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MARITIME REPORTER AND ENGINEERING NEWS

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August 2017

Shipbuilding

Mega Yards Largesse

Voices
Dr. Cleopatra Doumbia-Henry, President, World Maritime University

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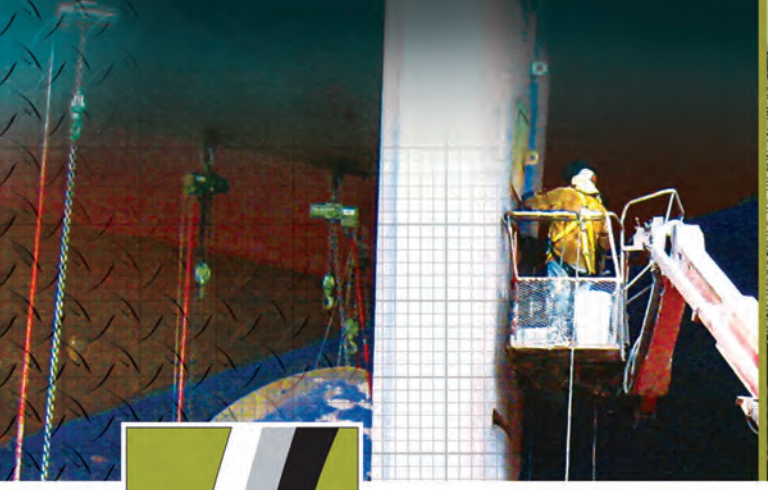
The Quest to Build a New National Security Multi-Mission Ship

Port Report
Port Corpus Christi: Energy Port of the Americas

Marine Fuel 2020
Engine Makers Take Center Stage



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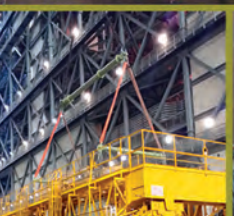

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THE COVER

Think Global, Act Global
This month *Maritime Reporter & Engineering News* visits with Krzysztof Kozdron, Managing Director, Schulte Marine Concept, for his take on the global shipbuilding situation, and SMC's — which has overseen more than 450 vessel projects — place in it. The story starts on page 38.

Photo courtesy of Schulte Marine Concept

MegaYards

As global shipbuilding fights to regain profitable footing, one critical question remains: will it ever ... can it ever ... learn from the past?

By William Stoichevski

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Photos Courtesy: Yamal LNG and Soycomflot

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Shipbuilding: Expect the Unexpected

Having covered the global shipbuilding market for more than a quarter of century, I've seen my fair share of market fluctuations, and now know that expecting the unexpected is the norm, not the exception. As we collectively slog through 2017, it is a good time to assess what we know, but perhaps even more importantly what we don't know.

If you look at the top five shipbuilding nations over the past five years by gross tonnage as reported by VesselsValue.com, there really is no big surprise as China, South Korea and Japan rank one through three, and have done so in various combination for more than a few years. If you look at the cumulative global order book to date, there are currently 2,826 vessels on order, representing a cumulative 105,960,703 gt and a value of $131.1 billion (for full details, turn to Shipbuilding Statistics on page 46). Looking at the top ship types on order, predictably bulkers, tankers and containerships dominate in terms of tonnage, but if you measure by number of vessels on order, OSVs sneak into the top three with 435 units on order, bumping out containerships (401). Gross tonnage output and current orderbook are measurable, tangible. Where we go from here somewhat of a mystery. Here are some of the things we don't know, moving forward, with thoughts on how they may impact you in the coming few years.

- **Leveling the playing field:** Since I sat in this seat starting in 1992, there has been persistent chatter at varying volumes and governmental levels regarding the need to 'level the playing field,' by eliminating subsidies. While there have been varying degrees of effort, in short it never has worked, and I don't believe it will. Shipbuilding and ship repair is a small yet important cornerstone industry for developing nations, and while the industry continues to move toward new heights in automation, it remains a business where a high volume of cheap labor can take you far. National interests will always outweigh international cooperation in this regard.

- **Energy:** When the price per barrel of oil was booming at $100+ as near as 4 years ago, who amongst you (honestly) predicted that oil would hit a protracted bust cycle now entering its 4th year? I certainly did not. Yet here we stay today, with oil hovering around the $50 per barrel line and oil majors talking of adjusting to the 'new norm.' History suggests that there is no 'norm,' and that this roller coaster will start heading back up that hill again. But the impact for our industry in regards to offshore exploration and production is still a bit blurry. Onshore fracking, combined with the emergence of renewable energy sources to a far lesser degree, has changed the energy production market. For now it would seem that the higher cost of offshore production will keep the market subdued … until innovation helps to drive the cost down.

- **Geopolitical struggles:** To be succinct, the world has become a more unsure and dangerous place. Geopolitical conflicts are on the rise, and the notion of the global economy – which effectively fueled a generation of shipbuilding and maritime expansion – has taken a hit. As energy production changes, so too do trading patterns and the ships that serve them. Emerging trends of a more robust regional and national trade will drive the coming generation's maritime cycle.

While the collective market may be tight, there are always pockets of opportunity and a means to exploit them. A few weeks ago I was on the waters in and around New York City test driving some boats, and there I was able to see the emerging fleet of CityWide Ferry by Hornblower zipping around the harbor, ferrying New Yorkers to work and to the beach. The service, powered by a fleet of boats from Horizon Shipbuilding and Metal Shark, has been an unequivocal success. For another success turn to page 54 and read about the work going on down at Port Corpus Christi. John P. LaRue, Executive Director of Port Corpus Christi visited us in New York recently, and we were interested to hear how this energy centric port was growing by leaps and bounds in the midst of the worst energy downturns in a generation.

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First Floating Mega Island Tested

MARIN (Maritime Research Institute) tested an innovative concept for a floating mega island. The island comprises 87 large floating triangles that are flexibility connected to one another. Together they form a flexible floating island that can be as large as 1 to 5 km in cross-section.

Olaf Waals (pictured) project manager and the concept developer: "As sea level rises, cities become overcrowded and more activities are carried out at sea, raising the dikes and reclaiming land from the seas are perhaps no longer an effective solution. An innovative alternative that fits with the Dutch maritime tradition is floating ports and cities."

https://www.marinelink.com/news/floating-island-tested427377

El Faro Investigators: Better Weather Forecasting

New recommendations coming out of the investigation into the 2015 sinking of U.S. cargo ship El Faro call for efforts to improve the weather information available to mariners. All 33 crew on board died when the 790-foot El Faro sank close to the eye of Hurricane Joaquin near the Bahamas on October 1, 2015, two days after leaving Jacksonville, Fla. en route to Puerto Rico. Now, as part of its ongoing investigation into the incident, the National Transportation Safety Board (NTSB), noting how Hurricane Joaquin and several other major storms had significantly deviated from their forecasts, has issued 10 safety recommendations aimed at enhancing the availability of weather information to mariners with a new emphasis on improving tropical cyclone forecasting.

https://www.marinelink.com/news/investigators-forecasting427013

NTSB

SWAMP Tough

A new all-terrain vessel propulsion system specially engineered and built for operation in extreme shallow water, riverine and mud flat environments will safely and reliably propel a vessel through dense vegetation, mud and debris-strewn waters.

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https://www.marinelink.com/news/propulsion-designed427216

Photo: Metal Shark

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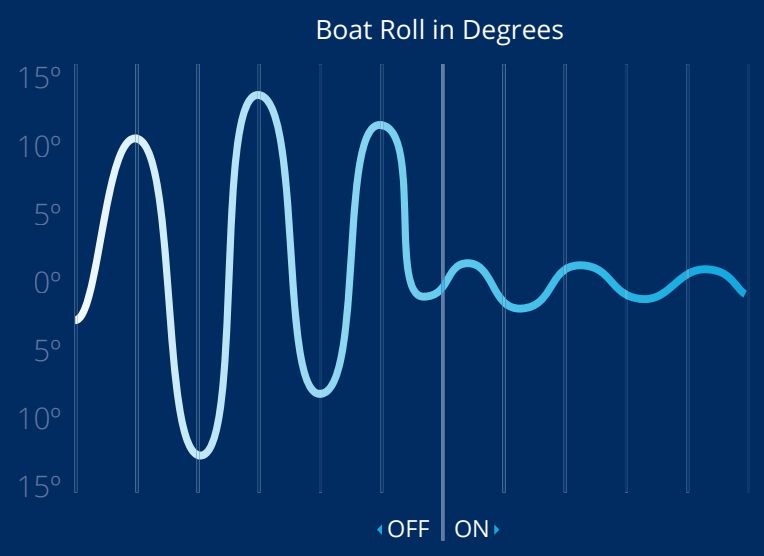

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Trends in Heavy Lift Solutions

Advances and developments in heavy lift transportation are allowing shipyards to rethink how, and where, they build and maintain vessels.

Utilizing this technology can help a yard expand its order book and improve its bottom line. The use of Self-Propelled Modular Transporters (SPMTs) in shipyards enables a facility to expand its operations in numerous ways, including new building, maintenance and repair, or storage. These projects can range from straightforward to complex transport engineering assignments. There are baseline best practices to employ whenever you are utilizing SPMTs to help ensure a successful, safe and cost-efficient operation. The most important advice, which is often neglected, is to never underestimate the importance of communication. Identify the key players, including your insurance broker and underwriter, early and allow them to be part of the planning and engineering review to mitigate risk and optimize safety.

Here at Allianz Global Corporate & Specialty (AGCS) the SPMT that we most often work with was developed by Mammoet in conjunction with Scheuerle in 1983. (http://www.transportoversize.eu/en/articles/id/4139/) They have revolutionized industrial transportation with the ability to transport heavy loads with a high degree of maneuverability within a small footprint. They can add significant modular construction capability to shipyard operations, allowing larger vessels to be maneuvered and expanding utilization of staging areas in a yard.

SPMT Best Practices

An excellent first step when exploring the potential use of SPMTs is to review the European Association of Abnormal Road Transport and Mobile Cranes (ESTA) Best Practice Guide for Self-Propelled Modular Transporters (http://estaeurope.eu/media/downloads/ESTA_A4versie_DEFdigitalHR-pages.pdf). This guide presents the required steps to help plan, engineer, train for, and execute a successful transport.

In our loss control roll at AGCS, we have witnessed the importance of the design phase. It is critical that all aspects of a load be evaluated in the design phase in order to help identify any potential problems before operations begin, or contracts are signed. The utilization of external engineering expertise, with SPMT experience, can be extremely beneficial to spot potential problems.

Even if you are utilizing a third-party SPMT provider, the client is responsible for the following:

- Gross weight of the load.
- Location of the center of gravity.
- Dimensions of the load.
- Allowable point loading forces.
- Location of support points.
- Location of lashing and securing points.

It is import to remember that any order changes that affect these criteria need to be evaluated from the point of the SPMT movement before they can be agreed to or implemented. If the final dimensions are changed, then an updated swept-path analysis of the route will need to be performed.

Engineering concerns that arise during the later stage of a project are typically due to insufficient initial engineering that have included allowable point loading forces both on the hull girder as well as on existing piers and wharfs. A key component of planning is to fully determine the material conditions of infrastructure before a project is undertaken. If building in a former laydown area, or moving an SPMT over a pier or apron, it is critical that these areas have their permissible point loading evaluated. Fully evaluating the route that a SPMT will transverse and knowing the allowable ground / surface bearing pressures is one of the most important components of a project.

Training is also a key component of a successful transport. Even if you will be utilizing an outside contractor to conduct the movement, it is still important that your workforce receive safety instructions in relation to working with an SPMT if they will be involved with the move. If you are employing a third party, review their training and maintenance records well in advance of the move.

Most insurers will request that a risk assessment (RA) be carried out before a transport is performed. An RA should address the risks associated with at least the following:

- All persons directly involved with the transport.
- All persons that will or may be present in close proximity to the transport.
- The load, the transporter and all objects/items that are in close proximity to the transport.
- The (work) environment through which the transport will travel/in which the transport will take place.

Method Statements

Method statements that lay out the engineering particulars of transports address key points, including the SPMT transporter configuration and suspension set-up. According to the ESTA SPMT Best Practice Guide, a comprehensive method statement should include at a minimum:

- How the transporter(s) will be (de) mobilized.
- Route the transport will travel.
- How the load will be loaded on/unloaded from the transporter.
- Which transporter configuration and suspension set-up will be used.
- Who will be responsible for the transport and how the different tasks related to the transport will be divided.
- Which Health, Safety and Environmental procedures will apply.
- Any situation-specific measures required for the transport to be executed safely.

Executing the Plan

After all the planning and engineering is completed and the method statement generated and reviewed, the actual transport takes place. As was true in the planning stage, communication among all parties during the execution phase is critical to the project's success.

A toolbox talk should be held prior to conducting the transport. At this time, all parties who will be present for the move should be in attendance, and introductions should take place. Nothing new should be addressed here – the parties present are here to ensure that the transport takes place in accordance with the previously agreed upon engineering and method statement. If a major change is required that was not addressed in an agreed upon contingency plan, then the transport should not take place.

Weather conditions can be critical to any operation with a marine component. In the event of a vessel hauling or launching, tide and current conditions must be within the go/no go criteria previously agreed upon.

Final checks should be conducted by all concerned parties. If warranty surveyors are present, they need to ensure that all recommendations have been complied with before executing the move.

Conclusion

The use of SPMTs can greatly assist a shipyard in generating new business or expanding upon work. This can range from hauling large yachts to building new barges. SPMTs can be integrated to work with existing dry docks, yard cranes and travel lifts to provide new or increased revenue streams. A well-organized, engineering-supported project built upon the framework of strong communication is your best voyage plan to help ensure a successful heavy lift project.

About the Author

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

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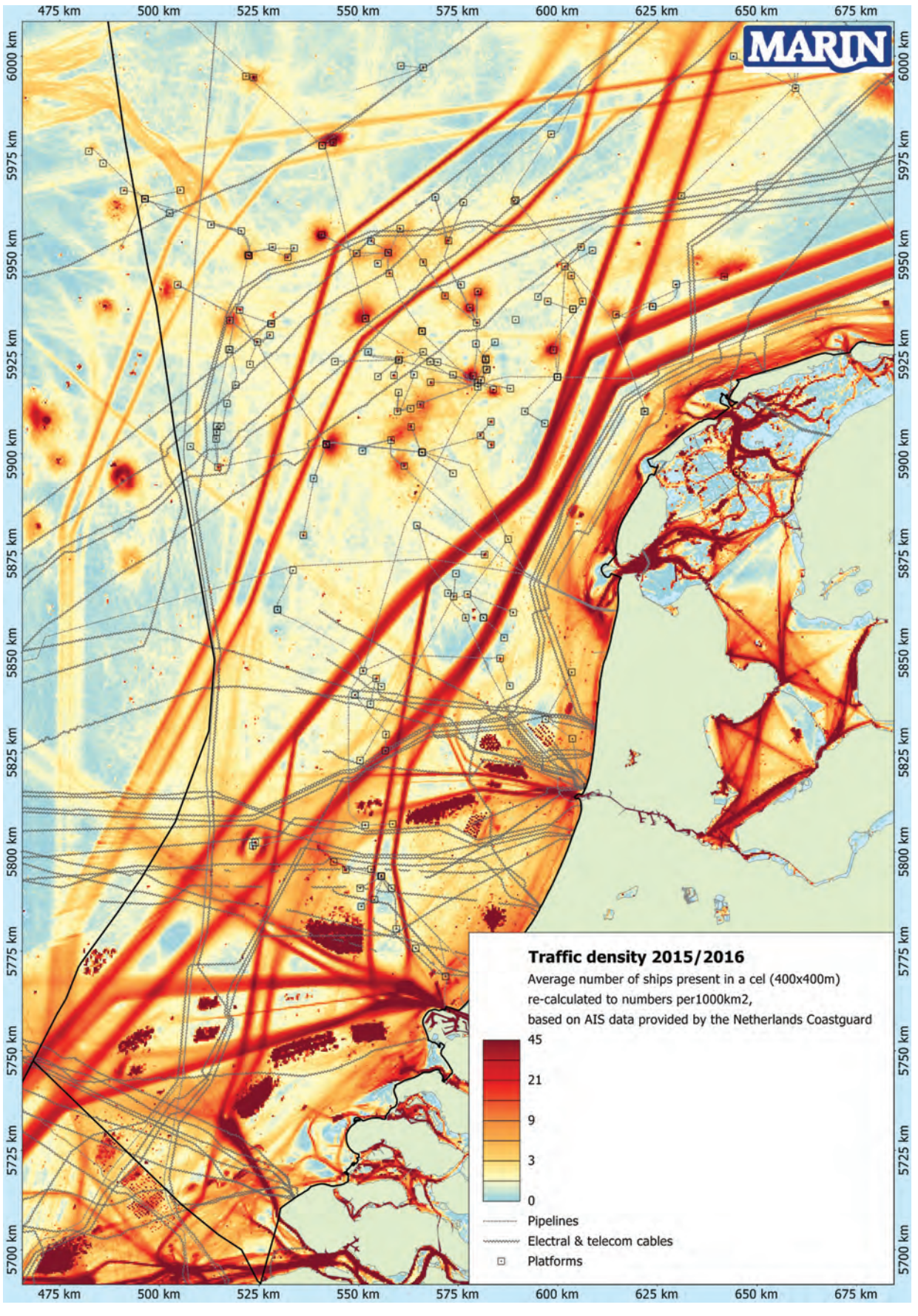

About the Author

Yvonne Koldenhof is Senior Project Manager at the Nautical Centre of MARIN, the Maritime Research Institute Netherlands.

In February 1989 the RoRo vessel Vinca Gorthon ran into heavy weather and sank off the Dutch coast. She landed on an oil pipeline that was severely damaged. Although the probability of sinking on top of a pipeline is very small, the incident showed that it can happen.

Shipping traffic can represent a potential hazard to subsea pipelines in various ways, such as sinking or grounding, lost containers or an anchor hooking onto a pipeline. Over the years MARIN has contributed to the development of a method by which the burial depth of a cable or pipeline is determined on the basis of actual exposed risk to the asset. This Risk Based Burial Depth method (RBBD), developed by ACRB, combines the frequency of the different events (maritime threats) happening, based on AIS data and incident databases, with the consequences of these threats based on the structural integrity of the asset. MARIN provided the input for the incident frequencies by combining AIS data, nautical accident models and historical (accident) data.

Seabed characteristics, such as soil data and seabed mobility, are included and integrated into the assessment of the probability of failure and risk. The probability of failure is determined for relatively small segments of the asset (in most projects 100 m). By adjusting the burial depth of different segments of the cable or pipeline, the probability of failure of the whole asset can be optimized in an efficient way.

The method has been applied in the design phase for new assets, as well as in the operational phase to determine the need for remediation - for example reburial or rock dumping. It proved to be an effective tool to demonstrate that initially proposed rock dumping was not required because the location was in an area with very low shipping intensity. The method has been successfully applied to several pipelines and cables in the North Sea, for example export cables connecting offshore wind farms to the Dutch coast, an interconnector cable between the UK and Denmark, and a large diameter gas pipeline between The Netherlands and the UK.

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Keeping a Tight Lid on Tier III & Sealing Solutions

With more than 90% of global trade carried by sea, shipping is a major battleground in the reduction of emissions. Tier III is the latest emission standard pertaining to NOx emissions from marine diesel engines. Tier IV is expected to come into effect for 2020 – with engine manufacturers already seeking sealing components to future-proof engines well into the next decade.

Here we explore challenges faced by diesel engine operators in the face of Tier III, and how the correct selection of sealing materials could deliver better performing solutions.

Photo: Precision Polymer Engineering

NOx and Sealing in Newer Engines

Clean fuel is a key sealing challenge for newer engines. The cleaner the fuel, the more chemically aggressive the fuel is to elastomer seals. The properties of the sealing material are critically important. Potential cost savings are substantial. Typical dry dock costs for maintaining a marine engine can be upwards of $100,000 per day – and with seal changes within a fuel injection system taking approximately 10 days, an unreliable seal isn't cheap. The correct choice in seal material can deliver a greater period of time between MRO windows.

Additionally, newer engines tend to run at elevated temperatures for longer. Long term exposure to mid-range temperatures can result in an increased rate of degradation over the lifespan of the seal. The seal technology required will typically migrate towards highly fluorinated seal materials, such as FFKMs.

NOx and Sealing in Older Engines

Older diesel engines may require additional works in order to comply with Tier III and upcoming Tier IV requirements, potentially involving the installation or retrofitting of system upgrades.

1. Low Pressure LNG Engines

Marine engines able to run on low pressure liquefied natural gas (LNG) operate on a relatively high air fuel ratio, with a pre-mixed charge of air and fuel ignited by pilot fuel. These low pressure LNG engines produce NOx emissions which are already below Tier III.

With engines of this type, low temperature capability of the seal material is a concern. An experienced sealing engineer can advise on the optimal choice of seal for applications demanding reliable performance in thermally and chemically aggressive environments.

2. Selective Catalytic Reduction (SCR)

SCR involves the injection of ammonia or urea into exhaust gas, before being passed through a high temperature catalyst unit. These additives react with NOx present in the exhaust gases, reducing NOx to harmless N2. Using retrofitted SCR technology, older engines can reduce emissions by up to 90%.

The pressure drop across the SCR unit requires a highly efficient turbocharger for the system. Together with the NOx to N2 reaction only being viable between 300°C and 400°C, seals in these systems need to demonstrate high thermal resistance.

3. Scavenge Air Moisturizing

After passing through turbochargers and compressors, air is at a high temperature. Seawater can be added to saturate the air and bring down the temperature. Levels of optimal humidity are maintained by keeping scavenge air temperatures between 60°C and 70°C, with expected NOx reductions of around 60%.

High humidity has the potential to reverse the cure of some older seal technologies. In such harsh environments, specially engineered terpolymers offer a more reliable sealing solution.

4. Exhaust Gas Recirculation (EGR)

By recirculating exhaust gas through a scrubber unit after the turbocharger, engine operators can reduce NOx emissions by between 50% and 60%. However, the cleaning water can become highly corrosive to seal materials after sustained use.

Highly developed perfluoroelastomer materials, like Perlast®, have demonstrated almost universal chemical resistance in the field.

5. Miller Cycle

In four-stroke engines, the expansion and cooling of intake air has a reducing effect on NOx production – particularly when coupled with Direct Water Injection (DWI) or water-in-fuel emulsions. NOx reduction through the Miller cycle method will require two turbochargers.

In two-turbocharger assemblies, elastomer seals have a significant buildup of heat to contend with. If using water-in-fuel emulsions, the sealing system will need to handle a diverse band of chemistries. FFKMs perform well against thermal and chemical aggression.

6. CSNOx

In this method, the scrubbing process uses electrolysis and seawater to convert atmospheric CO2, SOx and NOx into non-harmful substrates for safe disposal. Compact and low maintenance, the CS-NOx unit is a popular solution for cutting emissions. Some older seal technologies are prone to swelling in high concentrations of CO2. For a longer lasting sealing system, there are materials choices less likely to fail through chemical swell.

Decisions taken in respect of engine modifications may significantly reduce NOx and SOx emissions, but operators need to be aware of the effect on sealing components.

Consultation with an experienced sealing specialist can ensure that the resource involved in ensuring Tier III compliance is not undone by improper material choice in the seals, and that once chosen, optimised seals are sized and fitted correctly to deliver engine efficiency, long term reliability and reduced cost of ownership.

About the Author

Omer Raoof is Business Line Leader for Oil and Gas at Precision Polymer Engineering. He brings several years experience in the delivery of sealing support for flobal oil and gas markets.

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NEW CONSTRUCTION • REPAIRS • CONVERSIONS

Sailing Ships ... ... the Ship of the Future?

About the Author

Matthew Bonvento is the Senior Manager for Safety, Security, Regulatory, and Quality Compliance for Vanuatu Maritime Services Ltd. He is also a licensing instructor in Long Island. Holding a Masters in International Transportation Management, and an Unlimited Chief Officers License as well as a 1600 ton Master license.

For as long as there has been a need to transport cargo there has been a maritime industry. Throughout that history both owners and mariners have worked to devise ways of saving costs, making faster transits, and carrying more cargo.

In 1819 the Steam Ship Savannah made maritime history by being the first steamship to cross the Atlantic Ocean, sounding eight bells for the traditional cargo carrying tall ship. Although that eight bell sounded for quite some time, the future of shipping arrived with Savannah.

In 1911 M.S. Selandia, widely recognized as the first oceangoing diesel powered ship, was constructed and shortly thereafter began making her transit Copenhagen to Thailand. With the ushering in of the diesel engine, the Steamship Historical Society was created in 1935 to document the passing importance of the Steamship.

Today we sail with ships operating with diesel engines, gas turbines and even nuclear reactors for the military. No one has given a second though to sail for quite some time. Before the oil markets tanked about three years ago, fuel conservation was of priority number one in the maritime sector, and technologies such as air bubble lubrication, sky kites and auxiliary sails were explored. But to date, these ideas have not materialized into the mainstream shipping industry. To be clear, these were not to be used as the primary source of propulsion, rather a supplemental source of power to help save fuel in a market where fuel prices were rising with great pace and regularity. With the new Low Sulphur Fuel and NOX and SOX regulations we may see these technologies have a resurgence of interest, but that is a topic for another time. The most exciting part of working for a registry is the variety of interesting vessel owners with ideas that you meet. At the Vanuatu registry we are proud to talk about one of our more interesting niches in the industry: sailing vessels. We are not talking about the Tall Ship Association Sailing vessels that one might see at an Ops Sail, or at Mystic Seaport. We are talking about working, cargo and passenger carrying sailing vessels.

When the term 'sailing vessels' is mentioned, today thoughts turn to *Pirates of the Caribbean* or a sunset cruise. Many in the industry forget that before the IMO, before regulations regarding greenhouse emissions and navigation instrument installation, sailing vessels were delivering cargo for centuries.

114 tons or 201 barrels at 225 Liters of Rum, or 1,450 bags weighing 69 kilos each of coffee. About 7 TEU's worth of cargo. I asked my local high end coffee chain here in downtown Manhattan how much coffee they went through a typical day. The answer was around 60 pounds. With 21 shops, a ship load could supply this chain for almost half a year. This could also supply another very popular chain of coffee shops around the entire island of Manhattan for several days. This is the cargo carrying capacity of the Vanuatu flagged sailing vessel, Avontuur. So let us make a comparison.

According to the IMO, international shipping is the cause of approximately 796 million tonnes of CO2 emissions, which is about 2.2 percent of worldwide emissions as of 2012. As everyone involved in the industry is aware, there is a need to reduce NOX and SOX emissions over the next few years. A sailing vessel emits no CO2, SOX, or NOX gasses. When properly equipped with solar and wind turbine battery chargers and generators, systems can be run in an environmentally responsible manner.

From a regulatory perspective this ship presented significant challenges. To be clear, safety of the seafarer is always of utmost concern. Having sailed a number of years, and teaching mariners to this day, safety is the word. A key question is balancing modern safety standards on a vessel built on ancient standards. In order for the vessel to carry cargo we could not consider the vessel primitive build, but she is also non-SOLAS, being under 500 GT. IACS 99 Recommendations came in handy as well as an application of the Caribbean Cargo Ship Safety Code. Luckily we were able to find an old set of Class rules from 100 years ago and that provided some excellent guidance. But what was most helpful was something that mariners to this day have, and that is our experience and the American Merchant Seaman's Manual. Making the vessel more modern as far as safety was of concern to us. It was not so long ago that the HMS Bounty went down with a fair amount of modern equipment on board. It is a benefit that the current generation has a desire for constant communication, so convincing a vessel owner to carry a satellite phone, VHF radio and means for email was not an argument, rather already in place.

Another concern was the credentials of the seafarers. STCW does not cover sailing vessels, in fact the United States only issues Auxillary sail licenses, insinuating that the vessel will primarily be propelled by an engine. We were lucky to have the owner of the vessel, Ben Cornelius, who worked with us to provide mariners with a background in tall ships and to have an apprenticeship program for training new hires. The use of sailing vessels is not unprecedented in today's maritime environment. The Sailing Vessel Rauch is currently working to support Medical aid programs in Papau New Guineau for the YWAM (Youth with a Mission) ships program. The Sailing Vessel Rembrant Van Rjin is operating as a passenger vessel in Arctic waters. The Picton Castle is in Canada, training people in the art of traditional sailing. In fact this concept of returning sailing vessels to service is the basis of the Fairtransport Company out of the Netherlands, whose vessels are sail powered and carry cargo.

One does not have to look too far to see that Rolls-Royce is working diligently to change shipping as we know it by pushing toward autonomous ships. In one article it was forecast that autonomous ships will be crossing the oceans by 2020. Will that happen, I do not know, but I do know there will be the need for a lot of regulatory changes to make that to work. With much attention paid to Ballast Water Technology, SOx, NOx, Emissions Control Areas and Vessel General Permits, mariners not being mariners anymore, rather computer technicians. But I think that there is a lesson to be learned in to holding on to our maritime tradition, not just out of nostalgia, but out of lessons to be learned to do business in a sustainable manner with the human element at the center, always.

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Man Overboard Prevention and Recovery

About the Author

John Haynes, AFNI, is Operations Director of FRC International and a presenter of WBV courses. He is a Yachtmaster Ocean and Advanced Powerboat Instructor. Subject matter expertise includes high speed craft consultancy, product development and specialist training.

More than 80 maritime professionals attended two one-day events focused on the sub IMO / sub 80-ft. sector in Southampton UK this Spring. The Man Overboard Prevention & Recovery Workshop brought together an international group of experts armed with the latest knowledge to identify problems that affect the maritime sector worldwide.

Workshop lead John Haynes opened the day saying said, "Expectations, requirements and capabilities are changing for many maritime organizations. High profile roles are evolving close to shore and offshore in UK, European and international waters. Challenges may be changing and the use of technology increasing, but safety still remains high on the agenda for professional mariners."

The Marine Accident Investigation Branch (MAIB) investigates marine accidents involving U.K. vessels worldwide and all vessels in U.K. territorial waters. Inevitably, the MAIB have man overboard (MOB) accidents to investigate, many from commercial fishing vessels, but the lessons from these extrapolate easily to the small commercial sector. The presentation by Captain Andrew Moll, Deputy Chief Inspector of the MAIB, highlighted specific lessons learned from recent incidents that are relevant to all maritime sectors.

Captain Don Cockrill, Secretary General of the U.K. Maritime Pilots Association went on to look at the issues related to 'Man Overboard around Ships, Workboats and Port Support Vessels.' Maritime Pilots are required to board and safely navigate vessels into and out of most ports around the world. The size of modern ships has increased, plus movements of the ship and the pilot cutter in heavy seas can be the equivalent of an elevator going up and down between floors in seconds. Unimpeded spilt second judgment is often required. This presentation looked at the potential suitability of the numerous workboats and support vessels operating in the modern port for locating and recovering a casualty in the water.

Every pilot's nightmare is to fall off the ladder while boarding. Although such incidents are rare, when it does happen there are lessons to be learned by everyone involved – including the casualty.

In February 2011 Captain Jon Stafford, an experienced Pilot with the Port of London Authority, fell from a pilot ladder 6 miles off Margate while boarding a cargo ship at night. He recounted this MOB incident to help others; "I remember looking down to check whether I was falling onto the cutter or into the sea. Fortunately the cutter had moved clear of the ship and was running parallel, close to the ship's side. I knew then that I wasn't going to suffer serious injury from falling onto the cutter, but I was going into the icy North Sea in February between the ship and the cutter. As I hit the water my first thoughts were the propellers of first the cutter and then the ship. When I resurfaced I was at the stern of the pilot cutter but the water flow was pushing me hard up against the ship's side and I knew that it was taking me towards the ship's propeller."

He estimated that he passed within a meter of the propeller. Once he had survived that close encounter the cutter crew had to locate him in the dark and get him back onboard.

At this point it was relevant to hear from William Mills, HM Coastguard Maritime Operations Controller, on how an MOB rescue evolves. Search and rescue (SAR) skills require a unique mix of experience, local knowledge and digital technology. This is linked with sophisticated communications between land, sea and air assets.

Sir Robin Knox-Johnston, Chairman of Clipper Ventures, was the first person to sail single handed and non-stop around the world between June 1968 and April 1969. Among numerous sailing achievements he co-skippered 'Enza New Zealand' with the late Peter Blake to take the Jules Verne Trophy in 1994 for the fastest circumnavigation of the world. The 11th edition of the Clipper around the world yacht race starts later this year and will involve more than 700 crew on board twelve 70 ft. yachts which comply with the MCA's rules for commercially operated yachts. Sir Robin discussed actual incidents on the open ocean, the lessons learned and applied to prevent people falling over the side, finding them quickly in poor conditions and their recovery on board.

Maritime medical solutions consultant, Paul Savage of Saviour Global Solutions, is Chairman of the U.K. Search and Rescue Medical Group which shapes the future and direction of UK SAR medicine. Drawing on nearly 30 years of search and rescue service with the RNLI and HM Coastguard, combined with the latest medical research, he explained the detail of what actually happens to the human body's physiology when immersed or submersed in cold water. His presentation titled, '7 Ways To Die In Cold Water' highlighted crucial factors that can help survival.

To end the day JoJo Mains, Community Safety Intelligence Manager for the RNLI, discussed how the organization uses analysis of incident statistics from a broad range of 'on water' and 'close to water' activities to develop and refine safety interventions, manage risk and target behaviour change that can bias participants toward safety. This includes fundamentals such as wearing lifejackets and adopting a means of low resource MOB recovery, particularly for shorthanded crews.

Doug Vincett, Technical Sales & Support for Spinlock, showed its range of lifejackets which have a compact 3D shape with front opening belt system for fast and secure fitting. The wide range of chest and back adjustment allows the wearer to have a comfortable fit which gives increased freedom of movement for working on deck. Vincett said, "If a lifejacket is not comfortable enough to be worn continuously it is useless. Spinlock lifejackets are designed to provide efficient working and reduced fatigue for continuous wear commercial marine applications due to improved design, weight distribution and fit."

3Si, Safety & Survival Systems International group, has a large portfolio of man overboard recovery products ranging from traditional life rings to electronic devices for commercial and military markets. Alistair Hackett, General Manager of the Ocean Safety division, gave a brief overview of the various types of personal locator beacons. This highlighted how the units are now cost effective for all maritime sectors plus their size is both lightweight and compact.

Sally Dale, Director of Pinpoint Electronics, presented the Life Cell unit which is a SOLAS approved buoyant device that can store safety equipment including VHF, EPIRB, flares, flashlight, air horn, whistle and signalling mirror. The mounting bracket is designed to allow the unit to float free in the event of a vessel sinking, then people in the water can use it as a floatation device. Dale said, "Life Cell was designed and developed after a real-life accident at sea and aims to redefine how safety equipment is stored on boats."

Harken Industrial demonstrated its lightweight, compact, low-friction, certified MOB kit for singlehanded recovery of a man overboard. Harken Industrial has also developed a range of corrosion-resistant rails and cars that enable crew to move freely around decks with adjustable anchorage points. Andy Ash-Vie, Harken Industrial Group Director said, "From our experience of over 40 years building solutions for the high performance yachting sector, we have developed a range of products for inshore, coastal and short sea applications to make working in adverse conditions easier, safer and more productive."

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On the Origin of Meaning

The IT sector, like most other industries, is awash with technical jargon, terminology, acronyms and abbreviations that have very specific meanings. More than most other major industries, however, TechSpeak - the language of IT people - is regularly co-opted into the language of the everyday. This is an inevitable consequence of our increasingly networked, IT-driven world; but often there is a disconnect between the way we discuss technologies and the benefits they can bring; how they are designed to be used; and how we actually use them.

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The Power of Words

As an IT software provider developing products specifically for the international liner shipping and port agency markets, at Softship we have seen how IT jargon has entered into the maritime conversation in a swarm of buzzwords. The challenge from our perspective, is that across the maritime industry this very technical IT language is frequently used in a way that creates a disconnect between the IT department and the rest of the business (wittingly, or otherwise).

Buzzwords are increasingly being used to pepper presentations about big-picture trends (‘digitalization’), technologies (‘blockchain’) or threats (‘digital disruption’), without delving into what these terms actually mean for the end-user – the employee or decision maker within a shipping company.

While it is of course a good thing that IT and software solutions are being discussed across the board, the issue is that complex IT processes, tools and products are being talked about without adequate exploration of their context and specific application. It is problematic because these words are often used as short-hand expressions, which are not being explained to decision-makers in a way that clearly showcases the benefits of their application to an organisations’ ability to benefit from their use.

Missing the Point

In other words, IT is increasingly being talked about in abstract terms, rather than as tangible tools for aiding business efficiency and performance. The net result is that shipping companies are lagging far behind in their uptake of technologies that can help them to compete. It is for this reason that we are increasingly seeing shipping companies failing to adopt (often very simple technologies) that can help their end users – their employees, customers or suppliers. This is particularly true when the solution to their problem does not conveniently fit within the parameters of a buzzword.

For example, simple online platforms can now offer the same level of support, the same functionality and processes as an intranet-based software package which can only be used on networked computers within an office. The switch to the new technology is relatively simple, and can incorporate all of the legacy data and information from the older system, which many decision makers fear having to leave behind. But because these technologies are being referred to as ‘cloud-based big-data solutions’, they are often dismissed as being a security risk without adequate investigation.

Polarizing Language

When the conversation about IT developments takes place with little regard for how technologies are designed to actually be used and the tangible benefits they can bring, there is naturally cause for confusion. It is important therefore, that the IT and software solutions providers speak up, and correct the tone. They should step towards the parapet to explain properly, in specific detail and in layman’s terms, how they intend these technologies to be used day-to-day. In practical terms, this means talking directly to end users, taking the time to explain the minutia and working closely with the people who are intended to benefit from the digitalisation of shipping services to ensure that they get the most out of these solutions.

This is not to say that there is no appetite for newer digital technologies or IT solutions across the maritime industry. But there is a reluctance to act as an early-adopter, or to implement technologies or solutions that work specifically for an individual business. Importantly, shipping companies are often adopting technologies in a piecemeal approach – electing for ‘add-on’s to small problems rather than a comprehensive, integrated solution built for their business and operations.

Bridging the Divide

This makes the integration of digital solutions with their existing platforms and processes of working a significant problem, with a web of peripheral and transient programmes used without control, standardisation or secure archiving capabilities. It is only through integrating software that shipping companies can achieve the efficiency benefits these products have the potential to provide. Digitalisation without integration in today’s world is the equivalent of having a smart TV, but no home WIFI. You have the tools, but you are not using them properly.

To give an example, all shipping companies will operate an accounting package to handle receivables, payables, ledgers, reporting and other day-to-day book-keeping requirements. Similarly, most will also operate systems to handle the commercial requirements from quote to cash. But we frequently come across companies that have breaks in their commercial and accounting processes, where information is not flowing seamlessly between applications and where certain jobs are done manually. This lack of integration creates friction in the workplace, duplication of process and also encourages “silo” working.

Digital Integration

Integration of the separate systems into a combined solution will allow the tariff rating system to capture all the complex agreements relating to individual customers and– a hugely complicated matrix of prices, restrictions, incentives and discounts. When a quotation is requested by a customer, it an integrated system that allows the quotation system to automatically look-up the relevant rates and create an accurate and individualised quotation. When the quotation turns into a sale, it is the integrated system that will create the required booking, bill of lading, invoice, manifest and everything else required.

This is precisely what Softship’s software solutions do. Liner carriers, for example, can use our LIMA software, by buying the components of the system that they require. We then work closely with these clients to integrate their existing programmes or data management processes into one system in order to avoid duplication of work, increase visibility and control and enable them to provide a better service for their customers.

A More Positive Path

Just as there is a linguistic divide between what is said and what is meant with software solutions in the maritime space, there is often also a fundamental disconnect between the integration of new technologies and existing ways of working. It is in this sense that digital solutions may actually prove to be ‘disruptive’ to a shipping business; but they need not be. To overcome these problems, of perception and integration, shipping companies should turn to the technology providers. It is through working collaboratively, in an integrated way, that shipping companies can truly benefit from the digital solutions designed to enhance their businesses and support their employees and clients.

About the Author

Lars Fischer is Managing Director of German shipping IT provider Softship Data Processing Ltd, Singapore, a wholly-owned subsidiary of Softship AG, the leading provider of software solutions to the international shipping sector.

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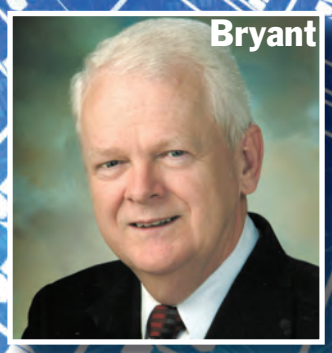
Getting caught in the Big Data Vortex

& the keys to Maximize Impact & Minimize Risk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MARITIME REPORTER AND ENGINEERING NEWS

Balancing Efficiency & Security

By Dennis L. Bryant,
Bryant's Maritime Consulting

We live and operate in a complex society. That society would be impossible without modern computers and other information technologies Those technologies have largely been developed piecemeal to address particular issues, and for the most part they have generally achieved their particular goals. Maximum efficiency is gained when multiple technologies are joined to coordinate their work. Computers get smaller and faster, with ever-growing memory. Joining computers together allowed for creation of the internet. Placing small efficient computers and related technologies on satellites allowed for establishment of the global positioning system and wireless internet connections such as Inmarsat. Putting computers and satellite communications equipment on ships allowed the collection of myriad data and rapid ship-shore communications worldwide. It also allowed for installation of such technologies as AIS and ECDIS. All of these and other developments have fundamentally changed the maritime industry, generally for the better. But there have been downsides.

The technology requires an increasing level of training for the human operators. This has proven especially difficult for the maritime industry where crew turnover is high. There are multiple manufacturers of the same equipment, such as ECDIS, and each takes a different approach to providing the desired service. As a result, the training received on a piece of technology on one ship may be largely useless on another ship. There is no standard method for integrating all the technologies on a ship so as to work together. Multiple individuals on each ship have access to the technologies. These individuals have widely varying levels of training and experience with those technologies.

A Few Examples

The Aegis cruiser USS Yorktown (CG-48) was commissioned in 1984. For twenty years, until its decommissioning in 2004, it was one of the most powerful and sophisticated warships in the US Navy. The continuing quest for sophistication, though, almost did it in. In 1996, the Yorktown was selected to be the testbed for Navy's Smart Ship program. The cruiser was heavily computerized, with an integrated control center on the bridge and other computers monitoring all shipboard activity. Unfortunately, crew training and system segregation were neglected. The computers were all tied together into one network. On September 21, 1997, the cruiser was operating solo about 100 miles off Cape Charles, Virginia. A crewmember in the engineering department, while ordering supplies, mistakenly entered a zero as the divisor in a mathematical equation. Dividing anything by zero results in an infinite number. The computer crashed. That caused all the other computers on the ship to crash. The ship totally shut down. Not only did the engines not work, neither did the radios. The ship could not send an SOS or notify its headquarters of the dilemma. It took approximately 2.5 hours to get the radios back on line so that a message could be sent to headquarters in Norfolk. Assistance was dispatched and the cruiser was escorted back to port. The Navy immediately declared the whole incident secret. It was not until some months later that a

report of the computer crash appeared in a technical publication. The Navy then acknowledged the incident, stating that the Yorktown had experienced "an engineering local area network casualty." Needless to say, the Smart Ship program was extensively revised.

On the night of June 10, 1995, the cruise ship Royal Majesty grounded on Rose and Crown Shoal just east of Nantucket Island. The ship was equipped with all the latest electronic navigation equipment, including an integrated bridge system. The GPS receiver was located in the chart room, which was seldom visited. GPS signals from that receiver were transmitted to repeaters on the bridge and to the integrated system. Unfortunately, the antenna wire connecting the GPS antenna to the GPS receiver had come loose. The GPS receiver defaulted to its dead reckoning mode. A flashing red light on the GPS receiver clearly indicated this situation, but the repeaters on the bridge and on the integrated system had no such warning signal. The integrated system showed that the ship was on its planned course from Bermuda to Boston. The current, though, had carried the ship west into shoal water. The navigation team on the bridge had gotten so comfortable with the process that they relied solely on the integrated system, not checking the radar, the fathometer, or even paying attention to the buoys and the shore lights until the grounding. In June 2017, someone or some group (suspicion has fallen on the Russian government) slipped some malware into an update to a software system utilized by the Ukrainian electrical grid. That malware not only shut down the national grid, it also hobbled the remaining portion of the Chernobyl nuclear plant. It then migrated to computer systems worldwide. Among those incurring this collateral damage were: Rosneft (the largest Russian oil company, largely owned by the Russian government - touché); a major international law firm; a multinational advertising and public relations company; and A.P. Moller-Maersk (the world's largest shipping company). Sadly, this malware attack was largely preventable. One of the security vulnerabilities exploited by the malware to infect the various computer systems had been identified months previously. Patches had been issued by Microsoft and various computer security companies. It appears that at least some of the affected entities neglected to fully install and activate the available patches.

The Threat

Bad actors infiltrate computer systems for a variety of reasons and utilize a variety of techniques. Sometimes, these individuals or groups want to steal the data. Sometimes they want to hold the data for money, utilizing so-called ran-

In December 2004, Crew members assigned to the guided missile cruiser USS Yorktown (CG 48) man the rails for the final time in preparation of the order to de-man the ship as she is decommissioned on board Naval Station Pascagoula, Miss. In 1996, the Yorktown was selected to be the testbed for Navy's Smart Ship program, effectively exposing a major flaw in the system when a simple error left the ship blacked out for hours.

somware. Sometimes they are malicious and just want to destroy data. And sometimes, as in the most recent incident, they lose control of the malware and it impacts unintended third parties.

Malware can be hidden in some other company's software that is then downloaded into a computer of the intended target, as happened initially in the June 2017 incident. Malware can also be hidden in a file that gets uploaded into a computer system. This is a common technique. The file is usually sent to someone with access to the computer system in an innocent-looking email, often appearing to be from a friend or co-worker. There are generally indications that something is amiss (e.g., the email address is unusual; the subject of the email is odd; the URL of the link suspicious; etc.). All it takes is one unsuspecting individual to accept and open the email or upload from an infected memory stick to corrupt the entire computer system with the malware.

Efficiency and Cybersecurity

Companies must adopt a robust comprehensive cybersecurity system, keep it up-to-date, and continually train their staff regarding the importance of cybersecurity. The threat evolves rapidly. Entities cannot assume that because they updated their system six months ago it is still effective against current threats. They cannot assume that only the company's main computer needs to be kept current. They cannot assume that because they are small fish, they will be ignored. As the June 2017 incident demonstrated, many of the computer systems that were infected were not intended targets. Some malware, once released, will attack any computer in any computer system that is unprotected. Don't be collateral damage. There is a balance in our modern world between efficiency and security – you can't have one without the other. Don't turn off your computers and other electronic devices, but don't assume that they will always do exactly what you and only you want. You don't leave your car unlocked, so why would you leave your IT system unlocked?

U.S. Navy photo by Stacey Byington (Released)

Martin Kits van Heyningen

President, CEO & Chairman of the Board, KVH

KVH @ a Glance

Revenue:	$185M (FY '15)
Ownership:	Public
Stock:	Nasdaq
Symbol	KVHI
Founded:	1982
Employees:	545
FY End:	December 31
HQ	Middletown, RI,

Offices: Illinois, Belgium, Brazil, Cyprus, Denmark, Hong Kong, Japan, the Netherlands, Norway, Singapore, and the U.K.

From humble beginnings KVH has evolved rapidly to become a central player in the maritime world's global Big Data revolution. Maritime Reporter & Engineering News caught up with Martin Kits van Heyningen in Oslo for his take on KVH's current position and future direction.

By Greg Trauthwein

"We certainly didn't envision that we would be in the high-speed satellite broadband business when we started," is how Kits van Heyningen, President, Chief Executive Officer, and Chairman of the Board, KVH, succinctly summarizes the biggest difference between the company he founded in 1982 versus the one he leads today.

In 1982, Arent, Robert and Martin Kits van Heyningen launched the world's first digital compass for use in racing sailboats. The product and the company were both dubbed Sailcomp, and as products and applications were added the company changed the name a few years later to KVH Industries. Today KVH Industries is a manufacturer of solutions providing global high speed internet, television and voice services via satellite to mobile users at sea, on land and in the air. It is a manufacturer of sensors and integrated inertial systems for defense and commercial guidance and stabilization applications. "We still do quite a bit with sensors. The digital compass is where we started, and from there we moved to interfacing with the autopilot, the radar and eventually, antennas. That is how we got into the business of building antennas," said Kits van Heyningen. "The technology today is different, but the focus on innovation (at KVH) remains the same"

Kits van Heyningen's on:

Investment Philosophy

"We tend to have a much longer horizon than other public companies. We still try to take (measured) risks, so if that means changing the company or taking a pause in your growth strategy, we'll do that. You need to re-invent yourself."

Big Data in Maritime

"(In every other industry) people are trying to figure out how to get more and more data. Over the last 30 years the maritime industry has been trying to figure out how to not transmit data from a vessel. Even as the technology has improved, the mindset remains: "how can we limit data."

"It's a new approach"

Just before the NorShipping exhibition in Oslo, KVH Industries announced the availability of AgilePlans by KVH, an all-inclusive Connectivity as a Service (CaaS) offering for maritime. "It's a new approach," said Kits van Heyningen, noting that there are no installation costs, no hardware to buy and no long-term sign-up plan. "We tried to do something that no one else is doing. We are not content being a 'me too' company."

AgilePlans confirms this, as for a monthly fee starting as low as $499 it brings an advanced satellite communications solution onboard with the aim of providing better communications and improved operational efficiency at sea. "We coined the phrase 'connectivity as a service,'" said Kits van Heyningen. (see box on 'AgilePlans').

Maritime & Data

The data revolution in maritime is slowly picking up steam as new generations – 'internet natives' – enter the workforce, and as increasingly large and global players exploit the efficiencies of broadband connectivity for competitive advantage. In addition, the drive for fewer crew and ultimately autonomous operations plays no small role in the evolution of broadband onboard.

The maritime industry is broadly considered 'conservative,' and Kits van Heyningen explains that it is wholly unique from nearly every other world industry in one key regard: (In every other industry) people are trying to figure out how to get more and more data. Over the last 30 years the maritime industry has been trying to figure out how to not transmit data from a vessel. Even as the technology has improved, the mindset remains: "how can we limit data."

Kits van Heyningen sees attitudes changing with the generational shift, particularly as it becomes more difficult to attract the younger generation to a life at sea. "Nobody wants to be cut off from the internet, social media and email for months at a time."

Even though his business is supplying the technology tools, Kits van Heyningen is the first to admit that high-tech tools alone are not the silver bullet answer to true data 'disruption' in the maritime sector. "If you simply increase your speed, but continue to do things as you have always done before, it is not an effective solution." For example, a company that incorporates a VSAT solution yet continues to transmit information via email might complain that 'nothing happened,' he said. But when the company starts transmitting engine or weather data real-time, the experience changes. "All of the sudden they realize the benefit of changing the process, not just the tool." To that end, Kits van Heyningen sees KVH as a partner, working with companies to help them maximize a system's effectiveness.

So continues the evolution of KVH, a true chameleon that consistently scouts new opportunities for its innovation. (In terms of investment strategy) we tend to have a much longer horizon than other public companies, said Kits van Heyningen. We still try to take (measured) risks, so if that means changing the company or taking a pause in your growth strategy, we'll do that. "You need to re-invent yourself."

AgilePlans by KVH in Brief

AgilePlans by KVH is, well, 'agile.' With the mantra 'connectivity as a service' KVH aims to deliver highest quality connectivity with no up-front fees and purchases. Monthly plans start at $499 per month, and include:

- **Hardware:** Choice of KVH's TracPhone V7-IP or TracPhone V11-IP antenna system; the below decks Integrated CommBox Modem (ICM); and required cables
- **Installation:** Free shipping to, and standard installation in select ports around the globe
- **Maintenance & Support:** Zero maintenance costs for the life of the subscription; KVH OneCare Global Technical Assistance Package; proactive performance monitoring
- **Airtime and Voice:** Choice of KVH's usage-based airtime data plans with speeds up to 4 Mbps shore-to-ship, and a KVH-assigned VoIP number
- **Management Portal:** myKVHTM
- **Vessel Tracking Service:** Basic Tracking
- **Crew Welfare:** NEWSlink Print and NEWSlink TV delivered and updated daily via KVH's IP-MobileCast content delivery service
- **Training Content:** TRAININGlink Videotel Basic Training Package of videos covering Standards of Training, Certification, and Watchkeeping for Seafarers (STCW)-related material for one of three categories: tankers, dry cargo, or offshore
- **Operations Data Delivery:** CHARTlink and FORECASTlink multicast delivery of third-party chart and weather data

IoT & Changing Connectivity at Sea

By Dan Rooney, Commercial Maritime Product Director, Speedcast

Whether it's autonomous cars or connected houses, it seems like everywhere you look these days, internet of things (IoT) technology is a focus. Even in the conservative maritime world, IoT is currently a hot topic. Shifting supply chain solutions and business models are fundamentally changing the way that commercial shipping and the wider transport sector operates.

IoT enables an organization to capture value from information, regardless of sector, and in essence forms a loop that creates a larger process. Deloitte conceptualized this process and named it the Information Value Loop in 2015. By capturing the pertinent stages of how IoT and sensors might cooperate with process modelling, the value in integrating IoT can be realized.

IoT Applications & Devices within the Maritime Sector

For many vessel owners and operators, IoT and machine to machine (M2M) applications and devices remain abstract concepts. The maritime industry can be slow to implement technological changes that are quickly implemented on the shore, although this is beginning to improve. A coherent and unified approach to delivering IoT/M2M solutions, via manufacturer and system integrator partnerships will allow vessel owners and operators to realize the full potential of IoT/M2M. Despite the maritime industry's reticence to adopt new technologies, IoT/M2M is becoming more commonplace on board as vessel owner and operators realize the value that IoT/M2M brings. However, deployment of an IoT/M2M application or device alone is not a panacea for cost savings. IoT/M2M applications and devices must be deployed as part of an end-to-end solution, including back-office intelligence for the augmentation and processing of received data into useful information.

One primary maritime area of focus for cost reduction is fuel consumption. Faced with rising costs for bunkers against low charter rates, vessel owners and operators are looking for alternative methods to reduce operational expenses. Some cost reduction methods give a clear return on investment, such as anti-fouling paint or weather-based routing services. When these methods are coupled with IoT/M2M applications and devices, the degree of information available for smarter cost saving decisions increases exponentially. For example, adding IoT/M2M fuel flow meters to a supply line can provide information regarding the (near) real-time operational efficiency of a vessel's engines. The current technical data from the vessel's machinery systems can be correlated against known data (manufacturers data/sea trials/previously gathered data), compared to determine if performance is lagging.

Cargo Monitoring

The containerization of the shipping and greater transport industry revolutionized supply chain logistics. Pioneering shipping companies such as Maersk have identified that the digitalization of the container industry is an important aspect of growth. It still has room to grow, but it will dramatically change the industry.

Chilled refrigerator transport (also known as reefer) is one area where IoT/M2M has revolutionized. For the most part, the general public remains blissfully unaware of how they get produce such as bananas or the challenges in transporting a banana from a tree to a supermarket. Meanwhile, a charterer wants to ensure that their cargo of bananas arrives at its destination in an acceptable condition and on time. Regular updates regarding cargo humidity, temperature and air pressure can be automatically transferred ashore, along with the ship's estimated time of arrival via IoT/M2M applications, allowing a charterer to update its onward supply chain. In the event of an anomaly, skilled refrigeration technicians can remotely make changes via satellite to the cargo conditions, or alert crew to failed equipment on board. All of this information can be aggregated and modelled then updated automatically onto a mobile app for relevant parties.

Trend Toward Automation

With the significant increase in efforts to provide automation within the maritime industry, experts are predicting that new vessels will face a gradual reduction in crew members over the coming years. The majority of decision-making processes are being moved to an onshore control center. For example, some major vessel owners are even proposing the potential for introducing new vessels that require as few as five crew members.

Major shipbuilders such as Rolls Royce are also striving towards the concept of the autonomous vessel. Rolls Royce announced an initiative called the Advanced Autonomous Waterborne Applications Initiative (AAWA), defining how by 2020, semi or fully autonomous vessels could be sailing across the world. Monitored and controlled by a small crew within a central location and guided by multiple sensors and controlled systems on board, the autonomous vessels will reduce the cost of shipping goods. As the maritime sector moves toward automation, there is a growing importance to introduce multiple and redundant layers of connectivity to enable secure and reliable communications. Considering the potential scenarios that could arise if a loss of connectivity was experienced on an automated vessel, having 24/7 connectivity regardless of location is critical. Ensuring vessels have the proper equipment to guarantee reliable connectivity, for example automated switching between disparate satellite and terrestrial networks is essential to operation. In order to achieve this high degree of connectivity, satellite communications company Speedcast has developed hybrid networks (satellite, 4G/LTE and wireless radio) to enable connectivity for critical communications - allowing a vessel to never be out of touch regardless of its location. The IoT/M2M revolution can only bring value when coupled with reli-

Image: iStock as supplied by Speedcast

able and redundant connectivity.

What's Next for Big Data?

We've heard it for several years now. The term big data has become an industry buzzword. The dilemma is that once companies implement IoT sensors that collect data, many don't know what to do with all of the extra information. It's like buying an expensive sports car before learning how to drive.

IoT/M2M generated data must be transferred in a cost-effective manner. For example, Maersk estimates that it transfers around 30TB of data per month for its fleet of 400 vessels. This renders data transfer unmanageable for a vessel equipped with standard L-band mobile satellite equipment such as Inmarsat Fleet Broadband or Iridium Pilot. Vessel owners and operators need to consider if there is an urgency to transfer even a portion of this vast amount of data. Primarily determining which on-board data is time critical, needing (near) real-time transmission and which data can be delayed is the first step of optimization. Applying further optimization techniques to the generated data, such as compression or batching before transmission will aid in cost effective use of the vessel's connectivity. The second step is considering where should the IoT/M2M generated data be uploaded to? Costs associated with cloud storage are dropping quickly, but considering our earlier vessel generating 30GB per day and 1TB per month cloud storage costs could quickly increase. Therefore, the business requirement for the IoT/M2M data should be well defined.

Keeping Data Secure

Whilst IoT/M2M and the big data revolution is viewed as the key to the future of the maritime and transport industry, cybersecurity represents a major area of risk. Maersk recently experienced a global outage for several days due to a Petya ransomware cyberattack that rendered all of their business units offline. As media reports an increasing frequency of cyber and ransomware attacks, organizations between to consider how secure their networks and data actually are. Considering that vessels will be transferring huge amounts of data to the cloud, there is an exponential risk of a cyberattack or data compromise.

Speedcast recognized that cyber-awareness and knowledge within the maritime sector was low, and developed a complete cybersecurity solution, delivering end-to-end cyber protection from the vessel to the cloud. IoT/M2M applications and devices can by default expose themselves to the internet, and without adequate cybersecurity policies in place, can be a potential gateway for a hacker. Speedcast can provide assistance in developing cybersecurity policies for shipping companies, plus determining if previous data has been compromised.

These secure solutions, coupled with the growth of big data and the use of innovative IoT/M2M applications and devices provide a roadmap to a bright future for the maritime industry. Why work and ship harder, when you can work and ship smarter.

Voices Dr. Cleopatra Doumbia-Henry, President, WMU

Photo: World Maritime University

"I see WMU as charting the course for a better world. Providing the best education and research facilities for post graduate studies and capacity building for a sustainable maritime industry."

Dr. Cleopatra Doumbia-Henry

President, World Maritime University

To say that Dr. Cleopatra Doumbia-Henry is passionate about all matters surrounding maritime and seafarers is a bit of an understatement. Prior to taking the helm as president of the World Maritime University (WMU) two years ago, she served as the Director of the International Labor Standards Department of the International Labor Office (ILO) in Geneva, Switzerland, responsible for developing the Maritime Labor Convention, 2006. Maritime Reporter & Engineering News was at WMU in Malmö in late June 2017 to sign a Memorandum of Understanding with WMU and Marine Learning Systems to jointly produce a benchmark study on global maritime training practices and trends. Dr. Doumbia-Henry discusses the future course of WMU and the importance of the coming survey..

BY GREG TRAUTHWEIN

"I've always had a passion for maritime and the shipping environment," said Dr. Cleopatra Doumbia-Henry, who completed her doctoral thesis on the carriage of dangerous goods by sea "at the time it was a very unusual topic to choose. I was looking at lawmaking by international organizations and the resultant impact."

The topic, which she admits was a bit esoteric when it was researched and written, was her effort to find a niche to add value to the existing safety at sea discussion of the time. "I thought it could have a significant impact, particularly when you look at the amount of goods carried by sea, and the amount of goods that are considered dangerous," she said. "It was another way to look at the impact on the oceans, and through this I got to know the International Maritime Organization much better."

MLC, 2006

Following her studies, Dr. Doumbia-Henry joined the International Labor Organization (ILO) as a commercial lawyer, and courtesy of her maritime background, she became the de facto "maritime" lawyer at ILO. As history suggests, a fortuitous choice by both ILO and Dr. Doumbia-Henry, as she served as the architect of one of the most sweeping instruments to meaningfully impact the seafarers' work and personal lives – MLC, 2006.

MLC, 2006 was painstakingly built over a period of six years, and before it there were 72 separate instruments – binding ones and non-binding ones– that sought to serve the same purpose. "We had too many instruments that were unevenly ratified and implemented and thus had reduced impact," she succinctly summarized.

"So I began a major exercise in engaging governments, employers (shipowners) and trade unions (representing seafarers) to look at making this body of international legislation more effective," she said. This "long haul" started in 2000 and ended with the adoption six years later of a single Convention, MLC, 2006, that effectively replaced 68 international legal instruments.

Dr. Doumbia-Henry is justifiably proud of the effort, not only for what it means to the world's 1.2 million seafarers, but from the universal buy-in with ratification by 84 countries including all of the major ship registries covering approximately 91% of the world's ships. "This ended up being an incredible enterprise, but one that has been my most rewarding venture. It took a lot of energy, a lot of sleepless nights, but at the end of the day it worked."

The intensity of the exercise was not only to bring all 68 legal instruments together under one umbrella, but to give it teeth.

"The most important thing was to get ownership, because with ownership everyone feels they are part of the deal and they are going to make it work," said Dr. Doumbia-Henry. "The idea was to get an instrument that was better, that was more effective and that would have an impact on the

working lives of seafarers, making living and working conditions better, give shipowners a level playing field and governments a single set of rules of the game. That was my mission. I had tremendous support, and I'm very proud, as it is one of the best ratified in the shortest timeframe possible of an ILO instrument when you consider its wide-ranging scope."

The work has paid dividends, and Dr. Doumbia-Henry credits Port State Control as being tremendously effective, citing the Paris MOU as an example in recording 17.4% detentions representing 113 ships after the first campaign one year after the entry into force of the Convention.

"This had never happened before in those numbers, because now they had clear identifying factors and targets." She also referred to the role and the impact of the ILO Committee of Experts on the application of Conventions and Recommendations (Committee of Experts), which is the body that has the mandate at the international level to monitor and evaluate legal and practical implementation by ILO members States of the provisions of ILO Conventions. The Committee of Experts began monitoring compliance with the MLC, 2006 in 2014.

"The number one challenge is financial sustainability. I will not rest until I have been able to get the university in a position where it can look well into the future and build financial reserves that would enable it to have a long-term financial perspective, to enable it to grow and to deliver the greatest impact possible for the maritime and ocean industries."

A Return to Academia

Following more than three decades of work, including more than 15 years in senior management positions, Dr. Doumbia-Henry was appointed to lead the World Maritime University (WMU) in 2015. "I thought I had a pretty good set of skills and I think I'm pretty good at managing people."

In addition, she looked at her experience covering all international labor standards around the world in 187 member States of the ILO, and concluded that these years of experience fit nicely with the mission of the United Nations in building capacity, particularly for developing countries.

Any organization comes with challenges, particularly a high-profile international educational organization, and Dr. Doumbia-Henry sought to first assess both the promise and the peril of the position at WMU.

"I knew one of the challenges of the university was its long-term financial sustainability," she said, "and that remains for me the number one priority; to help the university strengthen its financial base so it can have a much longer-term perspective than it currently has."

While WMU is a child of the IMO, it is not funded by the IMO budget; rather it is self-funded. The IMO does contribute financially, but it is not a fixed annual amount. "When you run any business, when you run any institution, one of the main concerns is the money to support operations and building reserves for the rainy days. So before I started I had to determine if I had the energy and capacity to go out and do resource mobilization in a very big way."

Dr. Doumbia-Henry has spent much of the first two years on the job thoroughly understanding where the university stood. "It's important to ground yourself before you leap forward. It's one thing to have a perspective from the outside (of the university), it's another to really know an organization from the inside," she said.

One significant step forward and one of the most important achievements in terms of financial stability – with the support of the IMO Secretary General and the Board of Governors of WMU – was establishing an endowment fund. "We have launched the endowment fund, and now we must grow it to ensure the financial stability and future of the university."

With the endowment fund 'box checked,' she is now focused on simultaneously working to energize the WMU alumni association, and preparing for a global launch, a fund-raising 'road

World Maritime University: Where world maritime leaders come to learn & grow.

show' by the end of 2017. Here again she will draw energy for the mission courtesy of her belief in the cause. "I see WMU as charting the course for a better world. Providing the best education and research facilities for post graduate studies and capacity building for a sustainable maritime industry."

Research is Key

On June 29, 2017 World Maritime University, Marine Learning Systems (MLS) and New Wave Media signed a Memorandum of Understanding to jointly research and produce a comprehensive study on global maritime training trends and attitudes.

"The publication that we just signed off is breaking new ground; I think this is a study that has never been undertaken, it is innovative, it is new," she said. "Seafaring and shipping is not possible without well-trained, well capacitated crew. Shipping is responsible for 80% of world trade; and as I like to say, without it, half of the world would freeze and half of the world would starve."

"What we signed today is critically important for me because research is a core part of any academic institution," Dr. Doumbia-Henry continued. "In my view, as an academic institution we have to 'lift our game' in the area of maritime research. That's why an annual, major report that will come out with research findings based on analysis of data is critically important. I want to strengthen WMU's maritime research. Maritime is our core, and we should be 'number one' in the world for maritime research. We need to have annual reports – this one is our first – and we have to be the independent arm providing research, outcomes and results and data that is independently assessed and available to the maritime community in the broadest sense.

> *"The publication that we just signed off is breaking new ground; it is innovative, it is new. Seafaring and shipping is not possible without well-trained, well capacitated crew. Shipping is responsible for 80% of world trade; and as I like to say, without it, half of the world would freeze and half of the world would starve."*

Central to the evolution of maritime training is the technological evolution of ships at sea; both regulation-driven to meet ever tightening environmental standards and market-driven to improve safety and efficiency. As maritime moves increasingly toward automation, there are also fundamental questions regarding the future role of the seafarer; where will they come from; where will they work; when and where will they train?

Dr. Doumbia-Henry sees the impact of the internet and eLearning as transformational to all training and education, and one that is quickly spreading through maritime circles.

"So much now can be done through eLearning platforms, and now it is impacting the maritime industry," said Dr. Doumbia-Henry. "I think face-to-face and practical onboard training – while they will still be indispensible – will be balanced with training people to learn through eLearning platforms, so seafarers, at sea, can continue their education."

To truly understand the pace and direction of change, more information is needed on the training habits, objectives and future plans of the companies training seafarers. "I think the survey will enable us to, first, establish a base-line; To achieve something that is objective, independent, and a comprehensive analysis of data relating to training policy and practices," said Dr. Doumbia-Henry. "For me, the outcome of this annual study will enable the maritime industry to gain insights that can assist with policy making, with decision making, with benchmarking, as well as to help optimize operations and potentially influence the international regulatory regime. We need to make sure the international regulatory framework are adapting to rapidly changing technologies."

Ultimately, well trained seafarers will support – in a very fundamental way – sustainable, safe and secure shipping on clean oceans.

"In my view that is critical to the long-term sustainability of the industry itself. And on the future of maritime, seafarers, the oceans and the WMU, Dr. Doumbia-Henry is passionate indeed.

Schulte Marine Concept

Krzysztof Kozdron

Managing Director, Schulte Marine Concept

If you are an American thinking Asia for converting a vessel, building a drydock or contracting a medium-sized newbuild, then Krzysztof Kozdron of Germany-based Schulte Marine Concept (SMC) is the man you need to speak to. Easy to talk to, the Shanghai-based naval architect and engineer knows shipbuilding from all sides. Parent company Bernhard Schulte Shipmanagement (BSM) has owned and operated ships for 150 years, and he draws on that and his own 25 years of project experience. As SMC has grown to operate 100 vessels and manage 600, Mr. Kozdron too has risen rapidly through the ranks. He discusses current shipbuilding challenges and opportunities.

BY WILLIAM STOICHEVSKI

> *"Only a few shipyards are capable of designing and delivering these vessels (small cruise ships) without losing money. The shipyards in Europe, of course. We've seen attempts by Asian yards to undertake such projects, but they've proven a complete technical-financial failure."*

"Within the ship management division, we have a specialized, dedicated entity, that helps develop and execute newbuilds, and that's Schulte Marine Concept. We try to be a one-stop shop for clients," said Kozdron. SMC has now overseen more than 450 vessel projects — from an advanced wind-service vessel in Norway to work for U.S. yards building drydocks at other U.S. yards. The number includes ballast-water system installs, modifications and newbuilds. Lately, though, the market has been "imploding" somewhat, although in China, at least, mergers have proven "very successful." Elsewhere, things are different.

"Everybody's kind of in survival mode, including shipyards. Some of them are struggling to exist. Some survive mostly because of help rendered by local ship-owning companies or via the financial sector and their government. Ship owners are also struggling with charters that are (inexpensive). They're struggling to arrange financing for newbuilding projects, and shipyards are struggling with low prices and a low number of (new) orders."

Much of SMC's recent business has been carried out on new-builds in Asia — China, Korea and Japan — in that order. "We actually managed a newbuild project in Europe last year (the Windea vessel at Ulstein)." Most of the recent work has been "very specialized, high-volume vessels. When it comes to bulk orders, big vessels, large numbers Asian shipyards are unbeatable."

The Market

That,"the market hasn't moved much the last years," isn't lost on Mr. Kozdron. "We've seen some movement into cruise liners or at least the small, adventure cruise sector. It's an interesting sector. It's always kind of a new sector. Only a few shipyards are capable of designing and delivering these vessels without losing money. The shipyards in Europe, of course. We've seen attempts by Asian yards to undertake such projects, but they've proven a complete technical-financial failure."

Mr. Kozdron says the cruise industry boom still underway means, that if you want a slot to build a new cruise vessel, then "You'll have to wait until 2025 or 2026." European shipyards, he suggests, will survive by excelling in niche sectors like Cruise. SMC, for its part, is involved in development-stage tenders for smaller, adventure vessels.

Outside of cruise, overcapacity has ravaged shipyards. "You can build a shipyard within two years from scratch to fully functioning, depending on the infrastructure. The main challenge is to find experienced people to manage the shipyard and work there, but once you dismiss people it's hard to get them back. The maintenance of these and other complexities is the main challenge. Shipyards were forced by the market to review their capacity, and they've done this by closing down floating docks, dry docks, production lines and by dismissing personnel.

"Today's shipbuilding prices are low. They're very tempting, and it's the perfect time for owners who can arrange financing and have employment for the vessels. Shipyards today are flexible and open to discussing (customization), new equipment and technology, unlike a few years ago when they were too busy and flooded with orders and they exercised the policy of "Take it or leave it," and they were afraid to move away from a vessel's standard design. At this moment, you can get the vessel you want made with the equipment you want at a good price." SMC, he says, would make sure the design is optimized for cash value, the customer's actual needs, re-sale value and a particular competitive edge. "We add value to the build."

The Challenge

"The hardest thing is to make sure the shipyard and the ship owner speak the same language, that they understand

Krzysztof Kozdron, MD, Schulte Marine Concept

Schulte Marine Concept

Schulte Marine Concept

Above: *Builders and Owners: A Shulte Group newbuild.* ***Below:*** *American Special: An SMC-supervised drydock build.*

Owners will always face the issue of adding a piece of equipment that costs $1.5 million for a vessel that originally cost a few million dollars. In the case of BWTs: "It may happen that a number of vessels that are 20-plus years old will be scrapped, as the installation of BWTs will not be affordable or justified from a commercial perspective."

each other," he says, before relaying the tale of two American yard clients who struggled in the roles of client vs. shipyard during their "agreed" build. "Both knew better than the other," he relates with a smile.

More often, there are cases when the contracting parties simply don't understand each other, and that's when SMC — with its pedigree as ship owner, ship manager and builder — can smooth things over. "You can't allow a shipbuilding contract and technical specs that are not 100 percent exhaustive," he says, adding that there's always a "technical, functional, operational grey area," so "you need to have common understanding between ship owner and yard on what you want to achieve."

Not all clients can do that. Mr. Kozdron recalls two wanting to be ship owners for the first time. They were given a rundown of their industry; their fleet needs; the right designs for them; negotiations with and supervision of the builds, as well as ship management advice for "that cargo" and "those destinations." "The shipyard's offered design was reviewed and optimized. So, yes, we channel our ship-owning experience into newbuilds. We don't just provide supervisors, we do the whole turnkey solution."

Some Conversions

Since regulations and technology have made vessels more complex than ever, that "universal rule" of finding understanding on expectations is more important than ever. The triple experience of shipowner, shipbuilder and ship managers means SMC and Mr. Kozdron are tuned right in to "the most reasonable" solution. "Whatever compliance is requested, we find the right technology, the right CAPEX and OPEX plan to meet it in full."

Installing ballast water systems, for one, "are not always easy on the newbuilding site," while building a vessel from scratch might require a new slip. The price of conversions and their equipment, too, are "very high." Owners don't always understand that "the new equipment requires energy to operate, and the energy might not be available due to the electrical balance or a space issue." Owners will always face the issue of adding a piece of equipment that costs "$1.5 million" for a vessel that originally cost "a few million dollars. They'll want to know that they can operate the vessel for five years in the current shipping market." For BWTs, he says, they might change a ship's capacity. "It may happen that a number of vessels that are 20-plus years old will basically be scrapped, as the installation of BWTs will not be affordable or justified from a commercial perspective."

Capex and Opex

Then there's MARPOL Annex VI, Regulation 14 — the sulfur cap on marine fuels (deadline 2020). "Owners are still wondering," he says, about what choices they'll have on compliant fuel or heavy oil versus exhaust scrubbers. "The only question is does the installation of that scrubber provide compliance with MARPOL which addresses sulfur content in the fuel."

He drills deeper: "The initiation of scrubbers is a very expensive exercise, both from the capex an the opex perspective. On the technical side, a special scrubber requires a lot of space. If you look at a smaller vessel like small feeders or small bulkers, the limited space available means the feasibility of a scrubber is a big question mark. It'll come at the price of cargo capacity. Smaller vessels are technically and commercially challenging (to convert for scrubbers)."

Build a Drydock in Asia

You won't bog Mr. Kozdron down in conversion talk. Despite the looming rules, he knows "most" shipyards "are reducing capacity." He'd rather talk newbuilds, especially of ships and drydocks built in Asia.

"We're trying to reach out to clients in the U.S. who want to build a vessel or drydock or are travelling to Asia for the first time with a big expensive, complicated project in mind. We want them to be aware that you can get value for money and make it efficiently and safely, if you have someone who knows how to do it and knows the local solutions. It'll be on-time and on-budget."

Building in Asia for international trade avoids Jones Act limitations. "It's a new experience that you bring home with you. Learning something new is always something good. Being stuck with in-house technology can make you fall into an excessive comfort zone."

He promises you'll be able to communicate your needs. "That's what we do. We offer communications channels. We translate," he says.

MegaYards

Photo Courtesy: Yamal LNG and Sovcomflot.

BY WILLIAM STOICHEVSKI

The Woodmac report we saw offered us cause for pause — "Strong activity from the (major oil companies)" while "national oil companies have tightened their purse strings." What Maritime Reporter found, was that national oil companies — nation-builders, for many — are putting their money in affiliate shipyards. The hope of two, new shipbuilding giants is jobs, innovation, national survival and export security. The model is to invite those who have done it before: Koreans, Japanese, French and a contractor with offshore and marine experience.

Competition, too, may be providing impetus for giant shipyard schemes at Ras El-Khair in Saudi Arabia and at Sabetta and Bolshoi Kamen in the Russian Far North and Far East. For Saudi, rival Qatar's shipyards produce large and small vessels, and its fleet of LNG carriers is large and emboldened by a new deal with Hoegh LNG to explore FSRUs. For Russia, there's the crush of destabilized oil prices.

At Ras El-Khair, a Saudi Aramco joint venture will produce jack-up rigs, offshore service vessels, or OSVs, and very large crude carriers, or VLCCs. At Sabetta on the Arctic Kara Sea and at Bolshoi Kamen on Russia's Pacific Coast, ice-breaking vessels, offshore structures, VLCCs and gas carriers. Russia's aim is to offer the world's first, arctic-only offshore fleet to complement its ice-breaking tankers and the Christophe de Margerie, St. Petersburg-based SCF's Korean-built ice-breaking LNG carrier. As with Saudi Aramco, energy giants Rosneft and Novatek are backing the Russian mega yards.

Global Impact

Whatever the mega yards' sprawl in square miles, their eventual impact on the market for smaller vessels is in doubt. "Big yards can build small ships effectively, too, if the number of vessels is high," said Cankut Demirkol, business development manager at Turkey's Özata Shipyard. "You can effectively build small tugs, ferries, trawlers, etcetera, if they are a series of vessels (otherwise) … the income from the vessel will not cover the expenses."

Apart from planned capacity for four rig builds and three VLCCs a year, some 40 other shipbuilding slots for unspecified vessel types will shape the Saudi yard. Its joint venture between Saudi Aramco, Lamprell and Hyundai Heavy Industries will use facilities built by U.S.-based marine contractor, McDermott International. It is understood that McDermott will engineer the Saudi yard

Arctic Firsts:
Arc 7 LNG carriers, including the Risunok (right) and the ice-breaking Christophe de Margerie (left).

Photo Courtesy: Yamal LNG and Sovcomflot.

The orders have swelled Korean yard orderbooks, **with HHI's up 150% since Vladimir Putin's 2016 visit to Seoul.** "It will be an addition to current shipbuilding overcapacity and as such contribute to a pattern of continued short earnings cycles in shipping. **As HHI is known to be an outstanding Tier I yard group — and quality never goes out of fashion — Tier II yards should fear this addition."**

Dag Kilen
Senior Shipping Analyst, Fearnley Consultants

and HHI the VLCCs. Mr. Demirkol sees transfers of Korean crews to El Khair. "It's wiser," he says.

In Russia, Daewoo is overseeing much of the work on yard facilities at the Zvezda shipbuilding complex in cooperation with Russian SCF, while a Zvezda-Hyundai JV formed in 2017 will focus on the shipbuilding. The orders have swelled Korean yard orderbooks, with HHI's up 150 percent since Vladimir Putin's 2016 visit to Seoul. Though their impact on markets for smaller vessels is in doubt, the impact of Korean know-how in Saudi and Russia will be felt. "It will be an addition to current shipbuilding overcapacity and as such contribute to a pattern of continued short earnings cycles in shipping," says Dag Kilen, senior shipping analyst at Fearnley Consultants in Oslo. He says it piles pressure on yards everywhere. "As HHI is known to be an outstanding Tier I yard group — and quality never goes out of fashion — Tier II yards should fear this addition," Mr. Kilen says about El Khair.

Saudi JVs

At Khair, the building of jack-up rigs in a depressed offshore drilling market looks set to kick-off by 2019, headed by jack-up builder Lamprell.

For Lamprell, working now from three smaller UAE yards, a JV at the biggest shipyard in the Middle East means "two rigs a year" plus non-rig marine maintenance. Lamprell will invest $140 million to earn 20 percent of the shipyard JV. Saudi Aramco will invest $350 million for 50.1 percent, and the Kingdom will inject $3.5 billion.

Rowan Companies chief exec, Tom Burke — part of a separate Aramco JV— declared a "growing Saudi Arabian offshore drilling market" was at hand, and that "rig commitments" for Rowan jack-ups were now long-term. Rowan will contribute three jack-ups to the rig JV, Saudi Aramco two.

Heikkinen Energy Advisors offshore analyst, David Smith, says the Saudi plan is "more about job creation" and not "Aramco's view of global jack-up market fundamentals in '20 and beyond." He points to jack-ups sold recently for $65 million, or over 60 percent less than original price. "If Aramco were only concerned about a future shortage of jack-ups, it would be much cheaper to buy their own fleet than to build it," Mr. Smith says. Heikkinen forecasts 365 jack-ups under contract in 2020, or 20-percent more than today. "But it's far below the current marketed supply of 461 rigs, not to mention the 98 jack-ups under construction."

Key Knowhow

McDermott will build the marine complex that'll be the JV's heart and will move to Khair from nearby Dubai for a long-term land lease from where it'll provide training.

For "the next 50 years," chief exec David Dickson sees McDermott expanding its offshore and subsea capacity at Al Khair to serve subsea markets from East Africa to the India. "The future fabrication is expected to provide up to 16 million manhours of capacity, up from eight million manhours" at McDermott's Jebel Ali facilities. Mr. Dickson says he supports the Saudis' Vision 2030 and Saudi Aramco's In-Kingdom Total Value Add program, or IKTVA, aimed at 51-percent local content by 2021.

Hyundai at Khair won't be limited to big builds and will sell 2-stroke and 4-stroke engines and pumps with on-site manufacturing. "Very large and small vessels" are to be served, Aramco says. "The new JV will also operate under a MAN-HHI sublicense for the manufacturing and servicing of 2-stroke engines."

Shipping Circles

Bahri, the largest VLCC owner in the world, will pay $139 million for 20 percent of the shipyard JV. VLCC builder, Hyandai, will front $70 million for 10 percent. Mr. McDonald, now Lamprell's outgoing chief exec, estimates Bahri will buy three-quarters of its oceangoing vessels from the JV over 10 years, or no less than 50 vessels, many of them VLCCs.

Some serious observers say the world has enough shipyard capacity already. "The ample, available existing capacity has, post the financial crisis, created short earnings cycles for shipping, as the supply side of the shipping market can respond quickly to any demand improvements," says Mr. Kilen, a tanker expert. He says the overcapacity pattern has recently been seen in most shipping segments. Dry cargo, for one, has made three "recovery attempts" since 2009, and the first two, he says, were killed "by massive newbuild contracting and deliveries once demand improved.

"The results of the third ongoing attempt remain to be seen. LNG and LPG shipping both had their brief periods with strong earnings a couple of years ago, but here, too, the high contracting

Photo Courtesy: SCF

A Mega Yard Order:
Sovcomflot arctic OSVs.

activity and newbuilding deliveries that followed took the market quickly back down to earnings that barely covered operations. Lately, the tanker market has started to suffer the same."

Russia Builds

Like the Saudis, the Russians are undeterred. In 2016, they began in earnest a campaign to secure supplier help for a mega shipbuilding program announced in 2015. Early on, China's Nantong COSCO agreed a deal to deliver four cranes to the shipbuilding complex at Bolshoi Kamen. Chinese heavy dockyard transporters were thrown into the deal. Like Aramco, it's oil major Rosneft penning deals to help naval repair yard Zvezda go commercial, with Novatek doing the same for Sabetta to built a sea port, airport and fabrication facilities. A steel-smelting JV involving RM Steel was formed especially for Zvezda, which is gearing up for its first ship orders — five 114,000 dwt, LNG-fuelled Aframaxes, and four Icebreaker 7 OSVs — to be built be built by FESRC (the Zvezda-Hyundai JV). The Aframaxes are for the HHI-design behind Shell and SCF' de Margerie.

Like the Saudis, the Russians have brought in the Koreans. In June 2017, France's GTT signed an MoU to develop membrane containment systems for LNG vessels to be built at Zvezda for Yamal LNG's Sabetta port, where Novatek has been trying to play the role of Rosneft and Aramco by allotting USD400 million in LNG fabrication capacity.

Arctic JVs

Zvezda Shipbuilding Complex will likely become the largest shipyard in Russia for the $4.5 billion being spent on commercial production facilities and infrastructure. Modern steel-cutting robotics are set to assist "automated lines and standard jigs and fixtures", as they build tankers of up to 350,000 dwt; LNG carriers of 250,000 cu. m. ice class OSVs and transports of up to 29,000 dwt. Phase 1 — keel-laying blocks, workshops, a coatings JV with ChemChina — sets the stage for two drydock builds and thousands of jobs. German IMG and Daewoo Shipbuilding & Marine are understood to be hired to make all go smoothly at Zvezda's Far Eastern Shipbuilding and Ship Repair Center, or FESRC. Also on-hand is an arctic drill-rig business of Zvezda, Keppel and MH Wirth called Antares.

A loose agreement with Italian Fincantieri to study new ship designs has also been arranged by Rosneft for Zvezda. Ice-breaking LNG shuttle tankers might be that agreement's pretext, as France's GTT has agreed to "(design and manufacture) cargo containment systems for LNG vessels" built by Zvezda but needed offshore at Sabetta. At it for 50 years, GTT tech is in everyone's LNG offering — everyone's.

Whatever the progress of the assembled expertise, Zvezda will have to ready — Order No. 1, a Rosneft Aframax of 114,000 dwt, is due for delivery in 2019, or when the mega yards really take off. By then, the tanker market might have changed again.

"My forecast … is a stronger tanker market," says Mr. Kilen. "The current down-cycle for earnings I expect will last until late 2018, before a stronger earnings cycle is experienced during the 2019-2021 period." A key driver of those stronger earnings is expected to be fewer newbuilding deliveries and a phase-out of older vessels due to the sulfur cap.

Shipbuilding Statistics

powered by VesselsValue

Top Building Nations of Past 5 Years by Gross Tonnage Output

Builder Country	Number of Vessels	Total Gross Tonnage	Total Value $ bn
China	4,319	144,580,375	$81.0
South Korea	1,929	135,289,606	$106.5
Japan	2,316	75,916,027	$48.3
Philippines	179	10,063,685	$5.4
Taiwan	63	3,397,398	$2.2

© jpldesigns / Adobe Stock

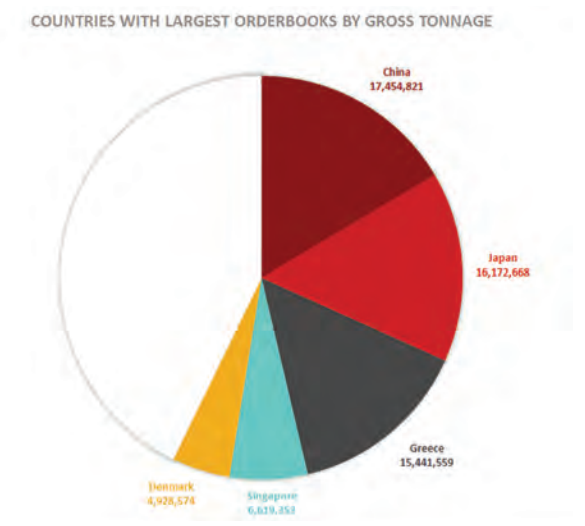
Top Building Yards of Past 5 Years by Gross Tonnage Output

Builder Yard	Number of Vessels	Total Gross Tonnage	Total Value $ bn
Hyundai Heavy Ind	329	32,204,402	$24.3
Daewoo	243	28,204,560	$21.9
Samsung	227	20,838,291	$21.8
Hyundai Samho Heavy Ind	184	17,174,709	$11.2
Shanghai Waigaoqiao Shipbuilding	132	14,221,671	$5.8

Photo: MISC Berhad

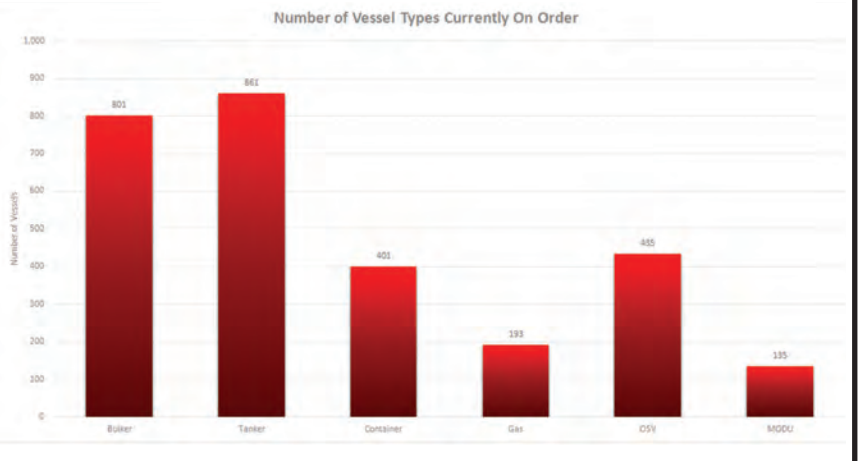
Countries with Largest Orderbooks by Gross Tonnage

Country	Number of Vessels	Total Gross Tonnage	Total Value USD bn
China	360	17,454,821	$15.9
Japan	269	16,172,668	$18.1
Greece	282	15,441,559	$16.3
Singapore	279	6,619,353	$10.1
Denmark	91	4,928,574	$4.2
Others	1,545	45,343,728	$66.6
Grand Total	**2,826**	**105,960,703**	**$131.1**



Orderbook by Vessel Type

Vessel Type	Number of Vessels	Total Gross Tonnage	Total Value bn
Bulker	801	27,224,758	$18.4
Tanker	861	34,752,868	$32.6
Container	401	25,473,367	$24.6
Gas	193	13,633,270	$25.2
OSV	435	1,287,177	$5.3
MODU	135	3,589,263	$25.1
Grand Total	**2,826**	**105,960,703**	**$131.1**



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Designing the New National Security Multi-Mission Vessel

Herbert Engineering / MARAD

BY EUGENE VAN RYNBACH
VICE PRESIDENT, HERBERT ENGINEERING CORP.

For more than 100 years the U.S. has depended on State Maritime Academies (SMA) to produce USCG licensed merchant officers. The SMA's have also been an important source of U.S. Navy and U.S. Coast Guard officers, as well as trained personnel for the maritime industry and electric power industries ashore. Key to training these future deck officers and engineers has been the annual sea cruise on dedicated training vessels.

The current SMA training ships, all of which were built for other purposes and later converted to be training ships, are getting old. The oldest one, Empire State VI at New York Maritime College, was originally built as a cargo ship in the early 1960's and has outdated steam propulsion. The newest training ships, at Cal Maritime and Maine Maritime, will soon be 30 years old. Much of the equipment on these ships is obsolete and vastly different from equipment on ships being built today. The U.S. Maritime Administration (MARAD) owns and funds the training ships and has embarked on a program to design and, it is hoped by many in the maritime industry, to build replacement training ships able to offer training with modern propulsion systems and navigation equipment, while also outfitted with improved berthing and equipped with flexible and fully wired class rooms, workshops and laboratories. Because the vessels are at the pier much of the year and they are U.S. government owned and managed, they can also be useful assets for government response to humanitarian and disaster crises in coastal and port areas. This ability to merge two primary missions into one vessel is a critical design feature that MARAD is looking to incorporate in the new training ships and is the reason for the class name given to them, the National Security Multi-Mission Vessel (NSMV).

Initial Design

Herbert Engineering Corp (HEC) was contracted by MARAD to prepare the NSMV design, and in 2015 a concept level design was prepared, with the Phase 3 design completed in early 2017, delivering a package that is expected to be sufficient for shipyards to prepare bids to build NSMV as the project progresses. It is hoped the new vessels will be delivered to all five SMA's over time, starting first with the Academies with the oldest training ships.

Development of Requirements and Application to the Design

HEC and MARAD undertook a major effort to determine what features and capabilities to include in the NSMV design to best incorporate the wish lists of each SMA as well as the mission requirements for humanitarian relief and disaster relief (HA/DR). This has been an ongoing process for the two groups, working in consultation with the SMA's and relevant parts of the U.S. government. There have been several rounds of design review and comment by the interested groups.

To start, MARAD in consultation with the SMA's developed a list of unified requirements. The HEC design team then visited three of the training ships – at Cal Maritime, Mass Maritime and NY Maritime – to see how the training ships worked and to hear from the schools themselves what they wanted to see in the new training ships and equally important, what should be avoided. Fulfilling the requirements to be both a training ship and a HA/DR ship required a lot of design decisions and tradeoffs. Some of the key design features include:

1. SAFETY: It was decided jointly by HEC and MARAD that the ships should be fully compliant with safety regulations and requirements for a ship carrying up to 760 persons, both international regulations and U.S. Coast Guard regulations and ABS Class Rules. This was a goal of the design even though as a U.S. government owned vessel documented as a Public Nautical School Ship, there was no legal requirement to meet SOLAS.

2. SIZE: A key design constraint was that the ships fit within the pier length and draft restrictions at the five SMAs and operate at no more than 25 ft draft for access to smaller and less developed ports in support of HA/DR missions.

3. LEAN & GREEN: Another design goal was for the ships to be efficient and economical to operate and also environmentally friendly. This goal is met by incorporating features such as full time operation on clean burning, low sulfur fuel, use of engine waste heat for accommodation heating, efficient LED lighting, and hull lines optimization for low propulsion power. LNG fuel was not adopted because the vessel's intermittent operation made managing LNG fuel onboard difficult and the lack of regular routes makes it impossible to ensure a reliable supply of LNG. The hull lines optimization by CFD methods and model testing, carried out by model basin SSPA in Sweden, was effective in reducing required propulsion power by about 10% between the concept design and the optimized hull design.

4. FORM & FUNCTION: A lot of the arrangement design was driven by the design goal to have a coherent and

Herbert Engineering / MARAD

DESIGN PARTICULARS

Length o.a.....159.85 m (524.5 ft.)
Beam.....27 m (88.6 ft.)
Draft.....6.5 m (21.4 ft.)
Design service speed.....18 knots/15% sea margin
Cruising Speed.....12 knots
Propulsion.....Diesel Electric
Propulsion engines.....4 x Diesel Generators
Total installed Power: .....15,680 kW
Propellers.....1 propeller, fixed pitch
Rudders .....1 flap type rudder on centerline
Fuel .....Single fuel - marine gas oil (MGO),
.....max Sulfur content 0.1%
Bow Thruster: ...retractable combi type - tunnel thruster
.....in up position, azimuthing thruster in down
..... position, "Take Home" source of power, 1450 kW
Stern Thruster: ..... Tunnel type, 890 kW
Fuel Consumption ..... 60 tons/day @ 18 knots,
.....26 tons/day at 12 knots
Fresh Water (including sanitary water).....35 gal/day per
.....person for 700 = 93 tons +
.....5 tons Ship Service FW = 98 tons/day
Fuel range..... About 11,000 nm range @
.....18 knots design speed with 10% remaining fuel
Food & Stores..... 60 days food storage for 700 persons
.....297 sq. m. (3,200 sq. ft.) reefer provisions
..... 240 sq. m. (2,580 sq. ft.) dry provisions
Propulsion motors.....2 x 4,500 kW propulsion motors.
.....Motors in separate watertight compartments.
Electric Power.....6,600 V main power generation,
..... 440 V ship service electric power,
.....120 V lighting and accommodations

RoRo deck

RoRo space aft with length of about 40 m (130 ft), width inside framing of 24 m (80 ft), clear height of at least 4.7 m (15.3 ft). Usable deck area is about 1,000 sq. m. (10,700 sq. ft.). Suitable for about 10 x 40 ft trailers with 26 autos or about 49 autos/light trucks.

Total container capacity ..... about 64 TEU for two high.

Crane1 x Jib Boom type with 35 MT SWL x 24 m outreach

RoRo ramp20 ft. wide watertight wide side ramp with 40 ton capacity

interconnected training ship environment while still providing practical and useful HA/DR mission capability. Meeting diverse requirements required focus on meeting key priorities and finding ways to integrate requirements into the same spaces. Some of the ways this was accomplished are as follows:

a. While HA/DR mission requirements are important to the design, they should not overly interfere with training ship capability. This was accomplished by focusing the HA/DR cargo carriage in the after part of the vessel and having the training ship spaces centered in the middle part of the ship to allow quick and easy access between all spaces. In this way berthing spaces are kept convenient to the mess, class and training facilities.

b. Berthing is provided for 700 persons in normal training ship mode, with 600 cadets and 100 non-cadets. An important quality of life feature and to make it easier to recruit persons to serve on the vessels, all 100 non-cadets have private cabins with private toilet and shower facilities. The goal was also to reduce the number of large cadet berthing areas compared to the existing ships. This is achieved by berthing 384 cadets in the accommodation deckhouse in four-person cabins, each with a separate toilet and shower unit. The remaining 216 cadets are in the typical 3 high berths located in the hull, but these spaces are convenient to class rooms and mess areas. During HA/DR missions, it was identified that there may be a need to increase persons onboard by 60 to a total of 760. This requirement is met by installing two high berths in some of the non-cadet cabins, so while these normally accommodate one person, in surge periods they can accommodate two persons.

c. The food storage, food preparation, food service, and mess areas are on the same deck and arranged for catering and service efficiency. This was an important requirement from the SMA's.

d. Redundancy is provided as required by safety regulations and to continue essential services in case of a fire or flooding casualty in any one area. Safe return to port is possible even in case of loss of the main propulsion system, up to and including the main shaft and propeller. This is achieved by use of a drop down azimuthing bow thruster that can propel the ship at speeds over six knots.

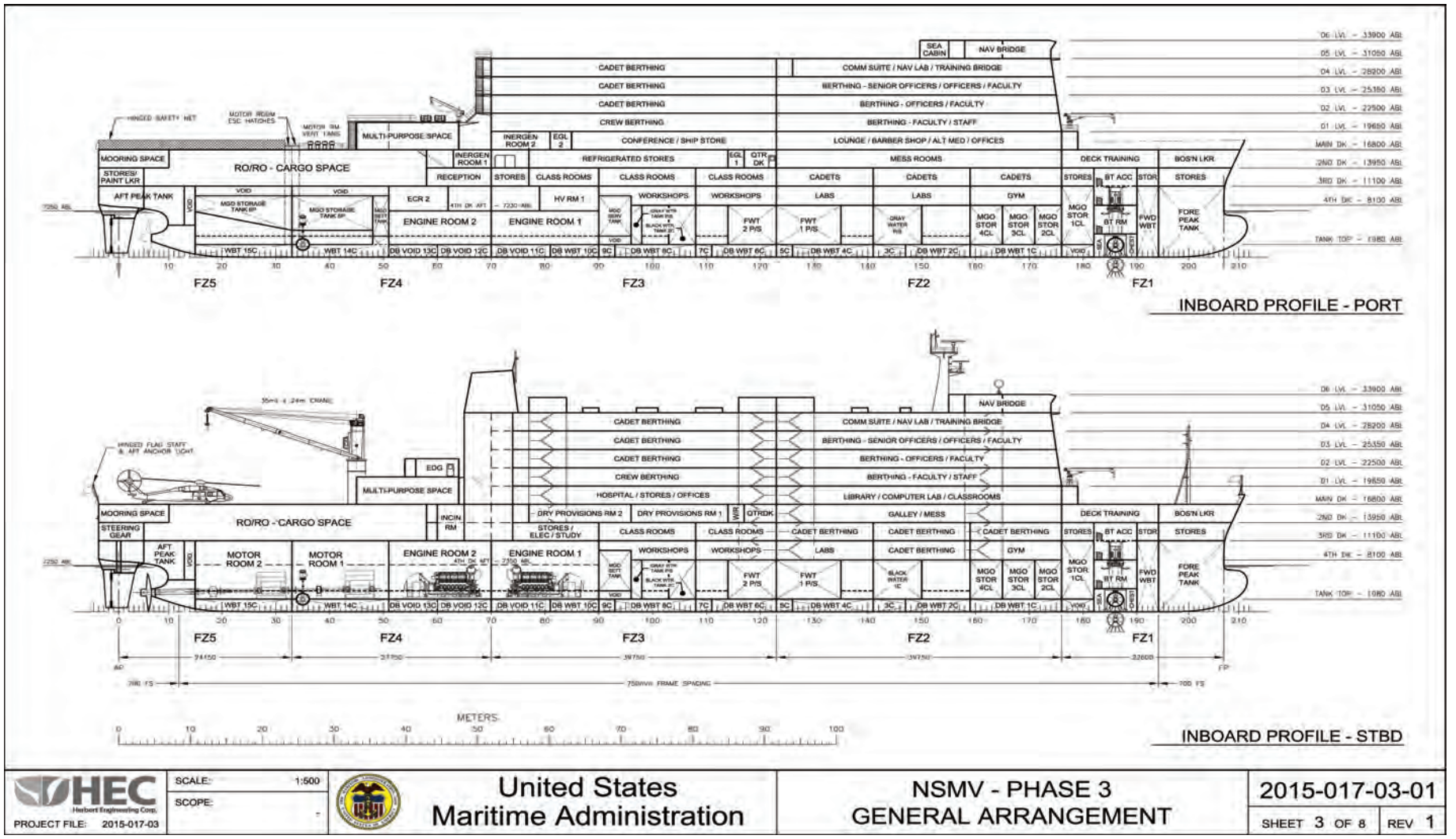
e. Two separate engine rooms are provided for reasons of redundancy in an emergency and to allow training to take place in one engine room while the second is used for propulsion. This is feasible on training cruises because the ships generally operate at slower speeds, around 12 knots, since the purpose is to be at sea and not to quickly reach a port.

f. Required training spaces are incorporated into the design, including eight class rooms, navigation lab, computer lab, several cadet workshops, simulator spaces and other laboratory spaces. A separate training bridge is located one deck below the main bridge with full visibility forward and equipped similarly to the main bridge so cadets can experience navigation of the vessel without interfering with actual safe navigation.

g. HA/DR mission capability includes transport of general cargo, containers, vehicles and trailers on the aft open deck area and in the enclosed RoRo space below that. A cargo crane, also useful for training, and a RoRo side ramp are provided to make the vessel self-unloading. Larger medical facilities than required for a training ship are provided and these can be easily expanded, including loading of medical modules on deck and in RoRo spaces with utility hookups provided. Ability to land helicopters, a key HA/DR mission requirement, was met by making the open aft deck also a helicopter landing area, but without capability to refuel or maintain helicopters.

h. During HA/DR missions, it is necessary to keep key personnel berthing and command and control areas secure. This was accomplished by placing these areas in the forward half of the deckhouse and allowing this area to be kept secure by locked doors.

i. The vessel is able to maneuver and moor without tugs, considered useful for HA/DR missions when ports may be disrupted by a crisis, and this capability reduces vessel operating costs during normal cruises.



United States Maritime Administration

NSMV - PHASE 3
GENERAL ARRANGEMENT

PROJECT FILE: 2015-017-03 | SCALE: 1:500 | SCOPE: - | 2015-017-03-01 | SHEET 3 OF 8 | REV 1

Herbert Engineering / MARAD

5. TOPSIDE: The need for open deck cargo space and a RoRo deck led to several challenges. It was determined that placing them aft would result in the least interference with the primary training ship mission, however, this created a structural challenge with locating the large side ramp opening. It was desired to have a more forward ramp location so when it was in the up position it would not interfere with helicopter landing, but the full ship and fine mesh finite element analyses (FEA) carried out identified high stresses if this were done. The solution was to relocate the ramp aft and install a folding ramp with a low profile in stowed position, minimizing its interference with helicopter landing. The transition of the large deckhouse to the open main deck aft also created structural challenges that were identified using the FEA. Modifications to reduce stress concentrations included fitting large transition brackets at the aft end of the house and separating the multi-purpose space house, located aft of the deck house, from the main deckhouse and engine casing to free the connection from hull bending stresses.

Propulsion System

One of the key items to be resolved during the design was the propulsion system to be used. Normal today in passenger ships is the use of diesel electric power, useful because of the large ship service electric loads to service the large number of persons onboard and because the engines can be put on line or taken off line to suit a wide range of operating speeds. These same requirements applied to NSMV so the initial decision was made to adopt an integrated electric drive propulsion system, similar to cruise ships worldwide. The simplest and most common prime mover for the electric generators are medium speed diesel engines. These offer low initial cost, relatively small size, and good fuel efficiency. These advantages made them attractive to both MARAD and HEC and thus the decision was made to use diesel electric propulsion on NSMV. This met with some resistance from the SMAs, who are looking at the training aspects of the vessel as well as efficient operation. However, it was felt that alternative propulsion methods such as steam turbines, gas turbines, or low speed diesels would significantly increase the cost for construction, and in some cases significantly raise fuel consumption. Furthermore, low speed diesel is not well suited for electric drive, and it was believed training was available on these alternate propulsion systems using simulators or shore side installations.

NSMV Design Team

Herbert Engineering collaborated with several other companies to provide the full range of design capability needed for a full ship design.

Key contributors were as follows:

- **Herbert Engineering** was the project lead and lead on arrangement, structure, systems, machinery, stability, and regulatory compliance design. Assistance was received from Carl Setterstrom, consultant naval architect.
- **Jamestown Metal** for galley and mess design and training space and cabin layout.
- **SPAR Associates** for cost estimation.
- **SSPA, Sweden,** for hull lines optimization, model testing and propeller design
- **VT Group** for IT infrastructure design
- **B. Rosenblatt & Associates** for accommodation piping systems and machinery space arrangements.

Port Corpus Christi

Energy Port of the Americas

BY GREG TRAUTHWEIN

(Image Courtesy Port of Corpus Christi)

Port Report

“We saw a significant downturn in tonnage and revenue (last year), as we were down about 10%, in some categories even more. This year has started to bounce back in a big way, and we have seen an uptick this year from just about everybody. The ability to export crude has made a big difference.”

John P. LaRue, Executive Director, Port Corpus Christi

The Port of Corpus Christi lives up to its moniker ‘Energy Port of the Americas,’ as the movement of energy in and out dominates the port’s history and future. John P. LaRue, Executive Director, Port Corpus Christi recently visited Maritime Logistics Professional’s headquarters in New York City to discuss the nearly $50 billion in investment projects driving the port forward.

“Let’s just start with what we are and what we are not,” said LaRue. “We are not a container port. Up until a few years ago we were an oil import port (serving) three refineries: Citgo, Valero and Flint Hills Resources. We also have two grain elevators; and the only facility that we operate directly is dry bulk.”

Pure and simple, the Port of Corpus Christi is an energy hub, connecting the Gulf of Mexico with the vast U.S. inland waterway system, positioned between the country’s two largest shale oil and gas plays, the Permian Basin and Eagle Ford. Port Corpus Christi is the fourth largest port in the United States in total tonnage (about 100 million tons per year), a gateway to international and domestic marine commerce.

While the general assumption may be that anything energy-centric would languish today given the three-plus year global swoon in energy pricing, Port Corpus Christi has held its own. Cheap energy has attracted foreign industrial investment in the port, and the decision by the U.S. government in 2015 to allow the export of oil means that today Port Corpus Christi exports more oil than it imports. (Last year it imported 15.7 million and exported 29.7 million tons of crude. For a look at the Top 10 imports and exports, see Chart 1.)

“We saw a significant downturn in tonnage and revenue (last year), as we were down about 10%, in some categories even more,” said LaRue. “This year has started to bounce back in a big way, and we have seen an uptick this year from just about everybody. The ability to export crude has made a big difference.”

Illustrating the point using a top Port Corpus Christi customer [Oxy], that firm

CHART 1

Port Corpus Christi: Top 10 Commodities, Import vs. Export

	Inbound		Outbound	
Rank	Commodity	Tons	Commodity	Tons
1	Crude Oil	15,761,584	Crude Oil	29,714,938
2	Fuel Oil	4,637,798	Gasoline	6,066,359
3	Gas Oil	4,246,925	Diesel	4,531,766
4	Bauxite	3,244,344	Sorghum	2,652,955
5	Feedstock	2,581,068	Feedstock	2,588,666
6	Aggregate	1,672,308	Condensate	2,045,939
7	Naphtha	1,072,998	Gas Oil	1,844,819
8	Reformate	708,888	Fuel Oil	1,653,480
9	Benzene	599,896	Cumene	1,336,286
10	Fertilizer	439,804	Naphtha	1,334,888
11	Other	3,218,693	Other	11,520,094
TOTALS	***	**38,184,306**	***	**65,290,190**

Source: Port of Corpus Christi

has made quantum leaps in the export of crude oil, going from zero barrels in 2015 to five million barrels in 2016, with a projection to export 35 million barrels in 2017.

$50 Billion in Investment

"About five years ago with the shale revolution, logistics started to change," said LaRue. "We received a lot of interest from mid-stream oil companies that wanted to move oil to other U.S. ports, which drove a mini-construction boom with new docks."

The mini-construction boom in new docks is one piece in a mega-construction boom in and around the port, with nearly $50 billion in investment over the past four years to today. "That's more than some states," LaRue said.

While cheap energy courtesy of the current global oil and gas price swoon conspired to reduce port revenues last year, there is a silver lining, LaRue said. "We have a lot of new industries coming in and we've been able to attract a lot of foreign direct investment because – not just because of the shale oil – but we have a lot of natural gas, and there are a lot of companies right now that want natural gas to use in their processes."

Austrian steel maker Voestalpine is one, as it is using gas to heat iron ore and make it into an iron briquettes, importing the raw materials and exporting the briquettes to Europe. MG is another, an Italian PET manufacturer, currently building one of the largest PET plants. The list goes on, with OxyChem involved in a JV producing ethylene; Chinese TPCO finishing a plant this year to manufacture oil and gas pipe, and Cheniere, which is building an LNG plant in Port Corpus Christi, a project which in and of itself has 3,500 people working today. "We have a lot of work for a lot of people right now," LaRue said. "Between TPCO, M&G and Cheniere, we probably have 5,500 to 6,000 construction workers active today (in the port) … and this is in a community of 300,000. The drop in oil prices has had its impact as a lot of the people that were working the shale formations have come down and are working construction for us."

While each of these projects is substantial, the showstopper was recently announced; a joint venture between ExxonMobil and SABIC for a new $10 billion, 1,300-acre plastics manufacturing complex on the South Texas Gulf Coast.

The project is under engineering review and design now, and when it comes to fruition it is touted to be the largest ethylene cracker in the country. The numbers surrounding the project are Texas-big, as it is projected to create 6,000 jobs during peak construction, create 600 new permanent jobs at the site with a $90,000 average annual salary plus benefits, not to mention the $22 billion in economic gains for the state during construction and the $50 billion in economic gains for the state during first six years.

Interestingly, LaRue sees even more room for growth, particularly in the cracker market. "I think this is really the start of a wave of larger announcements," he said, adding, "You see con-

Port Report

Port of Corpus Christi:
THE Energy Port of the Americas

The Port of Corpus Christi provides access to the U.S. inland waterway system from its location on the western Gulf of Mexico. It handles liquid bulk, RoRo, break-bulk, dry bulk and containerized cargo through multiple terminals. By the numbers, the port looks something like this:

- $50 Billion: Amount of investment projects, foreign and domestic, in past 4 years or underway.
- 11,016: Total vessel calls in 2015
- $350: Cost in millions to dredge the channel into Port of Corpus Christi from 47' to 52'.
- $140: Investment in millions that Port Corpus Christi is spending to start dredging its channel to 52'.
- 85.7: Total tonnage (domestic and foreign), in millions, in 2015.
- 80.2: Percentage of total tonnage classified as Petroleum and Petroleum Products.
- 47: The depth, in feet, of the current channel into Port of Corpus Christi.
- 52: Authorized channel depth to be achieved when project (approved in 2007 under WRDA) finally makes it into the president's budget.

Top 10 Trading Partners, by Dollar Value

1. Mexico
2. Venezuela
3. China
4. Italy
5. Brazil
6. Saudi Arabia
7. The Netherlands
8. Ecuador
9. United Kingdom
10. Colombia

Sources: Port of Corpus Christi Port Performance Freight Statistics Program – Annual Report to Congress 2016, U.S. Department of Transportation, Bureau of Transportation Statistics.

(continued from page 57)

tinued demand for basic plastics with a growing middle class in India, China and across Asia. Ethylene and Propylene are the building blocks, and there are many investments in cracker-type projects."

Digging Deeper

While LaRue is paid to attract businesses to his port, he is a fairly pragmatic in his assessment. He reiterates its proximity to the two major shale plays as a significant plank in the port's financial success, and also notes the positive business climate in Texas, "which is more conducive to energy operations."

"One of the unique things about Port Corpus Christi is we own our own oil docks," said LaRue, noting that it provides a significant revenue stream for the port. "Now with the shale we are seeing more and more activity."

"Most ports receive little or no revenue from (private dock) facilities 'inside the fence line' of the oil companies," he said. But at Port Corpus Christi, the port gets a percentage of the wharfage for cargo unloaded at private docks, as the port owns the land along the ship channel that ship must cross. "This is a unique revenue stream for the port." For vessel owners, shippers and manufacturers, LaRue is quick to mention these advantages:

- **Air Attainment:** The port is in Air Attainment, meaning the process to build a plant is cheaper and shorter than a port not in attainment.
- **Free Flowing:** Lack of vessel congestion, with normally only 4 to 6 ships waiting to get in. "We don't have fog, we don't have a big tidal fluctuation (normally only 1 to 2 feet)."
- **Rail Service:** There are three rail services serving the port, providing reliability and competitiveness.
- **Proximity to Mexico:** The port is 2.5 hours from the Mexican border. Mexico is a large and growing trade partner with Port Corpus Christi, with $1.7 billion in exports to Mexico in 2016 (vs. $1.4 billion in 2015), and $115 million in imports from Mexico in 2016 (vs. $88 million in 2015).
- **Stability:** The U.S. is a stable environment, and LaRue counts the stability of the U.S. as a factor in attracting foreign manufacturing dollars.
- **Cheap Energy:** Plentiful supplies of natural gas that, unlike other areas of the world, is more stable in price and availability, not beholden to political whim.

But Port Corpus Christi has its challenges too, with the number one being attaining the federal funding to dredge its 36 mile long ship channel from its current depth of 47 feet to the authorized depth of 54 feet. "Infrastructure is always the biggest challenge," said LaRue, and in step with most every commercial port in the world, dredging tops the chart. Port Corpus Christi received the authorization to dredge its ship channel to 54 feet in 2007, but federal funding has not followed. "The project is clean and there are no environmental issues with dredge material. We just we can't get it through the Administration," said LaRue. "Right now if you are not in the President's budget (because there are no earmarks) you can't start the project."

Rather than sit idle and hope, Port Corpus Christi is investing its own $32 million to get phase one of the project started, caring for the stretch from the Gulf of Mexico to inside the bay. "It's called accelerated funding, and there is some risk, because if it is never funded, we have to eat it," said LaRue. "But they will fund it. The total project cost to dredge to 54 feet is $350 million, but if we just sit here and wait for them to do it, it will never get done. We're going to put up $140 million (in total)."

Meanwhile the port will wait on a re-energized discussion on infrastructure funding in Washington. "This is the type of project that should be on someone's list, as the benefits are almost all export driven. If they get serious about infrastructure funding, we can get this project done in three to four years. If they don't it could drag on for seven or eight years."

Power Play

Engine suppliers prepare for IMO 2020 fuels sulfur content cap

BY TOM MULLIGAN

Kjeld Åbo, Chairman of CIMAC (the International Council on Combustion Engines) Fuels Working Group and Director Customer Support, Two Stroke Marine at MAN Diesel & Turbo, has said that the IMO's proposed 0.5% marine fuel sulfur content limit was not unexpected but that there were a number of practical and strategic issues that needed to be addressed if the new regulations were to be implemented successfully by 2020. This article looks at how manufacturers of marine engines are rising to the challenge of meeting the IMO's new sulfur oxides (Sox) emissions standards.

"The IMO's October 2016 announcement that the organization intended to impose a global marine fuels sulfur content cap of 0.5% by 2020 was not unexpected," Kjeld Åbo, said. "It sounds positive, but there will be hurdles to overcome in implementing it. At CIMAC, we expected such a cap to be imposed either by 2020 or, at the latest, by 2025, and about this time a year ago we were all convinced that 2020 would be the date – in fact we predicted this six months before the IMO actually decided on it.

Positive Attitude

"CIMAC has adopted a positive attitude towards the imposition of the fuel sulfur cap, even though the fuel refiners say it could cause a lot of difficulties," said Åbo. One of the problems is how can sulfur cap recommendations be made when the future availability of ultra-low-sulfur fuel oil (ULSFO) is such an unknown quantity? In addition, different types of fuel that comply with the regulations may become available but it's all a bit of a grey area and a mystery. "We need to prepare carefully for this so we can recommend the right kinds of fuel and its treatment on board for the commercial maritime sector to use."

"There's also the issue of ship capacity – will ships have to carry both 0.1% and 0.5% sulfur fuels at the same time? Will the fuels be comprised of a blend and a distillate on the same ship and how will they be stored?

"And, of course, there's the issue of the market and how it will settle. How many scrubbers will need to be installed on ships in order to be able to utilize remaining heavy fuel oil (HFO) stocks? In fact, will it even be possible to sell HFO? Desulfurization plant is seldom readily available in the refineries and there will be the need to use up the leftover from production of the lighter product, for example HFO residues, somehow," Åbo said.

Working Group Recommendations

CIMAC's working group WG7 'Fuels' will not only recommend what CIMAC should be doing to ensure industry compliance with the cap but will also publish its recommendations on how low-sulfur fuels should be handled, stored and used: "We each have our own crystal ball that we look into to try to foresee the future for fuels, but different companies see different visions and take different views on important issues," said Åbo. "What the market needs to know is that the available fuels, no matter what they are, will be able to be used in marine engines. As engine developers, we need to be able to design the fuel injection parts of the engine correctly to match the fuel it will use. Ship design has become much more complex than it was 10 years ago, with engines optimized for fuel efficiency, emission compliance and for the use of new fuels. Engine manufacturers need to strive to be in front of the competition by responding to new technology and regulatory issues."

New Tech for Regulatory Compliance

One of the first marine engineering and systems manufacturers to react when the IMO announced it had decided to implement its marine fuels sulfur content cap proposals from January 2020 was Wärtsilä, which released a statement that the company's proactive development of exhaust gas cleaning systems and its broad offering in gas and dual-fuel engine technologies meant that it was well positioned to assist fleet owners implement plans for complying with the new regulations. Wärtsilä also stated that it had actively developed the

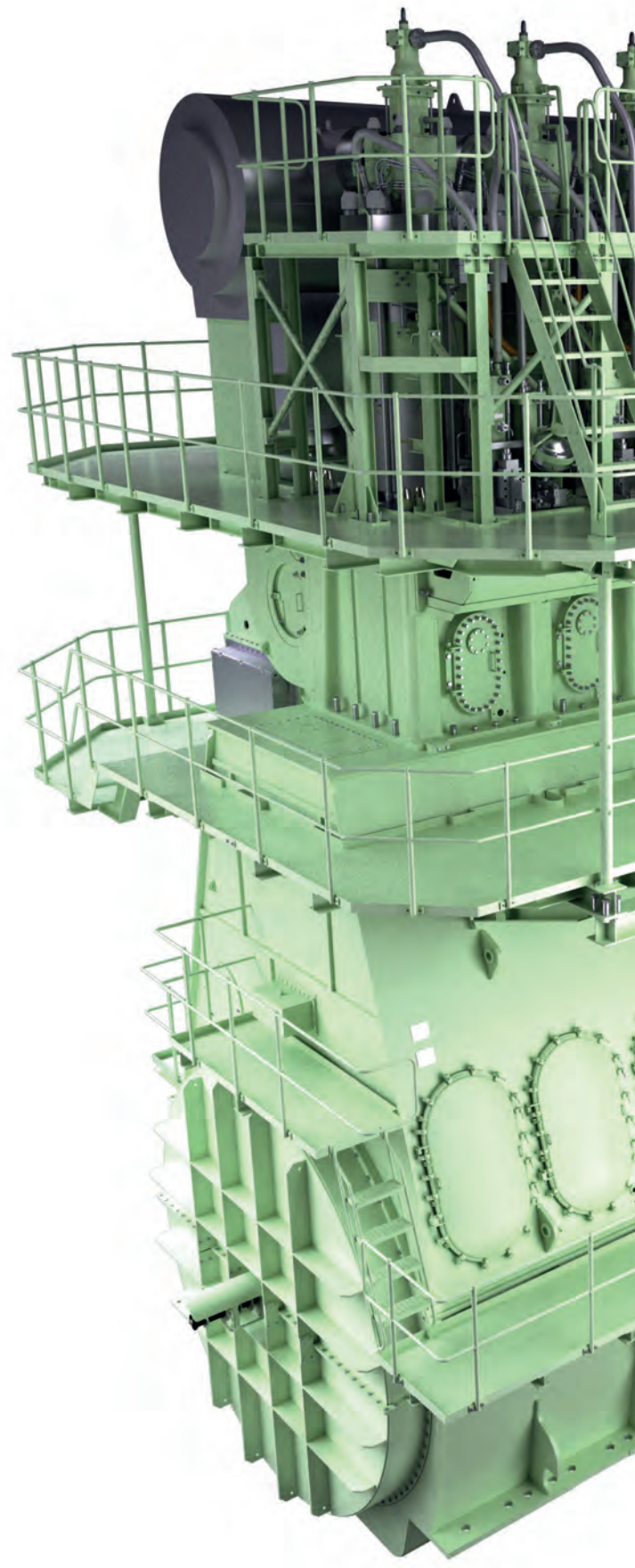


Photo: MAN Diesel & Turbo

The MAN Diesel & Turbo two-stroke B&W ME-GI engine: marine engine OEMs will need to know what IMO sulfur cap compliant fuels and systems shipowners will be using in order to be able to design and supply the right kinds of engines for the maritime industry before the new regulations come into effect in 2020.

technology, the capacity and the network to overcome the challenges faced by owners and operators in meeting the global sulfur cap regulations, and that it had been a pioneer in introducing dual-fuel engines to the shipping sector, thereby allowing the use of liquefied natural gas (LNG), which is sulfur-free, as a marine fuel. In addition, the company stated that the global sulfur cap meant that the world's shipping fleets would need to either change to fuels like LNG, or to install abatement systems, and that it had the expertise to provide such systems for marine use.

Of course, production of dual-fuel marine engines to meet new environmental standards had already commenced a few years prior to the IMO's 2020 sulfur cap announcement: the very first MaK dual-fuel marine engine to be produced by global engineering and industrial equipment manufactuer Caterpillar, the 12 M 46 DF, was shipped from the company's facility in Rostock, Germany to Japanese customer Mitsubishi Heavy Industries (MHI) in June 2013 to be combined with three regular 12 M 43 C engines to power the first of two new-generation cruise ships ordered by Germany-based AIDA Cruises.

These marine engines were developed by Caterpillar Motoren at the company's Kiel Engine Center in Germany and manufactured at its Rostock subsidiary. AIDA Cruises' new generation of ships are designed with environmental protection in mind: the new AIDA vessels will consume even less than the three liters of fuel per passenger per 100 km consumed by ships in the company's current fleet, being fitted with MaK dual-fuel engines that can run on liquefied gas (LNG), thereby substantially reducing carbon dioxide and particulate emissions. In fact, Caterpillar Motoren designed the MaK M 46 DF in anticipation of the IMO's upcoming SOx emissions and fuel sulfur content regulations, as well as to provide maximum flexibility for vessels operating in regulated and/or lesser regulated areas without significant changes to the engine room or the exhaust gas system.

Taking the Exhaust Gas Clean-Up Route

Although the new IMO regulations will reduce the allowable marine fuels sulfur content in all the world's waters from the current 3.5% limit to less than 0.5% from January 1, 2020 (except in the designated emission control areas, or ECAs, where it is and will remain at 0.1%), under the Interna-

"Over the next 10+ years, **I expect that fuels in the form of HFO (when using scrubbers), ULSFO 0.5% and DO/MDO will be the dominant fuels in the marine industry.** There will also be increased use of LNG, LPG, methanol."

Kjeld Åbo
Director Customer Support, Two stroke Marine at MAN Diesel & Turbo &
Chairman of CIMAC Fuels Working Group

Photo: MAN Diesel & Turbo

tional Convention for the Prevention of Pollution from Ships (MARPOL), state parties to the convention are allowed to use, in lieu of using low-sulfur-content fuel below 0.5%, marine fuel with a sulfur content of 3.5% on ships that are equipped with systems of equivalent efficiency as confirmed by the supervisory authority of the party to the convention. This trend has precipitated the move to commercialize SOx scrubbers that are compliant with the new regulations.

In January of this year, MHI and Japanese companies Mitsubishi Kakoki Kaisha, Ltd. (MKK) and Kawasaki Kishen Kaisha, Ltd ("K" Line) have been undertaking test operations aboard an actual ship of a newly-developed 'Hybrid SOx Scrubber System' for desulfurizing marine engine exhaust gases. Test results have verified that the effectiveness of the system in reducing emissions of air pollutants complies with international regulations. The system has been officially approved by the Republic of Panama, the country where the test ship is registered.

The test unit of the Hybrid SOx Scrubber System is the first system jointly developed by MHI and MKK specifically for marine applications and has been installed on marine transportation company "K" Line's large-scale automobile carrier Drive Green Highway. The system had been undergoing verification testing ever since delivery of the ship in February 2016, the results indicating that Japanese classification society Nippon Kaiji Kyokai (Class NK), with which the vessel is registered, had satisfied international guidelines for exhaust gas cleaning systems.

The MHI, MKK, "K" Line Hybrid SOx Scrubber System is the first commercialized system in Japan to comply with the more stringent SOx emission regulations that have come into effect, starting with the ECAs in 2015 and the three companies have stated that, going forward, they will continue to pursue diverse environmental protection initiatives, including the development of measures to prevent air pollution, in order to help curb increasingly heavy environmental loads on a global scale.

In a separate development, MHI and Mitsubishi Hitachi Power Systems, Ltd. (MHPS) announced a joint design of a Large-scale Rectangular Marine Scrubber that efficiently removes SOx from marine diesel engine exhaust gases. The scrubber is based on MHPS's fluegas treatment technologies developed through producing desulfurization systems for thermal power plants and will be produced by leveraging MHI's expertise in marine engineering.

The new scrubber was specifically developed in response to the new SOx emissions regulations. The adoption of a rectangular box-shape configuration, which the companies said is a world first, is intended to offer ease of installation in small spaces and regulatory-compliant emissions treatment for high-output engines used on large-scale container ships. The scrubber is able to purify exhaust gas emitted from inexpensive heavy fuel oil to a level equivalent to that emitted by the more expensive low-sulfur fuels.

Facing Reality

"Everyone has to face the issues, and this includes organizations that have been critical of the IMO's proposals," said Åbo. "The cap has major implications for fuel consumption and oil-producing nations – about 250,000 to 275,000 tonnes of HFO has to be converted to a useable form by 2020. Some stakeholders may be correct in saying that this won't work and there will need to be a time delay to make the cap work properly.

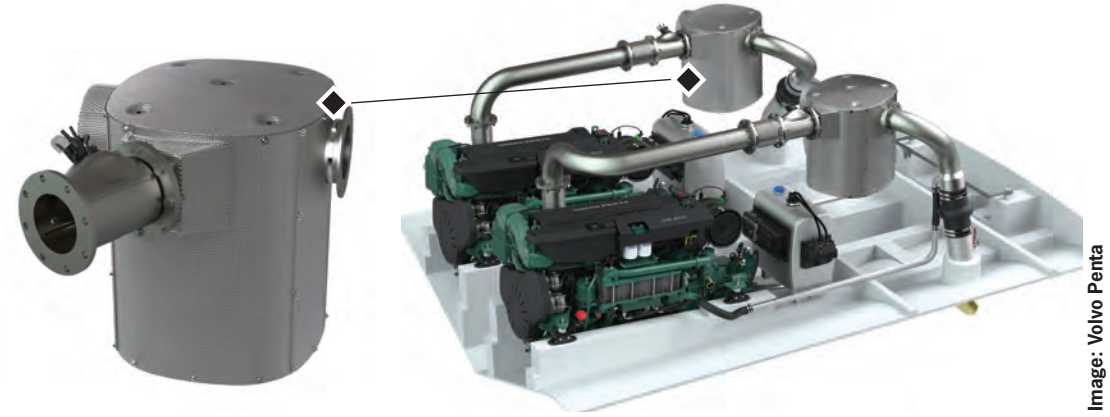
"However, we will be lobbying the IMO about the issue to some extent but CIMAC's position is basically that developments that complicate matters for maritime operators need to be addressed. We are taking a pragmatic approach to this issue, but of course we will be expressing some opinion. The implementation of the cap could be very difficult and we would expect that it could be a few years before there will be full implementation with all vessels compliant with the regulations and full availability of 0.5% sulfur fuel, and possibly even longer before policing of the limits by the authorities will work. Over the next 10+ years, I expect that fuels in the form of HFO (when using scrubbers), ULSFO 0.5% and DO/MDO will be the dominant fuels in the marine industry. There will also be increased use of LNG, LPG, methanol and others. A big question is, what will be the 'design' of new fuels like ULSFO 0.5%S so we in CIMAC can make the right recommendations regarding fuel specifications, and how do we treat the different fuels before they are used in engines?

"And, if I may make a final, paradoxical observation: will the shipowners wait to see the difference in fuel prices before they start ordering scrubbers and can the refineries wait for the high-sulfur fuel orders to come or will they need to find other markets for the bottom of the barrel?!"

For further information visit the following websites:

www.imo.org
www.cimac.com
http://dieselturbo.man.eu
www.wartsila.com/marine
www.cat.com
www.mhi.com
www.kakoki.co.jp/english
www.klsm.co.jp/en_index.html
www.mhps.com/en

Volvo Penta IMO Tier III Concept



IMO Tier III SCR

Image: Volvo Penta

Volvo Penta is launching a new engine and aftertreatment concept to comply with the forthcoming implementation of IMO Tier III standards, enabling a global solution for commercial marine operators. The solution is based on both the company's own experience along with that from the Volvo Group in leading selective catalytic reduction (SCR) technology, resulting in a system that is dedicated to heavy-duty marine operations. New emissions restrictions for vessels entering the Baltic Sea and North Sea, will be implemented in 2021. The IMO Tier III regulation will stipulate a reduction in nitrogen oxides (NOx) emitted of around 70 percent – depending on engine size – when compared to current IMO Tier II levels.

"Our new concept is designed with features and components to withstand the toughest marine environments," said Johan Carlsson, Volvo Penta's chief technology officer. "In complying with IMO Tier III requirements, Volvo Penta will meet international emissions standards, offering a truly global solution."

Volvo Penta's solution for IMO Tier III is optimized for marine use, and uses SCR technology for the exhaust aftertreatment system.

Volvo Penta is initially launching its IMO Tier III solution for its 13-liter models as the range is used for a wide variety of marine applications. It will be available for inboard engines and the Volvo Penta Inboard Performance System (IPS) package (with a power output of 294-588 kW), auxiliary engines (ranging from 294-441 kW), and gensets (ranging from 300-400 kW). The reduction in NOx will go from current permitted levels of 7.7 g/kWh down to 2 g/kWh.

Volvo Penta said its IMO Tier III solution exceeds stipulated emissions limits in reducing NOx by up to 75 percent. There is a separate UREA injector pipe. The two alternative exhaust outlets are designed for marine standards and will provide customers with different possible SCR configurations, leading to ease of installation. The DEF tank is designed to hold enough UREA for 3,200 liters of fuel, and there are sensors to check the UREA levels and quality; it also includes a dosage pump and control unit. For Volvo Penta IPS, there are also specific features, such as the exhaust bend, to ensure ease of installation and operation.

www.volvopenta.com

Moving Ahead Powerfully

MAN Diesel & Turbo optimizes the efficiency of ship propellers using cutting-edge CFD simulation methods

BY KEUN WOO SHIN, MAN DIESEL & TURBO &
ULRICH FELDHAUSM, FELDHAUS MARKETING & DATENTECHNIK

Image courtesy MAN Diesel & Turbo

The layout of ship propellers is a balancing act between optimal power conversion and the avoidance of unwanted cavitation effects, which can result in damage to the propeller structure and higher noise levels. MAN Diesel & Turbo in Frederikshavn, Denmark, is using the computational fluid dynamics (CFD) simulation solution STAR-CCM+ from Siemens PLM Software to model cavitation and optimize ship propellers.

Two mid-size container ships of 8,500 TEU – CSCL Europe and CSCL America – will be upgraded by retrofitting a efficient Kappel propeller. It is powered by a MAN 12-cylinder, two-stroke diesel engine, which is capable of giving the propeller shaft a power output of 68,520 kW.

These dimensions are even more impressive when one considers that the entire power output has to be converted into propulsion as efficiently as possible by just a single propeller. Ship propellers for drives of this size have a diameter of 10 meters or more, weigh over 100 tons and are manufactured with high precision from special alloys, such as nickel-aluminum bronze or stainless steel alloys.

Ship Propellers – a Balancing Act

The greatest challenge for designers of ship propellers is to use the available engine power as efficiently as possible in order to minimize fuel consumption and therefore operating costs: a mid-size container ship will consume bunker fuel at a rate of more than 100 tons per day. At a cost more than $300 per ton, even marginal improvements in fuel economy will lead to significant savings.

However, propeller designers do not have unlimited freedom, a propeller designed with too much emphasis on power output can produce various cavitation effects, which can result in undesirable vibrations and noise levels and give rise to erosion of the propeller structure.

In addition, the propeller does not act within a nice homogeneous flow field, but in the wake of the ship's hull, and the propeller blade passes through various flow regions with different pressure and speed ratios during each rotation.

MAN Diesel & Turbo

Dr. Keun Woo Shin is a research engineer in the Propeller & Aft-Ship R&D department at MAN Diesel & Turbo in Frederikshavn, Denmark, and is very familiar with this problem. As a member of the propeller R&D team, He has been working intensively for many years on the CFD-based optimization of ship propellers as well as on related topics, including simulations incorporating the effect of the wake, cavitation simulations including an estimation of the erosion risk, and the analysis of scaling effects.

MAN Diesel & Turbo is a leading supplier of drive components for various types of ships. The company supplies shipyards with a wide range of engines, as well as complete drive trains (engine, propeller, shaft, aftship energy-saving device and propulsion control system) in which the individual components are optimally designed to suit each other and the specific application. The company designs and manufactures propellers with diameters of 4 to 12 meters and

Figure 1

Image courtesy MAN Diesel & Turbo

Figure 1:
In the non-homogeneous wake flow, sheet cavitation occurs on the leading edge of the propeller in the upper region due to increased angle of attack and low hydrostatic pressure. This becomes detached (cloud cavitation) or becomes tip vortex cavitation.

Cavitation

Cavitation is the formation and implosion of cavities in liquids. It occurs when the hydrostatic pressure falls below the evaporation pressure of the liquid due to high flow velocities. Vapor bubbles are formed, which are entrained by the flowing liquid into areas of higher pressure, where the vapor in the cavities suddenly condenses and the vapor bubbles collapse. The ship propeller is considered one of the main sources of onboard noise and vibration and the correct determination of cavitation extension is crucial in securing the comfort of passengers and crews. Cavitation on the surface of solid bodies can cause microscopic deformation of the surface material due to the high mechanical stresses. Over time, larger particles break off the surface. Different types of cavitation include sheet cavitation, cloud cavitation, tip vortex cavitation, and supercavitation.

Figure 2

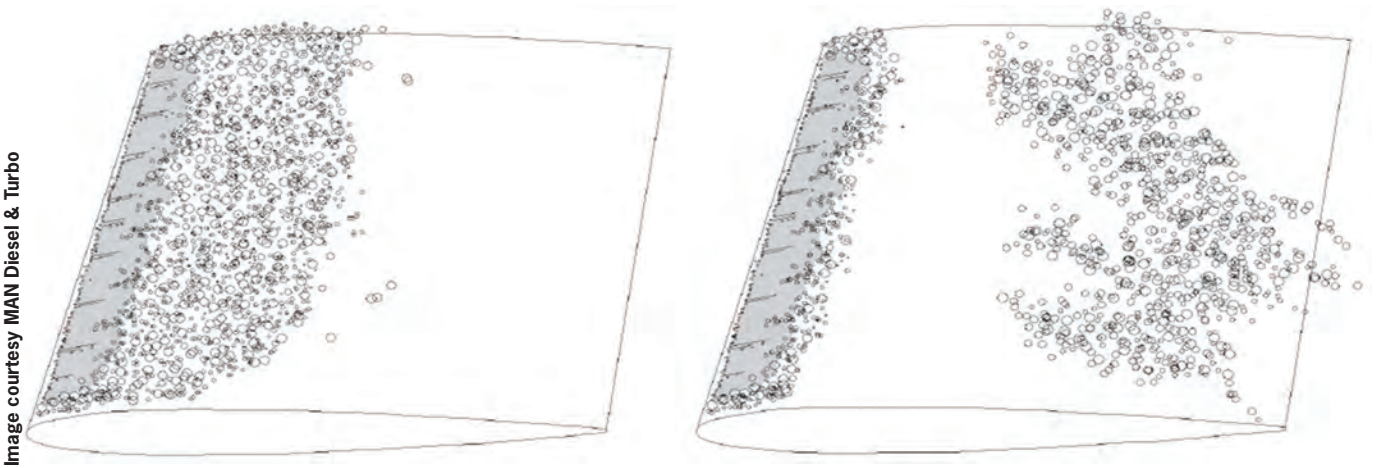


Image courtesy MAN Diesel & Turbo

Figure 2:
Sheet cavitation (top) is detached due to turbulent flows and becomes cloud cavitation (bottom)

weights of up to 100 tons. Lead times for a "normal" propeller design are extremely short. As such, there was a strong impetus for adopting (and reaping the benefits of) modern simulation technology early on - MAN Diesel & Turbo have been using the CFD solution STAR-CCM+ from Siemens for the analysis and optimization of ship propellers and related areas of activity since 2004.

MAN was thus also a pioneer in encouraging a development that has led to numerical simulation techniques becoming a now indispensable part of the development chain at many companies. The range of applications is diverse and includes almost all areas relevant to shipbuilding, such as the hull flow, maneuverability, propeller design, seakeeping, etc.

Cavitation Simulation

Kappel propellers have become increasingly prevalent in recent years because they operate much more efficiently than conventional propellers. These propellers feature blade surfaces that are no longer helical, and they have tips that are very similar in shape and operation to the winglets on the ends of the wings on modern aircraft.

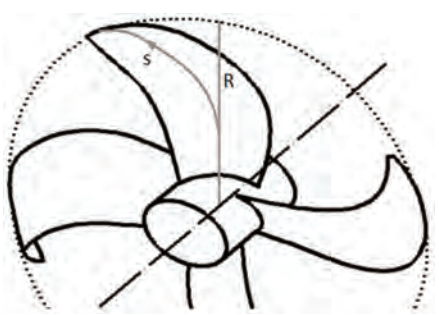
To achieve the greatest possible propulsion efficiency, a certain degree of cavitation is deliberately accepted in the design of modern ship propellers. However, too much cavitation can cause high pressure pulses on the hull, surface erosion on propellers and rudders and loss of propulsion.

In order to investigate the factors that cause cavitation in more detail - and to find an optimal compromise between propulsion efficiency and cavitation tendency/formation - Dr. Shin carried out investigations at MAN Diesel & Turbo on the effect of a modified geometry of the propeller blade tips of Kappel propellers. In order to have a reliable basis for comparison, a reference model was chosen--a Kappel propeller with four propeller blades for which test results from experiments in the cavitation tunnel were available. The experiments were carried out at the SSPA in Gothenburg, Sweden, on a complete model of a ship. The propeller model had a diameter of 250 mm (original size d = 5.9 m), with a curvature of the blade tip towards the suction side and a low area ratio of Ae/Ao = 0.38. The experiments were carried out with a flow velocity of 4.5 m/s and a propeller speed of 24 RPS and the cavitation number was 3.8. A high degree of sheet cavitation was observed, which is detached near the front edge and forms a cavitation cloud.

PropellerVariants with Varying Loads on the Blade Tips

From the reference model, two variants with a modified pitch distribution of the blade tip were then derived. In the case of the reference propeller, the reduction in the pitch compared to the maximum pitch was 35 percent, while a reduction of 10 percent and 60 percent was chosen for the variants. Compared to the reference propeller, the propeller variant with the small reduction has a higher load, and the one with the larger reduction has a lower load at the blade tip.

The CFD solution STAR-CCM+ version 9.02 from Siemens was used for the calculations, for which the DES method (detached eddy simulation) was chosen, as cavitation detachment and erosion risk can be predicted with greater precision with this than with the RANS method (Reynolds-averaged Navier-Stokes). In spite of this, the calculation effort is lower than that for a large eddy simulation (LES); this is an aspect that should not be overlooked, especially with regard to the routine use in the design process.



The cavitation model implemented in STAR-CCM+ was used. This is an Eulerian multiphase model using the VOF approach, whereby the phase interaction is mapped by means of a cavitation model based on the Rayleigh-Plesset equation. The influence of hydrostatic pressure was taken into account by considering gravity.

CFD Model

Computation grids with several million cells are generally used for CFD simulation in the maritime domain. While relatively small meshes with 1 to 2 million cells are sufficient for a simplified calculation of the propeller blade, 5 to 6 million cells are required for a complete propeller simulation with or without consideration of the hull wake. If the entire hull is included in the simulation, grids can comprise up to 20 million cells. The same order of magnitude also applies to cavitation simulations of propellers and rudders.

Hull Flow

While the physical experiments were carried out on a complete ship model, the simulation used the axial (velocity inlet) and transverse (momentum source) flow components determined from a separate simulation of the hull flow according to a method developed by Dr. Shin as inflow boundary conditions for the computational space. The experiment without a propeller showed good agreement for the axial flow, whereas the upward flow observed in the experiment did not occur in the CFD simulation.

Figure 3

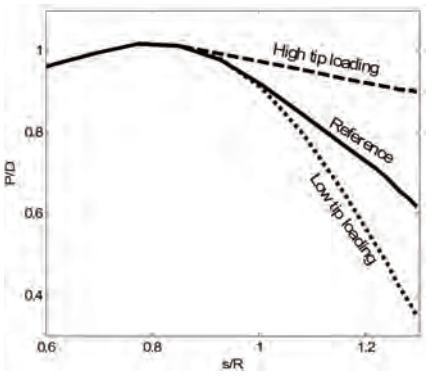


Figure 3
Pitch distribution P/D as a function of the relative mid-chord length s/R

Model Generation

For the purposes of this task, a computation grid was generated in which the propeller is surrounded by a rotating grid, but the rudder is outside the rotating region. A rigid body movement was assumed and the transition between the computational space and the rotating mesh was carried out using a sliding mesh. Cylindrical mesh refinements were made in the region of the expected cavitation detachment.

For the propeller, a trimmed hexahedral mesh with Δx = 0.5-1.0 mm on the wall surface and Δx = 0.1-0.5 mm on the blade edge was generated. For the description of the boundary layer, six layers of prismatic elements (Δh = 0.12-0.25 mm) were generated on the blade surface.

The simulation began with relatively large time steps, corresponding to an angle increment of the propeller rotation of 5°. As soon as stable flow conditions had been established (4 to 5 revolutions), the time steps were reduced (Δt = 116 µs) in order to correspond to an angle increment of 1°, so as to detect small changes

Figure 4

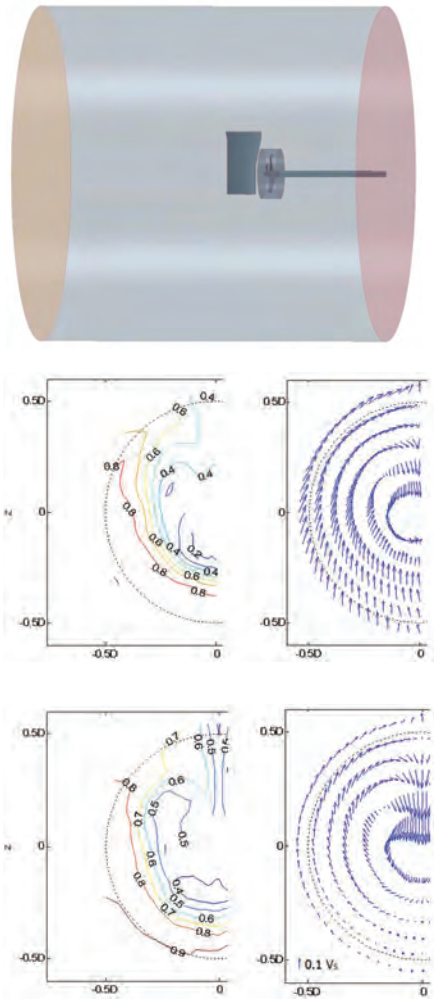


Image courtesy MAN Diesel & Turbo

Figure 4
Computational space for the propeller simulation

Figure 5

Figure 5
Grid refinements are used on the propeller surface and the blade tips to achieve better resolution.

Figure 6

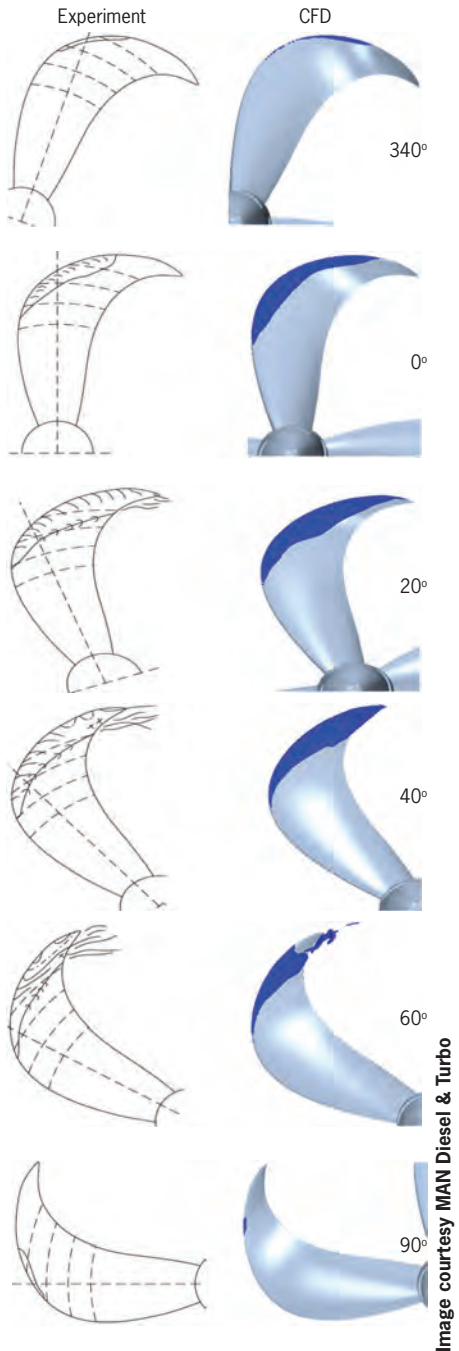


Image courtesy MAN Diesel & Turbo

Figure 6:
Both in the physical test and in the simulation, cavitation occurs between φ = 340° and φ = 90°, which shows good agreement in terms of type and form.

in the non-uniform cavitation.

Results of Cavitation Simulation

It was found that the calculations carried out on the reference propeller showed a high level of agreement with the experimental data, thus meeting a basic prerequisite for drawing reliable conclusions about the variants.

The shape, extent and form of the calculated cavitation demonstrated good agreement with the experimental results. Cavitation occurred between φ = 340° and φ = 90°, with sheet cavitation turning into a tip vortex being observed around φ = 40°. Likewise, good agreement was achieved with regard to the formation and detachment of sheet cavitation and the formation of a large amount of cloud cavitation. Compared to the reference propeller (24 RPS) at equal loading, a reduction in the sheet cavitation can be achieved by reducing the propeller speed by 0.5 RPS for the high tip-load propeller (tip pitch reduction 10 percent). However, tip vortex cavitation then occurs, which reduces propeller efficiency by 0.5 percent. In the propeller variant with low tip load (tip pitch reduction 60 percent), sheet cavitation increases with an increase of the propeller speed of 0.5 RPS, and cloud cavitation is intensified.

An abrupt reduction in blade tip load results in pronounced cloud cavitation. However, if the load is lowered gently, cloud cavitation can be reduced or avoided. However, it is necessary to accept a loss in efficiency due to the occurrence of tip vortex cavitation.

Conclusion

The results of the investigations carried out can be regarded as successful in several respects.

- The simulation results demonstrated good agreement with the onset and extension of cavitation in the physical tests under the assumptions provided and the boundary conditions.
- It was found that the method outlined here, of including the wake in the calculation without including a hull model, is effective and feasible.
- The DES (detached eddy simulation) method used for these investigations is suitable for predicting the occurrence of cloud cavitation.

Figure 7

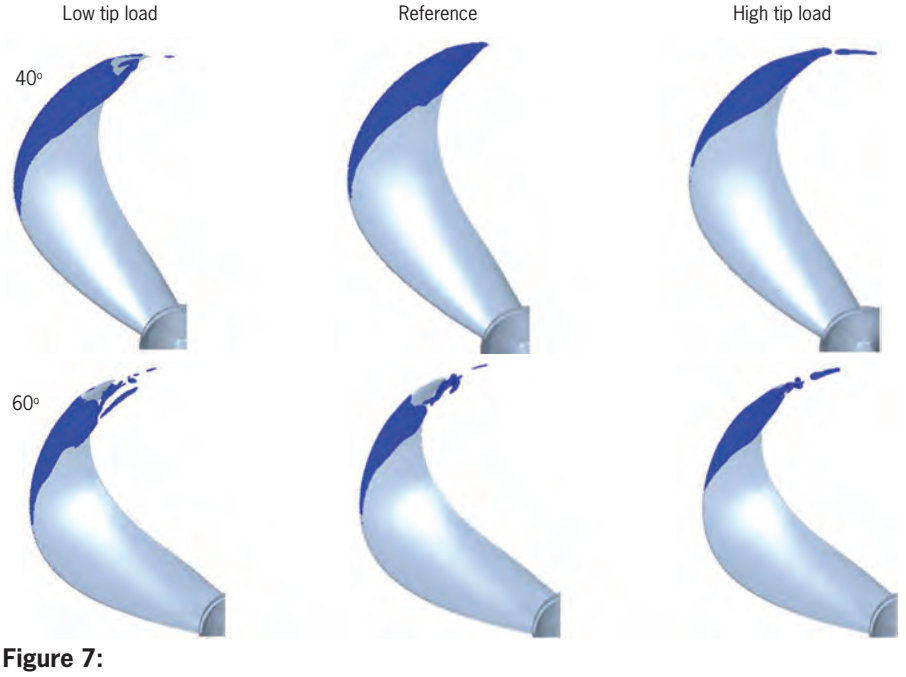
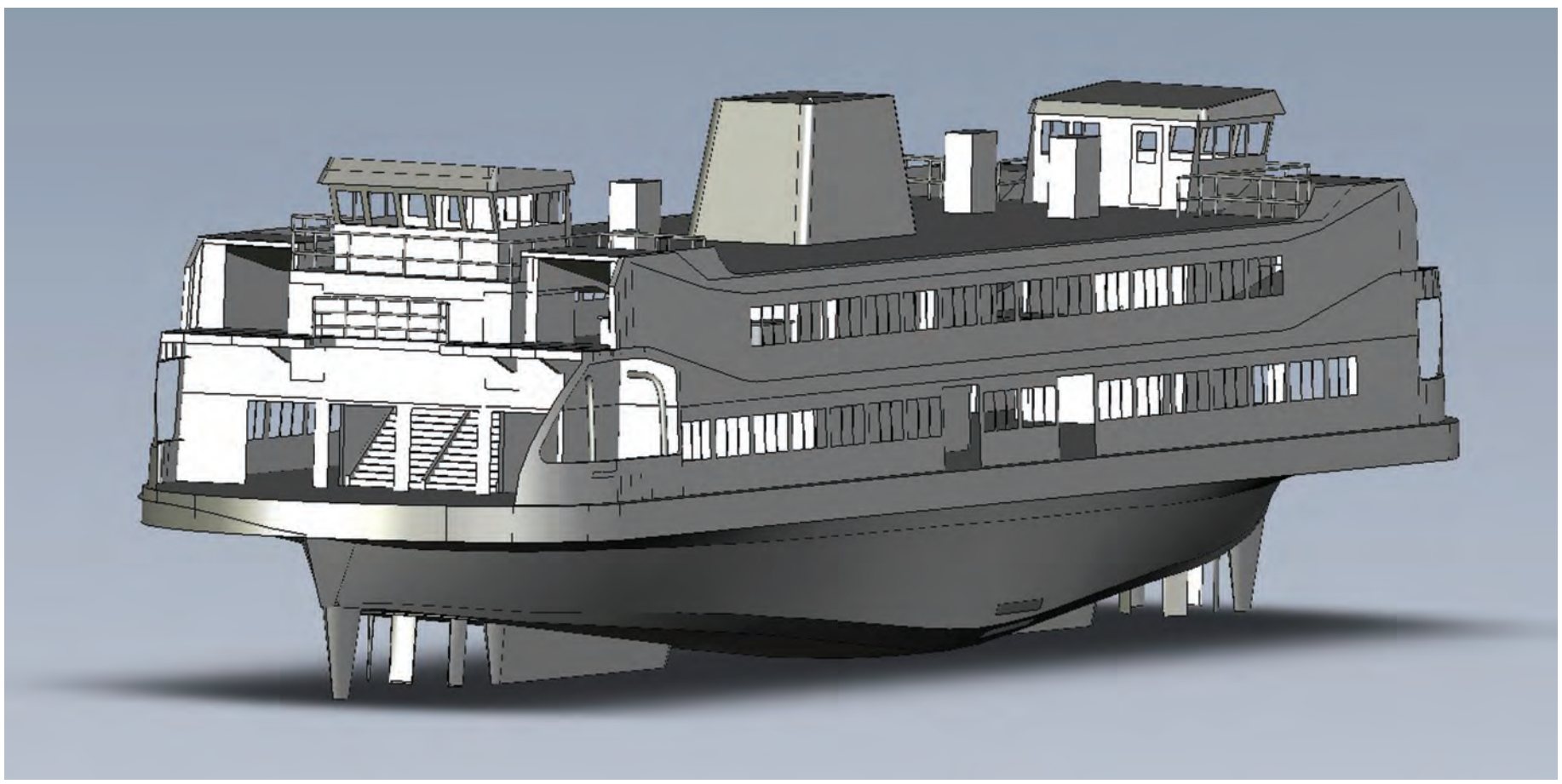


Figure 7:
CFD cavitation on reference propeller and high & low tip-load variants

Greg Trauthwein

3D Scan & Save

NYC DOT leverages the power of 3D scanning solution to contain repair and maintenance costs on iconic Staten Island Ferry Fleet.



Neptune Global Design / New York City DOT

"There was a massive price difference in regards to coatings needed premised on the square footage specified by the shipyard (in the General Arrangement drawing) and what NYC DOT thinks the quantity of coatings should be. In step, there was a big price difference."

Tom Thompson, President and CEO, Neptune Global Design

Greg Trauthwein

BY GREG TRAUTHWEIN

Neptune Global Design is a Miami-based Marine Engineering, 3D Scanning, Reverse Engineering and Naval Architecture firm led by Tom Thompson, President and CEO. Thompson is a six year veteran of the marine industry, and has used 3D scanning for this and other purposes for more than a decade. In the maritime sector, Neptune Global is a partner to vessel owners, a partner in helping them to manage and mitigate the inherent risks and costs associated with maintaining and repairing a fleet of vessels. Thompson uses FARO's 3D Laser Scanning technology to accurately profile a vessel. "My typical scanning equipment is a FARO Focus3D X130 with at least ten spherical targets," said Thompson. "The advertised accuracy of that specific scanner at the distances that I work with is +2mm. That tolerance varies based on range but is also quite generous, as it's truly around +1mm."

Staten Island Ferry System

The Staten Island Ferry System is an iconic part of New York City, and like the Big Apple itself it has a long and colorful history. The direct link reaches back to the early 19th century and the Richmond Turnpike Company, which received the right to run a ferry to New York. It was in 1817 that the company began to run the first mechanically powered ferry between New York and Staten Island, the steam-powered Nautilus, commanded by Captain John De Forest, the brother-in-law of a young man named Cornelius Vanderbilt, according to www.siferry.com.

Today the Staten Island Ferry System includes a fleet of nine vessels and transports 22 million people per year (70,000 passengers per day, not including weekends) making about 37,180 trips annually between St. George on Staten Island and Whitehall Street in lower Manhattan. The New York City NYC DOT operates and maintains the nine vessel fleet.

Knowledge is (Negotiating) Power

As anyone in the maritime sector can attest, careful management of a fleet's maintenance and repair regimen is a cornerstone to profitable operations. Simply put, mismanagement of maintenance can sink the corporate ship, literally. So when NYC DOT was taking its ferries into dry dock, it was finding a discrepancy between what it and the shipyard believed was necessary for maintenance, specifically regarding the amount of coatings needed for specific projects.

"There was a massive price difference in regards to coatings needed premised on the square footage specified by the shipyard (in the General Arrangement drawing) and what NYC DOT thinks the quantity of coatings should be," said Thompson. "In step, there was a big price difference in regards to coatings cost." Thompson's mission was clear: Use his FARO Focus3D X130 to deliver new, accurate 'as built' GA's for four vessels in the Staten Island Ferry fleet Senator John J. Marchi, Samuel I. Newhouse, Andrew J. Barberi & John Nobel – allowing the NYC DOT to better estimate and negotiate maintenance and repair costs with the shipyard.

He achieved the mission, spending time while the vessels were in dry dock in Norfolk, Va., and at the owner's maintenance facility in New York, scanning the underwater hull, the superstructures and the interiors. "Pre-scanned, reverse engineered gives a full, updated and accurate model regarding the amount of square footage that actually needs to be covered," Thompson succinctly summarized While the savings for this particular project were not available from the NYC DOT, Thompson said that it is not uncommon for savings to quickly enter the 'millions of dollars' range.

Long Experience with 3D Scanning

Until 3D laser scanning came along, the traditional tools to 'accurately' measure a vessel were the GA drawings and a tape measure. "As we know, the GA drawings are usually close, but they're not quite accurate," said Thompson.

He has been using the FARO System for about 12 years, "ever since it was a baby." In comparing the FARO 3D scanning solutions to other systems, Thompson said that FARO was a pioneer of sorts, the first to provide a battery powered system that offers significant advantages when continuously moving equipment through tight maritime spaces.

"Up until lately – lately being until the last couple of years – Faro was the only battery powered system out there," said Thompson. "With other systems, as you tried to drag it around, you had to have a constant power source, you had to have a laptop tied to it; the FARO system is battery powered with an internal SD card, so it was more portable."

But compact and portable were not the only factors that drew Thompson to the system. "It also, until the last several years, was the only one that was available with color," he said. "That might not seem like much of a value add, but as it turns out when you start dealing with multiple piping arrangements in an engine room, for example, it makes your life a lot easier as you're sitting and trying to discern between different pipes and different systems, particularly when you're trying to reverse engineer things." In brief, the systems portability and advanced features helped to save time.

Thompson's job is a mix of speed and accuracy, and he said in the case of the Staten Island Ferries, time spent was dependant on the scope of the project. "The total reverse engineering time was 80 to 100 hours with the John Noble and that was modeling the entire ship; the hull, the superstructure, the interiors … everything," said Thompson. But on the Newhouse the project was limited to superstructure coatings and flooring, as NYC DOT was removing the linoleum flooring and replacing it with a poured coat flooring. "To go out to bid they need an exact square footage; I can give them that relatively quickly, about 50 hours or less," said Thompson

"With the FARO system I can re-model the entire ship and come up with an entirely new GA," said Thompson. "Being able to give an 'As-Built' is valuable to the owner, whether it's the entire vessel or a specific system or area. In the case where we're doing something like piping for a ballast water system, once I'm done modeling the ship or a system, the owner ends up with the new GA's anyway because I have to reverse engineer certain parts so that I can get the system in."

MEPC 71: Ballast Water Management Update

About the Author

Tom Kirk is the Director of Environmental Performance, ABS. Kirk was a member of the U.S. delegation to MEPC 71 and the member of the IMO's ballast water review group.

MEPC 71 was a very busy week and shipowners can now benefit from having a firm view of the regulatory timeline for complying with the latest global requirements for managing the ballast water from their vessels. Unfortunately, the timeline remains very crowded and for owners with ships trading to and from the U.S., compliance is more complicated. While some deadlines were eased to reflect the fact that many dates from the original BWM Convention had lapsed while consensus was being reached, the Convention still enters into force on September 8 this year.

At a minimum, all applicable ships will need to have approved Ballast Water Management Plans demonstrating compliance with the ballast-water exchange requirements on or after the Convention's entry into force.

The MEPC set new schedules for shipowners to meet the requirements for ballast water treatment, in some cases delaying by two years the deadlines for installing those systems on ships already in operation.

Exactly when that deadline will apply to each existing ship will depend on the date the owner sets for renewing its International Oil Pollution Prevention (IOPP) certificate. For vessels not required to carry an IOPP certificate, the mandatory installation of an approved BWM system will be required to take place no later than Sept. 8, 2024.

If a ship's IOPP renewal survey is undertaken between Sept. 8, 2017 and Sept. 7, 2019, the system installation is required at the next IOPP renewal survey. Any new ships built after Sept. 7 this year must be fitted with a treatment system at delivery.

Ships trading to the U.S. and discharging ballast will find that the applicable USCG implementation schedule for the treatment system is unaffected by the related changes at the IMO and, in most cases, the compliance dates will be before those mandated by the MEPC.

From a practical standpoint, owners need to look at these as two separate regimes and, aside from the divergent compliance schedules, it also will be important to remember that the USCG does not recognize IMO type approval for BWM systems. The USCG has its own scheme, which uses a restricted number of recognized, independent labs.

Conversely, while the IMO Code took into consideration U.S. Environmental Technology Verification procedures, it is not entirely consistent; systems that meet USCG approval will not necessarily meet the Code, and systems that are tested to the Code may not meet the USCG requirements.

There are manufacturers that are currently undergoing testing who are asking for their systems to be tested to both procedures in parallel, but they will remain as two distinct certificates.

The USCG will consider extensions to systems-installation deadlines on a vessel-by-vessel basis, but the compliance process for ships trading to the U.S., as well as internationally, is complex for the shipowner. The owner has to consider not only the IMO and USCG compliance dates, but also whether there is an argument to make for an extension of the latter dates.

The USCG announced in December last year that consolidated fleet applications are no longer accepted. Each request for an extension needs to be a standalone argument stating why the existing type-approved technologies would not work when they are intended to be compliant. The argument has to articulate why an installation cannot be done at the next scheduled dry-docking and when the owner intends be in compliance.

So, if you're a shipowner, where do you start?

From the IMO-compliance perspective, owners need to look at their certification history and pending certification-renewal dates to determine how the amended dates in the Code will impact each and every one of their vessels.

ABS is working with owners to identify their survey histories and what their options may be and, in many cases, those options will have to be subsequently discussed with the ship's Flag administration. Once owners have identified their installation date, they can determine what BWM system is best suited for each individual ship.

In the U.S., four BWM systems have been type approved (two applications are pending). Elsewhere, there are more systems for shipowners to navigate; so, for the past two years, ABS has made available to the industry a BWM technology evaluation service to compare and raise understanding of the technologies offered by most vendors.

Once the vendors are selected, owners can then begin the detailed planning and engineering that will be required for installation.

California &
Ballast Water Compliance Protocols

By Lawrence Younan, Snr Applications Scientist, Turner Designs & Chris Brown, Senior Environmental Scientist, CSLC

We are quickly approaching September 8, 2017, the date when the International Ballast Water Convention will enter into force requiring ships to manage their ballast water using methods to remove or render harmless organisms contained within their ballast water. This is in an effort to halt the spread of invasive species that have crippled many local ecosystems, both monetarily and environmentally, in some cases causing irreparable damage.

In the U.S., the regulations are already in place. Recently, the United States Coast Guard (USCG) announced that Alternate Management Systems (AMS) currently being used for managing or treating ballast water may not necessarily be type-approved and operators of those systems will have a tough time obtaining extensions to use AMS. This is in contrast with earlier years when it was relatively easy to obtain extensions as the USCG has now type-approved several ballast water treatment systems.

State regulators in the U.S. can have their own limits, some more stringent than the USCG limits, for ballast water discharge. However, state and federal agencies are working together to keep our coastlines safe from invasive aquatic species.

California State Lands Commission Validated Indicative Sampling Tools

California State Lands Commission (CSLC) is working hard to be on the front line of this fight and much work is being done on the state's side. Out of the roughly 10,000 ship arrivals at California ports per year, typically 15% or 1,500 arrivals have intent to discharge ballast water. CSLC is mandated to board 25% of all ship arrivals. That means their field staff is inspecting ~2,500 arrivals per year performing outreach, checking log books, verifying exchange locations, etc. to ensure violations are at a minimum. CSLC is taking advantage of ship-boarding opportunities to run tests using indicative sampling tools to determine whether ballast water treatment systems are efficiently working. Indicative sampling is part of their draft compliance assessment protocol which employs a tiered approach: 1) paperwork, calibration, functionality, 2) indicative sampling, and 3) full scale testing. Expectations are that the compliance protocols will be finalized in the fall of 2017.

CSLC recently completed a validation exercise of several indicative sampling tools while developing their draft compliance assessment protocols. They evaluated the sampling tools with three different ballast water treatment systems – one UV system and two Electrochlorination systems. Chris Brown, Senior Environmental Scientist with the commission's Marine Invasive Species Program, presented the results of their validation at the March 16, 2017, ICES/IMO Ballast Water Workgroup meeting. Indicative tools would be employed when the second tier of indicative sampling is deemed necessary.

Validation Results

In all three assessments, The Turner Designs Ballast-Check 2 results were very similar to the microscopy and flow cytometry results. Ballast-Check 2 uses specific fluorescence to estimate cell abundance as cells/ml. The other validated instruments estimate cell abundance using a variable fluorescence (Fv) measure. It seems that in certain cases the Fv-based estimate, although very repeatable, can be inaccurate when compared to microscopic and flow cytometric analyses, whereas Ballast-Check 2 is significantly more accurate though not as precise. This means triplicate samples would be ideal for obtaining more accurate results, which is practical considering results are calculated, logged, and displayed in less than a minute. The CLSC test results below indicate how well the Turner Designs' Ballast-Check 2 compares with ground truth methods such as flow cytometry and microscopy relative to Fv-based estimates. Note that the very high results from the Fv-based tools in figures 1 and 2 are likely due to post-test growth of bacteria from enrichment of the test water.

Indicative sampling is being considered and evaluated to simplify the process of determining risk of exceedance of the ballast water standards. IMO port state guidance advises several years of collecting data on indicative sampling. CSLC has taken a big step forward in validating several instruments and releasing their data to show the efficacy of currently available indicative sampling tools.

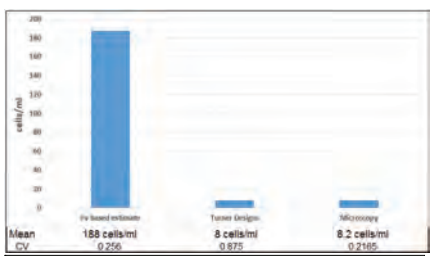


Figure 1: Test 1 – TA Test of UV System.

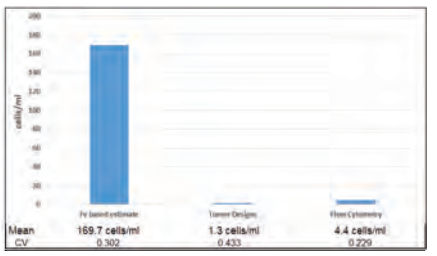


Figure 2: Test 2 – Electrochlorination Unit TA Test (Freshwater).

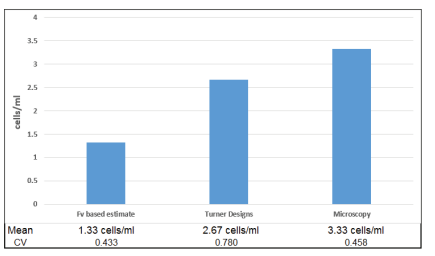


Figure 3: Test 3 – Ship Installed Operational Electrochlorination Unit.

Step-by-Step Improved Safety & Training

Step #3: Using Real Time Data to Improve Training

Photo: © Photocreo Bednarek / Adobe Stock

Everyone responsible for safety or training in their organization is very aware that everything is changing in the maritime world. The worker demographic has shifted. Regulatory demand is rising and compliance is more complex. Fortunately, it is also the case that maritime safety and training has entered a renaissance period. New tools are available that improve training outcomes and allow organizations to assess their state of training and compliance with a level of insight not previously possible. At the heart of these tools is the practice of blended learning supported by a Learning Management System (LMS) - software to deliver training, assessments, tracking and insights.

This is the third and final in a series of short articles that provides step-by-step instructions to address modern safety, training and compliance challenges with the new and highly effective practice of blended learning. The first article, which appeared in the June edition of *Maritime Reporter*, focused on the creation of a minimum viable plan (MVP) for the pilot. This is a two or three page living document which acts as a roadmap for the management of blended learning. The second article, in the July issue, discussed giving life to the plan by implementing and running a blended learning pilot.

There, aspects such as engagement, the choice of training materials and the use of a learning management system (LMS) were covered. This third article completes the series by presenting what is arguably the most important aspect of any critical operational activity – measuring our success and using those result to begin the ongoing cycle of continuous improvement. Let's get started.

Defining Success

The overall outcomes we are looking to achieve are improved training results, improved compliance tracking, and the ability to continuously measure the success of our training to inform a process of continuous improvement. This latter goal, continuous measurement and improvement, is the one that ensures that we not only learn from mistakes, but that we are always improving and fine tuning our processes to achieve the best possible outcomes.

It is often said that if we do not take this step to monitor and improve training outcomes, we can be confident that those outcomes are continually worsening. So success here is defined as having a simple and efficient process to achieve continuous improvement.

Starting the Ball Rolling

Remember that the best structure for rolling out blended learning is an incremental approach – starting with a pilot, and then continually adding more learning materials covering a broader range of knowledge and competencies. Each time we expand in this manner, this is an opportunity to take a retrospective look at how things have turned out up to this point. Was it a success overall? What parts can be improved? What should we do differently next time? So here we analyze (measure how well things are going) and adapt (brainstorm and implement ideas that we believe will improve the outcomes next time we measure).

At this point in our process, we have created a simple plan, and we have designed and run a pilot implementation. Now our first opportunity to analyze and adapt has arrived.

Step 1: Analyze

"If we don't measure it, we can't manage it". So it is time to measure. When it comes to measuring training success, what tools do we use? The high-level answer is that our measurements must be objective so they can be meaningfully compared each time we take them, and they should measure aspects of training that we have some control over. There may be a point in measuring things we cannot control, but such measurements are not helpful in a continuous improvement process.

The tools that support blended learning, namely the learning management system (LMS), provide a wealth of metrics that can be used to support continuous improvement. For example, an LMS can provide graphs detailing trends in exam performance to show whether it is improving, stable, or getting worse. An LMS can also provide real data on how long your learners are spending learning the materials. This is important to make sure your expectations are aligned with reality. It will also help identify learning content that your trainees are finding confusing or difficult. An LMS will give you details on how each question on every exam is being performed to help highlight future performance or safety issues. It will even tell you if employees have let critical competencies lapse – or warn you ahead of time. These are but a few examples of the myriad of metrics that blended learning technologies can deliver for the specific purpose of giving you real insight into the success of your training and forming the basis for continuous improvement.

In addition to LMS-generated metrics, there are other sources. For example, trainee surveys are critical in understanding what they believe worked well and what did not. Likewise trainer surveys (where the trainer is surveyed) to ask about their experience, and the suitability of training duration, support materials, curriculum and facilities will also provide valuable feedback. Although these are not as objective as the measured results above, they still provide useful information.

When you begin your blended learning program use the above suggestions to define your initial set of metrics, and then measure these metrics immediately after the pilot. Realize that just like the training itself, the list of metrics you gather can (and should) be continually reconsidered and adapted in the light of experience. So don't panic about making sure they are perfect at the start. Just put a reasonable set in place, and then improve that list as time goes on.

Step 2: Adapt:

After the pilot has been run and we have the results from the metrics we put in place, the task now is to brainstorm ideas that you believe might improve the metrics – especially those that show the greatest need for improvement. At times, the ideas will be obvious; you will know they will have a positive effect. At other times, it may not be obvious what the best approach to improving a metrics will be. But that's OK as the structure of the continuous improvement cycle assumes that not every change you make will yield a positive result. Instead, the goal here is to make your best guess as to how to improve, implement that change, run your next training session, and then measure again.

In some cases, you will find that your metrics have improved. That is a signal that the changes you put in place to improve those metrics have yielded a positive result. Keep those changes. But in other cases, you may find that a metric has actually indicated a worse outcome. Chances are here that the change you put in place was not positive, and that change may need to be abandoned. But it is through this repeated process of small changes, measurement, and small incremental steps to expand your training that you will continue to arrive at better and better training outcomes.

Step 3: Repeat

This is the easy part. Remember that this is an iterative process: train – measure – adapt – train – measure – adapt ... and so on. We never stop training, so we must never stop improving.

Note that this cycle not only ensures that we improve, but it also guarantees that our training models keep pace with changes in the world we operate in. As the demands on our workers change and grow, so too will the training we provide them. This all happens as a consequence of this simple, repeated measurement and improvement process – the continuous improvement process.

About the Author

Murray Goldberg id CEO of Marine Learning Systems, maker of MarineLMS. A researcher and developer of learning management systems, his software has been used by millions of people and companies worldwide.

What's Next?

For those interested in improving their training outcomes through blended learning, the next step is the first step: develop a simple plan (Maritime Reporter, June 2017), and then go from there. It is an exciting journey and one that will make your operations safer, more efficient, and future proof. Enjoy the trip!

Class is 'In' @ SeaSchool

Images courtesy Sea School

Clockwise, starting top right:
Jean Wahl, President, Sea School; Ken Wahl, Vice President, Sea School; Invesing in cutting edge Simulation Technology

SeaSchool lays claim to being the largest private sector maritime training center in the U.S., operating nearly 100 schools/courses dedicated to training and certifying a wide range of professional mariners from "six-pack" charter fishing boat captains up to and including crewmembers of unlimited sized tankers.

Headquartered in St. Petersburg, FL, SeaSchool also has Florida offices in Fort Lauderdale, Jacksonville and Panama City as well as Charleston, SC; Freeport, NY; Mobile, AL and a recently opened 75,000 sq. ft. facility opening soon in Toledo, OH to serve the Great Lakes market.

Founded by Captain Ron Wahl in 1977, SeaSchool has trained about 10,000 students annually to work in all levels of the maritime industry – including offshore oil and gas, international shipping, domestic maritime, military, government and pleasure boating. According to Sea School, it accounts for 47% of all certificates awarded by the U.S. Coast Guard.

Simulation Technology

One of SeaSchool's most useful training tools is its array of maritime simulation equipment, and throughout its system SeaSchool offers maritime simulation systems manufactured by Kongsberg, NAUTIS V-Step, SIS- Sea Information Systems, and BCG

SeaSchool's centers in Mobile, Jacksonville, Charleston and Toledo school plan to conduct full simulator training, a training scenario which allows instructors to throw virtually any sea situation at the students, from vessel traffic; weather; port obstructions; distress calls; engine room fires, a useful tool to assess the student's ability to deal with situations safely and effectively, navigating safely on a virtual voyage.

SeaSchool has a new generation of maritime simulators for the civilian and military marine industry. These simulators fulfill training requirements in compliance with the latest international maritime standards and regulations and include a complete range of simulators – from desktop trainer to full mission bridges.

The newest members of SeaSchool's collection of marine simulation tools are two complete Kongsberg simulators delivered in late April 2017.

Most of their facilities have simulators which may include desktop units aimed at specific tasks. Others have full-mission virtual bridge and engine rooms that demand considerable multi-tasking.

The desktop simulator courses, typically held monthly, cover:

- **Navigation:** Voyage planning; bridge resource management;
- **Watchkeeping:** Ratings forming part of the navigation watch;
- **Radar:** Original; 5-day/3-day refresher; river, inland, & 1-day re-certifications;
- **ECDIS:** A live, computerized chart that displays virtual vessel traffic;
- **ARPA:** A computer that shows the student the results of changing course, speed and other variables when approaching another vessel;
- **GMDSS:** A vast radio communications suite carried aboard with a virtual 'panic button' that broadcasts maritime emergencies worldwide;
- **SAR:** setting up a full-grid search pattern for man-overboard emergencies amid variables such as traffic, visibility, current and wind.

Simulation training has evolved rapidly, in step with computing and visualization technologies, and it helps to prepare mariners for hazardous activities with no risk to personnel, property or the environment. Equipment can even be customized to train crews for a particular cruise ship or line as well as operators of the new generation of Panamax cargo ships. It will be key to cultivating the next generation of mariners.

Despite a slump in some sectors of the maritime industry, SeaSchool has experienced very little slowdown. In fact, it anticipates opportunities for growth--particularly in the towing industry. It expects to continue to provide cutting-edge training for better, safer and more-qualified crews.

"Learning on the bridge has huge risks to property, environment, safety of personnel," said Ken Wahl, Vice President, Sea School. "We cannot continue this ritual, because the cost is far too great. We will always follow our motto: 'We hold your hand till it holds a license.' That simply means we provide customer service second to none. These business principles have stood the test of time. Integrity means everything to us and our customers know it."

In step with the school's global expansion aspirations, Sea School recently became the East Gulf of Mexico branch of The Nautical Institute (NI) based in London, England.

New School: **Seattle Maritime Academy**

Students in the new simulator.

The Seattle Maritime Academy is a new name on the maritime simulation training scene, opening its doors in 2016. But a $600,000 investment in simulation equipment and a solid base in a U.S. Pacific Northwest maritime stronghold have powered the academy forward quickly. Machinery (Engine Room) and Bridge Operations Simulators recently installed at the Seattle Maritime Academy (SMA) campus of the Seattle Central Community College. The systems provide realistic hands-on training in a simulation environment for those who train at the SMA, and are ultimately destined to serve in the maritime industry. The scope of simulator systems gives SMA the ability to provide mariners with internationally recognized, state-of-the-art training and experience, providing the necessary skills and knowledge to aid the safe, efficient, and environmentally friendly transportation of seaborne goods around the globe. The bridge and engine room simulators allow SMA to meet and exceed the training needs of the deep sea, inland, and towing industry, as well as for training of State and U.S. governmental personnel.

The systems comprise three main elements;

- **Machinery Operations Simulator**
  - Class A Full Mission Simulator
- **Bridge Operations Simulator**
  - Class B Multi-Task Simulator
- **Classroom desktop Simulators**
  - Class C Limited Task Machinery Simulators
  - Class C Limited Task Bridge Simulators

The basis of the simulation systems includes two Transas software programs:

- Transas TECHSIM 5000, to satisfy the marine engineering requirements
- Navi-Trainer Professional 5000 (NT PRO) to satisfy the marine deck/navigation requirements

Recent Developments

The academy opened in October 2016, and to date it does not have USCG approved courses … yet. It provides access to maritime companies and individuals to have custom skill building and practice sessions in its simulator. It also uses the simulators in its Marine Deck (AB) and Engineering (QMED) Technology programs for hands-on learning and performing RFPEW and RFPNW Assessments.

As the academy has a full engine room simulator as well as a bridge simulator, it is finding that companies are just beginning to explore what they can do in Engine Simulation.

Shipyard Highlights 2017

While certain maritime markets continue to struggle, we found some compelling stories of success in ship and boat yards, new build and repair at various points around the globe.

HSHI Delivers 15,000 TEU Ship

Hapag-Lloyd took delivery of the 11th and final 15,000 TEU vessel received through its merger with UASC. The 369 x 51-m containership, AFIF, was handed over to Hapag-Lloyd's Ship Management by Hyundai Samho Heavy Industries (HSHI) in South Korea in July. As a result of the merger, the average capacity of vessels in the fleet has risen by almost 1,000 TEU, from 5,860 to the current 6,840 TEU, and the average ship age has dropped from 8.5 to 7.2 years. Hapag-Lloyd now has 230 vessels, including six ultra large container vessels (ULCVs) with capacities of 19,870 TEU and 11 vessels with capacities of 15,000.

C&C to Build $60m Cutter Dredger

Weeks Marine Inc. (WMI) ordered a new $60 million oceangoing, 30-inch hydraulic cutter suction dredge, the JS Chatry. Construction is underway in Belle Chase, La., at C&C Marine and Repair.

The JS Chatry will measure 310 x 72 ft., its pumps are powered by GE's Tier IV diesel electric engines. Those engines and others provide 23,269 total installed horsepower, with 3,000 hp on the cutterhead. When the dredge is not offshore, it is equipped with a walking spud carriage for efficient work in inlets and in protected waters. 52 people can be comfortably housed onboard.

The dredge is named for Senior Vice President and Manager of Weeks Marine's Dredging Division, J. Stephen Chatry.

BAE Starts on UK Warship

BAE Systems has begun to build the first of the U.K. Royal Navy's new Type 26 Global Combat Ships, the first ship to be dubbed Glasgow. This event follows the U.K government's recent award of a contract worth approximately $4.8 billion for the first three ships to be built at BAE Systems' sites in Glasgow.

According to the shipbuilder, the Type 26 Global Combat Ship will be a world-class antisubmarine warfare ship, replacing the Type 23 anti submarine variant frigates, with the first ship due to be delivered to the Royal Navy in the mid 2020s. Type 26 is cutting edge in terms of its capability and benefits from the latest advances in digital technologies, including 3D and virtual reality, to ensure that the ship's design is refined earlier in the process.

Fassmer to Build LNG Fueled RV

The Fassmer shipyard in Germany is constructing a new research vessel to be owned by Bundesamt für Seeschifffahrt und Hydrographie (BSH), the Federal Maritime and Hydrographic Agency.

The 75-m ship dubbed Atair will replace its 30 year old namesake, and will be the first German research vessel operating on liquefied natural gas (LNG) fuel. The engines for the new vessel will be supplied by Wärtsilä, who will also supply exhaust cleaning systems based on selective catalytic reduction (SCR) technology and the LNGPac system for complete fuel gas handling. The full scope of Wärtsilä's supply for the Atair includes two six-cylinder Wärtsilä 20DF dual-fuel engines capable of running on either LNG or conventional liquid fuels, one six-cylinder Wärtsilä 20 engine, two exhaust cleaning systems and a Wärtsilä LNGPac fuel storage, supply and control system. The engines will be double elastically mounted to minimize the noise, a technique to enable the ship to fulfill the DNVGL classification society's 'Silent R' rating, thus allowing the sonar equipment to be used without disturbance from underwater radiated engine noise.

Damen, Metal Shark Team

Damen Shipyards Group entered a partnership with Metal Shark for the construction of up to 13 Damen SPa 2606 patrol boats. The U.S. Navy recently selected Louisiana-based Metal Shark to build Near Coastal Patrol Vessels (NCPVs) for U.S. partner nations through the Department of Defense Foreign Military Sales (FMS) Program. Under the terms of the contract Metal Shark will build up to 13, 85-ft. Defiant-class welded aluminum cutters for the Dominican Republic, El Salvador, Honduras, Costa Rica, Guatemala and other U.S. partner nations.

Additionally, Metal Shark will supply electro-optical infrared sensors, diagnostic equipment, in-country reactiva-

HSHI delivers a 15,000 TEU Containership for Hapag Lloyd.

Hapag-Lloyd

BAE Systems Starts on UK Warship

Image: BAE Systems

Fassmer to build LNG-fuelled RV

Image: Wärtsilä

tion, crew familiarization and test support to NCPV operators.

The new vessels are based on Damen's Stan Patrol 2606 Foreign Military Sale (FMS) design, which will be tailored by Metal Shark to suit the requirements of the NCPV mission. The cutter can carry out a wide range of mission profiles including search and rescue, border patrol, police and customs duties, counter-narcotics operations, and securing waters of economic importance.

The NCPV fleet will be built at Metal Shark's Franklin, La., shipyard.

FBS Delivers an ATB for Kirby

Fincantieri Bay Shipbuilding (FBS) of Sturgeon Bay, Wisc., delivered a second Articulated Tug Barge unit (ATB) – Paul McLernan – and the 155,000-barrel barge 155-02 to Kirby Corporation, completing a contract signed in July 2014. The 6,000-hp tug measures 123 x 38 x 22 ft. and is certified ABS Class +A-1 Towing Service, +AMS. The 155,000 BBL barge measures 521 x 72 x 41 ft. and is purpose-built to carry petroleum or chemical cargoes domestically.

Blount Boats taps Ferry Business

Blount Boats is a full service shipyard in Warren, R.I. Recent deliveries include the M/V Skyview to Shoreline Sightseeing, Chicago in July 2016, a 100 x 35 ft. Subchapter K passenger vessel designed by Seacraft Design, LLC, certified to carry up to 318 passengers and is operating as an architectural tour boat in partially protected waters. Over the past 12 months, the shipyard has also completed repair work on seven U.S. Coast Guard vessels including the 42 ft. Near Shore Lifeboat (SPC-NLB), the 45 ft. Response Boat-Medium (RB-M), and the 47 ft. Motor Life Boat (MLB).

Blount Boats is currently working on a project for the University of Connecticut to extend the mid-body of the R/V Connecticut by 13.5 ft. This project is scheduled for delivery in October 2017. The shipyard is also working on repairs to the 45-ft. USCG Eaton Neck that will be completed August 7, 2017.

In July 2017, Blount Boats together with Elliott Bay Design Group (EBDG) was awarded the contract to design and construct a new passenger-only ferry for Governor's Island, New York by the Trust For Governors Island. The initial vessel design will have a maximum holding capacity of 334 passengers, with a length of 132 ft., a beam of 40 ft. and a depth of 13 ft.. The vessel will be built to meet

Newbuild Orders Drop

Newbuild orders for tankers and bulkers have increased during the first half of 2017, though overall the number of orders placed in all vessel segments has more than halved when compared to the same period in 2015, according to VesselsValue. The most glaring example is in the offshore vessel sector: 50 offshore vessels were ordered in H1 2015, compared to zero orders during H1 2017.

Similarly, orders for newbuild containerships, LNG carriers and LPG carriers declined respectively from 90, 26 and 18 in H1 2015 to 10, 4 and 16 in H1 2017.

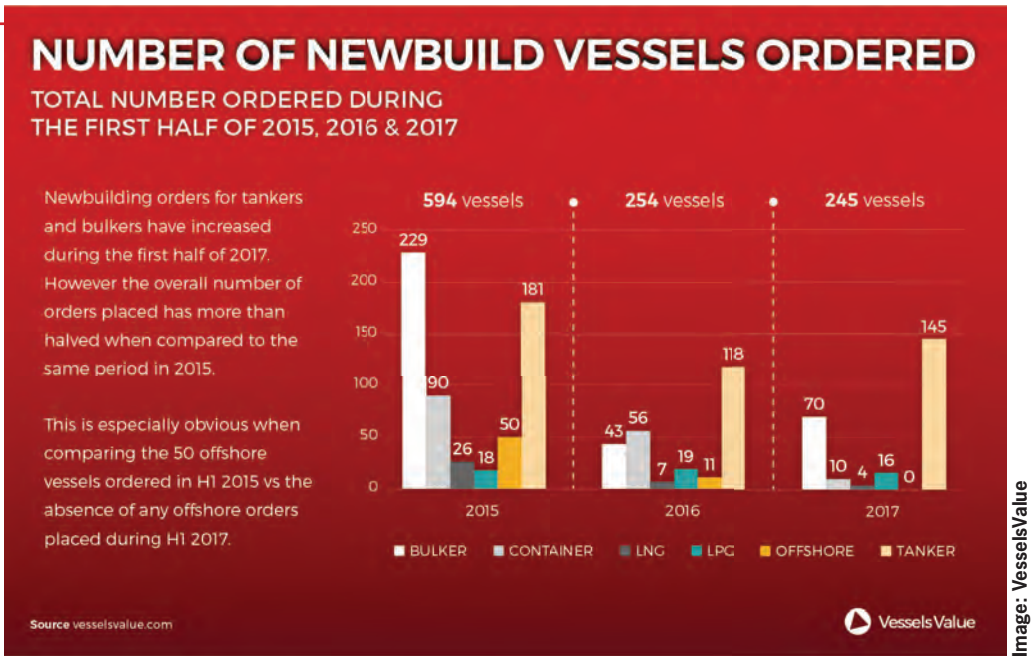


Image: VesselsValue

USCG Subchapter K and is scheduled for delivery in March 2019.

LCS USS Gabrielle Giffords

The U.S. Navy's tenth Littoral Combat Ship (LCS) USS Gabrielle Giffords was commissioned at the Port of Galveston, Texas, earlier this summer, becoming the 16th ship to be named for a woman and only the 13th ship to be named for a living person since 1850. This is the fifth such LCS in a 10-ship Independence–variant ship program with Austal USA that uses the LM2500 marine gas turbine. The two LM2500 engines are arranged in a combined diesel and gas turbine or CODAG configuration with two diesel engines. LCS 10 is named for Giffords, a U.S. Congresswomen who resigned in 2011 to recover from wounds she sustained following an assassination attempt.

Ulstein & the Largest Hybrid Ferry

Rolls-Royce received an order for four B33:45L diesel engines to power the world's largest hybrid ferry being built for the Norwegian cruise and transport company Color Line. The ferry, designed by Fosen and to be built at Ulstein Verft in Norway, is due for completion by the summer of 2019 and is scheduled to operate on the crossing between Sandefjord in Norway and Strømstad in Sweden. The new Color Line ferry will be a plug-in hybrid combining diesel and electrical power. The batteries will be recharged via a power cable with green electricity from Color Line's own shore facilities or recharged on board by the ship's generators. The 160-m long vessel will have a capacity for 2,000 passengers and 500 cars.

Vigor Delivers LGC

Vigor is historically one of the busier U.S. commercial yards, and it recently delivered Harvest, the first complex liquefied ammonia transport barge built in the U.S. for Jones Act trade since 1982. The 508 x 96-ft. ATB tank barge was built to support the operations of The Mosaic Company, a producer and marketer of concentrated phosphate and potash. Harvest will be operated by a subsidiary of Savage Companies as part of an articulated tug and barge (ATB) unit. Built to the highest ABS (American Bureau of Shipping) and U.S. Coast Guard safety standards, the first-in-class Harvest was completed on an aggressive timeline. Abundance, the connecting tug, was built and delivered by Washington-based Nichols Brothers Boat Builders and is also classed by ABS.

Grand Bahama Shipyard

Grand Bahama Shipyard (GBS) reports that despite generally down market conditions, its business model has proven strong as it has completed work on 30 commercial vessels within first half of 2017, predominantly comprised of companies returning to the yard with repeat business, including the likes of Crowley, OSG, Seabulk, Seaboard, Tropical, Trailerbridge and TOTE.

Crowely Marine Services, Inc. will dry dock more than a dozen vessels in 2017, starting in January with the containership National Glory, and followed soon thereafter by Barge 750, Tug Legend, Tug Coastal Reliance, Tug Ensign, Barge 550-4 and Barge Miami. Other GSB highlights in the first six months of 2017 include:

- OSG Overseas Longbeach was dry for 10 days. Work included pipe replacements of over 300 m throughout, and on multiple systems.
- Polska Zegluga Morska PP returned to the yard with two bulk carriers. Raba in followed by the San. Both were docked for propeller overhauls, minor engine work, seal renewals.
- Bibby Offshore Ltd. docked the diving support vessel Bibby Sapphire for an extensive 20-day work period. Works included: steel replacement, tank cleaning and disposal of sludge, electric motor overhaul, pipe replacement and bow thruster overhaul.
- GBS also welcomed first time visitors, Chinese-owned BGP Pioneer managed by Thome Offshore Management and companion tug Supply II double dry docked in February. For a full rundown on GBS's 1H '17 work, visit: www.marinelink.com/news/commercial-shipyard427892

Gladding-Hearn: Pilot Boat Order

Delta Launch Services, the operating company for the Associated Branch pilots on the SW Pass of the Mississippi, ordered a new pilot boat from Gladding-Hearn Shipbuilding, Duclos Corporation. Delivery of the new 52-footer, scheduled for 2018, is the fifth St. John's Class launch built for the Delta pilots by the Somerset, Mass. shipyard.

The new launch, a sister-ship to Mississippi, delivered in 2013, and measures of 52.6 ft. overall, with a beam of 16.1 ft. and a draft of 4.8 ft. The all-aluminum pilot boat features the C. Raymond Hunt-designed Deep V hull. It will be powered by twin Caterpillar C-18 EPA Tier 3 diesel engines, each delivering 671 Bhp at 2100 rpm and a top speed of 24 knots. "Quickshift" gears will turn five-blade Bruton bronze propellers. The launch will be equipped with a 12kW Northern Lights genset.

Gulfstream Launches Ferry

Gulfstream Shipbuilding launched a custom passenger/vehicle ferry for the U.S. Department of Homeland Security (DHS) in July 2017. This 118 x 27 x 10.75 ft. crew boat-style vessel will be delivered in the fall 2017 to service the New York and Connecticut waters. The aluminum ferry will service the DHS

Fincantieri Bay Shipbuilding delivers another ATB for Kirby

Fincantieri Bay Shipbuilding / Kirby

Damen & Metal Shark team to build boats.

Damen

Grand Bahama Shipyard (GBS): Work on 30 vessels.

Grand Bahama Shipyard

Hendry Marine Keeps Growing

Hendry Marine Industries, Inc. (HMI), is a Tampa-based maritime company that, unlike many in the sector, continues to grow its ship repair and maritime service business. Recent company highlights include:

- 2015: HMI became a 49 percent employee-owned company, a succession plan for the Hendry family.
- 2016: HMI hired Jim Long as its new CEO. Long came to HMI after having served as CEO for several companies, including a $1 billion environmental services company.
- 2017: HMI acquired Anchor Sandblasting & Painting, Inc., in May and changed the name to Anchor Sandblasting and Coatings, LLC (Anchor). HMI also established a new business development team to stay focused on growing the business.

Hendry Marine Industry

Directorate of Science and Technology Plum Island Animal Disease Center in Orient Point, NY. The vessel is capable of transporting passengers, freight and vehicles in and around the waters of the Eastern Long Island Sound and Gardiner's Bay.

The welded aluminum, mono hull, diesel propelled, quad screw passenger / vehicle ferry includes a 6.5 ft. draft and an upgraded 100 Hp Wesmar Hydraulic Dual Prop Thruster for added maneuverability.

The USCG Subchapter T certified vessel also features four Caterpillar C32 diesel engines producing top speeds of 26 knots. Other key components include twin John Deere GK4045-powered gensets, a Skipper Hydraulics steering system and ZF four-station Clear Command controls with synchronization capabilities.

Blount Boats

Blount is finding ferry market success.

Gulfstream

Gulfstream is building a ferry for DHS.

Cruise Shipping with European Style

From the oceans to the rivers, modern cruise design and construction with signature European flair.

"Crystal Bach"

MV Werften delivered Crystal Bach, the first of four identical "Rhine Class" ships to be built by MV Werften. At 135 x 11.4-m, it was designed for river cruising in Europe. Up to 106 passengers will sail in 55 large suites, all designed to be above the water line with horizontal sliding windows.

Most of the public areas have floor to ceiling glass, providing a spectacular view of the surroundings and reminiscence of designs of new personal yachts. The Palm Court has a glass-domed ceiling, which will allow passengers to see the sky during daylight and the moon and stars in the evening. The luxury river yacht offers its passengers the award-winning Crystal service, including personal butler service and the world's highest crew-to-guest ratio in the river cruise industry.

The ship also features three gourmet restaurants, a spacious spa and gym, a counter current swimming pool, electric bicycles, piano bar, bistro and other facilities.

"Crystal Bach is the first newbuilding project to be completed under the MV Werften flag," said Jarmo Laakso, Managing Director of MV Werften

"We have incorporated the best navigational and safety standards on ocean ships to the Crystal fleet of river ships with four Azimuth thrusters for easy maneuverability, forward bridge with two navigators seated at all time with state-of-the-art navigation system and had river ship training at the Simwave simulator center in Rotterdam," said Gustaf Gronberg, SVP of Newbuilding and Marine Operations. Crystal Mahler, the second ship, will be delivered soon, with the last two coming in early 2018.

"Ecoship"

Ecoship, a new cruise liner set to feature the latest innovations in renewable energy usage, has been designed by Oliver Design, working from Getxo, Spain.

The design was commissioned by Peace Boat, a Japanese NGO nominated for the 2008 Nobel Peace Prize and the promoter behind this ambitious project to design and build the high-range eco-friendly cruise ship.

For this pioneering project, Oliver Design is working in collaboration with a world-class team of experts, including prominent engineers, scientists and thinkers from the fields of eco-technology and shipbuilding. The work is being coordinated by Peace Boat's project manager, naval engineer Dr. Andrés Molina, who has long experience in the cruise ship sector.

In May, Peace Boat signed an agreement of intent with Finnish shipyard Arctech Helsinki Shipyard Inc. The aim is for the ship to be delivered to the Japanese NGO in time for the 2020 Olympic Games in Tokyo.

The 60,000 grt Ecoship will be an ocean liner capable of housing 2,000 passengers in 750 cabins. It will measure 250 x 32 m with an 8-m draft with a maximum speed of 21 knots and a cruising speed of 17 knots.

Design of the Ecoship cruiser includes 10 large retractable elements made up of solar panels, which can operate as large sails in suitable wind conditions. The sails can be used for propulsion and at the same time to generate power. The Ecoship is designed to include a total of 6,000 sq. m. of solar panels with an output of 750 kW.

As well as harnessing renewable energy sources, the ship will have a hybrid engine, capable of being powered by diesel or LNG. Ecoship will also have all the latest advances in waste disposal and architectural design features based on the biophilia concept, which is a building concept that advocates maximum use of natural elements such as air, light and water, as well as materials and designs based on nature itself.

Crystal Bach

Delivery of the 135-m long river cruise vessel in Germany.

© MV WERFTEN

Image: Oliver Design

Ecoship

An ode to renewable energy

ISA Yachts Ramps Up

Acquired in August 2016 by the Palumbo Group, ISA Yachts is an Italian yacht builder established in 2001 and based in Ancona. Specialized in the design, construction and refit of motor yachts, 40-80m in steel, aluminum and composite, ISA Yachts has built 33 pleasure craft to date. The ISA Yachts site has a twofold strategic function: it is a central hub for the Columbus Yachts and ISA Yachts' new units construction and after-sales, but also an important refit and repair service point of PalumboSY, expanding its presence in the Adriatic Sea. The shipyard, with direct access to the sea, occupies 52,000 sq. m. with 18,000 sq. m. covered. It features a new 560-ton a travel lift, a shed for the two 110-m units and will soon count on a Syncro Lift for vessels over 60m.

After the acquisition by the Palumbo Group, the new course of the shipyard will be based on a fully redesigned line-up, starting with the complete restyling of the Sport, Classic and GT ranges by Team for Design-Enrico Gobbi.

"The very recent launch of M/Y Clorinda has a huge symbolic value for ISA Yachts" said ISA Yachts CEO Giuseppe Palumbo. "Less than a year after our acquisition of the brand, Clorinda, whose construction began in October 2016, is the first yacht completed in the Ancona yard. ISA Sport 120 is a model that strongly reflects the philosophy and aesthetic features of the ISA Yachts production, representing an 'icon' of the Italian brand."

ISA Yachts

"We decided to dedicate the Ancona shipyard to the building of new yachts but also to become the largest after-sale and refit center on the Adriatic. In fact, the market trend is positive for super and mega yachts."

Mr. Giuseppe Palumbo, CEO, ISA Yachts

Photo: Royal Dawn

Photo: Power Fuel Savers

Photo: Sacred SeaTuna

FITCH FUEL CATALYST

Making Engines More Efficient

Fuel quality is a perpetual focus of the commercial maritime sector, as not only is it the major operating expense, the quality of fuel greatly affects performance and lifespan of major mechanical systems onboard. More complete combustion means less fuel needed, as well as reduced maintenance and unscheduled downtime, cleaner injectors, cleaner piston crowns and cleaner firing tubes. The Fitch Fuel Catalyst is designed to reverse the natural aging process of fuel by inducing a chemical reaction using a patented metal alloy catalyst (not a liquid additive) that reforms diesel fuel, reportedly creating a more combustible, cleaner burning product.

The Fitch technology is designed to reverse oxidization and promote oxygenation of all carbon-based fuels. Oxidization begins the day a fuel is created and continues until the time it is combusted. Oxidization causes the fuel quality to deteriorate, reducing the amount of energy that can be produced and greater pollution and residue. Oxygenation takes place at combustion. By adding oxygen to the combustion process more energy is created meaning less fuel is needed to do the same work.

The 305 ft. fish processing vessel Golden Alaska, which first started using Fitch in 2014, closely monitors its fuel consumption at all times and reports an increase in fuel efficiency of 8.51 percent when using Fitch Fuel Catalyst to treat fuel. In addition, "There has been a clear reduction in smoke and a significant reduction in carbon build up which translates into reduced engine maintenance and unscheduled downtime," said Mark Purdue, Chief Engineer, Golden Alaska Seafoods, LLC.

CASE STUDY: SACRED SEATUNA

According to Captain Rick Goche, Sacred SeaTuna is a family owned business, fishing the F/V Peso II out of Charleston, Ore. "We fish tuna and salmon (when they let us) and all of our products are sold under our family label Sacred Sea Tuna," said Captain Goche. "We normally fish from June 15 till the end of October. We provision for 14 days and hope we are full before then. Annually we use 4,000 to 5,000 gallons of fuel."

According to Captain Goche, since he was having smoke and filter clogging problems, and was looking for a means to improve fuel economy, too. After installing the Fitch Fuel Catalyst "I've seen a noticeable improvement in exhaust and engine responsiveness. The most impressive aspect of improvement though is how clean the top end of my engine is. When my mechanic pulled the valve cover he was so impressed he started taking pictures. He said, 'This is the way a new engine looks when I pour oil over the rockers before it's first started up.'"

The clean engine is one thing, the fuel savings another. "It's hard to say (what our exact fuel savings is) since we don't have a fuel consumption meter but just looking at hours run vs gallons I'd have to say (we've saved) around 10-13 percent since we've gone from about 75 gallons per hour to about 65 gallons per hour."

Brent Bixler of Royal Dawn considers himself an early pioneer to evaluate the Fitch Fuel Catalyst in the mid-90's when he bought a unit for a Cummins KTA1150 main engine and another smaller unit for a Caterpillar 3304 generator engine.

CASE STUDY: ROYAL DAWN

Brent Bixler of Royal Dawn considers himself an early pioneer to evaluate the Fitch Fuel Catalyst in the mid-90s when he bought a unit for a Cummins KTA1150 main engine and another smaller unit for a Caterpillar 3304 generator engine. "Fishing the South Pacific, traveling for 30 day clips to reach the fishing grounds, I was provided the ideal environment to track fuel consumption operating at normal running speed," he said in written response to our questions. "Using a FloScan metering system, I was able to compare fuel consumption without Fitch and retrofitted with Fitch during these lengthy trips. At an AAFA (American Albacore Fishing Association) meeting just recently, I expressed to the Association that I saved 12% after retrofitting my engines with Fitch almost 15 years ago."

Being the Fitch units purchased in the mid 90s were past their life expectancy, Bixler recently purchased three new heavy-duty Fitch catalyst canisters for the Royal Dawn. In addition, he bought an auto kit for his Dodge RAM 2500 diesel pickup with a Cummins 5.9 liter engine with the expectations of quieting down the truck and picking up a bit more mpg.

FITCH FUEL CATALYST

The Fitch Fuel Catalyst is designed to save operators money. Here's how:

- Reformulates the fuel to extract more energy/gallon
- Reduces fuel consumption by 5 to 10%
- Pays for itself in five working months, lasts for years
- Helps to reduce emissions, maintenance costs and unscheduled downtime
- Easy to install, maintenance free
- Approved by LR and ABS
- Installed on more than 500 commercial vessels

STEERPROP & THE SWITCH

New Propulsor Leverages PM Tech

Finnish collaborators unveiled a new propulsion unit. Azimuth propulsion specialist Steerprop has rolled out its new CRP ECO LM propulsor featuring permanent magnet (PM) technology from The Switch.

Steerprop has been developing propulsion units since 2001, while The Switch, a developer of advanced drive train solutions, has been using its technology to enhance performance in marine applications. The PM machine, currently in serial production, has a track record in the world's largest wind turbines in rough offshore conditions.The new Steerprop CRP ECO LM propulsor utilizes a vertical PM motor, allowing it to sit inside a vessel hull, which simplifies installation and maintenance, the developers said. When the motor is placed on top of the thruster, the unit size can be more compact, increasing efficiency without compromising on hydrodynamics and lowering operational costs.

According to Steerprop, its CRP ECO LM propulsor is especially suited to harsh environment operation and the demands of ice breaking, having received the highest ice classification. It is robust and, thanks to its lightly loaded CRPs, offers lower noise and vibrations, enhancing levels of comfort onboard.

The Switch entered the marine segment in 2013, acquiring Wärtsilä Drives in Norway in November last year. The business, part of the €3.3 billion turnover Yaskawa Electric Corporation, is now targeting growth of 200 percent in the sector across the course of the next five years.

www.theswitch.com
www.steerprop.com

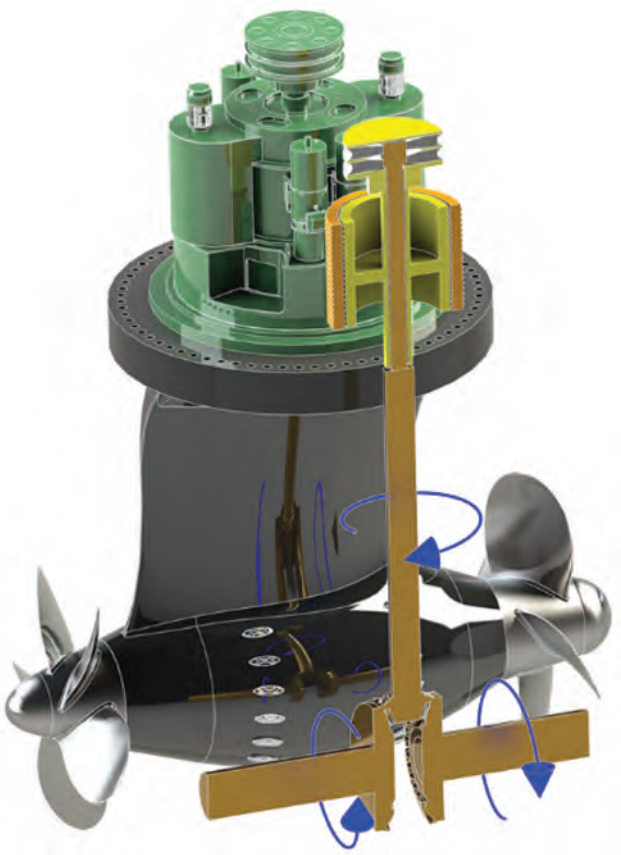


Image: Steerprop / The Switch

RSC Bio, Drew Marine Partner

Mike Guggenheimer,
CEO, RSC Bio Solutions

In Oslo at Norshipping 2017, RSC Bio Solutions and Drew Marine announced a new global marine distribution partnership, an alliance that enhances availability of RSC Bio Solutions' High Performance Environmental Lubricants globally.

"The partnership with Drew Marine is going to allow to greatly expand the coverage and availability of our product line, and also enhance the technical service and support that we bring to our customers, said **Mike Guggenheimer, CEO, RSC Bio Solutions (pictured)**. "In terms of port availability, we just went from a handful to more than 900 ports where the product is available. This really gives us access to the full range of Drew and 900 ports. The availability and responsiveness is huge."

"RSC Bio Solutions' deep commitment to industrial biochemicals, impressive track record in marine applications, and unmatched performance profile sets a leadership pace in the industry and makes them an ideal partner for Drew Marine," said David Knowles, CEO, Drew Marine, in a prepared statement jointly released by the companies. "Our customers trust us to deliver high-quality solutions backed by superior technical service and compliance monitoring. Bringing new technology, like the game-changing FUTERRA range from RSC Bio Solutions, supports Drew's strategy to bring additional value and extends our trusted product offering."

According to Guggenheimer the deal Is a global distribution partnership connected to the marine space. "Drew has an extensive global network and deep marine experience, with a strong technical sales and service network. We're going to partner with them to distribute our products and service our customer base directly. That means our innovative product line will now be coupled with their supply chain and service network," said Guggenheimer, speaking from the company's shared booth space at the Norshipping exhibition.

RSC Bio Solutions isa leading industrial biochemical company, focused on the performance environmental space. "That means we develop and design renewable and readily biodegradable lubricants and cleaners," said Guggenheimer. "The problems we tend to solve are companies and fleets operating in sensitive areas, and the equipment itself is sensitive. What we are trying to do is develop a range of fluids, predominately lubricants in the marine space, that can interface with the ocean."

By virtue of new regulation, such as the EPA's Vessels General Permit, the demand for environmentally benign products is growing. But new rules alone are not the driver, according to Guggenheimer.

"We see in the marine space the demand for these products growing, particularly in far ranging ports worldwide" he said. "The trend in the industry is not only the regulatory trend to comply, but the scrutiny around sustainability and environmental risk is growing. So it could be incentives in a port, it could be a reduction in fairway dues, or it could simply be the stakeholders themselves – the vessel owners and operators – that are simply looking to minimize risk."

Continued Investment

Investment in industrial solutions that benefit the environment is hardly new, but delivering solutions that perform, affordably, is not always seamless. "I think when you say investment mentality, for us the core is not trading off performance," said Guggenheimer. "Historically, to solve some of these problems with the older technology meant that you had to accept some sort of trade-off in performance. Our motivation from an R&D standpoint is to develop and design products that can offer a performance advantage. A good example is the FUTERRA product line that we launched last year (at SMM in Hamburg, Germany), is a line that comes with a limited 10 year, $1 million product warranty on the oil.

RSC Bio Solutions' EALs have more than a 20-year history with zero failures in the field, according to the company. Its RSC FUTERRA HF Series is the first of its kind: renewable hydrocarbon EALs designed to withstand extreme conditions and prevent corrosion while operating in severe outdoor environments.

"We want to be that technical and service leader in this space, and that brings us back to the value of the Drew Marine partnership," said Guggenheimer. RSC Bio Solutions will continue to invest in this space, but working closely with Drew to leverage their experience.

Schottel's Underwater Mountable Thruster

Schottel

Schottel expanded its portfolio with the successful tests of the 5.5 MW SRP 800 U rudderpropeller, which can be installed afloat for vessels that cannot be docked easily due to their size or area of operation. Besides application in larger offshore vessels or rigs, the Schottel thruster is suited for cable laying vessels, offshore construction vessels and crane ships.

"As a result of customer requests, Schottel decided to further develop the robust, well-proven rudderpropeller technology in the power range up to 5.5 MW," said Roland Schwandt, Schottel Sales Director Tug & Offshore Energy.

Schottel said calculations for increasing the power went hand in hand with developments for greater installation flexibility and higher safety factors that exceed the strict requirements of the classification society. This includes, for example, the full load gear test for checking the gearing of the bevel gear set that has now been carried out in the German test facilities successfully.

The full load gear test was preceded by model tests at Potsdam Shipbuilding Research Establishment (SVA Potsdam), Germany and CFD simulations. The thruster sets superlative standards in real dimensions. Tests were carried out with a rated torque of 80,000 Nm at the power input of the underwater gearbox. This corresponds to continuous heavy-duty operation on the open sea using a propeller with a diameter of 4,100 mm. Two large hydraulic motors with working pressures of up to 300 bar provided the drive and braking power.

The results of the evaluation show that the position and extent of the contact pattern exactly match the simulation, the manufacturer said. In the contact pattern, it can be proven that even with the high operating loads and the resulting displacements of the teeth, the torque is always transmitted ideally from tooth to tooth.

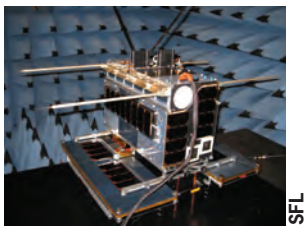
With a view to safety, Schottel said customers benefit not only from the rolling-contact bearings, but also from the double-checked seals with a longer service life than required by the classification society. The certified LEACON propeller shaft seal was successfully tested. The endurance test under real operating conditions simulated water pressure and temperature fluctuations, for example. The key design feature of the system is an intermediate chamber between the propeller gearbox and the water. Multiple special seals on the propeller shaft and the connecting shaft separate lubricants from the seawater.

According to Schottel, the SRP 800 U has been optimized with a focus on maximum market coverage in terms of fit variability. The design of the interface to the vessel corresponds to that of models commonly available on the market and is thus ideal both for new installation and as a replacement unit. Using a three-way roller bearing as the slewing ring, it was possible to reduce the required installation space and increase the compactness of the drive. Furthermore, the number and size of the protective caps was minimized for underwater installation.

Two stem variants open up a broad application spectrum. In addition to the standard version with a 90° gearbox, Schottel also offers a variant with a propeller shaft inclined by 8 degrees. This reduces detrimental effects on the thrust of adjacent drives and interaction with the hull. In terms of flow characteristics, the azimuthing SRP 800 U thus adapts itself optimally to its area of operation, be it as a main propulsion unit in a drill ship or construction vessel, or as a positioning aid in a semi-submersible rig. The optimal flow contour was the result of CFD calculations as well as cavitation and maneuvering trials at the SVA

www.schottel.de

Norway Launches Microsatellites



SFL

The Space Flight Laboratory (SFL) announced the launch of two Norwegian microsatellites developed and built by SFL for the Norwegian Space Center with support from the Norwegian Coastal Authority (NCA), Space Norway and the European Space Agency. The first satellite, dubbed NORsat-1, carries an Automatic Identification System (AIS) receiver to acquire messages from maritime vessels, a set of Langmuir probes to study space plasma characteristics, and a Compact Lightweight Absolute Radiometer (CLARA) to measure total solar irradiation and variations over time. The payloads were provided by Kongsberg Seatex, the University of Oslo and the Physikalisch-Meterologisches Observatorium Davos World Radiation Center. The will serve the NCAin monitoring maritime traffic while also performing science.

Cobham Antennas in EpicNG Tests

Cobham SATCOM

Cobham SATCOM's SAILOR and Sea Tel antennas have been used by maritime VSAT service provider Marlink to test the upper limits of throughput on the new Intelsat 33e (IS-33e) satellite. The testing at Marlink's Eik teleport included Cobham SATCOM's Sea Tel 9711 IMA, Sea Tel 6012 VSAT and SAILOR 900 VSAT High Power systems, all of which demonstrated high throughput capabilities. IS-33e is the third of seven new High Throughput Satellites (HTS) that power Intelsat's next generation EpicNG network an exciting new platform for very high-speed maritime broadband. The purpose of Marlink's IS-33e testing was to verify throughput for diverse maritime antennas from major manufacturers on the latest EpicNG satellite, which is located at 60° East, providing seamless spot beam coverage between Asia and Europe.

www.cobham.com

Load Cells for Offshore Mooring Project

TSM Molène and TSM Penzer

straightpoint/Iroise Mer

A tug is connected to the buoy for pre-tensioning.

The RLP was used to measure pre-tension up to 30t to check anchors were set properly.

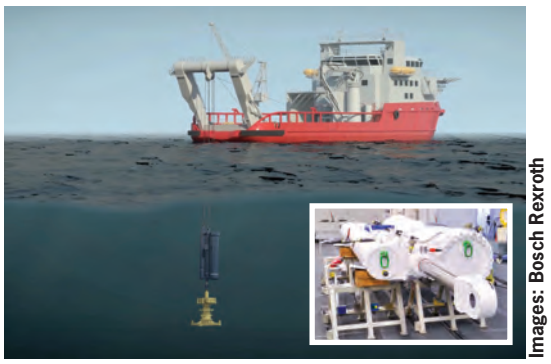
France's Iroise Mer used a 50 ton Straightpoint Radiolink plus (RLP) load cell during a refit of a tanker mooring system located 500m off the Corsica coast, recently. Iroise Mer's job was to update the site, comprising four different mooring lines, complete with anchors, chains and concrete deadweights, and all existing components had to be removed and new ones installed. The RLP was used to measure pre-tension up to 30 ton to check new anchors were properly installed into the seabed. The RLP was positioned between the anchor line (or chain) and the towing cable on a vessel, attached with two Green Pin shackles. Straightpoint does have a product for measuring tension on lines, the Running Line Dynamometer (or TIMH), specifically built with dockside, marine, offshore, towage and salvage applications in mind.

However, as David Mullard, SP business development manager, explained, "the TIMH wouldn't have been suitable because anchor chain was being used rather than wire rope. Wire rope can bend, allowing it to pass through the sheaves of the TIMH so that a tension measurement can be calculated. The large dimension chain wouldn't have allowed the same thing to happen," he said. Pierre Recoules, project manager at Iroise Mer, who was aboard the nearby boat, took Readings on a Handheld Plus. He explained that safety was improved, as there was no need to put personnel in the towing line where the load cell was attached. "The buoy is the extremity of the mooring line, where the tanker will be connected. The tug was then connected to the buoy for pre-tensioning. We encounter this kind of work only once or twice a year and when the need arises, utilizing a load cell will add efficiency and safety to any scenario where we need to calculate force on lines, anchors, cables or other maritime equipment." The new anchors and chains were manufactured in France before being shipped to Corsica, a mountainous French island that is actually close to the west coast of Italy. The jobsite was off the coast of Solenzara on the island's east.

Iroise Mer, founded in 2002, has been part of the Thomas Services Maritimes (TSM) group since 2013. Iroise has a fleet of six vessels, ranging from 10m to 41m in length, all of which boast cranes, winches and shallow drafts, suiting them to lifting and towing projects. TSM has a fleet of 20 additional vessels, predominantly tug boats for harbour towing operations.

Two vessels, TSM Molène and TSM Penzer, were used for the Corsica project, which are 21m and 27m in length respectively. Tension was applied via the vessels' thrusters. Recoules led a 10-person team, who completed the work inside a calendar month.

New Split Hoist System from Bosch Rexroth



Images: Bosch Rexroth

A new 'split hoist' heave compensation system from Bosch Rexroth combines active and passive heave compensation (AHC and PHC) elements with a control system to enable AHC functionality to be added to new and existing hoisting installations. Using a modular and mobile design, the new split hoist system is especially interesting for use with existing multi-part reeved hoisting equipment.

The new system supports a higher working load, while also improving system efficiency by as much as 80%, according to the manufacturer. A passive in-line heave compensator, supports the load and passively compensates for some of the ship's movement. The passive in-line system is hoisted and held by an existing winch or crane.

The new system was developed and designed fully in-house by Bosch Rexroth, and a first prototype has been built. With the help of Seaway Heavy Lifting, who also showed interest in the concept, the prototype was tested in real life conditions.

www.boschrexroth.com

Dellner's New Heavy Duty SKD Disc Brakes

Dellner Brakes AB introduced two new heavy-duty disc brakes to its SKD range that, through a new modular design, are set to deliver more choice and stopping power for large industrial, marine and offshore applications. Dellner's new SKD 140 brake delivers braking force of up to 258 kN through two brake housings, each containing a powerful hydraulic piston. The SKD 4x140 brake combines two brake assemblies containing a total of four powerful hydraulic pistons to deliver braking force of up to 516 kN, making it Dellner's most powerful brake yet. The brakes come with a range of optional extras including mounting brackets; double sealing kits; brake pads made from several different friction materials; indicators that show brake pad wear, whether the brake is on or off or needing adjustment; micro switches and electrical control boxes.

www.dellner-brakes.com

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Oman Drydock Names Aumann CEO

Stephan Aumann has been appointed by ASYAD (former "Oman Global Logistic Group") board of directors as the new CEO of the Oman Drydock Company S.A.O.C. in Duqm, Oman. Aumann assumed the role June 15 and replaced the former CEO Jin Han Lee (DSME), who advised at the end of 2016 that he would be stepping down. With a bachelor's degree in naval architecture and a master degree in industrial engineering from the University of Applied Sciences in Kiel, Germany, the 50-year-old German Aumann brings 20 years of senior management experience with overall P&L responsibility within the international maritime industry, especially in the ship repair and conversion as well as the oil and gas business.

Roberts Joins Foss as CCO

Will Roberts has joined Foss Maritime as Chief Commercial Officer (CCO), responsible for building the customer facing team to drive and sustain the company's market share and long-term revenue generation. CCO is a newly developed position at Foss Maritime. In his role as CCO, Roberts will set out to advance Foss' global perspective on market opportunities and lead in the assessment and prioritization of geographic and operational market segments through marketing, sales and business development activities.

Prior to joining Foss, Roberts served as Senior Vice President, Customer and Services-Americas, for Rolls-Royce.

MV Werften Promotes Luukkonen

Janne Luukkonen has taken over the position of Director of Project Management at MV Werften as of August 1, 2017. He is a member of the senior management, responsible for all shipbuilding projects, and reports to CEO Jarmo Laakso. Luukkonen was previously a member of the Meyer Werft management team in Turku, Finland. Now as director, he is responsible for the project management of MV Werften's newbuilding program.

Crowley Names Vargas VP

Veteran sales executive in ocean transportation and logistics Daniel Vargas has been appointed vice president of international business development to support the Crowley Maritime Corp. liner and logistics services groups. He will work closely with Crowley's new director of logistics in St. Maarten, Jeffrey de la Combe, to bring supply chain solutions for customers and their cargoes originating outside the U.S.

VSY Appoints Corr VP

Vancouver Shipyards (VSY) announced the appointment of Jim Corr as Vice President – Planning & Estimating. Corr joined VSY in January 2017 as a consultant, and in June 2017 was promoted to Vice President, Planning & Estimating. In this role, Corr will be responsible for providing leadership and direction on network planning, detail planning and production control, as well as estimating for new ship construction.

With a background in major government procurement projects, Corr's experience is critical to VSY as it continues to deliver on its commitments to the Government of Canada as part of the National Shipbuilding Strategy (NSS).

Liebherr Bolsters Its Australia Maritime Business

Liebherr Maritime will establish full service, spares and sales activities in Australia, New Zealand and the Oceania region to create better support for maritime customers using factory trained and locally recruited engineers.

Additionally, Liebherr representative Morrow Equipment Australia will focus on the purchase and rental of tower cranes in the future.

With the Morrow target now being tower cranes, on the service side Liebherr will recruit Kalman Kis, the Morrow MHC engineer assuring a seamless transition. He has started with the company on June 13.

Effective September 1, Gordon Clark will cease his function as Sales Director for Offshore Cranes in Liebherr-MCCtec Rostock GmbH andtransfer to Liebherr-Australia Pty. Ltd. in Sydney to manage the development of the maritime sales division in the regions Australia, New Zealand and Oceania. Clark has already been internationally active for the Liebherr Group in various sales positions since 1991.


IMO

Awarded:
Former IMO Sec-Gen Sekimizu

The International Maritime Prize for 2016 will be awarded to former Secretary General of the International Maritime Organization (IMO) Koji Sekimizu for his contribution to the work of IMO over many years. The Council unanimously decided to award the Prize to Sekimizu, IMO Secretary-General Emeritus, in recognition of his invaluable contribution to the work and objectives of the organization and the international maritime community as a whole. Sekimizu held a long and distinguished career with the organization, culminating in his four-year stewardship as Secretary-General from 2012 to 2016.

Sekimizu joined the IMO Secretariat in 1989 and worked in both the Maritime Safety and Marine Environment Divisions, holding the post of Director for each before going on to be elected Secretary-General.

In this role, Sekimizu oversaw the adoption of a number of key instruments, including the amendments to make the IMO Member State Audit Scheme mandatory, the Polar Code, and the Cape Town Agreement on fishing vessel safety. Japan also highlighted his work to push forward with the reduction of air pollution and greenhouse gas emissions from ships. He contributed greatly to the enforcement of anti-piracy measures, including setting up the Djibouti Regional Training Center.

Sekimizu worked to strengthen the governance and capacity of IMO's educational institutions, and the financial sustainability of the World Maritime University. Within IMO, Sekimizu began a review and reform process which led to the organization's subcommittees being restructured and revised working methods being introduced, including "PaperSmart" practices and enhancements in information and communication technology.

A naval architect by training, with a Master's Degree in engineering from Osaka University, Sekimizu joined the Ministry of Transport of Japan in 1977 as a ship inspector. He was promoted to various posts in the Ministry, including Deputy Director of the Environment Division and Deputy Director, Safety Standards Division, Maritime Technology and Safety Bureau.

Russia *in Focus*

powered by VesselsValue

Russian Fleet Vessel Types

Vessel Status	# of Vessels	Avg. Age	Value $ m
TANKER	577	20.6	$4,651
LNG	9	5.3	$1,480
MODU	13	12.8	$1,037
SMALL DRY	584	29.1	$674
OSV	59	20.1	$393
BULKER	33	16.7	$195
LPG	5	11.8	$120
CONTAINER	18	15.2	$61
Grand Total	**1,298**	**24.0**	**$8,611**

Russia Fleet Ranking

Rank	Country	# of Vessels	Value $ bn
1	Greece	4,537	$94.5
2	Japan	4,267	$84.0
3	China	4,805	$72.3
4	United States of America	2,421	$45.7
5	Singapore	2,686	$41.9
***			
18	**Russia**	**1,298**	**$8.6**

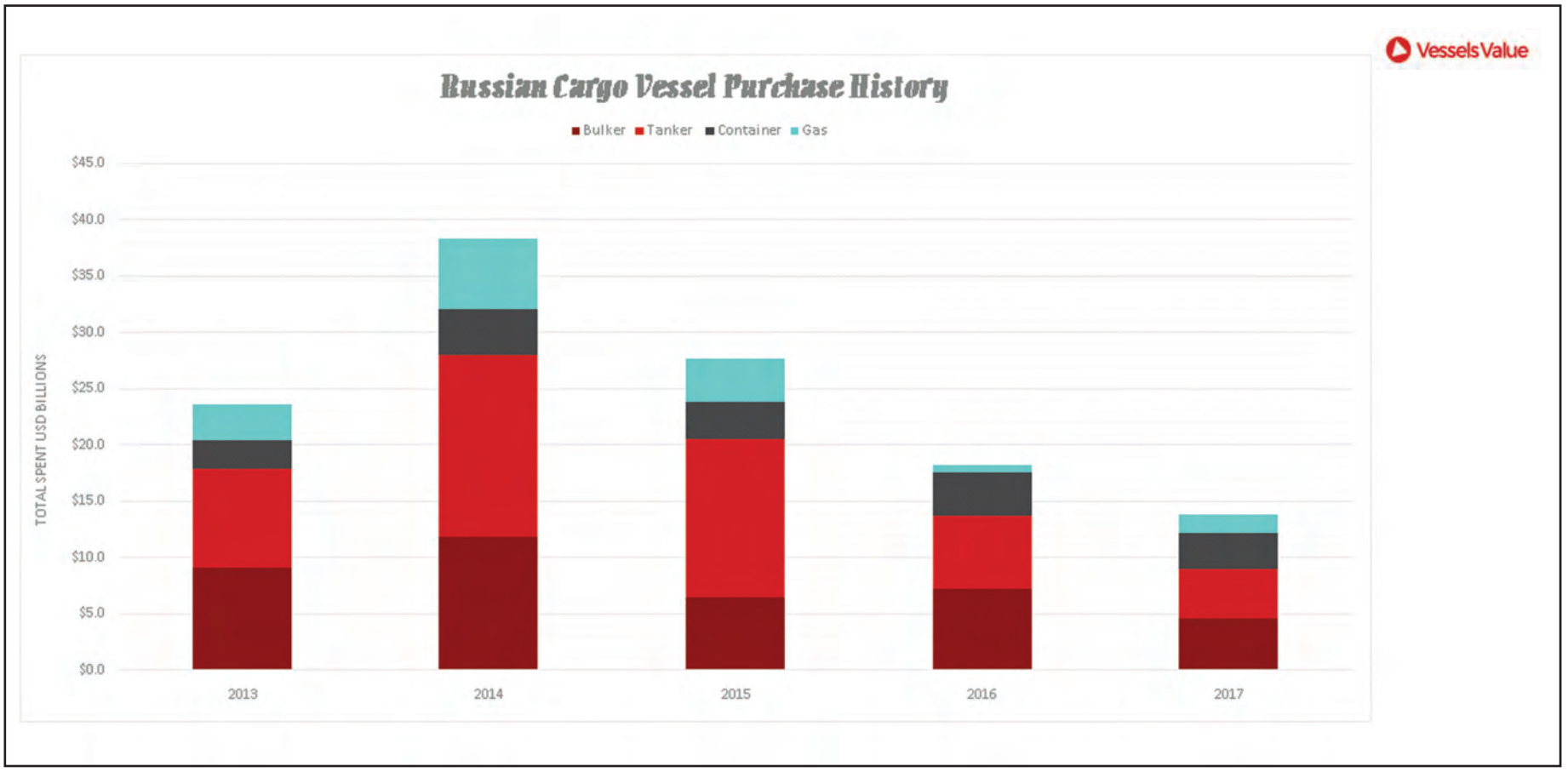
Top Russian Companies by Fleet Value

Company	# of Vessels	Value $ bn
Sovcomflot	103	$3,839
Novoship	47	$836
Fecon International Corp	3	$553
Gazpromneft	12	$305
Gazflot	11	$285
Others	1,122	$2,793
Grand Total	**1,298**	**$8,611**

Russian Cargo Vessel Purchase History

VesselsValue

Sale Date	Bulker		Tanker		Container		Gas	
	# of Vessels	Total $ bn	# of Vessels	Total $ bn	# of Vessels	Total $ bn	# of Vessels	Total $ bn
2013	816	$9.2	542	$8.8	220	$2.4	88	$3.2
2014	808	$11.8	619	$16.2	291	$4.1	86	$6.2
2015	550	$6.5	442	$14.1	228	$3.3	66	$3.9
2016	846	$7.3	308	$6.4	177	$3.8	32	$0.6
2017	405	$4.6	198	$4.4	159	$3.2	31	$1.6
Grand Total	**3,425**	**$39.3**	**2,109**	**$49.9**	**1,075**	**$16.8**	**303**	**$15.6**



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- Building the Customer Experience
- New Ship Technologies
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14th EDITION

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Anchor Marine & Supply, INC., 6545 Lindbergh Houston, Texas 77087 , tel:(713) 644-1183, fax:(713) 644-1185, david@anchormarinehouston.com

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David Clark Company (Wireless Headset Communication Systems), 360 Franklin Street, Worcester, MA 77060, USA , tel:(800) 298-6235 , www.davidclarkcompany.com/marine

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Chief Radio Electronics Technician

Military Sealift Command
Salary: $ $59,426 , Full Time , Mid Career
Category: Vessel Operations
Description:
Announcement #: 16-210-02EXOC **AMENDED MINIMUM ELIGIBILITY REQUIREMENTS AND EVALUATION CRITERIA**
Title, Series, Grade (Code) Chief Radio Electronics Technician WM-9995-10 (210)
Base Salary: $59,426 Per annum
Type of Appointment: Excepted Service Career-Conditional
Opening Date: February 29, 2016
Closing Date: Open continuously with periodic cut-offs
Location: Military Sealift Command (MSC) Vessels Worldwide
Who May Apply: Open to all qualified United States citizens who are not currently employed with Military Sealift Command (MSC) as civil service mariner (CIVMAR) employees. Relocation expenses are not authorized for this position.
Us: If you require technical support, please use the support tab located in the top right corner of the Start the Process page www.sealiftcommand.com/start-the-process . This will generate an email a message for you to submit your issue. Emails will be responded to during business hours M-F 0800 – 1700 CST. If you have any questions regarding the position or to follow up on an application submitted, please email us at civmar@sealiftcommand.com or call us at (757) 341-4610 or (757) 341-4611, or our toll-free recruitment hotline at 1-877-562-7672 during the hours of 0700 to 2000 EST.

Marine Mechanic

Salary: $ $38.37 - $51.61 per hour , Full Time
Category: Vessel Operations
Job Location: 60 Washington Ave Bremerton, WA, 98337 United States
Contact
Human Resources Associate
Email: stephaniem@kitsaptransit.com
Work Phone : 360-475-0211
60 Washington Ave Bremerton, WA, 98337 United States
Skills:
Open Until Filled
EMPLOYMENT OPPORTUNITY
Position Summary: We are looking for a Marine Mechanic to join our team. The person in this position will perform preventive maintenance on a small ferry vessel, execute light to medium repairs, and supervise heavy repairs in conformance with agency policy. This position is also responsible for conducting daily preventive maintenance, ad-hoc repairs, organizing and ordering spare parts.
To Apply: If you decide to apply for this position, please visit our employment link at http://kitsaptransit.appone.com/
Closing Date: Open until filled.
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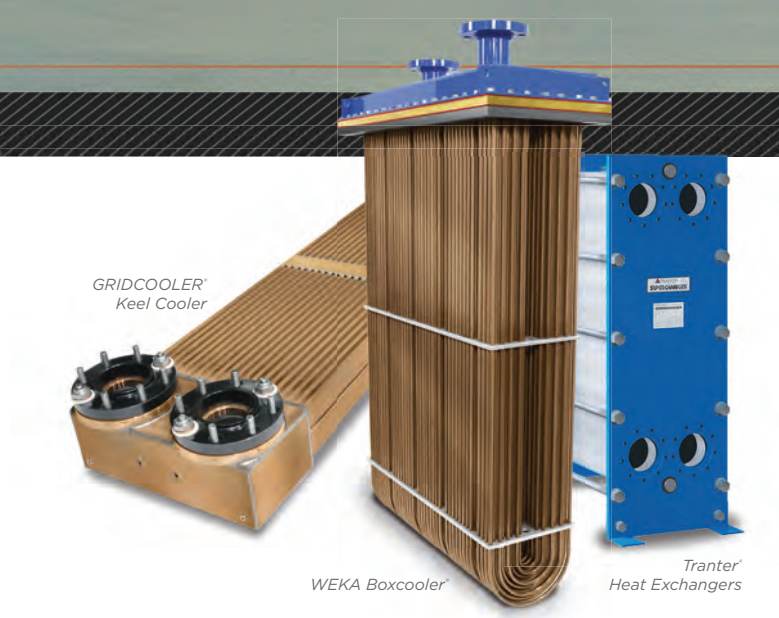

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