYC Ferry

Photo Credit: Greg Trauthwein

The ferry business, unlike more industrial parts of the shipping business, touches wide swaths of the world's population across continents. The membership of Interferry, the leading trade group for the industry, with non-Governmental organization (NGO) status at the International Maritime Organization (IMO) includes 200+ members from all parts of the ferry spectrum. These include passenger ferries (including fast ferries), Ro/Pax and cruise ferries operating globally. In selecting "the best" we looked beyond the league tables of "the most" (passengers) and "the biggest" (fleet size). **Instead, we identify important trend setters.**

By Barry Parker

Passenger transport on ferries is old news around Europe and Asia, while in North America, ferries are in growth mode. The U.S. Department of Transportation's Bureau of Transportation Statistics described the boom around San Francisco, noting in a 2017 report: "This resurgence… has prompted the construction of new ferry vessels, terminals, and route segments to create additional transportation options in an area where roadways and other public transportation options are overcrowded, or where there previously was no other accessible public transportation."

The connection with passengers puts ferries into the public consciousness. Not surprisingly, leading operators are at the forefront of a leading trend: sustainability, where LNG fueling is gaining traction. Alternative fuels, methanol and battery power are also moving from naval architects' wish-lists, past the drawing boards to actual deliveries. The ferry business is not all about relaxing journeys; ferry companies are not immune from geopolitics. As we go to press, concerns about the logistical implications of Brexit are looming large around docks in the United Kingdom and northern Europe.

The LNG wave, which brings reduced emissions of sulfur, nitrogen and particulates, along with decreased costs amidst abundant gas supplies is occurring across geographies. Gas makes sense for ferries, which operate in predictable routes, enabling certainty of fuel supply, usually in coastal regions, often with tight emission standards. The first LNG fueled ferry was Viking Lines' Viking Grace (2,800 passengers, 500 cars, 75 trailers), delivered in 2013 from the former STX Turku, and presently in the Stockholm/ Turku run across the Baltic Sea.

In North America, BC Ferries, with routes serving the Canadian coast from Victoria (at the bottom of Vancouver Island, across from Washington State) up

Delft Seaways
is on the Dover - Calais cross channel run.
Photo Credit: DFDS

MORE THAN HALF OF WASHINGTON STATE FERRIES' 23-VESSEL FLEET IS SCHEDULED TO BE RETIRED BY 2040. **THE FERRY SYSTEM NEEDS 16 NEW VESSELS IN THE NEXT 20 YEARS,** INCLUDING 13 FERRIES TO REPLACE VESSELS DUE FOR RETIREMENT AND THREE ADDITIONAL VESSELS **...CALLS FOR ELECTRIFYING THE FERRY FLEET TO REDUCE FUEL USE, EMISSIONS, NOISE AND MAINTENANCE COSTS."**

Suquamish in Elliott Bay during sea trials in July 2018.

Photo: Washington State Department of Transportation

as far as north as Prince Rupert, is converting two of its largest vessels to LNG. Its Spirit of British Columbia (2,100 passengers/crew and 358 cars capacity) returned to service in June, 2018 after being converted at the Remontowa Ship Repair Yard S.A., in Gdansk to run on LNG. The vessel is serving the Vancouver (Tsawwassen) to Victoria (Swartz Bay) run. Its sister vessel, Spirit of Vancouver Island, is expected to complete its conversion in mid 2019. Three smaller vessels, dual fueled with LNG or low sulfur diesel fuel, Salish Orca, Salish Eagle, and Salish Raven (each 600 passengers/ crew and 138 cars capacity serving other parts of the system) were delivered to BC Ferries from the Polish yard, all in 2017.

Ferry operators in the San Francisco Bay region are at the forefront of moves to non-fossil fuel sources, especially renewable diesel (fuel made from animal fats and greases, for example). A number of the operators around the Bay Area are in the early stages of this transition, in 2019- these include private operators Hornblower, Golden Gate Ferry, Blue and Gold, and the municipal operator

Stena Lines

RoPax vessel Stena Germanica.
Route: Gothenburg - Kiel.
Photo Courtesy Stena Line.
Photographer: Ann-Charlotte Ytterberg
Drone Pilot: Robert Nyström

BC Ferries

BC Ferries passing.
Photo Courtesy BC Ferries

Viking Gabriella
runs between Helsinki, Finland and Stockholm, Sweden.
Photo: Viking Lines

Baleria's
Hypatia de Alejandria and Marie Curie
Photos: Baleria

San Francisco Area Ferries – Red & White Fleet
Photo Courtesy BAE Systems

Viking Line

San Francisco Bay Ferry – operated by the Water Emergency Transportation Authority (WETA). In September 2018, Red and White Fleet, another private operator, launched Enhydra, a 600 passenger (built by Bellingham, Wash., yard All American Marine) powered by lithium batteries- with redundancy provided by a Cummins (EPA Tier 4) diesel engine. Red and White is also constructing an experimental vessel powered by hydrogen fuel cells.

Washington State Ferries (WSF), operates an extensive system 24.5 million people a year. Its landside hubs run to islands stretching from Point Defiance (near Tacoma) northward to Puget Sound and further out to the Olympic Peninsula and Swartz Bay (Vancouver Island). The system had previously been exploring LNG conversions, and is now looking at battery power. In January, 2019, WSF released a Strategic Plan looking out to 2040. The operator, part of the state's Department of Transportation, says: "More than half of Washington State Ferries' 23-vessel fleet is scheduled to be retired by 2040. The ferry system needs 16 new vessels in the next 20 years, including 13 ferries to replace vessels due for retirement and three additional vessels to fill in when other ferries are out for maintenance and to respond to growth." WSF says that its plan "…calls for electrifying the ferry fleet to reduce fuel use, emissions, noise and maintenance costs." Class society DNV GL, working alongside state officials in its "Maritime Blue" initiative, cite the electrification (borrowing from concepts being developed for Norwegian vessels operated by Color Line and others) as a key demonstration project.

In New York City, a new ferry network begun in mid-2017 (operated by West Coast based Hornblower Cruises), reaching areas inaccessible by subways and bus routes, has greatly exceeded initial expectations. Statistics from the burgeoning NYC Ferry show a passenger count of at a 6 million annual rate in mid-2018 ; ridership in 2023, as new services come online, is projected to be 9 million.

European operators are among the largest (qualifying them for a traditional "Top 10") but also among the most forward thinking- gaining them a mention here.

The Spanish ferry operator Baleària (which connects mainland Spain with the Balearic Islands and with Northern Africa) has developed a strategy which couples newbuild orders for gas powered vessels with conversions of existing ferries to dual fueling. In 2017, Baleària ordered two LNG-fueled ferries from the Italian yard Cantiere Navale Visentini, after a 2016 order gas powered ferry from the Spanish shipyard LaNaval. In late 2018, it announced a plan to convert five existing ferries, Naples, Abel Mat-

Baleària

Red & White Fleet

utes, Sicily, Bahama Mama and Martín i Soler- to dual fuel propulsion over a three-year span. The two other LNG fueled vessels, Hypatia de Alejandría, and Marie Curie (each 800 passengers, 150 cars and 2,100 lane meters for cargo) are also being readied for early and mid-2019 deliveries from the Italian yard.

Baleària also announced plans to build an LNG fueled 1,200 passenger catamaran fast ferry for Mediterranean service at the Armon shipyard in Asturias (in northern Spain), with delivery for mid-2020.

Stena Line, an industry stalwart, is a major catalyst as the ferry industry switches over to the cleaner fuels. Stena Line has ordered a half dozen vessels from the Avic International yard in China for delivery through 2021, five of which are "LNG ready" while a sixth vessel in this "E-Flexer" series of RoPax vessels (1,000 passengers, 3,100 "lane meters", or approx. 1,300 cars), ordered in mid-2018, will run on LNG (dual fueled).

The new ship be delivered into a 10-year charter to Brittany Ferries, running between Portsmouth, on the English Channel, and Bilbao - Santander, in Spain. Stena Line will operate three of the E-Flexers in its runs across the Irish Sea; another will be chartered long-term to the Danish outfit DFDS (on the cross-Channel Dover/Calais route).

The fifth will also be put into a Brittany Ferries charter (also on the run between the UK and Spain). In 2017, Brittany Ferries had ordered an LNG fueled vessel, Honfleur, 1,680 passengers, and 2,600 lane meters (roughly 1,000 cars) from the Flensburger yard, for delivery in Q2 2019. The vessel, with a price at around $230 million, will run between Portsmouth, and Caen- on the Normandy coast.

In 2015, Stena Line had converted its Stena Germanica to run on methanol at the Remontowa yard. The vessel services the Gothenburg/Kiel run. With a corporate focus on sustainability, it is also moving towards electrification – with its Stena Saga now tied in to the electrical grid during port calls in Oslo, 14 of its 38 vessels can now connect to electricity during port visits.In future years as attention to sustainability becomes standard practice, further electrification, digitalization and then-automation will likely drive "Top 10s." As a prelude, Finferries, which serves ports throughout Finland, announced a successful demonstration of autonomous operation (in conjunction with Rolls Royce) on the double ended car ferry Falco on a short voyage between two ports in the archipelago south of Turku. Wartsila has conducted a similar project in the fjords south of Bergen, Norway- demonstrating autonomous capability, on the hybrid powered Folgefonn, owned by Norled. Rolls Royce is working with Fjord1 on a similar project.

Ferries: By the Numbers

By Barry Parker

The traditional measures for "Top 10"s are annual passenger counts and vehicle counts. The big players of the industry, who rank near the top of these leaderboards, can be found across continents. We've presented lists showing the top operators, by these standard measures. We've also added a few others. The source for the data is a 2015 economic study done for the WSF's parent organization, showing 2013 rankings; we've tried to update with 2017 figures where possible.

Baleària: Baleària is a Spanish shipping line in passenger and cargo services to the Balearics, providing connections between the islands and the mainland ports of Barcelona, Valencia and Denia. At the international level, Baleària has an ambitious expansion plan, we operate in Moroco through the Algecrias-Tangier route and Almeria-Nador route and in Algeria through Valencia-Mostaganem route. While also offering services between Fort Lauderdale, Fla., and the island of Grand Bahama, under the Baleària Caribbean brand. Baleària by the numbers: 3.7m passengers, 1,500 employees and 30 boats.

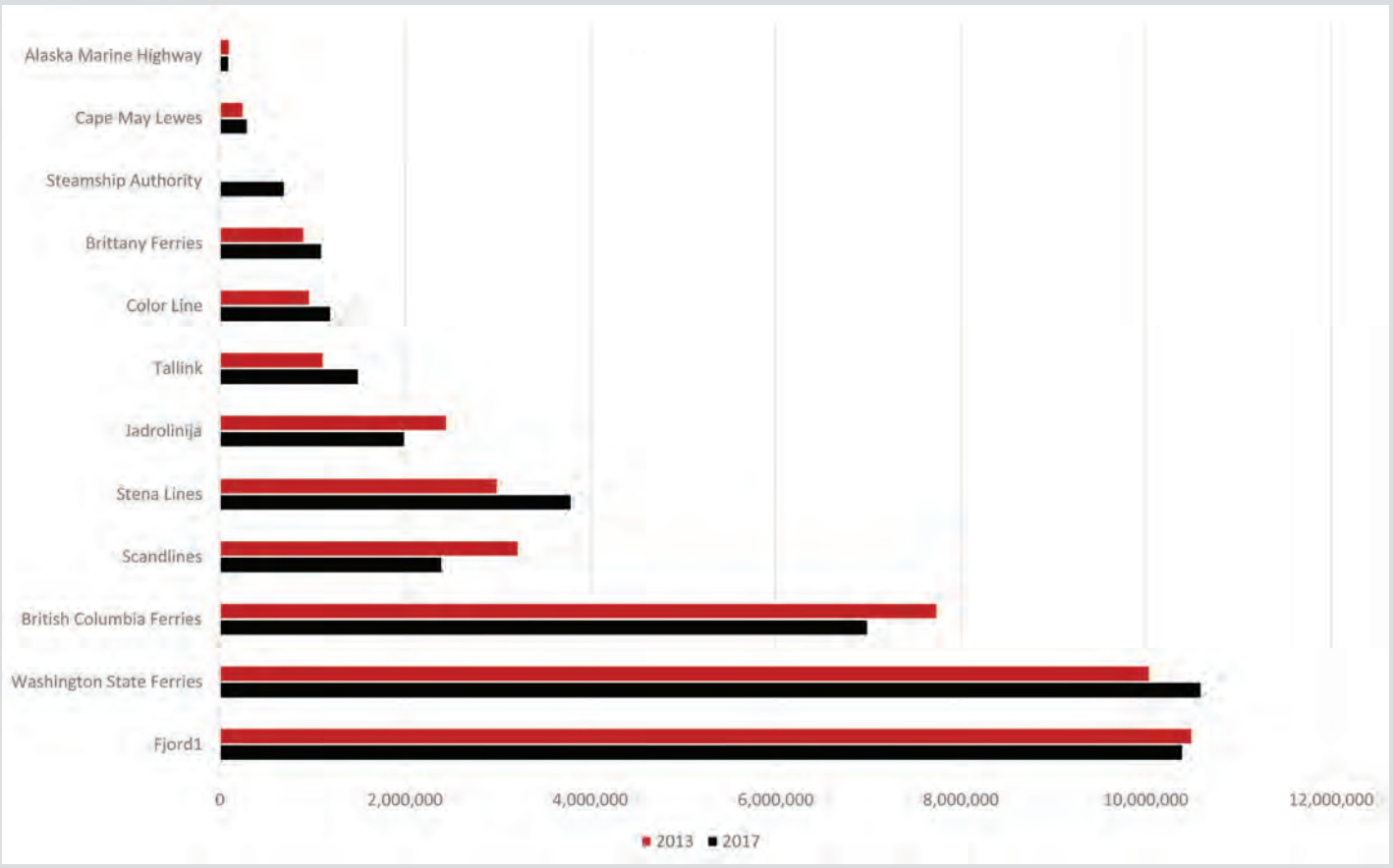
BC Ferries: BC Ferries is one of the largest ferry operators in the world, providing year-round vehicle and passenger service on 25 routes to 47 terminals, with a fleet of 35 vessels. We are an essential transportation link that connects coastal communities and facilitates the movement of people, goods and services.

Brittany Ferries: Based in northern France, Brittany Ferries serves U.K., Ireland, and Spain (including runs from the U.K.). The fleet includes seven Cruise/ Car Ferries, and the high speed (42 knot) Normandie Express- running between Portsmouth (U.K.) and Cherbourg in three hours. Routes for the Cruise/ Ferries include the more lengthy 20 hour trips from Plymouth (U.K.) and Cork (Ireland) to Santander (Spain).

Color Line: Color Line has passenger, vehicle and cargo routes linking its home base in Norway with ports in Sweden, Germany and Denmark. Its routes are served by a mix of fast ferries, Ro-Pax vessels and two cruise vessels with car decks. A new hybrid vessel is set to enter the Sandefjord (Norway) / Stromstad (Sweden) route in 2019.

DFDS: This Danish operator (linked to the well known Lauritzen family), calling itself "The

Top Ferry Operators: Cars & Freight



SOURCE:
Maritime Reporter & Engineering News; Statistics are an estimation based on the author's investigation of public records, requests for information and and interviews.

NOTE:
Two operators omitted due to lack of current information, but likely to have some of the highest capacity numbers in the world, include Istanbul Deniz Otobusler (Turkey) & Transtejo Soflusa (Portugal).

World's Largest Ferry Operator" traverses the well known Copenhagen / Oslo route, but also maintains a large cross Channel business between England and France. Its runs also link Finland Lithuania and Estonia with Germany and Sweden. DFDS also operates a sizable waterborne freight and logistics network, in northern Europe but also throughout the Mediterranean serving ports including Tunis, Trieste and Istanbul.

Fjord1: Fjord1 started in western Norway in the 1850s. The operator, which claims to have a 50% market share in Norway as smaller local companies have been subsumed into a bigger entity- is listed on the Oslo stock exchange. Though its routes are mainly in western Norway- on short runs around Stavanger, Bergen and further north as far as Trondheim, it has expanded into a run adjacent to the Oslofjord. Because of its service in environmentally sensitive regions, it has been a leader in electrification- with a building program of two dozen battery powered vessels (all having hybrid generators for back-up) continuing through 2019. It is also working with Rolls Royce on automated operations for short crossings.

San Francisco Bay area Operators

Ferry operators in the San Francisco Bay region are at the forefront of moves to non-fossil fuel sources. Private owners Hornblower, Golden Gate Ferry, Blue and Gold, and the municipal operator San Francisco Bay Ferry – operated by the Water Emergency Transportation Authority (WETA). In September 2018, Red and White Fleet, another private operator, launched Enhydra, a 600 passenger vessel powered by lithium batteries with redundancy provided by a Cummins (EPA Tier 4) diesel engine. Red and White is also constructing an experimental vessel powered by hydrogen fuel cells.

Staten Island Ferry & NYC Ferries

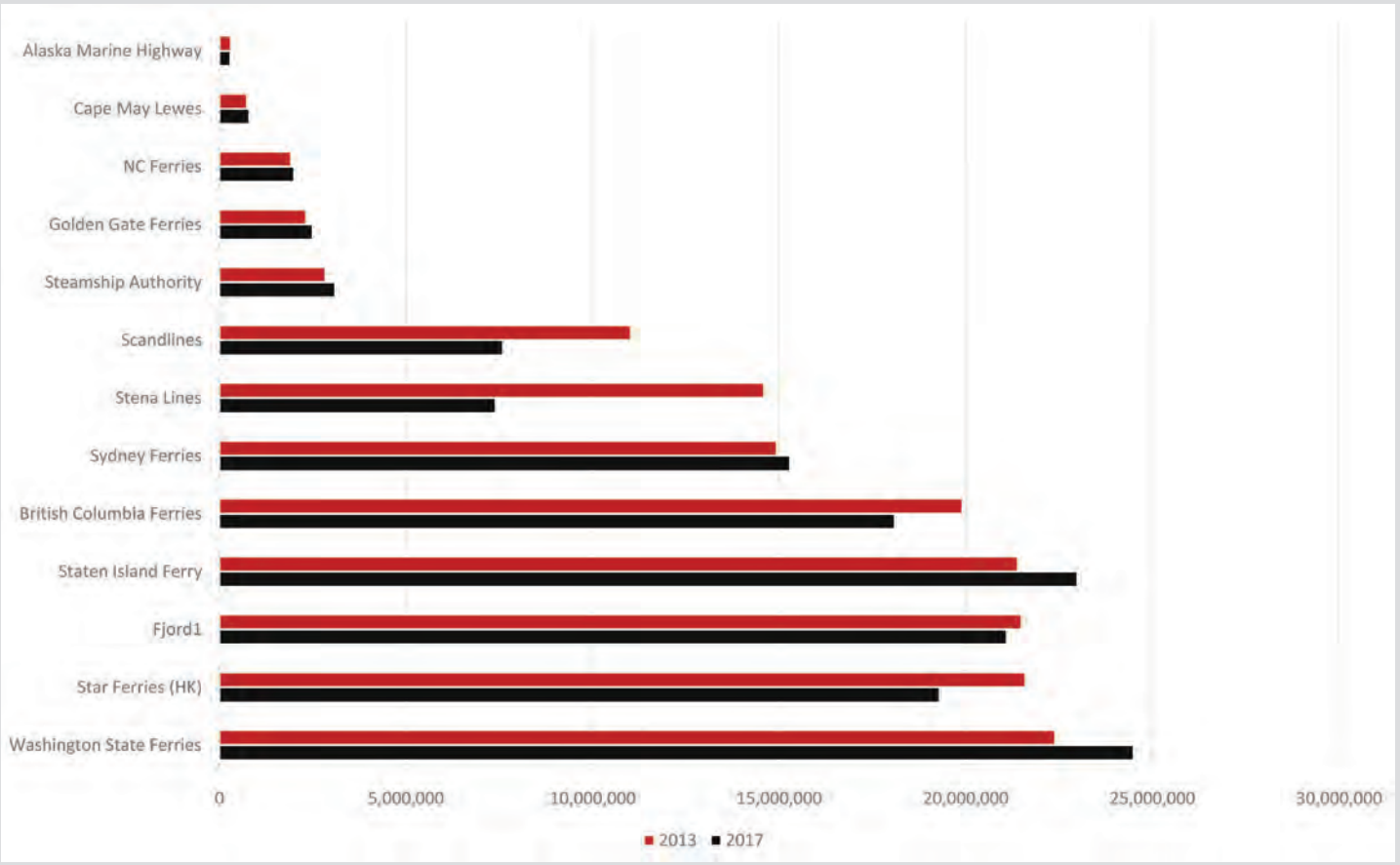
Three thousand miles across the country, New York is in the midst of a ferry renaissance as commuters (and summertime tourists) switch from automobiles to boats. The Staten Island Ferry shuttles back and forth across New York Harbor between lower Manhattan and the Staten Island with a fleet of boats taking as many as 4,400 passengers. The first of three new vessels being built at Eastern Shipbuilding, in Panama City, Fla with a passenger count of 4,500, is scheduled for a late 2019 delivery. NYC Ferries, operated by Hornblower Cruises , is a new effort backed by the city's Economic Development Corp (EDC), where smaller boats link mass transit-challenged parts of Brooklyn, Queens and the Bronx, bringing commuters, mainly, into downtown and midtown business districts of Manhattan. The Incat- Crowther designed boats, conventionally powered, have been built at Horizon Shipbuilding and Metal Shark, in the U.S. Gulf. The initial order saw construction of 16 boats, each with 150 passenger capacity; the initial ante was upped with six additional vessels with capacity for 350 passengers.

Stena Lines: Stena Line has a route-based organization with eight geographical business regions: Denmark, Norway, Germany, Baltic Sea North, Baltic Sea South, North Sea, Irish Sea North och Irish Sea South. The head office is in Gothenburg, where the management team and staff functions are based. Stena Line's fleet matches the combination of passengers and freight which are transported on its routes, and its fleet consists of 38 ships including RoPax, combi ferries and cargo vessels. Stena Line is owned by Stena AB, a company in the Stena Sphere.

Viking Line: This operator runs seven Car Ferries (including the LNG pioneer Viking Grace) in the Baltic Sea- calling at Sweden, Finland and Estonia, serving passengers and also transporting cargo. Its original run, now expanded to multiple ports, linked southern Sweden with the Åland Islands- full of maritime heritage.

Washington State Ferries: Annual ridership on Washington State Ferries system increased by more than 225,000 last year to nearly 25 million, its highest level since 2002. Supporting such growth demands investment in equipment, which WSF plans to do. Its recently released 2040 Long Range Plan calls for 16 new vessels by 2040.

Top Ferry Operators: Passengers



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5 Minutes with Chris Allard

Metal Shark has arguably been one of the more active and successful boat builders in the U.S. over the last 12 to 24 months, boasting a strong orderbook and expanding facilities and portfolio. In particular, the company has been able to capitalize on the burgeoning ferry market, today accounting for about a quarter of its business, as Chris Allard, CEO, explains.

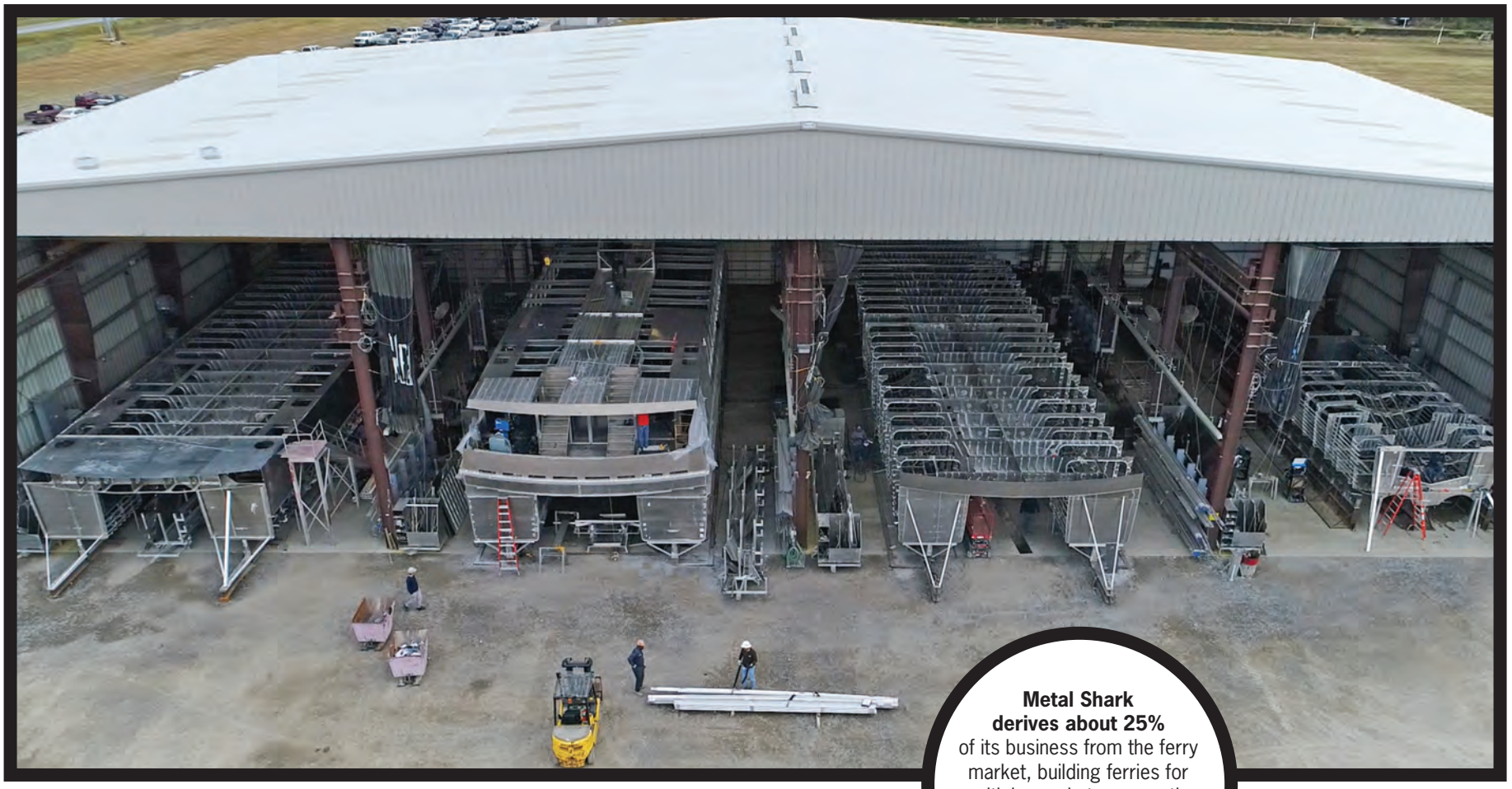
By Greg Trauthwein

When you look at the ferry business today in relation to Metal Shark's business, what do you see?
Metal Shark has delivered 16 high speed passenger ferries to date with five more vessels currently in process and multiple additional contracts pending. The passenger vessel market is a key part of our business and currently represents about 25% of our annual revenue.

The ferry business has been vibrant in recent years, and as our office is in Manhattan I see your work zipping around our waterways daily! When you look at the ferry market today, where do you see opportunity?
We continue to view the ferry market as robust. The NYC Ferry program was certainly a market driver, and while that program continues to grow, we're seeing growth around NYC outside of that specific program as well. Additionally, as in New York, cities nationwide continue to struggle with the development of critical infrastructure. As long as cities are growing, we see continued opportunities for the passenger vessel market.

Serial Production offers obvious manufacturing efficiencies, but it is not the norm in commercial marine construction. Can you put in perspective the advantages of efficient, serial production for a shipyard?
We have spent many years honing our serialized production methodologies. The process began with our government contracts, where in some cases we build hundreds of identical vessels, turning new units out on a weekly basis. Transferring serialized production to passenger vessels was a logical step for us. From the shipyard's perspective, serialized construction presents opportunities to develop systems, processes, and skills that single-order builds do not afford. Ultimately, they help us to grow and strengthen the company for future serialized, or individual builds. Simply put, the lessons learned, the skills and expertise gained from the volume all pay dividends across the entire company.

And the advantage from the vessel owner's perspective?
In terms of advantages for the client, the main value we see is faster production. Some cost savings are possible, but with materials being such a major component of the build, cost savings of the total platform are somewhat limited. The true value of serialized production as it relates to passenger vessel construction lies in the speed of delivery. Today, a vessel from our serialized portfolio can be built and delivered in about six months, whereas a first-of-kind new vessel or single order continues to hover in the 12-24 month range. The time savings lies not only our construction process, but also in the design, procurement, and process flow we have in place. Serialization also increases quality. The old adage is true that the more you do something, the better you get at it. Serialized production allows the client and the builder to incorporate lessons learned, adapting



Metal Shark derives about 25% of its business from the ferry market, building ferries for multiple mar-kets across the country.

Photos courtesy Metal Shark

based on actual usage and experience, and also leveraging the process improvements afforded by serialization. Finally, the logistics, parts ordering, and documentation support of a serialized product are all superior.

We see you have some active partnerships – Incat Crowther, BMT, Damen – to name a few. What is the importance of partnerships in modern vessel construction?

We have partnered with Incat and BMT on multiple passenger ferry contracts each. Working with firms that have the most experience and knowledge concerning these specialized vessels reduces risk for the shipbuilder as well as the client. Our relationship with Damen, while very important to us and fruitful on other fronts, hasn't branched into ferry markets, although we have actively chased multiple projects with them. To date, our close collaboration with Damen focuses mostly on government and military craft. Naming one relationship as the "most" fruitful would imply favoritism. Each company has their own area of expertise and specialty, and the right partner for one particular situation may not be the best one for another. All of that aside; in terms of dollars and in units, we have built more Incat designs to date than any other.

What do you see as the primary tech drivers in the sector today?

We see two technology drivers here. The first is fuel consumption and emissions; a two-pronged but related subject where operators are concerned about costs. At the same time, there is a perception issue in play. Operators, riders, and the general public are all increasingly concerned about emissions as well. Regulation certainly has lead the charge here, but it is important not to lose sight of growing public sentiment. To varying levels we're see increasing pressure for low-emissions ferries from riders, cities and communities, and operators. Simply put, people care, and increasingly, they are considering emissions when choosing their form of transportation and specific transport provider. We are seeing market forces where people are willing to pay more for "green" solutions.

The second area of technology that we see coming is autonomy. Recently we worked on a joint project with ASV Global (now L3 ASV) to launch our Sharktech brand. Sharktech is a company we created that specializes in the integration and installation of autonomous systems, whether in our new builds or in retrofits. The results of the Sharktech development were eye-opening to us. We generated significant interest across multiple sectors, including interest from passenger vessel operators. While we don't expect to immediately see "autonomous ferries," we predict that autonomous systems will be installed for crew reduction, and that passive systems will be developed and integrated to increase safety. As in the automotive sector, semi-autonomous technology will arrive before full autonomy. With Sharktech we are staying ahead of the curve, and looking forward to the evolution of the technology.

The Amazing World of ***Mixed Reality***

Fostech's mixed reality technology allows you to view not just a whole ship in 3-D, but by clicking with your fingers ...

Photo: Fostech AS

New holographic technology is set to revolutionize training procedures, fleet management, ship performance and engineering maintenance in the maritime sector.

By Tom Mulligan

Have you ever wished you could move around your fleet of ships, in full 3-D, without ever moving from your desk? Have you ever wanted to be able to delve into the complex inner workings of one of your vessels and inspect its internal structure while sitting in your office? Have you ever been performing maintenance work within a boiler room and wished you had a 3-D plan of what's in front of you and receive expert guidance on how to fix any problems you detect? The stuff of imagination? Not now. Intrigued? Then read on...

Mixed reality: not just virtual reality, but a whole new concept in which any object with a complex internal structure can be fully, not just represented, but reproduced as a fully three-dimensional object with which it is possible to interact through your own physical movement. Fostech AS, headquartered in Fosnavaag, Norway, has been developing and pioneering this amazing technology since2016.

Fosnavaag, Norway:
The 'Silicon Valley' for Maritime

"This part of Norway has had the same kind of influence over the global maritime industry as Silicon Valley has had on the global tech industry in recent decades," said Havard Notøy, Fostech's Founder and CTO. "This heritage comes from the region's fostering of fishermen operating in some of the most harsh environments to be encountered and the companies that operate here are proud of the fact that state-of-the-art ship design, equipment and solutions from the region are now in operation all over the world. This is the reason why Fostech focuses on delivering state-of-the-art holographic solutions for the global maritime industry in recognition of the push towards autonomous vessels and operations, and therefore a reduced onboard crew presence.

"This means that remaining crewmembers need to be able to cover a wider range of equipment and hence have a wider range of product knowledge. We recognized that to obtain this knowledge, a new and improved type of product documentation was needed and had the business idea of developing mixed reality solutions that add value for maritime customers.

By adding value, we mean improving quality, safety and productivity, or improving the customer's profit in any other way, and so we are now developing ways of visualizing and physically, not just virtually, interacting with any maritime object with deep and complex internal structure, including mechanical equipment such as engines and compressors, structural objects such as cranes, and, of course, the vessels employed by the industry."

Mixed Reality:
Where real &digital objects interact

So what exactly is mixed reality? A mixed reality (MR) experience combines elements of augmented reality (AR) and virtual reality (VR) to enable real-world and digital objects to interact. Augmented reality simply adds digital elements to a live view, often by using the camera on a smartphone (examples of AR experiences include Snapchat lenses and the game Pokemon Go), while virtual reality implies a complete immersion experience that shuts out the physical world. Using VR devices such as HTC Vive or Oculus Rift, users can be transported into a number of real-world and imagined environments. Mixed reality technology is just now starting to take off, with Microsoft's HoloLens as one of the most notable early mixed-reality apparatuses. The current estimate of the size of the market in 2023 for the global delivery of AR, VR and MR hardware and software is in the range of $100 billion to $200 billion and VR, AR and MR are currently among the fastest growing tech industries globally.

The areas of the maritime industry where Fostech's MR technology has the potential to deliver solutions include sales and marketing, maritime video communications, education and training, sales and maintenance, and other operational solutions, and for companies interested in the potential applications of MR in their maritime business, Fostech recommends that they "dream big but start small", understand their "as-is" working processes, and involve end-users in their decision-making. It is essential that they determine what drives customer value and that they look to see what areas of business can be improved, for example production efficiency and determining optimal production flow, achieving the highest possible quality levels and "getting it right first time", and, finally, ensuring that critical procedures such as the most expensive or most time-consuming ones are optimized as fully as possible.

Benefiting the maritime sector

Hans PetterHildre, Head of the Department of Oceanspace Operations at NTNU, the Norwegian University of Science and Technology, had this to say about the new technology:

"The maritime industry has begun a long journey towards autonomous ships. It is going to take many years before we see extensive shipping traffic without crews, but the voyage towards unmanned ships creates vast, new opportunities. We will see a gradual reduction in operating crews, which will lead to major demands on remaining crew members. This will be especially demanding in the engineering field. The question is how an engineer can carry out troubleshoot-

ing and maintain service on increasingly complex equipment. Technology supporting these activities is a prerequisite for succeeding with crew reductions. Technology must also attend to communication with onshore experts operating a wide range of equipment. With focus and close contact to the maritime industry, Fostech could be an important participant on this voyage."

While HåvarRisnes, Head of StartUp and ScaleUp at ÅKP Blue Innovation Arena, the local Sunnmøre region's hub for innovation, business development and social development, commented:

"Fostech enters an increasingly relevant niche in VR and AR in their fresh effort. As an incubator company at ÅKP, Fostech is closely linked to the DigiCat catapult and the clusters of Norwegian Rooms, Blue Legasea and GCE Blue Maritime. Businesses need companies that utilize the latest technology and adapt it to relevant customer groups. Fostech's idea of an 'appstore' for their products are exciting and innovative. They have attracted contributors from other countries and with different experiences. ÅKP really values Fostech's efforts within the maritime sector."

Proprietary presentation platform

Fostech has developed the Fostech HoloPodium v2.6 Configurator, a proprietary presentation platform/configurator that manages 3D animations, voice instructions, text instructions, warnings and notes to reduce MR systems development time and costs by about 50 percent and ultimately making it less expensive to develop MR solutions compared to the traditional animated movies of old.

The Fostech HoloPodium supports a number of animation systems including Microsoft Hololens, PC and various mobile platforms.

The next developments will be to include multiple same-time users to allow classroom-based use of the system and to enable external participation: the company is currently looking for a commercial partner to support its work in these areas and complete these technology development stages.

Maritime APP Store

Fostech is also developing its own Maritime APP Store (www.themaritimestore.com),an online augmented/mixed reality store meant for the maritime sector, where customers can subscribe to hardware and selected software solutions.

The intention is that most of the company's customer projects can be published on the Store, with shipping companies as the 'number one' customers being featured, while one of the benefits of the Store for equipment manufacturers is that they will have full control of where their solutions will be distributed. Notøy commented that nothing similar exists today and that the solution has the potential to become some kind of a disruptive force in the industry.

Investment opportunity

Fostech was established in late 2015 and started working solely on mixed reality and Hololens in May of the following year. Notøy commented: "We have built lots of knowledge about the capabilities and solution directions of this exciting new platform and 2018 has been the year in which we compiled all this knowledge and developed our own presentation solution, where the final product is a unique Unity plug-in configurator, enabling us to develop high-quality solutions at a much lower cost compared to only a few months ago. In addition, we have developed a Beta version of the Satellite Video Communication application and we have plenty more exciting solution proposals for the maritime industry in our drawer. If you are interested in investing in this opportunity, please contact Fostech."

An exciting future

"Microsoft in a way took the AR/MR market a little by surprise when the company launched its Hololens device in April 2016," stated Notøy. "Nowadays, most of the other big players are talking about launching their own solutions in the next few years. At Fostech, we see in the work we do, and the work that others are doing, that the technology is already bringing value for many enterprises around the world.

And since Microsoft is launching Hololens version 2 next year (with a new AI chip, an improved field of view, depth sensors, tracking, plus battery and processing power), I think we have only seen the top-of-the-iceberg of what this technology will enables us to do in the years to come. But most importantly, it's already here, and it is already making a difference."

… it also allows you to view inside the vessel down to the level of individual components.
Photo: Fostech AS

INMEX VIETNAM

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The **Virtual** Walk-Through

Elliott Bay Design Group (EBDG) uses Virtual Reality as a valuable tool in ship design allowing naval architects and owners the ability to experience the space in advance of final design; a powerful asset in ship repair and refit to help a team more efficiently and cost-effectively plan and execute the project.

By Greg Trauthwein

The process of designing and building a ship has changed dramatically in the last 20 years, with the advent and evolution of computer aided design that allows a vessel to be designed, tested and 'built' prior to the first actual cut of steel. Virtual Reality (VR) technology available through Elliott Bay Design Group promises to bring ship design and construction to the next level, allowing a virtual 'walk through' of the vessel at the design level – giving stakeholders the most immersive way to experience vessel spaces before construction – as well as functions allowing the user to pull apart the vessel, layer by layer, for a closer look inside. While VR tech offers obvious efficiencies in the initial design phase, it also has exciting applications in the redesign and conversion of existing vessels.

"EBDG started using virtual reality in 2017," said Michael Complita, Principal in Charge, EBDG. "We are always on the lookout for new technologies that we can adapt and revolutionize the marine engineering field. VR is one of the most exciting opportunities I have seen in my career. This technology provides us with powerful, innovative ways to engage with our clients and communicate with our project teams. We have the ability to offer our clients a life-like and interactive way to experience their new vessel design or modification like never before." VR technology is a powerful means for engineers to communicate from the field to the office, putting entire teams on the same page and providing critical information required for decision making instantly.

EBDG's VR technology can be used via App, powered by Visual Vocal (Vv), a company which is primarily working in the architecture, engineering and construction industry. While VR itself is certainly is not a new technology, the capabilities that Visual Vocal has added make it ideally suited to modern ship design.

"There are two ways to use the software: one to visualize new designs and existing vessel modifications, and the other is to bring an entire design team into the field virtually in real time," said Complita. "You can use models produced by any 3D modeling software to create a Vv. You can also use spherical or basic cellphone cameras on board a vessel or in the field to create a real time Vv."

Virtual Reality, Real Solutions

The value proposition to VR technology in maritime applications is immense,

Photos: Visual Vocal

"VIRTUAL REALITY TECHNOLOGY PROVIDES US WITH POWERFUL, INNOVATIVE WAYS TO ENGAGE WITH OUR CLIENTS AND COMMUNICATE WITH OUR PROJECT TEAMS."

MICHAEL COMPLITA,
PRINCIPAL IN CHARGE,
ELLIOTT BAY DESIGN GROUP (EBDG)

Photos: EBDG

particularly as the manufacturing of vessels in the sector is traditionally one-off or short production runs, meaning that gains early on in the decision making process can deliver huge cost savings throughout the project.

"Stakeholders now have the ability to walk through every nook and cranny on their vessel from access to the piping in the bilge to the visibility out the pilot house at the earliest stages of the design process. Critical decisions and changes can be made with confidence which reduces the time and expense needed to complete the design. This also significantly reduces the risk of change orders during construction," said Complita. This can help to save tremendous costs, as design changes increase exponentially as the design and construction progresses.

"During a recent vessel ship check, one onsite engineer and three "teleported" engineers conducted an engine room inspection on a passenger vessel," said Complita.

"Visual Vocal gave remote engi-neers instant, on-demand access to every detail on the vessel for immediate input and problem-solving."

When using VR, conceptual designs come to life and allow not only a pre-construction walk-through, but also the opportunity for owners to train crew and plan operations while the vessel is still under construction.

"During hosted meetings where Vv's are shared, each participant has the ability to instantly add their own mark ups to the group views highlight items of interest that require discussion," said Complita. "There is also the ability to record comments and flag them to particular points of interest on a Vv and share it with other users."

While getting the design right from the outset has obvious benefits, VR technology can also be used throughout the build process to help solve problems that do arise. "Really, the uses are endless. We have been applying this technology in creative ways on as many jobs as possible and continue to find new applications and opportunities to help our clients," said Complita.

"We continually update our engineers and clients to inform them what more this software can do and how best to use it."

Show Me the Money
The Cost-Saving Benefits of VR

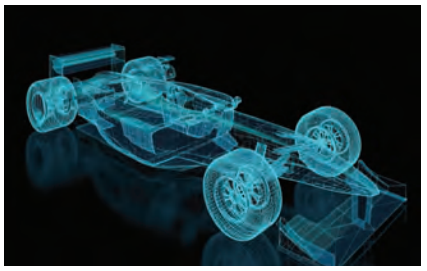
There are many potential cost saving benefits to the owner/operator by using this VR technology through the vessel design, construction and inspection process.

1. One engineer can conduct a ship check and engage a team in multiple locations in real-time problem-solving via Visual Vocal, you save travel expenses.

2. Visualize a design before construction to ensure satisfaction with the lay-out of machinery access, visibility, etc. That would save on change orders and post-build modifications.

3. Build a training program around VR to train ahead of delivery and minimize prep time for entering services.

4. Many people in many locations can all view the model or issue together in VR saving the need for travel to meetings and reducing design time and cost.



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SMITH SYSTEMS: FROM RACE CARS TO SUB-M

The implementation of 46 CFR Subchapter M requirements recently attracted the interest of Smith Systems, a manufacturer of precision sensors for the rail, automotive, mining and aerospace industries. With the new subchapter M requirements, workboats have an increased need for reliable, durable and cost-effective sensors. The engineering staff of Smith Systems is focusing its attention on offering "Designed to Survive" speed, motion and temperature sensing devices to meet specialized marine needs. Those efforts include providing associated controls, custom instrumentation, cabling and harnesses. The company also provides parts that meet full OEM specifications, often with additional unique engineering and operational improvements, often at lower cost. Smith Systems serves a diversity of industries, from NASA's Space Shuttle spacecraft to the world of high performance auto racing.

www.smith-systems-inc.com

New Crewboat for PSA Marine

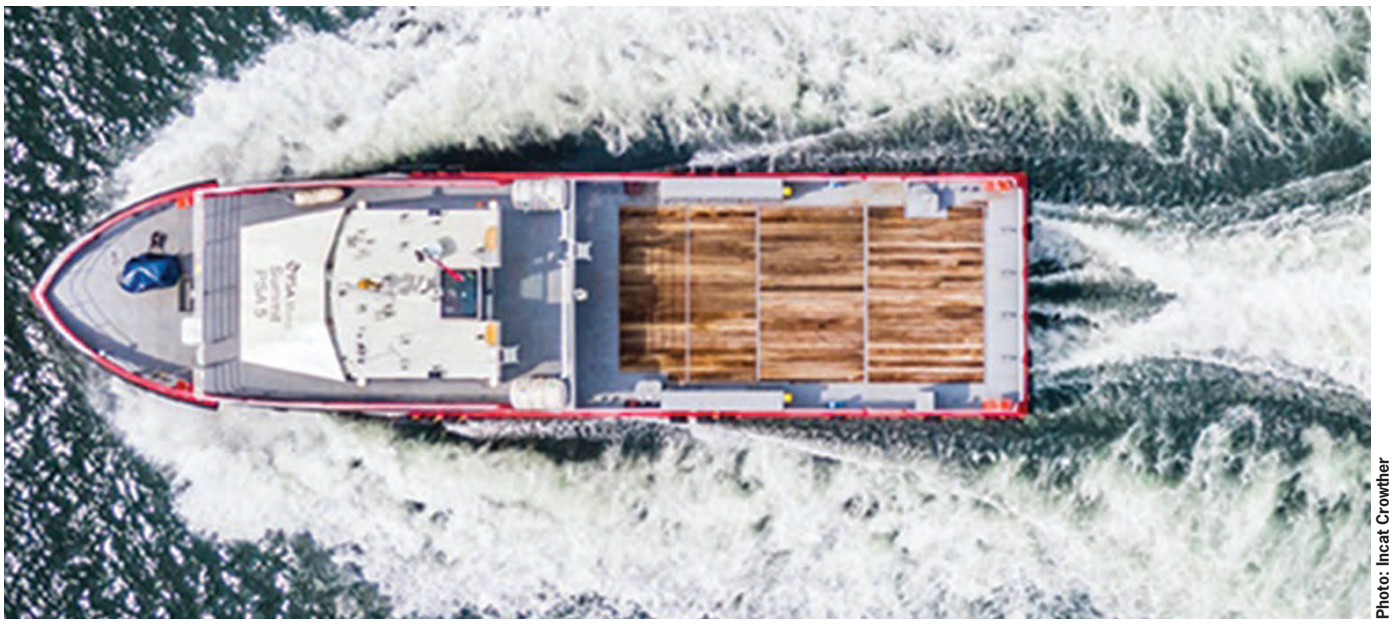


Photo: Incat Crowther

Lita Ocean, a shipbuilder based in Singapore, delivered Summit PSA 5, a new 25m monohull crewboat for PSA Marine. Based on an Incat Crowther design, the vessel is intended to provide for the transport of both personnel and light cargo to and from a floating storage regasification unit (FSRU).

The vessel is powered by two MAN D2842 LE410 marine engines rated at 809 kw @ 2,100 rpm driving two fixed pitch propellers. It has a full load speed in excess of 26 knots.

Tank capacities include 2,900 gallons of fuel oil and 1,320 gallons of fresh water.

The boat's crew accommodations below deck feature two staterooms for four crew members. A generously sized galley, mess area, washroom, laundry room and pantry complete the well-appointed crew accommodations. The main deck includes a spacious 45 cu. m. aft cargo deck covered in hardwood planking and a passenger cabin featuring 16 business class seats, 16 economy seating, one lavatory, luggage shelves, two (2) PFD storage lockers, and a deck locker.

Summit PSA 5 Main Particulars

Dimensions	25 x 6 x 3 m
Construction	Marine grade aluminum
Fuel Oil	2,900 gal.
Fresh Water	1,320 gal.
Sullage	215 gal.
Passengers/Crew	32/4
Speed (Service/Max)	23/26 knots
Main Engines	2 x MAN 2842 LE410
Power	2 x 1 809 kW @ 2,100rpm
Generators	2 x Perkins
Flag	Panama
Class/Survey	Lloyds Register (LR)

MIW to build Tour Vessel

Moran Iron Works, Inc. (MIW) signed a contract with Pictured Rocks Kayaking (PRK) to build a specialized passenger tour vessel. Together, and in conjunction with DLBA (a division of Gibbs & Cox, Inc.), MIW are creating a special purpose tour boat that is first of its kind in the Great Lakes region.

Measuring 65 x 19 ft. the vessel will be built of aluminum at Moran Iron Works' headquarters in Onaway, Michigan. The purpose of this particular vessel is to escort 72 passengers and 36 kayaks around Pictured Rocks National Lakeshore for guided kayak tours.

This vessel will feature a custom-designed kayak launch.

Photo: Moran Iron Works

The main engines will be twin Cummins QSK19, rated at 800 hp each, driving propellers through Twin Disc reduction gears. Twin Seakeeper HD gyro stabilizers will be fitted for passenger comfort and safety. The hull form will be a double chine, variable deadrise monohull for improved seakeeping and efficiency. The vessel's hull form, structure, machinery, and electrical systems will be designed by DLBA (a division of Gibbs & Cox, Inc.) to meet USCG Subchapter T requirements.

The vessel is scheduled to launch in late 2019.

Kayak Tour Vessel Main Particulars

Length	65 ft.
Beam	19 ft.
Builder	Moran Iron Works
Designer	DLBA, a div. of Gibbs & Cox
Main engines	2 x Cummins QSK19
Power	2 x 800 hp
Gears	Twin Disc
Gyro stabilization	Seakeeper

FSV for Seacor

Gulf Craft delivered the third vessel in a series of new class monohull fast support vessels (FSV) for SEACOR Marine. Built to an Incat Crowther design, Libby L. McCall features redundancy to mitigate against down time or loss of functionality due to mechanical complications. Five Cummins QSK 60, EPA Tier 3 compliant diesel engines, each producing 2,680 bhp, coupled to Twin Disc MGX 61500 SC gearboxes, are provided for main propulsion power. The propulsion machinery drives Hamilton HT-810 waterjets through a cardan shafting system from Driveline Service of Portland.

Electrical power is derived from three Cummins QSM 11 generator sets, each producing 290ekW and offshore station-keeping and dockside maneuverability is enabled by three Thrustmaster 30TT200 bow thrusters each outputting 200 hp. Station keeping is enhanced through a Kongsberg DP-21 system providing Class 2 capability.

Additional design features include two FFS 250x350 XP firefighting pumps feeding FFS 1200LB remote-controlled monitors rated for Class 1 capacity, a Naiad Dynamics interceptor active ride control system for optimal passenger and crew comfort during transit, a fully redundant Technicold chilled water air conditioning and heating system, as well as a pair of Headhunter marine sanitation devices to help ensure the vessel remains environmentally friendly at all times. Specially designed gangways are also provided on each side of the vessel to provide safe boarding means to both crew and passengers.

Libby L McCall Main Particulars

Dimensions	59.1 x 9.75 x 4.57m
Passengers/Crew	125/16
Deck Cargo	300LT
Fuel	16,061 gal.
Fresh Water	5,600 gal.
Fuel (cargo)	46,100 gal.
Service Speed	33 knots
Main Engines	5 x Cummins QSK50
Installed Power	5 x 2680 bhp at 1,900rpm
Gearboxes	5 x Twin Disc MGX 61500 SC
Propulsion	5 x Hamilton Waterjet HT810
Generators	3 x Cummins QSM 11
Material	Marine grade aluminium
Flag	U.S.

Class: USCG Subchapter T/L Oceans ABS +A1 HSC Crewboat Restrcited Service OE +AMS +DPS-2 Fifi Capable

Photo: Incat Crowther

Rolls-Royce Invests in Thruster Facility

Rolls-Royce completed a $65m upgrade and refurbishment of its thruster manufacturing plant in Rauma, Finland, consolidating production over a single site. The plan to overhaul the site started in 2016, and after nearly three years the refurbished site was officially opened on January 22, 2019. The investment included the complete rebuilding of the site's existing production hall, along with the building of a new, 35m high hall with 40t, 80t and 200t lift capacities for the manufacturing and testing of thruster units in all size ranges.

A renewed welding hall, six factory acceptance test (FAT) rigs, an integrated logistics center and a main office complex also formed part of the extensive work scope. The new facility streamlines production and the simultaneous testing of a wide range of mechanical thrusters, including the US and UUC type azimuthing thrusters and newly launched Elegance pods.

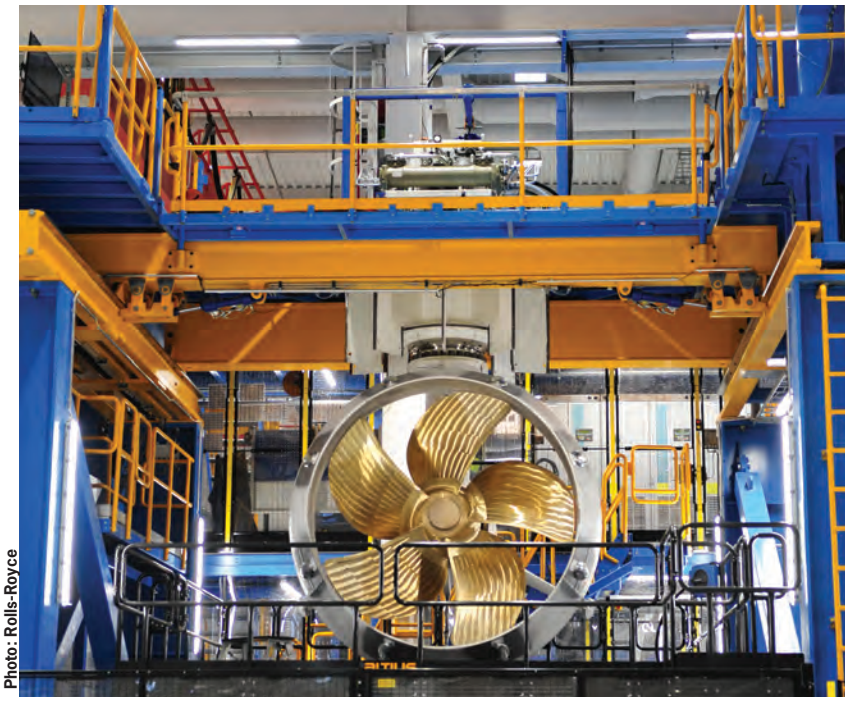


Photo: Rolls-Royce

Photo: Forsta

FINCANTIERI BAY SHIPBUILDING DELIVERS

Fincantieri Bay Shipbuilding has delivered the newly-converted 495 x 72-ft. freight barge to Port City Marine Services. The barge, Commander, underwent extensive conversion, including the installation of new cargo holds, trunk deck and bow, and a new cargo unloading system. It will operate as an ATB.

HYBRID POWER FOR FISH FEED BARGES

Fjord Maritime ordered 10 hybrid power management systems at Bosch Rexroth for application onboard of fish feed barges. The plug-in systems is designed to reduce generator running times up to 80%, cutting fuel consumption up to 60%, emissions and total cost of ownership.

Fjord Maritime and Bosch Rexroth worked together to develop the system, with Rexroth providing the drive and control technology, software and expertise for development of the first complete systems that are now in operation.

Photo: Bosch Rexroth

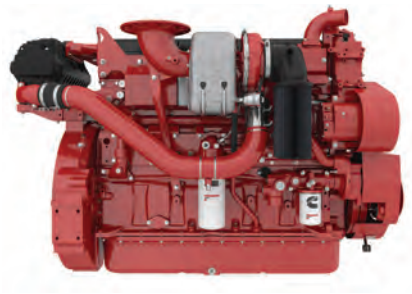


Photo: Cummins Marine

WEEKS MARINE REPOWERS WITH CUMMINS X15

Weeks Marine is running one of its crew boats with Cummins' latest marine engine, the X15. The first pair of the new Cummins X15 marine engines have been installed in a Weeks Marine 65 by 17-ft. aluminum crew boat named Joseph M. The new 15-liter, six cylinder, in-line engines are rated at 575 HP at 1800 RPM and replaced a pair of 450 HP 12V71 diesels in the boat. The US EPA 3 and IMO Tier II certified engines turn 32-inch 5-blade propellers on 2.5-inch shafts, through Twin Disc MG514B gears with 2:1 reduction. Both of the new engines have front mounted hydraulic steering pumps. Originally built in 1982 by Breaux, the repower was completed by the Weeks crew at Dulac Shipyard. The repowered crew boat achieved 21 knots on sea trials and is anticipated to show a 20 percent fuel savings over the previous engines. Work for the 24-passenger boat includes transferring passengers and light equipment to dredges working in the Northeast of the US out of the port of Barnegat, New Jersey.

New Pilot Boat for Brazos

Photo: Metal Shark

Metal Shark delivered a custom welded-aluminum pilot boat to the Brazos Pilots Association in Freeport, Texas. Brazos Pilot is a 64 x 19-ft. Defiant-class monohull pilot boat designed by Metal Shark and built at the company's Franklin, La., shipyard. This new pilot boat is intended to replace the pilots' smaller, single-engine 40-ft. pilot boat, improving safety for crews while enhancing service to operators and providing around-the-clock service at Port Freeport. Key operators who rely on the services of Brazos Pilots Association include Dow Chemical, Enterprise, Phillips 66, FLNG, and BP.

A spacious, climate-controlled wheelhouse employs Metal Shark's signature "Pillarless Glass" for improved visibility, in a reverse-raked arrangement developed by Metal Shark specifically for pilots.

Large overhead skylights provide upward visibility while approaching and operating alongside moving ships. Visibility is further augmented by the vessel's centerline helm position.

In the wheelhouse, shock-mitigating seating has been provided for five crew members, with a footrest, cup holder, gooseneck light, and 110V USB plug at each seating position for comfort and convenience.

A settee and table are also provided in the main cabin.

An integrated suite of navigation electronics includes GPS, radar, depth sounder, and AIS, which are accessed primarily through three 19" Furuno MU195T multifunction displays. These large touch-screen panels also display real-time video from a FLIR M400 thermal imaging system, as well as live onboard video feeds via two CCTV cameras installed in the engine room.

Accommodations include a galley area with microwave, coffee maker, refrigerator, and sink; an enclosed head compartment; double-tiered set of lockers for crew storage; and a berthing area with double bunk, drawer storage, and a 4K LED TV with Blu Ray player and KVH TracVision TV3 satellite television system.

Outside, the 64 Defiant Pilot's fully flush non-skid decks allow for unimpeded access around the vessel, and hand rails have been placed for easy reach at all times. Low-level LED pathway lighting enhances safety during nighttime operation.

To meet the client's requirements, a large pilot transfer platform was engineered into the vessel's foredeck, with a wide, integrated non-skid stairway and specially-configured safety rails.

To facilitate operation in close quarters, the vessel has been outfitted with a secondary control station on the aft deck, equipped with steering and throttle controls and a set of digital displays, which allow the operator to monitor engine performance while controlling the vessel from this station.

Powered by twin 803-horsepower Caterpillar C-18 diesel engines coupled to Twin Disc MGX5146SC transmissions and turning five-bladed 36" x 43" Nibral propellers, Brazos Pilot achieves a top speed in excess of 28 knots, with a nominal cruise speed of 18 knots.

Jensen's Design for Shaver Tugboat

Photo: Jensen Maritime

Jensen Maritime, Crowley Maritime Corp.'s Seattle-based naval architecture and marine engineering company, has provided the detailed design for Shaver Transportation Company's new, Z-drive tug – Samantha S. The multi-purpose tug was built at Diversified Marine Inc., in Portland, Ore., and is operating along the West Coast. The tug is ABS-classed and carries a FFV1 firefighting notation. The 112-foot by 44-foot tug has a 22-foot draft, was built for escort, ocean towing and ship assist, and has firefighting capabilities if needed. The tug features a raised pilot house and a squared forward end. The large, flat bow allows the tug to come up flat against the transom of ocean-going ships in the Columbia River. The tug is equipped with two wire winches forward, and six aft, for hard wiring to the stern of large ships for escort.

GH Refits Pilot Boat

Gladding-Hearn Shipbuilding, Duclos Corporation, has delivered a retrofitted pilot boat to the Delaware Bay pilots association. Brandywine, one of the shipyard's early 53' Chesapeake class launches built in 2004, is one of nine pilot boats built for the pilots since they took delivery of their first boat from the Mass. shipyard in 1957. Along with installing new shafts and Brunton propellers, the yard replaced the twin Daewoo 650 Bhp diesel engines with a pair of Volvo D16 EPA Tier-3-compliant 650 Bhp diesel engines, each delivering the same output at 1800 rpm as the original engines with a top speed of 25 knots. The new engines are connected to ZF 500-1A gear boxes. The yard also converted the engine cooling system from seawater cooling to keel cooling, using Fernstrum grid coolers. A Humphree interceptor trim control system, with automatic trim control, was installed at the transom. The hull's fendering system was replaced with Duramax replacement rubber, along with additional diagonal strakes aft.

Photo: Gladding-Hearn

Overhaul for Bouchard Barge

Photo: Bouchard Transportation

Bouchard Transportation Co., Inc. said that Bouchard Barge No. 295 has completed a major overhaul. Approximately 90% of the B. No. 295's main deck plate has been replaced, freshly painted and triple-coated. New internal coatings have been applied, along with the installation of new anodes on the hull and in the ballast tanks to protect the hull for many more years of service. Cargo and ballast pumps, and the thermal oil cargo heating system has been entirely overhauled, and the hose-handling cranes have been rebuilt. Additionally, the deck and navigation lighting, and electrical cabling have been renewed. The B. No. 295 is equipped with all new hoses, lines, emergency response equipment, and a new gas detection system in the void spaces which provides early detection capability.

Gulf Island Delivers First of 10

Gulf Island Fabrication's Shipyard Division has delivered the M/V Mark E. Kuebler, a Z-Tech 30-80 Terminal/Escort Tug to Bay Houston Towing Company. The M/V Mark E. Kuebler was designed by Robert Allan and built at Gulf Island's, Jennings, LA facilities. The vessel will be operated by G &H Towing on behalf of Bay Houston Towing Company. Gulf Island is currently building nine (9) sister vessels that are at various stages of construction.

Photo: Gulf Island Fabricators

Tier IV Tractor Tugs for Foss

Photo: Jensen Maritime

Jensen Maritime has provided the detailed design for an initial four, with an option for six additional, Tier IV tractor tugboats being built by Nichols Brother Boat Builders for Foss Maritime. The 90-short ton bollard pull tugs are based on Jensen's popular Valor tugboat design, of which 9 have been successfully built and deployed to date and an additional five remain under design/construction. Once delivered, the Foss tugs will be deployed along the U.S. West Coast. These 100-foot by 40-foot tugs are multi-functional to include ship assist and escort capabilities as well as towing. Powered by twin Z-drive propulsion units, the tugs will be suitable for offshore service, ship assist, escort, maneuvering and docking. The tugs feature a large fuel capacity for long trips, comfortable crew accommodations and a spacious engine room along with an anchor windlass and chain locker. The tugs will come with a 900 GPM fire pump and monitor and will be Subchapter M compliant.

In Liebherr's Type MTC 78000 heavy-lift offshore cranes, 2000 tons lifting capacity puts them among the world's largest machines of their type. When deployed on the world's largest heavy-lift vessels such as the OSA Goliath for drilling-rig modifications in the Gulf of Mexico, limits of the load-bearing capacities of both the design and the materials are approached.

Photo: Liebherr/Dillinger

Heavy Plate for Big Lifters

Heavy plate from Dillinger used in the world's largest offshore heavy-lift cranes

In Liebherr's Type MTC 78000 heavy-lift offshore cranes, 2000 tons lifting capacity puts them among the world's largest machines of their type. When deployed on the world's largest heavy-lift vessels such as the OSA Goliath for drilling-rig modifications in the Gulf of Mexico, limits of the load-bearing capacities of both the design and the materials are approached.

In addition to their out-of-the-ordinary properties spectrum, including yield strengths of up to 690 MPa, the unique diversity of thicknesses and formats of steels from Dillinger provided the decisive impulse for their use by Liebherr-MCCtec Rostock GmbH in the MTC 78000. These steels assure the cost-efficient construction of this crane, and lasting dependability in operational service far out at sea. A total of 1400 tons of steel in thicknesses up to 200 mm are used in the MTC 78000, 900 tons being high-strength steels in Z grade. The basis for these far-reaching projects is provided by the perfect interaction between two industry leaders in quality and technology.

Heavyweight Stars

Installation vessels work at sea for several months on end installing, modifying or dismantling offshore platforms, laying miles-long pipelines and setting up offshore wind turbines. At lengths of 180m, beams of 32m and a 25812 t gross tonnage, the OSA Goliath and her sister-ship, Sampson, are among the world's largest heavy-lift vessels of this type.

A total of three cranes are used on board - the Liebherr MTC 78000 heavy-lift crane, with its maximum load of 2000 tons, and two others, with lifting capacities of 100 and 70 tons, respectively.

Liebherr-Werk Nenzing GmbH developed the first MTC 78000 heavy-lift offshore crane with a maximum dynamic load torque of 78000 kNm for the OSA Goliath. It was then built and installed on the OSA Goliath at the Liebherr yard in Rostock. The crane can lift its maximum load of 2000 tons - equivalent to the take-off weight of five fully loaded Jumbo jets - with a reach of up to 35m. Its lifting capacity within a radius of 74m is up to 530 tons, and still no less than 500 tons at its maximum reach of 87m. In addition to its main hoist, it also has two auxiliary units, with lifting capacities of 200 and 50 tons.

Despite its enormous size, the MTC 78000 is designed as a mast-type crane incorporating conventional slewing-bearing technology, but with one inner and one outer bearing on a single level. These slewing bearings are 9m in diameter, and are thus almost twice as large as most other rolling-element bearings of this type. They connect the 10m high base column to the turntable, the central element of the crane. This supports two mast sections one above the other, the diameters of which taper from 8.5m at the bottom to 3.8m at the top. The crane can be rotated through 360 degrees even when bearing its maximum load, since all machinery, winches, etc., are installed above the slewing ring. The base column, at 370 tons, the lower mast section, at 250 tons, the upper mast section, at 160 tons, and the 89m long boom (311 tons) make up the crane's dead-weight of 1790 tons. Compared to all this, the slewing ring, with its "only" approximately 70 tons, is virtually a flyweight. Even the quadruple hook on the main hoist weighs in at no less than 66 tons.

Dillinger supplied a total of 1400 tons of DILLIMAX steels, of which 1200 tons took the form of high-strength heavy plate with minimum yield strengths of 690 MPa, for the construction of the MTC 78000. In addition, 900 tons of these high strength heavy plates were produced in conformity to the customer's unique specifications. This order included 200 mm thick plates, by means of which the girder-mast boom was fastened at its rear end, no less than 10m wide, to the mast using only two bolts, both of 500 mm in diameter and 730 mm long. Each of these bolts weighs 1.1 tons. The weight of the boom and the forces exerted by the load generate enormous stresses, which the steel used at this most critical point in the crane's structure must continuously withstand. High-strength heavy plates from Dillinger were also indispensable for the fabrication of the slewing ring. These plates transmit the enormous forces from the mast into the hull of the vessel, generating stresses acting in the plate-thickness direction. Welding of the slewing ring segments gave rise to additional stresses, since the stiff structure hinders shrinkage during cooling. The use of Z grade heavy plates in thicknesses up to 145 mm and in sizes which only Dillinger can supply in this grade provided a solution that is both cost-effective and reliable. Such plates are produced from high-strength steel containing only extremely small percentages of undesirable impurities, such as sulfur. Cast into slabs or ingots of a thickness unparalleled anywhere in the world, this steel is homogenized right down into its center by rolling it at rolling forces of 11000 tons, and then additionally water-quenched. The size of these plates made it possible to fabricate the slewing ring, with its diameter of 9.2m , from only four segments, each weighing 35 tons. Time and cost-savings of up to 50 percent were reportedly achieved for the welding work. Liebherr in Rostock machined all these segments to a thickness of precisely 130 mm, in order to assure the necessary absolute flatness.

The Dimensions

The welding together of the first of the total of 12 rings making up the mast was a very special highlight for Karl Thrumann, project engineer at Liebherr in Rostock, who was the project manager responsible for the construction of the first MTC 78000.

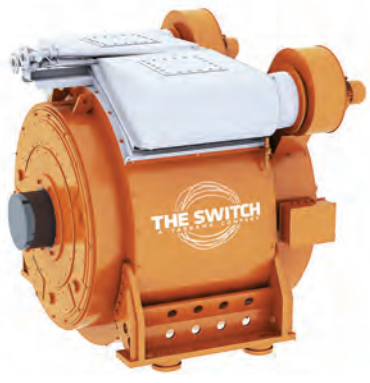
"It simply fills you with awe to see weights and dimensions like these," he recalls.

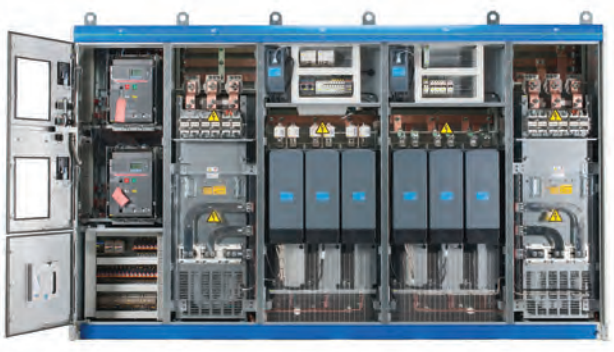
Looking back, he refers to the privilege of tracking and guiding the construction of the MTC 78000 and its subsequent installation on the OSA Goliath from start to finish as an experience unique in his professional career. "It was an absolutely spot-on landing. Everything fitted: an excellent performance from everyone, extremely good co-operation and, above all, satisfied customers."

He has now been involved in the completion of three other heavy-lift offshore cranes of this type, all employing only German steel from Dillinger, as specified by the customers.

Ice & Easy: Hybrids Advance

Images: WE Drive/The Switch





Above:
MS Viikki, the first LNG-fueled bulk carrier.

Far Left:
A permanent magnet machine at the heart of this solution generates energy to match shipping's push for less waste and increased efficiency.

Left:
Increased efficiency via variable frequency drive technologies in shaft generator systems.

'More steel, more power' is the common mantra for an ice class vessel, two requisites that generally don't mean fuel effiency.

One ship, MS Viikki, incorporates some innovative hybrid propulsion technology that could change the conversation. MS Viikki, the world's first LNG-fueled bulk carrier which sails the waters of the Baltic Sea and the Gulf of Bothnia, features WE Tech's variable frequency drive technology WE Drive and The Switch direct drive permanent magnet shaft generator to help the vessel achieve Ice Class 1A propulsion while still slashing fuel consumption, costs and emissions.

It is a game-changer for ice-class operations. ESL Shipping is a leading carrier of dry bulk cargo on the Baltic Sea and the Gulf of Bothnia – an operating area that is both harsh, with significant winter ice coverage, and protected, as a sulfur emission control area (SECA). MS Viikki and sister ship MS Haaga are both designed in accordance with the EEDI (Energy Efficiency Design Index), and in the case of this innovative pair LNG proved to be the most attractive fuel option, enabling the vessel design to cut CO2 emissions by more than 50% compared to traditional heavy fuel alternatives.

This is when WE Tech and Yaskawa Environmental Energy / The Switch technology came to the fore.

The WE Tech solution utilizes WE Drive, the variable frequency drive technology, together with the market-proven The Switch PMM 1000 direct drive permanent magnet shaft generator.

WE Tech Solution Three which is implemented on these vessels comprises Economical Operations (PTO) and Boost Mode (PTI). Solution One, Economical Operations (PTO), allows mechanical energy from the propeller shaft to be converted to electrical energy – the most energy-efficient way to generate power in a vessel.

Using the Power Take Out (PTO) mode, WE Drive enables propulsion machinery to operate in combinator/variable speed, while the direct-drive permanent magnet shaft generator produces electrical power up to 700 kW for the vessel's electrical network. This helps to deliver significant savings by decreasing the operating hours of the auxiliary generators – saving fuel and resulting emissions – as well as reducing maintenance requirements.

When it comes to sailing smoothly through ice, WE Drive the power to perform on demand with a Power Take In (PTI) mode that converts auxiliary generator power to propulsion power by employing the direct-drive permanent magnet shaft generator as an electrical motor, with an additional 1250 kW of mechanical power to boost the propulsion system.

Meet the e5 Pure Electric Tanker

The global push to dramatically reduce emissions from the world's fleet of ships continues to drive innovation across the sector, including the introduction of a new Pure Electric Tanker concept released from Japan. With ClassNK in place to make technical advice on the ship design and electric propulsion package, Asahi Tanker Co. Ltd. and its partner Exeno-Yamamizu Corporation Tokyo jointly developed the new domestic shipping tanker design which incorporates "zero emission electric propulsion."

Dubbed e5, the first variant is envisaged as a bunker supply vessel serving Tokyo Bay. Unlike many other concept designs, the e5 Pure Electric Tanker concept is on track to become a reality in a relatively short time, with the first vessel launch anticipated in Q4 2020. Simultaneously work is underway on an e5 coastal variant with a longer cruising range.

The e5 Pure Electric Tanker focuses on five core elements:

1. **Electrification:** The ships core energy source via lithiumion batteries.
2. **Environment:** Emission (CO2, NOx, Sox) controls together with minimizing noise and vibration.
3. **Economics:** Utilizing IoT and Digital tools to improve propulsion performance.
4. **Efficiency:** Simple hull construction combined with automated equipment.
5. **Evolution:** Fully embracing digitalization and technological advances to create the most advanced design concept.

e5 Main Particulars

Length:	60m
Width:	10.3m
Propulsion machinery:	2 x 350 kW azimuth thruster, 1 x 130 kW bow thruster
Gross tonnage:	499 tons
Cargo tank capacity:	App. 1,300 cu. m.
Vessel registration:	Japan
Concept designer:	Groot Ship Design

Image: Copyright Asahi Tanker Co. Ltd. & Exeno-Yamamizu Corp.

3D Printed Pipe Fitting

Huntington Ingalls Industries' Newport News Shipbuilding Division Delivers First Transformational 3-D Metal Part For Installation On Nuclear-Powered Aircraft Carrier

Huntington Ingalls Industries' (NYSE:HII) Newport News Shipbuilding division achieved a milestone in the integration of additive manufacturing into the design and fabrication of components for nuclear-powered warships. The company has delivered the first 3-D-printed metal part to the U.S. Navy for installation on an aircraft carrier. The part—a piping assembly—will be installed on the aircraft carrier USS Harry S. Truman (CVN 75) and evaluated for a one-year period.

Photo by John Whalen/HII.

The prototype piping assembly will be installed on the aircraft carrier USS Harry S. Truman (CVN 75).

MEET POBO: FLOATING PLATFORM FOR DISASTER RELIEF

GD European Land Systems develops floating platform for civil protection and disaster relief.

General Dynamics European Land Systems-Bridge Systems won a contract to develop a multi-functional, modular floating platform known as Pontoon Boat (PoBo). The project was awarded under the Innovation Program for the Support of Diversification Strategies of Defense Companies in Civil Security Technologies, or DIVERS. DIVERS is a program launched by Germany's Federal Ministry of Economics and Energy (BMWI), with VDI Technologiezentrum GmbH as the responsible project executing agency. "The PoBo is a modularly configurable floating device," said Sascha Wahlster, head of civil activities for GDELS-Bridge Systems. "It can be used to assemble heavy-duty transport, working, diving and recovery platforms or bridges."

"By means of specially developed propulsion systems and supported by drone based underwater sensors, safe, semi-autonomous driving in flooded and unmapped areas will be made possible," said Wahlster.

World First: New High-Pressure SCR for Two-Stroke Engine

MAN Energy Solutions announced the first order for its SCR-HP (Selective Catalytic Reduction – High Pressure) product, as Mitsui (MES) ordered 3 × SCR-HP (cluster 3) units in connection with the building of three 87k-dwt bulk carriers for the Ocean 21 Holdings company. Each bulker will be powered by a single MAN B&W 6S46ME-B8.5 low-speed engine delivering 9,900 kW at 84 rpm, and aspirated by an MAN TCA66 turbocharger. The engines will accordingly meet IMO Tier III emission standards. Delivery dates for the three SCR-HP packages are set respectively for December 2019, and March and May 2020.

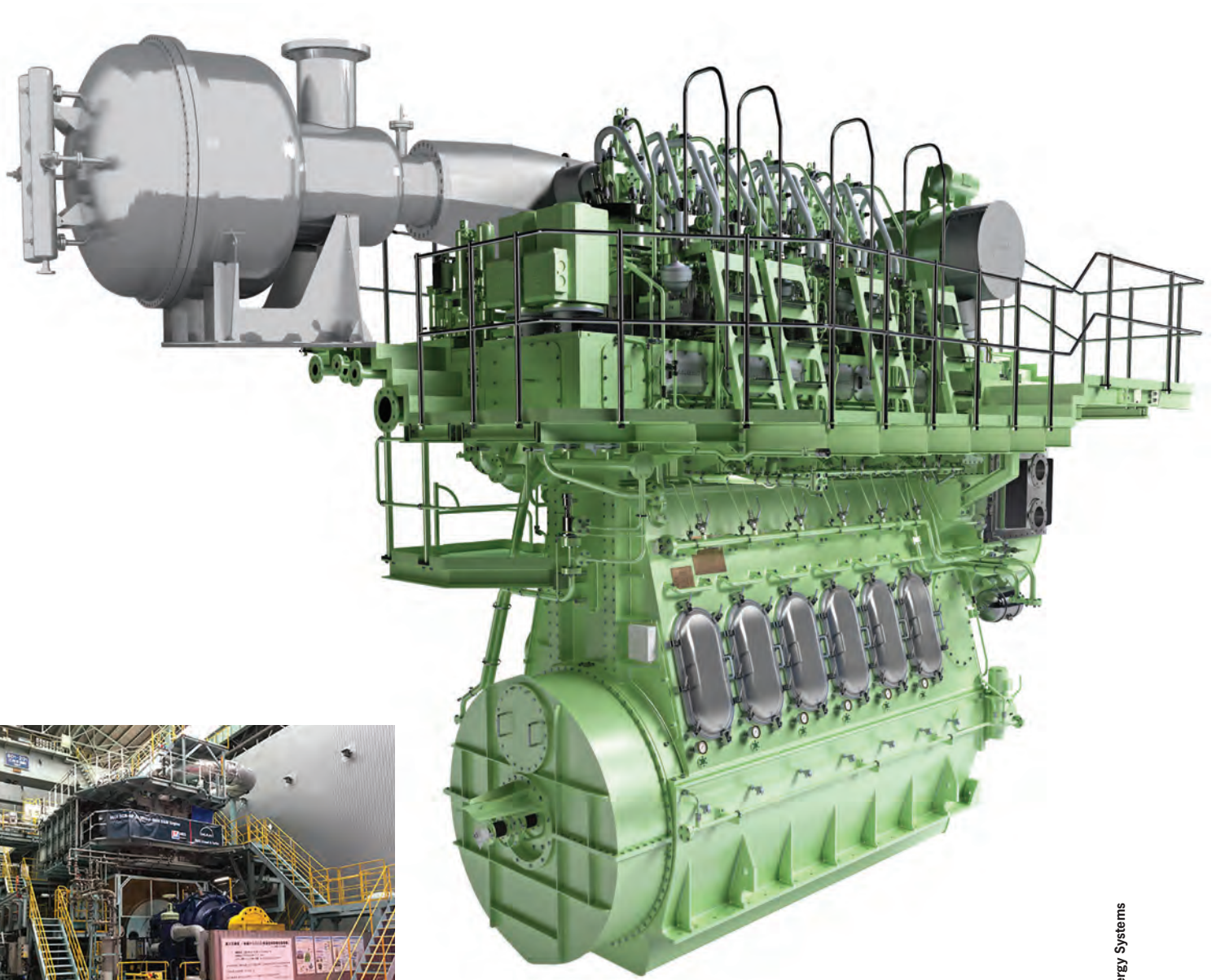
"It's always a challenge – and an important milestone – to land a first reference but we expect MAN SCR-HP sales to push on now as a result of this order," said Ralph Klaunig, Vice President, MAN Energy Solutions. "Crucially, we are now the only manufacturer capable of delivering both exhaust-gas aftertreatment solutions: high-pressure selective catalytic reduction, and exhaust-gas recirculation – including an electrical turbo blower."

MAN Energy Solutions introduced SCR-HP along with licensee, MES, in 2017. The development of the new system is based on MAN's in-house competence with four-stroke engines, for which it can already reference more than 650,000 operating hours. The MAN SCR-HP is available for two-stroke engines of all bore sizes and reduces – through internal catalytic reaction – NOx exhaust emissions to IMO Tier III limits. With specially developed honeycombs and honeycomb materials, as well as an integrated mixing unit, the overall size of the reactor has been drastically reduced compared to typical market designs and its medium-speed counterpart.

The SCR-HP comes in six frame sizes, covering engines up to 25 MW with one reactor for the entire exhaust stream. Larger engines will require two reactors, which can be arranged in a multi-setup similar to turbochargers.

The SCR-HP system consists of the reactor – including mixing unit, urea injection lance, honeycombs and soot blowers – along with a module-based supply system, as well as the reactor's control unit that communicates with the engine-control system.

The SCR-HP system is available for Scheme A and Scheme B classification approval.



Right:
Rendering of the SCR-HP reactor with a host two-stroke engine.

Below, left:
The SCR-HP reactor at Mitsui's Tamano works.

Below, right:
The Mitsui-MAN B&W 4S50ME-T9 test engine hosting the new MAN SCR-HP technology.

MAN Energy Systems

When a Nautical Box goes Shoreside

'Green' initiatives continue to sweep the globe, with companies such as Agricool leading the way with its plan to revolutionize urban agriculture while giving containers a second life. Enter CMA CGM Group, one of the world's largest containershipping companies, which is supporting Agricool not only with recycled containers, but also investing in the company and sharing its experience in logistics with the sapling company as is matures and enters its industrialization phase. Founded in 2015 in Paris, Agricool is developing an urban agriculture system based on recycled containers, aiming to used the old boxes to create urban farms, producing fruit and vegetables without pesticides, picked and sold on the same day and prioritizing short circuits. Today several containers are in the 'test' phase. Bringing its 'green' mandate beyond the simple reuse of containers, In Paris Agricool grows strawberries by saving 90% of water and nutrients compared to classical agricultural methods and uses renewable energy only. Not only are these fruits more environmentally benign, according to the company the strawberries contain an average of 20% sugar and 30% vitamin C more than retail store strawberries.

In 2018, the CMA CGM Group provided its first concrete support to Agricool by offering technical and logistical support for the delivery and installation of a "cooltainer" in Dubai.

Jennifer Pallanich
Jennifer Pallanich is Offshore Engineer's Houston correspondent and a veteran oil and gas journalist writing about the technologies that move the oil and gas industry forward. **She authors a weekly column on OEDigital.com.**

Oil Spill Calculator

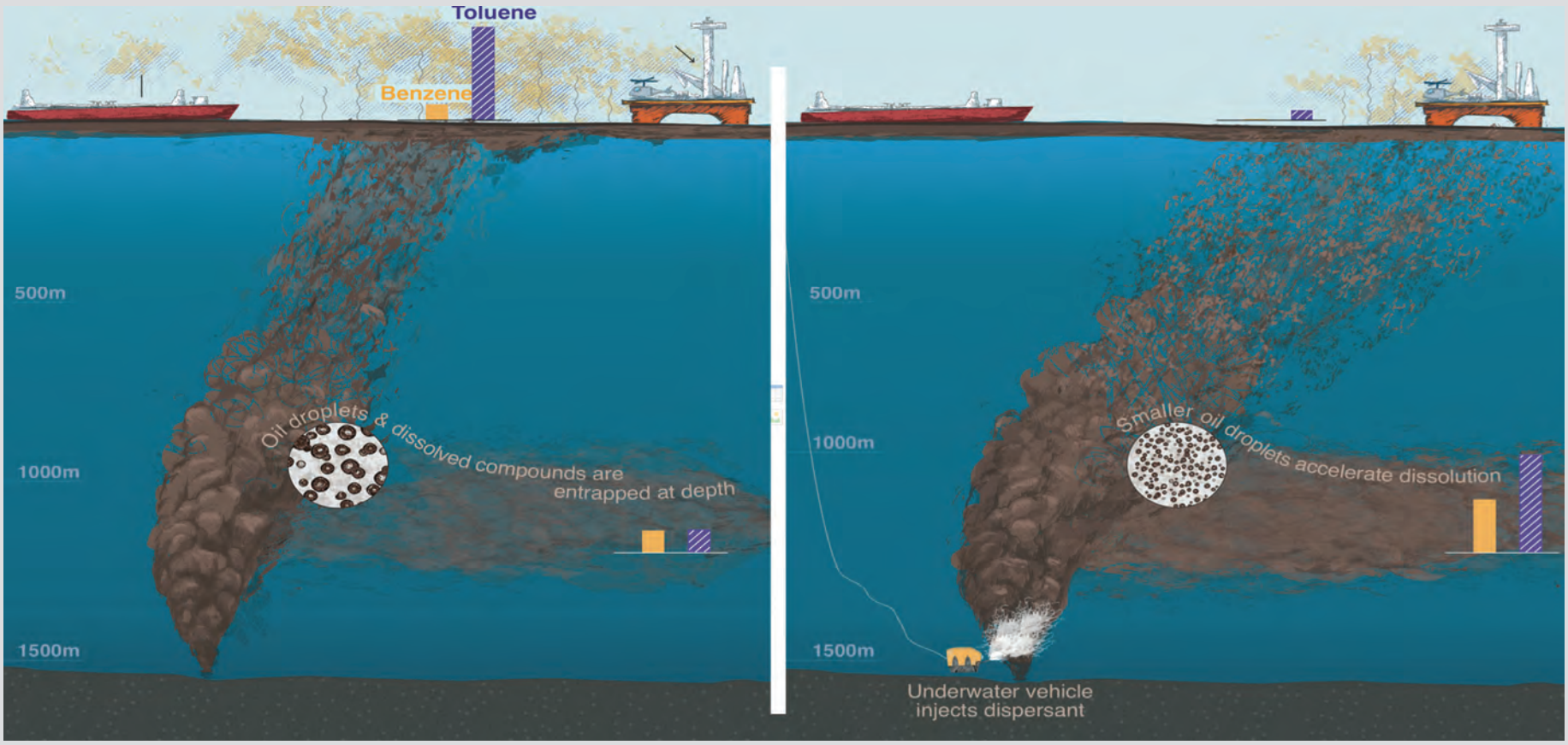


Image credit: Natalie Renier, Woods Hole Oceanographic Institution

The Deepwater Horizon oil spill changed a lot of the thinking about subsea blowouts, including how to predict the movement of the oil and gas.

"One thing that was clear early on during the Deepwater Horizon was that dissolution of oil into water was a major process," said Scott A. Socolofsky, Professor in the Zachry Department of Civil Engineering at Texas A&M University. Before, he added, oil had been modeled as inert, but during the Deepwater Horizon spill, "up to 27% of the mass dissolved into the water column before it reached the surface."

Socolofsky led the development of a spill calculator that takes that dissolution of oil into the water into consideration. The Texas A&M Oil Spill Outflow Calculator (TAMOC), freely available through GitHub, is intended to help cleanup efforts for blowouts in the Gulf of Mexico, as well as preparedness planning. Socolofsky, who has been studying bubble plumes since his PhD days at MIT in the 1990s, built the physics framework and wrote the code for the calculator; Jonas Gros, Sam Arey and Christopher Reddy built the chemistry framework; and Michel Boufadel provides data on droplet size.

The TAMOC model, originally developed for use in predicting oil spill behavior in the Gulf of Mexico, is intended to accurately predict behavior of the constituents in the spill plume from a subsea blowout, including methane, oil, seawater, and the many chemicals found in wellbores and reservoirs.

"It's right at the source, when the spill hits the ocean, predicts what happens to it and how it gets to surface, and forecasts what is its composition is when it gets to the surface," Socolofsky said. "To do that, we have to understand what is in the oil."

The TAMOC framework focuses on the area close to the blowout itself, as the range of the model is tied to the behavior of the ocean currents at the spill site, he added.

The TAMOC model feeds its oil movement predictions to the National Oceanographic and Atmospheric Administration's (NOAA) oil spill model GNOME (General NOAA Operational Modeling Environment), which forecasts longer-term movement of the oil, such as traveling to shore.

Socolofsky is now putting the final touches on a model intended for use in Arctic spills and expected to be available this summer.

"We adapted the model for ice cover," Socolofsky said.

What would improve accuracy for predictions, he said, is better data on droplet sizes. "Where oil goes depends a lot on the size of the oil droplet, so that's an important thing to predict, and it's hard to model in the laboratory at a reduced scale," Socolofsky said. Full-scale data is necessary, and he hopes "someone will figure out how to fund and do that in an environmentally responsible way."

Autonomous Drone Inspections

Sulzer & Schmid Laboratories AG launched a new inspection platform, the 3DX HD which has been developed to cost-effectively handle large volumes of high definition blade inspections in the offshore wind market. Based on the DJI M-210 drone, the 3DX HD is designed to deliver high performance and fully autonomous drone inspections at a favorable cost. “Our drone inspections offer a myriad of benefits: they are automated and therefore immune to human error, repeatable and consistent in quality while covering 100% of the blade,” said Tom Sulzer, Co-founder of Sulzer Schmid. “Most importantly, the fully digital end-to-end process creates a foundation for trend analysis and predictive maintenance.” The new 3DX HD product is compact enough to be checked-in as regular luggage for air travel and can be deployed easily on CTV ships for Offshore Wind inspections.

www.sulzer-schmid-labs.ch

Corvus Energy for Five New Fjord1 Ferries

The five ferries are a Havyard design and will be built in Havyard Shipyard in Leirvik, Sogn. Photo: Corvus

Corvus Energy was selected by Norwegian Electric Systems (NES) to supply lithium ion battery-based energy storage systems (ESS) for five new all-electric ferries being built by Havyard for Norwegian ferry operator Fjord1. To date, Corvus Energy has supplied ESSs on eight Fjord1 electric ferries operating on four Norwegian coastal routes. These five latest all-electric ferries are of Havyard 932 design and will be built in Havyard Shipyard in Leirvik, Sogn. Each ferry is 67m long, able to carry 50 cars and equipped with air-cooled Corvus Orca Energy ESS that will supply electrical power to the ferry’s NES all-electric power and propulsion system.

https://corvusenergy.com

ABI-CAR Welding Tractors

Abicor Binzel enters the Hard Automation arena with the launch of its first Welding Tractor product ABI-CAR. ABI-CAR Tractors, which will initially come in three models – including one with an oscillator feature, boast a durably constructed carriage design and easy to use interface to allow welding professionals to easily operate the tractor. A strong magnet base lets the ABI-CAR be used for horizontal and vertical welding positions. The tractors come with a variety of cross support and clamping options for user-specific product customization based on the application.This is the first product rollout for ABICOR BINZEL in the Hard Automation welding space, with several additional Hard Automation-focused products set to be introduced over the next couple years, including additional features and models to the ABI-CAR lineup.

www.binzel-abicor.com

BioGrease HDS 2

BioBlend Renewable Resources announced its newest lubricating grease for dredging applications, BioGrease HDS 2. When it comes to clamshell or dragline dredging, there are multiple lubrication requirements. The large clamshell has two primary lubrication points, the hinge pin and the sheave, and proper lubrication of these components is crucial. Extreme pressure and water wash-out, provide a challenge for lubricants, especially in salt water. Therefore, poor lubrication can lead to wear that causes premature failure of the pin and sheave, costing contractors time and money for repairs. BioBlend’s BioGrease HDS 2 meets the standards for the EPA’s Environmentally Acceptable Lubricants (EAL’s). BioGrease HDS 2 is available in drums, kegs, pails and case tube allotments.

www.bioblend.com

CWind Digitizes with CrewSmart

CWind has implemented CrewSmart’s management support service across its fleet of 21 crew transfer vessels (CTVs) and team of offshore wind technicians. The cloud-based CrewSmart system provides CWind with control over personnel and fleet administration, optimizing the overall efficiency of the operations team. CrewSmart’s cloud-based system provides an end-to-end management platform, enhancing CWind’s ability to deliver against the key metrics of vessel availability and ‘time on turbine’ for technicians. CrewSmart provides a single management platform that integrates directly with other mission-critical software tools. The system has been integrated with CWind’s existing vessel monitoring platform, BareFLEET, providing CWind with a single point of access to all performance data from across the fleet.

www.crewsmart.co.uk

Oldendorff Updates with ECO Ships

Photo: Oldendorff Carriers

Oldendorff Carriers started 2019 with clear intention to update its fleet, including the delivery of five – including four on the same day – new new eco-ships, all designed to reduce fuel consumption and subsequently their carbon footprint.

M/V Jan Oldendorff, M/V John Oldendorff and M/V Julius Oldendorff were delivered from Nantong Cosco KHI Ship Engineering Co., Ltd. in Nantong, PRC. The three 61,400-dwt Ultramax vessels measure 199.9 x 32.24 m with a 13m draft, and feature 4 x 30 tons SWL Mitsubishi cranes. Each ship is powered by a 10,000 kW MAN-B&W 6S50ME-B9.2 main engine, and feature fuel saving devices such as a semi-duct system with contra-fins and rudder bulb system with fins.

M/V Christiane Oldendorff was delivered from the Samjin Shipyard in Weihai, PRC. This is a 35,762-dwt Handysize vessel measuring 180 x 20m with a 10.21m draft, featuring 4 x 35 tons SWL Mitsubishi Masada-license cranes with 12 cbm grabs. This ship is powered by a 6,100 kW Wärtisilä 5RT-flex 50-D main engine and is fitted with a Mewis energy saving duct from Becker.

M/V Kai Oldendorff was delivered from the Hantong shipyard in Hantong, PRC. This 81,242-dwt Kamsarmax measures 229 x 32.26m with a 14.51m draft. It is powered by a Hyundai-MAN B&W 6S60ME-C8.5 main engine and Yanmar auxiliaries. Next year it will be retrofitted with an Exhaust Gas Cleaning System (Scrubber).

Having sold most of the older vessels, the Oldendorff Carriers owned and chartered fleet of 111 vessels now has an average age of just 4.78 years. With the remaining order book of 38 Newbuildings including, 21 owned, 13 time chartered and four bareboat chartered, Oldendorff Carriers will maintain a young and fuel efficient fleet of bulk carriers going forward. Most of the additional roughly 600 operated vessels are also young and fuel-efficient and closely mirror our owned fleet.

Next-gen LNG Carrier Christened

Mitsubishi Shipbuilding Co. christened what it calls a next-generation LNG (liquefied natural gas) carrier under construction for Trans Pacific Shipping 5 Ltd., a joint venture of JERA Co., Inc. (JERA) and Mitsui O.S.K. Lines, Ltd. (MOL). Nohshu Maru is the fourth vessel of the Sayaringo STaGE type, featuring improvements in both LNG carrying capacity and fuel performance due to the adoption of a more efficient hull structure and an innovative hybrid propulsion system. Completion and delivery is scheduled for February 2019, after which the Nohshu Maru will be put into service, transporting LNG for the Freeport LNG Project in Texas, among other ventures.

The Nohshu Maru measures 297.5 x 48.94m, with a depth of 27m and a draft of 11.1m. Deadweight tonnage is approximately 80,300 tons, with total tank holding capacity of 180,000 cu. m.

Mitsubishi Shipbuilding received the order for the new vessel from the owner through MI LNG Company, Limited, a joint venture for the design and sale of LNG carriers established by MHI and Imabari Shipbuilding Co., Ltd. Construction was managed by Mitsubishi Heavy Industries Marine Structure Co., Ltd., an MHI Group company based in Nagasaki. The vessel's name is derived from the old provincial name for the southern region of Gifu Prefecture, one of the areas served by Chubu Electric Power.

The Sayaringo STaGE is a successor to the Sayaendo, a vessel acclaimed for its reliability and innovatively refined MOSS-type spherical tanks. The use of apple-shaped tanks allows for greater LNG carrying capacity without increases to the ship's width, while the hybrid propulsion system further improves fuel efficiency over the previous model.

STaGE, an acronym derived from Steam Turbine and Gas Engines, is a hybrid propulsion system combining a steam turbine and gas-fired engines. Effective utilization of waste heat from the engines for the steam turbine provides a substantial improvement in plant efficiency, allowing for high-efficiency navigation in both low and high-speed areas.

Photo: MHI

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MARITIME REPORTER AND ENGINEERING NEWS

2019 Editorial Calendar

JANUARY

AD CLOSE: DEC 21

Ship Repair & Conversion: The Shipyards

MARKET FEATURE: **Tankers and Bulkers**

TECHNICAL FEATURE: **Hybrid Drives**

PRODUCT FEATURE: **Ballast Water Treatment Systems**

THOUGHT LEADERSHIP: **Fuels & Lubricants**

EVENT DISTRIBUTION

PVA Maritrends: Jan 17-20, New Orleans, LA
Surface Navy Association: Jan 15-17, Crystal City, VA

FEBRUARY

AD CLOSE: JAN 24

Ferry Builders

MARKET FEATURE: **Inland Push Boats & Barges**

TECHNICAL FEATURE: **Loading and Unloading: Cranes, Conveyors, Davits & Hoists**

PRODUCT FEATURE: **Passenger and Crew Safety Equipment**

THOUGHT LEADERSHIP: **TOP 10 Ferry & Riverboat Owners**

EVENT DISTRIBUTION

Ferry Safety & Technology: Feb 20-22, Bangkok, Thailand
Inland Waterways Conference: Cincinnati, OH

MARCH

AD CLOSE: FEB 21

Cruise Shipping

MARKET FEATURE: **Satellite Communications**

TECHNICAL FEATURE: **Maritime Simulation**

PRODUCT FEATURE: **Clean Water Technologies**

THOUGHT LEADERSHIP: **Coatings & Corrosion Control**

EVENT DISTRIBUTION

Seatrade Cruise Global: Apr 8-11, Miami Beach, FL
CMA Shipping 2019: Apr 2-4, Stamford, CT
NACE Corrosion: Mar 24-28, Nashville,TN
INMEX Vietnam: Mar 27- 29 Saigon, Vietnam

APRIL

AD CLOSE: MAR 21

Navies of the World

MARKET FEATURE: **Offshore Support Vessels**

TECHNICAL FEATURE: **RIB & Patrol Boat Report**

PRODUCT FEATURE: **Deck Machinery**

THOUGHT LEADERSHIP: **Autonomous Ship Technology**

EVENT DISTRIBUTION

Sea-Air-Space: May 6-8, National Harbor, MD
MACC 2019
OTC: May 6-9, Houston, TX
Ballast Water Mgmt
Intermodal Asia 2019: May 22-24, Shanghai, China

MAY

AD CLOSE: APR 21

Propulsion Annual - Green Marine Tech

MARKET FEATURE: **Tug and Tow Boats**

TECHNICAL FEATURE: **Ballast Water Management**

PRODUCT FEATURE: **Emission Scrubbers**

THOUGHT LEADERSHIP: **2019 Engine Guide**

EVENT DISTRIBUTION

Norshipping: Jun 4-7, Oslo, Norway
MegaRust 2019: May 14-16, Norfolk, VA
Inland Marine Expo: May 20-22 St. Louis, MO
Tugnology: May14-15, Liverpool, UK
Bari Ship 2019: May 23-25, Imbari, Japan

JUNE

AD CLOSE: MAY 24

80th Anniversary World Yearbook

MARKET FEATURE: **Cyber Security**

TECHNICAL FEATURE: **Offshore Renewable Energy: Wind Wave, Tidal**

PRODUCT FEATURE: **Navigation: Marine Electronics, Radar & ECDIS**

THOUGHT LEADERSHIP: **Top 10 Shipowners**

EVENT DISTRIBUTION

Electric & Hybrid Marine World Expo: Jun 25-27, Amsterdam
MAST Asia: Jun 17-19, Tokyo, Japan
CIMAC Congress 2019: Jun 10-14, Vancouver, Canada
Marine Money Week: Jun 17-19, New York, NY

MARITIME REPORTER AND ENGINEERING NEWS

2019 Editorial Calendar

JULY

AD CLOSE: JUN 23

Cruise Vessel Design & Outfit

MARKET FEATURE: **Expedition Cruise Vessel Construction**

TECHNICAL FEATURE: **Training and Simulation**

PRODUCT FEATURE: **Autonomy, Robotics & Drones**

THOUGHT LEADERSHIP: **Maritime Software Solutions**

AUGUST

AD CLOSE: JUL 25

The Shipyard Edition

MARKET FEATURE: **Heavy Lifting: Cranes, Winches, Windlasses & Capstan**

TECHNICAL FEATURE: **Icebreakers**

PRODUCT FEATURE: **Welding & Cutting Equipment**

THOUGHT LEADERSHIP: **Energy Efficiency Systems**

EVENT DISTRIBUTION

Offshore Europe: Sep 3-6, Aberdeen, Scotland
Seatrade Europe: Sep 11-13, Hamburg
NEVA 2019, Sep 17-19, St. Petersburg
Seatrade Offshore Marine & Workboats: Sep 23-25, Abu Dhabi, UAE

SEPTEMBER

AD CLOSE: AUG 24

Satellite Communications

MARKET FEATURE: **Containership Technology**

TECHNICAL FEATURE: **Marine Firefighting, Safety & Salvage**

PRODUCT FEATURE: **Controls & Bridge Automation**

THOUGHT LEADERSHIP: **Maritime Port & Ship Security**

EVENT DISTRIBUTION

Shipping Insight: Stamford, CT
Clean Gulf: Houston, TX
Interferry 2019: Oct 5-9, London, UK
KORMARINE: Oct 22-25, Busan, Korea

OCTOBER

AD CLOSE: SEP 22

Marine Design Annual

MARKET FEATURE: **Alternative Marine Fuels**

TECHNICAL FEATURE: **Coatings: Deck, Hull and Tank**

PRODUCT FEATURE: **Software Solutions: CAD/CAM**

THOUGHT LEADERSHIP: **Ship Classification Societies**

EVENT DISTRIBUTION

SNAME: October 29 - Nov 2, Tacoma, WA
Europort: Nov 5-8, Rotterdam
Blue Tech Week: Nov 4-8, San Diego, CA

NOVEMBER

AD CLOSE: OCT 25

Workboat Edition

MARKET FEATURE: **Propulsion, Thrusters & Gears**

TECHNICAL FEATURE: **Multi Mission Boats; Patrol, Escort, Fire and Search & Rescue**

PRODUCT FEATURE: **Deck Machinery Product Guide**

THOUGHT LEADERSHIP: **Offshore Wind Power**

EVENT DISTRIBUTION

Workboat Show: Dec 4-6, New Orleans, LA
Marintec China: Dec 3-6, Shanghai China
INMEX China: Dec 12-14, Guangzhou, China

DECEMBER

AD CLOSE: NOV 22

Great Ships of 2019

MARKET FEATURE: **Top 10 Shipbuilders**

TECHNICAL FEATURE: **Digitalization in Ship Design & Construction**

PRODUCT FEATURE: **Bridge Electronics and Communications**

THOUGHT LEADERSHIP: **Maritime Emission Reduction**

EVENT DISTRIBUTION

SNA 2020 - Crystal City, VA

Information may be subject to change

BUYER'S DIRECTORY

This directory section is an editorial feature published in every issue for the convenience of the readers of MARITIME REPORTER. A quick-reference readers' guide, it includes the names and addresses of the world's leading manufacturers and suppliers of all types of marine machinery, equipment, supplies and services. A listing is provided, at no cost for one year in all issues, only to companies with continuing advertising programs in this publication, whether an advertisement appears in every issue or not. Because it is an editorial service, unpaid and not part of the advertisers contract, MR assumes no responsibility for errors. If you are interested in having your company listed in this Buyer's Directory Section, contact Mark O'Malley at momalley@marinelink.com

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Marine Exhaust Systems of Alabama, 757 Nichols Ave. Fairhope, Alabama 36532 , tel:(251) 928-1234, mark@mesamarine.com

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Contact
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Email: tharris@entertainmentcruises.com
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Category: Shoreside Operations
Job Location: 58 South Service Rd. Suite 150 Melville, NY, 11747 USA
Contact
Email: humanresources@bouchardtransport.com
Work Phone : 631 390 4900
58 South Service Rd. Suite 150 Melville, NY, 11747 USA
Description:
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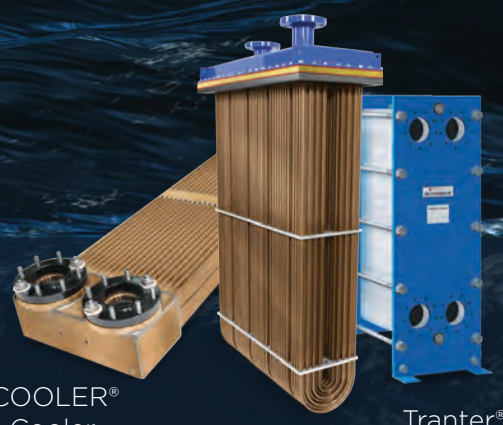

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