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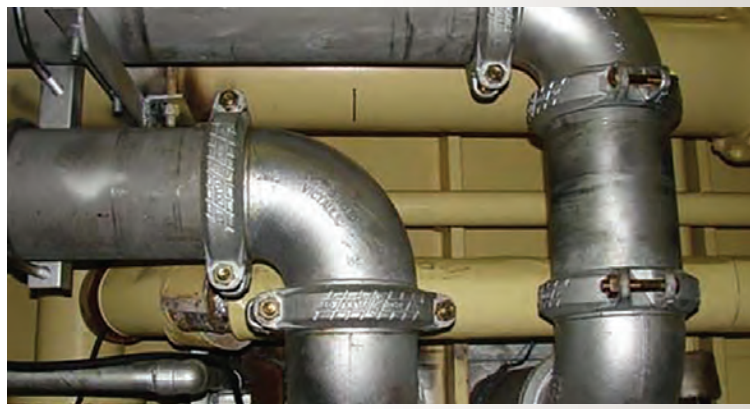

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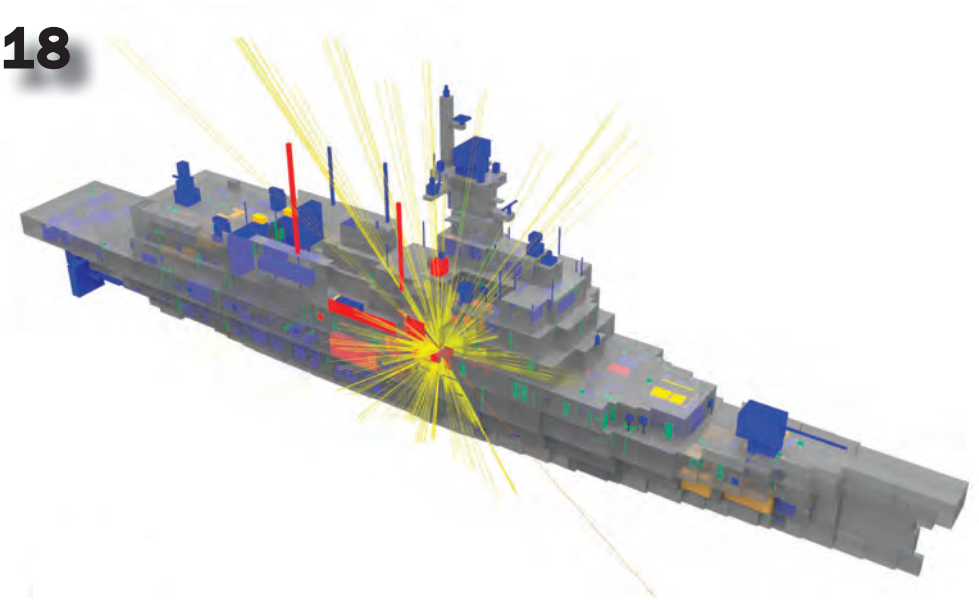

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IN THIS YEARBOOK

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Contents

THE COVER

The 2015 World Yearbook breaks down the year in maritime: the winners and the losers, the drivers and the detriments. Turn to page 26.

(Photo: Danny Cornelissen)

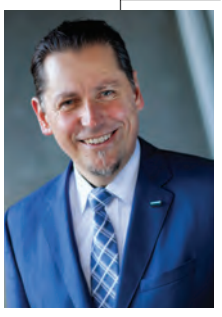
Graham Morrison

Slow & Steady

Slower than expected global growth has some maritime sectors in neutral. Shashi N. Kumar, Ph.D., Master Mariner, Fulbright Senior Specialist Fellow, helps *MR* make sense of it all.

By Greg Trauthwein

Siemens



DNV GL

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... a look behind & a look ahead ...

GREG TRAUTHWEIN, EDITOR & ASSOCIATE PUBLISHER

Everyone has (or should have) one or more 'voices of reason' in their business endeavors, a sounding board, an insight provider, a contrarian thinker that always seems to have a depth and breadth of insight that exceeds your own. Two of my favorites are presented in this edition, Dr. Sashi Kuman and Jim McCaul.

Shashi N. Kumar, Ph.D., is a Master Mariner, Fulbright Senior Specialist Fellow, Emeritus Professor of International Business & Logistics, Academic Dean, United States Merchant Marine Academy. Given his position at USMMA his insights always come with the caveat that the opinions expressed are his alone and not that of the U.S. government, etc.

When you read the main feature of this 2015 World Yearbook you will quickly learn that he is certainly not shy to call it as he sees it.

His insights and opinions are rooted in nearly 40 years serving an industry he clearly, dearly loves, and also in an intensive, daily study and analysis of the myriad economic and social statistics and factors that cumulatively dictate the direction and duration of maritime trends. I encourage you to read the full five pages starting on page 28 to find out, among other things, why:

- Hedge funds and equity investors have contributed to the Black Swans haunting the dry bulk shipping market today, a perfect recipe for destruction.
- The U.S. role as an energy swing player should power a vibrant U.S. shipbuilding and maritime market for 20 years or more.
- That ships are simply getting too big.

Another favorite voice is **Jim McCaul**, founder and managing director of International Maritime Associates and partner in World Energy Reports. I have known Jim for each of my 22 years in my current post, and his connection to the publishers of this magazine date another 20 years plus. Jim is an excellent sounding board on nearly any matter maritime, but his true expertise lies in the offshore energy sector, more specifically the analysis and projection of the size, shape and direction of the Floating Production System market.

This month Jim spoke with our **Patricia Keefe** to lend perspective to the continued low price of oil, and specifically it impact on the ascent of LNG. In the past year I have had hundreds of discussions with hundreds of people regarding the drivers for the current low price of energy and the likely pace of its recovery. And I've received hundreds of different answers.

McCaul envisions a few years of oil in the $70 per barrel range, with random spikes above and below. He, like most others, believes that oil and gas is an excellent long-term play, and that the current situation is a mere blip on the chart. Read his insights starting on page 34 through 39, or visit www.world energyreports.com for information on his insightful report on Offshore Floaters which has been updated daily for nearly 20 years.

Finally, special thanks to **Tom Cantero**, Managing Director of Air Products and his artist at the Air Products stand at the recent Nor-Shipping 2015 in Oslo. I've never captained anything larger than my 27-ft. Glastron, so the chance to take the helm in full captain regalia – even if only in caricature – was irresistible for this, my 22nd Yearbook Edition.

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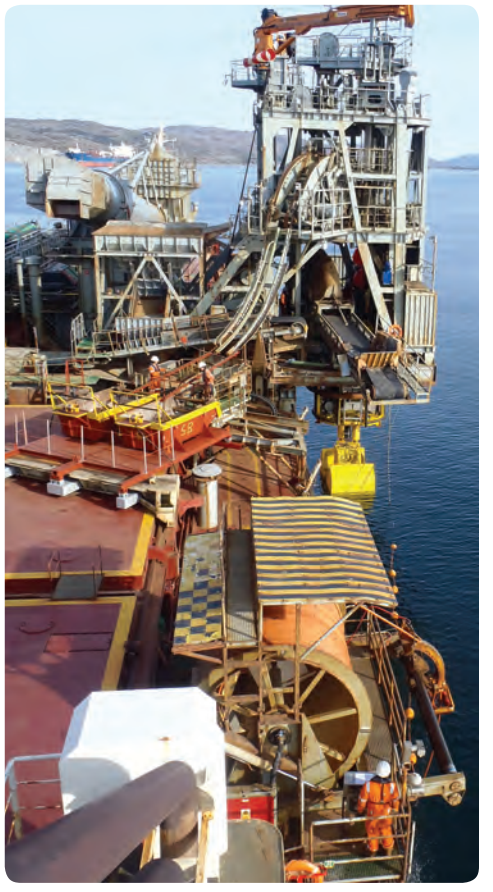
Van Oord Develops

Deep Excavation System

By Kira Coley



Stretching across oceans and continents, approximately 32,000 km of new pipelines are constructed each year forming an industry worth $28 billion. The installation of pipelines on the seabed require engineers to develop innovative technologies and methods to inspect, repair and maintain pipelines at depths sometimes reaching 1000m. The Deep Excavation System (DES) is a new, cost-saving technique designed for dredging at great water depths for use in the offshore pipeline industry.

For new laid pipelines, large changes in seabed height can create free spans which can lead to stresses in the pipe. For decades, Subsea Rock Installation (SRI) has been the traditional approach for seabed preparation where dips and hollows are filled with crushed rock (installed by Fall Pipe Vessels) to support the pipeline and avoid these free spans.

For the stabilization and protection of offshore pipelines, cables and other installations, SRI is a vital process for these subsea industries. While rock installation is a proven technique, new methods and innovative technology are still needed to reduce costs, especially as the industry moves deeper into the marine environment.

Developed by engineers at Van Oord, the Deep Excavation System (DES) combines the use of a clamshell for the excavation of the soil, and the Fall Pipe Remotely Operated Vehicle (FPROV) for positioning and operation. The DES has a very accurate position control system and generates only very limited turbidity while allowing dredging to take place at depths varying from 100 to at least 1,000 m. Van Oord's flexible fall pipe vessels Stornes and Bravenes (operational in 2016) can be equipped with this system, which has been developed in-house.

"The most important benefit is the cost reduction in preparation of the seabed prior to pipeline installation to avoid unacceptable free spans. Another benefit for the environment is that DES does create very little turbidity.

This is extremely important when there is coral present in the area. In addition, this system easily removes harder soils (as shown on a project executed in Australia in 2011)," explains Jan Vlak, Operations Manager SRI at Van Oord Offshore. "Excavating several thousand cubic metres of hard and soft soil can make the installation of hundreds of thousand tonnes of rock unnecessary, saving time and cost for offshore operators during these vital preparation stages."

As a market leader in the SRI industry, with more than four decades of experience, Van Oord's fleet of DP flexible fallpipe vessels and side stone dumping vessels enables Van Oord to provide pre-pipelay and post-pipelay rock installation, scour protection, seabed improvement and ballasting services for offshore structures at depths up to 1,500 m.

Mr. Robert de Bruin, Head of the department Communications and Markets and Spokesman of Van Oord said, "We have a deep-rooted passion for water and technology and a focus on performance and production. Our Marine ingenuity is the foundation of our success. We specialise in projects requiring a pioneer mindset, vision, impassioned commitment and innovative solutions. We continuously modernise our fleet, equipment and technology to meet our clients' needs. The DES is an example of this."

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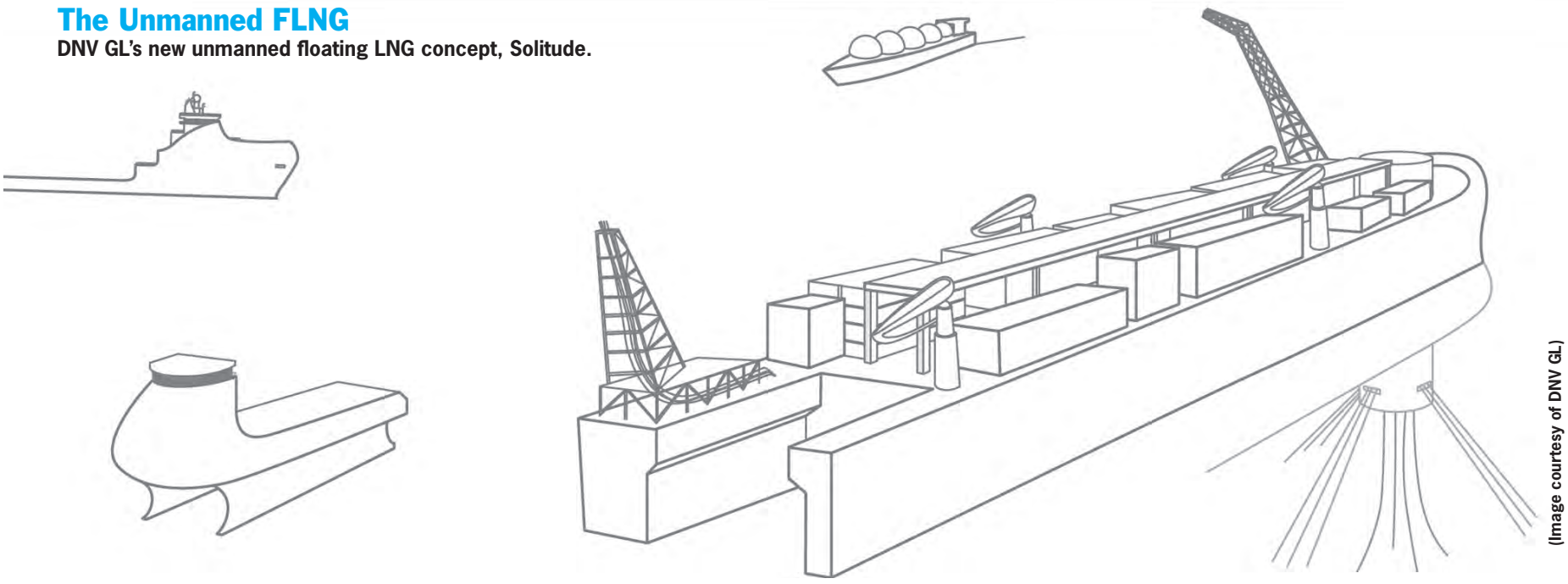
The Unmanned FLNG
DNV GL's new unmanned floating LNG concept, Solitude.



(Image courtesy of DNV GL)

Driving Innovation

For an industry dubbed conservative, there are many interesting marine designs and concepts on the drawing board.

The Unmanned FLNG

DNV GL developed a new unmanned floating LNG concept that it claims overcomes many of the challenges faced by operators looking to unlock the potential of remote offshore gas fields. Called Solitude, DNV GL said the concept demonstrates how technological advances can be combined into a solution that offers an estimated 20% reduction in annual OPEX, only adding a few percent increase in CAPEX and at the same time increasing overall safety. Foreseeing the need for more remote projects to be able to overcome even more challenging cost barriers, while still meeting increasingly stringent safety and environmental standards, DNV GL embarked on an Extraordinary Innovation Project to explore the future of LNG technology.

"Solitude has been developed with maintainability foremost in mind," said Elisabeth Tørstad, DNV GL CEO Oil & Gas. "By changing the focus from maximum efficiency to maximum reliability, and selecting robust processing options with built-in redundancy, we were able to develop a solution that ensures production levels and boosts the economic viability of FLNG projects."

DNV GL maintains that the concept leverages advanced but proven technologies including fuel cells, shore to ship monitoring as well as self-programming autonomous inspection and maintenance robots via a topside that has a system of rails that run along each process train, providing these robots with access to all the equipment.

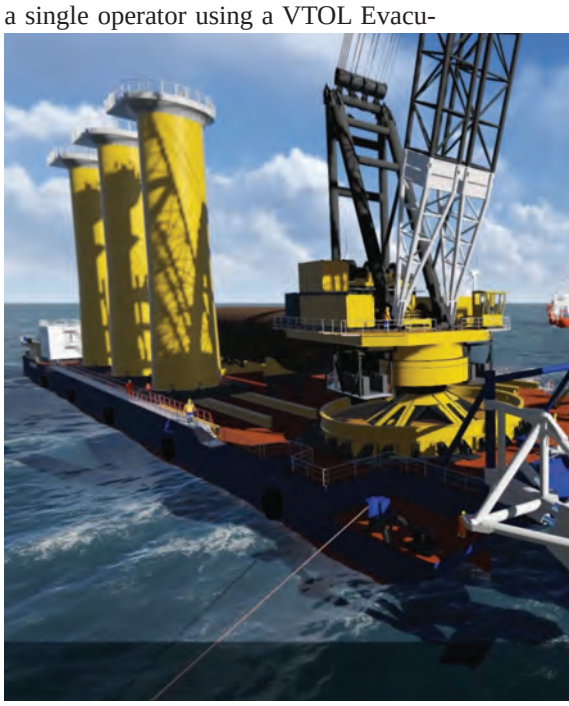
Wireless sensor networks act as eyes, ears and noses, feeding information to a condition monitoring system that overseas fault detection, proactive maintenance and repair planning.

As there will be no one living on board or working on the topside during normal operation, the associated personal safety risks are eliminated.

Single Controller, Multiple Unmanned Systems

Unmanned air and ground systems work together from single controller in flight demo; UCS architecture enables collaboration between big and small business. A flight demonstration using a hand-held tablet has shown how unmanned air and ground vehicles can be supervised together by a single operator, and how big and small businesses can work together. The demonstration was conducted on March 26, 2014, at Kaman Aerospace in Bloomfield, Conn., involving a Kaman K-MAX helicopter equipped with Lockheed Martin's mission management system operating in the unmanned mode, and a Neya Systems UxInterceptor unmanned all-terrain vehicle. During the medical casualty response and resupply scenario, the two vehicles were given instructions by a single operator using a VTOL Evacu-

(Photo: Neya Systems)



Single Controller
The March 23 demonstration showed how the UAS Control Segment (UCS) UCS Architecture can integrate a different systems, such as the VTOL Evacuation and Resupply Tactical Interface (VERTI) Medic Interface and UxFleet / Collaborative Mission Planning system from Neya Systems used here.

ation and Resupply Tactical Interface (VERTI) Medic Interface and UxFleet / Collaborative Mission Planning system from Neya Systems.

The flight test showed how the UCS Architecture can integrate a handheld ground control station with the aircraft and ground vehicle and enable collaborative activities between multiple autonomous platforms. Neya Systems, a small business located in Wexford, Pa., near Pittsburg, developed the rapid prototype and demonstration effort leveraging several different small business innovation research (SBIR) grants and follow-on DoD funding. The company was partnered with the Lockheed Martin and Kaman team to deliver the innovative technology to existing systems.

The UCS architecture enabled the seamless integration of the K-MAX helicopter with the Lockheed Martin UCS-compliant ground control station; the UxInterceptor UGV and the Neya VERTI android tablet. Using the UCS-compliant VERTI system, there was no redesign of the UAS or UGV system required. The user interface on the tablet is simple to use.

The Offshore Wind 'Game Changer'

With the engineering of Temporary Works Design (TWD) and Barge Master, Conquest Offshore (and deugro) present the efficient installation system for Monopiles (MPs), Transition Pieces (TPs) and Pre-piling of Jackets. The 136 x 36m Conquest MB1 barge is a tool designed to execute this kind of work. Three monopiles, or up to 16 transition pieces, can be stored on deck by the effective skidding system. Upending can be done on deck or floating. The challenge is the floating installation of the MPs. The specially designed motion compensated pile gripper (MCPG) is the key to the success. While hammering the pile, hydraulic cylinders actively compensate the surge, sway and heave motions of the barge to ensure the verticality within limits. The gripper and the relative good workability of the Conquest MB1 barge with its anti-heeling system (8,000 cu. m. per hour), creates a game changer in offshore wind industry.

Compiled by MR Staff & Edward Lundquist

Wind Farm Game Changer

The efficient installation system for Monopiles (MPs), Transition Pieces (TPs) and Pre-piling of Jackets.

(Photo: Neya Systems)

Super Mario

Leading the charge at Siemen's Oil & Gas and Marine global business unit.

With worldwide revenue of $98B in 2014 and 343,000 employees in more than 200 countries, Siemens, by any definition, is big. **Mario Azar**, president of the Houston-based Siemens Oil & Gas and Marine global business unit spoke with Maritime Reporter regarding the Siemens Oil & Gas and Marine's focus and future.

By Greg Trauthwein

Say the word "Siemens" and it likely means 100 things to 100 people. A common thought would be 'big.'

The German conglomerate is vast in its product lines, engineered solutions, and geographic presence. Late in 2014 Siemens officially enacted the plan to combine its offshore oil & gas and marine business units, collectively a $1.5B enterprise, with Mario Azar at the helm. "Siemens was soul-searching, trying to figure out 'who we are, who do we want to be,'" said Azar. "We defined three core pillars to focus on as a company: electrification, automation, and digitalization."

From introspection was born this reinvigorated business unit, bringing together a collective set of business minds and engineering talents to complement each other.

"Siemens serves many verticals (markets) but oil and gas is an important market" for the company, said Azar. "So we looked at it and we saw that the business unit's oil and gas solutions is heavily focused offshore. We had a different unit in Siemens that was focused on marine systems, electrical management and propulsion, electrical propulsion systems for all kinds of vessels, including oil and gas, but also commercial vessels."

The combined group represents an engineering acumen and product line-up that Azar is comfortable comparing with any other entity in the world. "We pulled it together and now we are refocusing on going to the shipbuilding industry, talking about how we could electrify not only the drilling drives and automate the drilling process, but also electrify the propulsion, the drives and motors, and the automation of the (entire) vessel."

This Siemens business sector has a stronghold in Scandinavia, but it is global in vision and reach. "(Norwegians are) seamen by heritage. They like the business. So we have developed a lot of our know-how over the years in Norway, and it remains our offshore brain trust," said Azar. To this end, Azar's business unit is literally setting up shop around the world – a feat made easier courtesy of Siemen's existing global office network – to be closer to where ships are being built, primarily in China, Singapore and South Korea. "We developed a second hub in Singapore, and a hub in China, that are heavily supporting from Norway," said Azar

Standardization

A driver in combining the Siemens Offshore Oil & Gas and Marine units was to develop a higher level of standardization in product, manufacture, assembly and service, as the two distinct business sectors share many commonalities in the technical requirements for their drives.

"This is now focused on (developing) the electrical drives, (specifically) looking at standard technology platforms for the electrical drives that are going on these vessels," said Azar. "We've essentially doubled our R&D and brain trust in combining these two groups and now we are unifying 'the path forward?' This includes 'how do we produce,' because the marine units (before the business unit integration) were producing not only in Germany but also in China. We are producing our drives mainly in Norway. So now we're looking at the whole production network and looking at 'how do we globally set it up for the different markets?'"

With the trend in shipbuilding toward outsourcing of technically complex components and systems to qualified engineering and manufacturing entities, creating a situation where advanced units are delivered to shipyards ready to 'plug and play,' the Siemens strategy is designed to advance its position amongst shipyards that increasingly seeks to import rather than develop, manage and house internal capability.

"Modularization is a trend, and it is a trend that we are tightly focused on," said Azar. "Our business unit is a little bit more than just strategy, as we have five global segments. For example, Siemens has introduced a "modular home" concept to the O&G industry call E-houses. E-Houses are customized, fully equipped and pre-tested modular power substations for power supply. E-houses are completely developed, manufactured, assembled and pre-tested at the factory, and installed, connected and put into operation on site using plug-and-play technology.

We are also fabricating there. We have a segment for water solutions and we are fabricating the water treatment modules – also plug-and-play – in that yard. So, you know, it's not just about the drive and electrical. When you talk about an FPSO, now we have in our portfolio, whether it's E-House, whether it's a compression module, a power generation module, or water treatment, all these different modules that go on the topside. We build them and can offer them to the shipbuilder."

Down is the New "Up"

Having just stepped into this post a few years ago, the current swoon in energy pricing is the first "down cycle" for Azar. "I think it's actually healthy. If you really listen to the customers, the way they see it is their profit will be their profit; the cost is what needs to adjust. The oil majors look at it and ask 'how

There are some aspects of the market that will consolidate even faster, like the shale industry. So consolidation, I believe, is inevitable: it is opportune time. **Does Siemens see it as an opportune time? Of course, we do.** We just have to focus on what could be relevant to us. Part of what I described to you was focus on electrification, digitization and automation.

Mario Azar on Consolidation

can the costs adjust so we could still participate with a $50 barrel?"

Azar believes that Siemens and companies like it – companies that produce automation technologies that demonstrably and positively impact efficiency and costs – will emerge from this down market even stronger.

"They (the oil majors) see it as an opportunity to recalibrate. It's like the real estate market. Before the crash, houses were way overvalued and it was, in a way, an adjustment. I think the market is seeing this as also driving a necessary adjustment. Now that doesn't mean people would not like to see the $100 barrel again, but it means, it is viewed as an opportunity to recalibrate. But suppliers can only could go so far; they're not going to close the whole gap. Part of the gap needs to be closed also by looking at how the requirements are defined, and how they could use technology to do things smarter and cheaper."

While Azar admits that companies in the sector are still conditioned to simply demand a percentage price cut rather than engage actively in conversation regarding the fundamental value of investing in new technology, he does see the beginning of a fundamental shift toward a more holistic and long term assessment of technological specifications, technological needs and having a conversation with key suppliers regarding their capability in helping to make operations more rational and cost effective.

"Our biggest challenge, really, is to make sure that we continue to develop relevant solutions, adding value through engineering and project execution, and sometimes procurement and fabrication," said Azar. "We need to be one step ahead. Always."

Siemens Oil & Gas and Marine Highlights

• Siemens combined its O&G and marine businesses to take advantage of crossover technologies; technologies that have grown up in marine and can now be applied to O&G vessels and rigs.

• The business has a focus on Asia, building on existing infrastructure to support the continent's high concentration of shipbuilders, many of which manufacture marine vessels as well as offshore platforms for O&G.

• OM cumulatively has a portfolio to help producers cut costs; leveraging technology to dramatically cut costs.

• Siemens has introduced a **"modular home"** concept to the O&G industry call e-houses. E-Houses are customized, fully equipped and pre-tested modular power substations for power supply. E-houses are completely developed, manufactured, assembled and pre-tested at the factory, and installed, connected and put into operation on site using plug-and-play technology.

They said it ...

"Then, there are the hedge funds and equity investors who have contributed in their own ways to **the black swans haunting dry bulk shipping today. What a perfect recipe for market destruction** (from the owners' perspective)!"

Shashi N. Kumar, Ph.D., Master Mariner, Fulbright Senior Specialist Fellow, Emeritus Professor of International Business & Logistics, Academic Dean, United States Merchant Marine Academy.

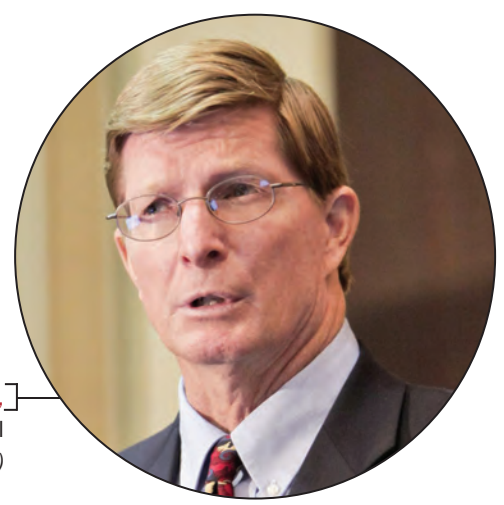
(See story page 28)

"The most likely scenario is for oil prices to hover in the $70s over the next few years – with spikes above and below. This price level will support many deepwater project starts, particularly as development costs fall as a result of surplus supply capacity."

Jim McCaul, International Maritime Associates and World Energy Reports.

(See story page 38)

"We are creating the means for companies to collaborate for the good of business - and the good of the ocean - that has not existed before. A prime example is our "Smart Ocean-Smart Industries" program which builds on the concept of 'ships of opportunity.'"



Paul Holthus,
CEO, World Ocean Council
(see story page 46)

Marine Casualty Reporting

Addressing the Marine Casualty Reporting and Investigation Processes

BY DENNIS BRYANT

The United States marine casualty reporting and investigation processes as administered by the U.S. Coast Guard are seriously flawed and in need of major overhaul. These processes have been broken for years, yet minimal efforts have been made to address the root causes.

The Coast Guard is drowning in marine casualty reports. The majority of its informal investigations are never closed. Those that are closed are seldom read again. Lessons that might have been learned from marine casualties are rarely shared with the maritime industry.

It is time to go back to basics. Why does the Coast Guard require the reporting and investigation of marine casualties?

It's the Law

Federal law directs the Coast Guard to prescribe regulations on the marine casualties to be reported and the manner of reporting. Marine casualties involving death, serious injury, material loss of property, material damage affecting the seaworthiness or efficiency of a vessel, or significant harm to the environment are defined by law as reportable casualties. Federal law also directs the Coast Guard to prescribe regulations for the immediate investigation of marine casualties to determine, to the extent possible, the cause of the casualty; whether there was any misconduct or negligence that might result in any action against a seafarer's document or license or the assessment of a civil penalty; or whether there is need for new or amended laws or regulations.

The International Convention on Safety of Life at Sea (SOLAS Convention) provides that each Administration undertakes to conduct an investigation of any casualty occurring to any of its ships subject to the Convention when it determines that such an investigation is appropriate. The Casualty Investigation Code was adopted in 2008 to provide guidance to Administrations in the conduct of such marine casualty investigations.

Thus, federal law and the IMO Casualty Investigation Code provide the foundations for the Coast Guard's marine casualty investigation program. These two foundations are outside the ability of the Coast Guard to effect unilateral changes, but they also provide the Coast Guard with broad discretion in how those foundational requirements are implemented.

Given that the Coast Guard's ability to consistently implement and enforce its current marine casualty reporting and investigation processes is over-taxed, I recommend that the Coast Guard cease this endless suffering from self-inflicted wounds and reduce the program to its foundational requirements.

Regulations promulgated by the Coast Guard include a very detailed, extensive, and confusing definition of "marine casualty or accident" along with a separate (but no less detailed, extensive, and confusing) definition of marine casualties that must be reported to the Coast Guard. The regulations further provide that, upon receipt of information of a marine casualty or accident, the Commandant or District Commander will immediately order such investigation as may be necessary. Coast Guard guidance, policy, and tradition basically require that each reported marine casualty be investigated, although there are different levels of investigation, depending upon the severity of the casualty.

These reporting and investigation regulations are the root cause of the current problems with the Coast Guard's marine casualty program. The regulations require the reporting and investigation of many more incidents than are provided for (or contemplated) in either federal law or the SOLAS Convention.

Amending the Law

The reporting regulations should immediately be amended to reduce the requirements, particularly with regard to personal injury and property damage. There are many minor injuries necessitating more than first aid (such as a sprained ankle) that should not require a marine employer to file a report with the federal government. The current property damage provision (any damage exceeding $25,000) is ridiculous. Very little damage on a commercial vessel can be repaired for that amount today. In addition, how is a master to determine the cost of repairs when the extent of damage is only partially known? This provision results in masters reporting almost all damage.

The IMO's Casualty Investigation Code contains a more practical approach to both issues. It defines marine casualty to include, among other things, the serious injury of a person or material damage to a ship. Serious injury is further defined as an injury resulting in incapacitation where the person is unable to function normally for more than 72 hours, commencing within seven days from the date the injury was suffered. Material damage is further defined as damage that: (1) significantly affects the structural integrity, performance, or operational characteristics of marine infrastructure or a ship; and (2) requires major repair or replacement of a major component or components. These IMO definitions are concepts that mariners can readily grasp.

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There is another basic problem with the current Coast Guard approach. The statute provides the Coast Guard with broad discretion regarding the casualty investigation process, but that discretion has been circumscribed by policy. Police may respond to every reported traffic accident, but they only open an investigation when considered appropriate. On the other hand, the Coast Guard requires either an informal or a formal investigation of almost all reportable marine casualties involving commercial vessels. The Coast Guard should quickly amend its policy to allow its field personnel to exercise increased discretion regarding which marine casualties require an informal investigation. Current policy, for example, directs that if a commercial vessel experiences a loss of propulsion, even momentarily, the data collection option is unavailable and an informal casualty investigation is required to be conducted by Coast Guard personnel. It is recommended that this policy be changed so that garden variety commercial vessel marine casualties can be closed by means of data collection.

The next level of Coast Guard marine casualty investigation is the informal investigation, which includes a determination and report of the causal factors of the casualty, but is less exhaustive than a formal investigation. In my opinion, there are far too many informal investigations and they generally provide no lessons learned. Once completed and reviewed, few informal investigations are ever read again, and there are so many informal investigations that many are never completed, thus rendering the effort virtually useless. Sector Commanders should be given broad discretion to determine which marine casualties require an informal investigation, which can be closed by basic data collection, and which incomplete informal investigations can be closed with no further action.

Formal investigations, including Marine Boards, should continue to be reserved for the most serious marine casualties. These are the ones most likely to provide lessons learned so that mistakes are less likely to be repeated. These reports must be written for maritime professionals, not bureaucrats.

Finally, to make finalized marine casualty investigations more accessible to industry and the public, the format of those investigations should be changed to place all personal identity information (which is subject to the Privacy Act) in a separate annex. Then the final report, without this annex, can be quickly released and posted on the internet.

The Coast Guard has taken some important steps at improving the marine casualty reporting and investigation processes, such as hiring more civilian investigators. But until it addresses the root causes of the problems, it will just be applying bandages to broken legs. It is time to keep those legs from breaking in the first place.

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Putting a Number on It

Using survivability measures to quantify combat capability and performance

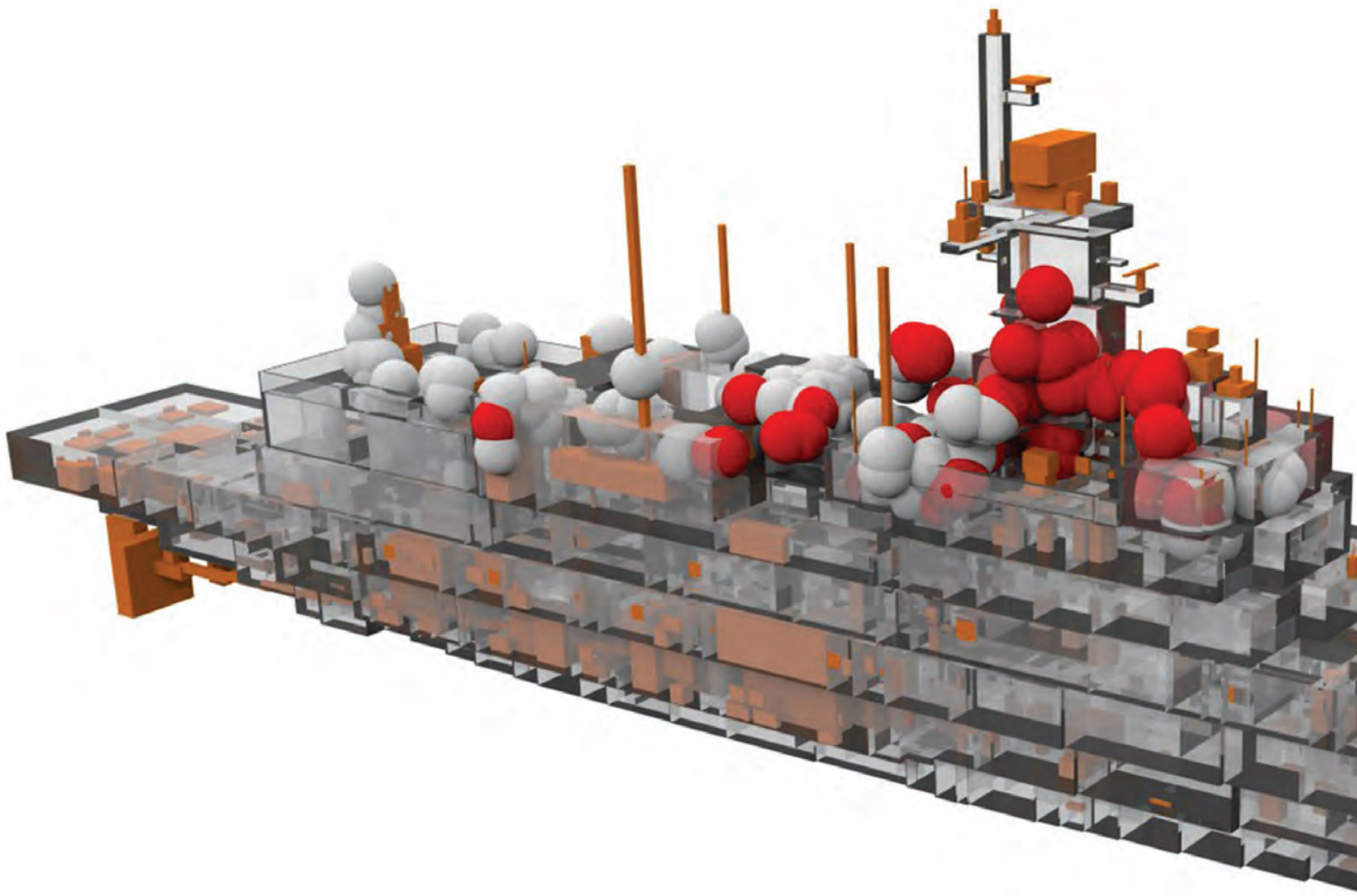
BY JOHN A. WALTHAM-SAJDAK, PH.D.

VISBY, ZUMWALT, INDEPENDENCE, FREEDOM, TORNIO, SAN ANTONIO, INCHEON, SIGMA, FREMM ...

... these ships are not only capable, tested and proven warships, they are extremely complex. ZUMWALT alone carries 16 Electronic Module Enclosures that contain 235 electronics cabinets each supporting a complex Total Ship Computing Environment. This complexity is driven by the operational need of navies to provide 'ever more flexibility within increased multi-mission capability performance requirements' — Navy-speak for "these ships are so expensive they'd better go faster, carry more, kill more, be more survivable and generally outperform the other guys.'"

"Warships represent a significant investment for any country. It follows that, regardless of whether they are being used to defend national boundaries or project power, that they are as survivable as possible." The challenge, however, is to "provide the maximum possible survivability within an inevitably restricted budget." In recent years as the acquisition costs of naval vessels have increased and the public has become more and more aware and sensitive to the risks to sailors, the term 'survivability' has become the buzzword for effectiveness and capability. So important is the attribute of survivability that the United States Congress as well as other nations have enacted survivability legislation (e.g. US CFR Title 10 Section 2366) requiring the realistic threat-based survivability testing of surface ships and submarines with the intention of assuring what 'we the people' buy has had its metaphorical tires properly kicked.

These survivability legislations often require full-up system-level Live Fire Test and Evaluation (LFT&E) unless suitable alternatives are approved for reasons of cost and practicality. To this



Alion's MOTISS solution identifies susceptible weapons impact locations and analyzes the impact of the impact to mission capability by examining structural integrity, damage to mechanical and electronic systems, and crew survival.

end, the U.S. Department of Defense continues to accelerate the development and adoption of modeling and simulation (M&S) capabilities in order to reduce weapon system acquisition costs and provide developmental and operational test and evaluation to assess combat capability and performance prior to delivery.

These M&S software and engineering tools are designed to simulate the ship's:

- **Susceptibility** (realistic battle engagements including the tracking and prediction of missile and torpedo seekers against the ships signatures and the targeting of the ships combat systems to counter the threat);

- **Vulnerability** (physics based prediction of battle damage inclusive of ballistic impact, blast, shaped-jetting, structural failure, equipment failure, system damage and crew injury); and

- **Recoverability** (assessing cascading system failures, fire and smoke spread, and flooding). Additionally, more advanced programs like Alion's MOTISS (Measure of Total Integrated System Survivability) solution assess man-in-the-loop operations and human systems interactions — such as firefighting, system isolation, jumpering and damage control repair — bringing together the total integrated survivability program, which allows navies to understand the combat capability and performance characteristics before any ship steel (or aluminum) gets wet.

The use of M&S to supplant live fire testing is not without detractors however – after all M&S software technologies in the real world are not like we see on television. We are still learning some of the chemistry, physics, biology and mathematics and it's not as simple as 2+2 – that we can do. But accurately and precisely predicting how a missile fragments, how underwater explosive bubbles form and collapse, or how weapons induced conflagrations progress is difficult – and add onto that attempting to predict crew actions (which is like trying to predict the next viral cat video) ... well… we're still at 2+2 = 4.1573 (close but not quite).

Conversely, with Full Ship Shock Tests (FSSTs) and Total Ship Survivability Trials (TSSTs) costing a naval program between $20 and $40 million (that's 5 to 10% of the ship acquisition cost), and land-based test sites for newer technologies costing the same or more, and the Navy frowning on any full scale potentially-destructive testing conducted on their $400 million to $1 billion dollar plus investments, the reality is that the nation can't afford to live fire test everything, yet sufficient live fire tests are needed to truly quantify a ship's

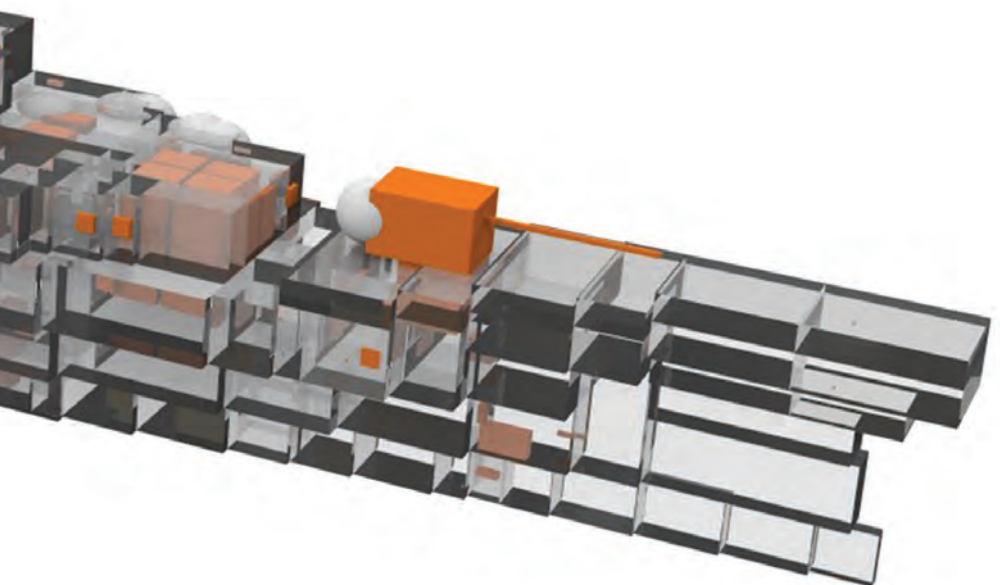


Image © Alion Science and Technology

Graphical output from **Alion's MOTISS solution** showing initial impact and fragmentation of explosive weapon.

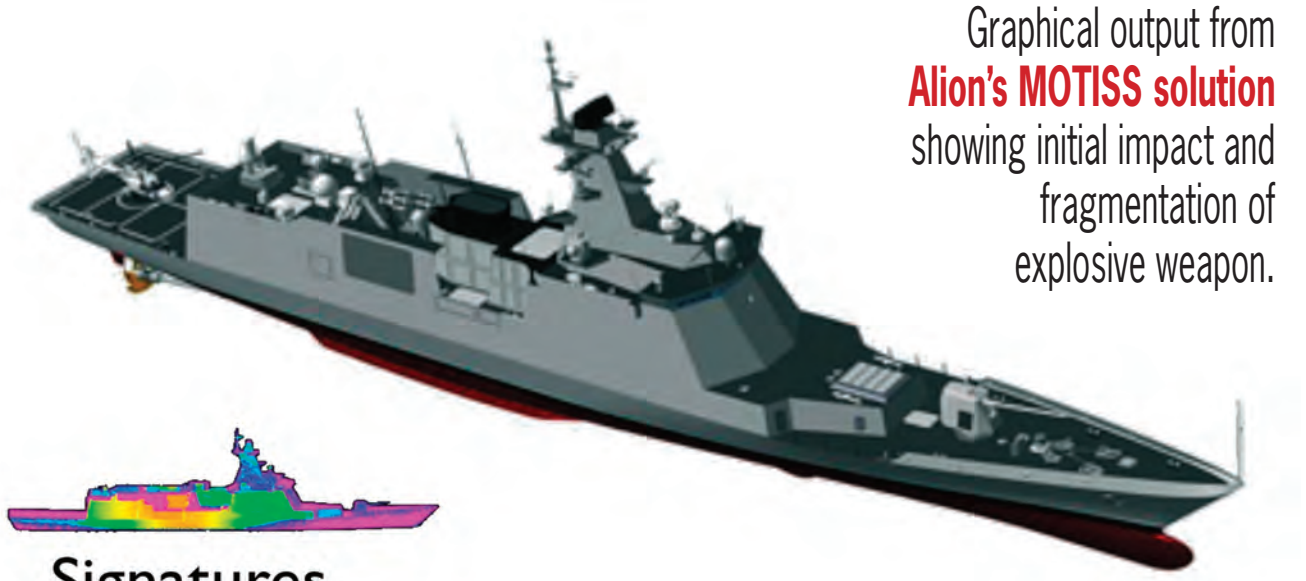


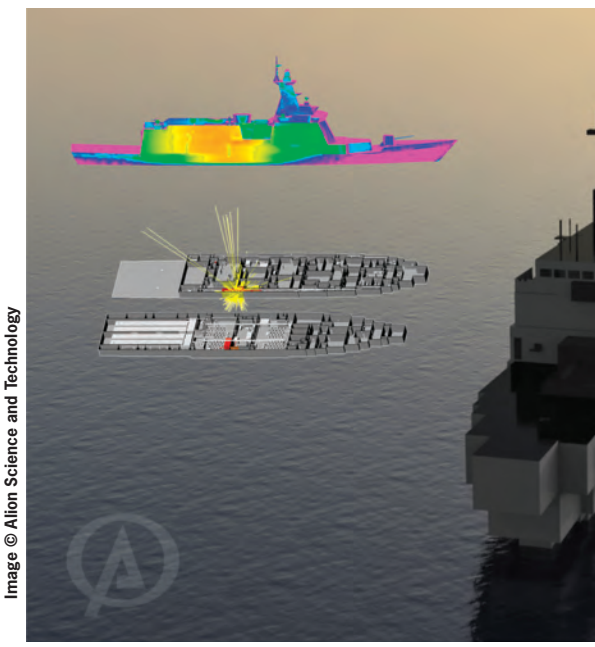
Image © Alion Science and Technology

combat capability and performance.

Pioneering statistician William Gosset developed the statistical model to prove this point. Called the "Student's t-test," it deals with problems associated with inference based on a "small" number of data points. Skipping the complex math, what Gosset identified was that if you only have 5 test results then the average result will be within +/- 1.241 standard deviations of the real result and if you have 10 test results then the average result will be within +/- 0.715 standard deviations of the real result. So, assuming an acceptable 5% standard deviation with 5 live fire tests: 2+2 = between 3.752 and 4.248; and with 10 live fire tests: 2+2 = between 3.857 and 4.143. Even at a minimal estimated price of $10 million for an FSST, that means adding $50 to $100 million to already expensive vessels to get the same answer from LFT&E as we do from M&S.

The approach in proving our naval ships' combat capability and performance prior to delivery, therefore, is to couple

Alion's MOTISS solution allows **prediction of signatures, weapons damage and progressive systems recovery** providing users a comprehensive view of ship survivability within a single M&S package.



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our advanced M&S with live fire testing. Using the few live fire tests we can afford now as well as tests we've done in the past to verify and validate the survivability M&S software and engineering tools allows us to apply these tools to assess and quantify the ships combat capability and performance. After all, confidence in a particular model or simulation must be justified before its results are used to make decisions. To ensure that confidence in an M&S application is justified for our ships, a rigorous validation, verification and accreditation (VV&A) process is followed such that the modeling assumptions are all well documented, the results produced by the M&S are stable, and the correlation between M&S behavior and real world behavior is well understood. As an example, the MOTISS survivability software used over 890 live fire test events to verify and validate its algorithms prior to receiving naval accreditation in 2008. Regardless, variables such as a random poor quality weld or blast and ballistic resistance of a previously unknown material can only be determined through live fire testing. But once known, this information can be used to enhance M&S software capabilities so that we can ensure our next generation of warships is still more capable and survivable than our opponents'.

1 Turner, Horstman and Bain, Warship Survivability, Royal Institute of Naval Architects, Warship 2006: Future Surface Warships Conference, London, June 20-21, 2006

2 Thornton, Coulthard and Hardy, Modeling Maritime Survivability, Royal Institute of Naval Architects, Warship 2006: Future Surface Warships Conference, London, June 20-21, 2006

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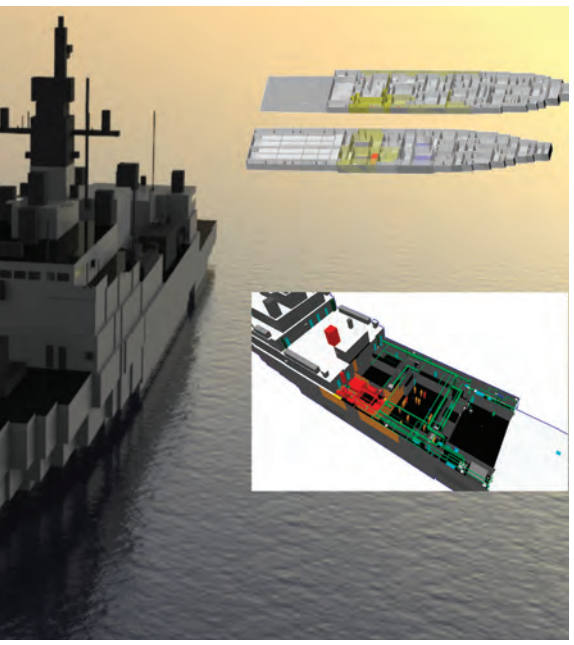
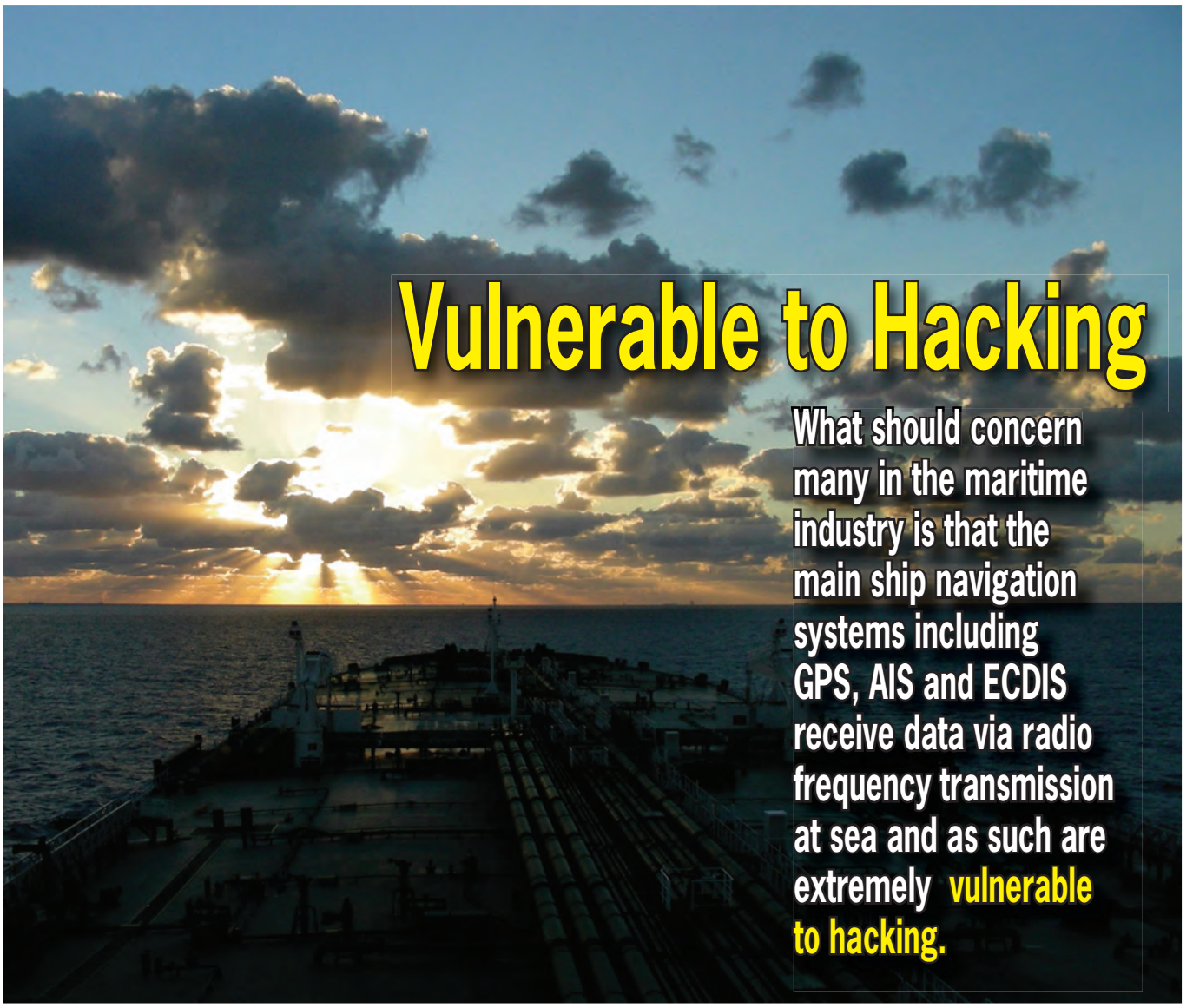


Five Short Blasts

Is Maritime Simulation the Solution to Maritime Cyber Security Threats

BY CAPTAIN EMIL MUCCIN

The U.S. Executive Branch has declared that the cyber threat is one of the most serious economic and national security challenges we face as a nation, and that America's economic prosperity in the 21st century will depend on effective cyber security. Before the maritime industry sounds the danger signal, it needs to monitor other industries and branches of the government and take proactive preventative measures. There is no better place to prepare future and current mariners for these challenges than in maritime simulators.



Cyber Security

Cyber security refers to the technologies and processes designed to protect computers, networks and data from unauthorized access, vulnerabilities and attacks delivered via the Internet by cyber criminals. With the advent of computers, network devices and telecommunications that make transport of data via radio frequency common place, it has opened a new world of vulnerabilities to hackers to tap, steal, destroy or alter data. This has led into a new area of potential maritime threats that go well beyond physical piracy such as the Maersk Alabama. With the recent GPS spoofing of a yacht by students at the University of Texas, the maritime sector has entered into a new arena that must be addressed as Maritime Cyber Security.

The U.S., as a world leader and major target for terrorism in early 2013, through the Executive branch signed an Executive Order (EO) 13636 to Improve Critical Infrastructure (CI) cyber security and Presidential Policy Directive 21 – Critical Infrastructure Security and Resilience (PPD-21). It established an All Hazards approach to critical infrastructure security and resilience. The cyber security EO establishes a requirement for federal agencies to collaborate with their respective industry sectors to identify Critical Infrastructure that can be impacted by cyber activity.

This initial foray by the federal government has led other departments and agencies to take initial steps to address the growing issues with cyber threats.

The U.S. Department of Transportation, Maritime Administration (MARAD) being one of those proactive organizations has recently teamed with the Ship Operations Cooperative Program (SOCP) to cooperatively develop Information Systems Security Awareness Computer-Based Training (CBT) on cyber threats in the maritime environment. This is a first for the U.S. maritime community to recognize and take action to assist vessel owners and operators with training U.S. mariners on best practices to reduce the risks and vulnerability associated with information systems and devices.

Newly developed cyber training will provide mariners with a comprehensive overview of the range of threats that information systems and devices are subject to, and the practices recommended to minimize those vulnerabilities. Best practices that are addressed in the training include a wide range of topics, from maintaining security for networks, to personal use of workplace computers, good password practices, and issues concerning the use of social media like Facebook and Twitter. This training also addresses issues for mariners working aboard vessels, such as specific log-in policies and rules surrounding working with sensitive information.

Department of Homeland Security (DHS), through the United States Coast Guard (USCG), has also taken to task these growing threats and has determined that American ports, terminals, refineries, vessels and support industries are vital to the safekeeping of the nation's infrastructure, security and our economy.

In short, there are as many potential avenues for cyber damage in the maritime sector as there are cyber systems. While only some cyber-attack scenarios in the maritime sector could credibly lead to a Transportation Security Incident, we must identify and prioritize

those risks, take this threat seriously, and work together to improve defenses.

Security and Survival at Sea

Will the next hacker chess match take place on the high seas with oil tankers, container ships and other specialized vessels that transport approximately 90 percent of the goods moved around the world?

Many devices are connected online which makes them more vulnerable to attack. As the maritime and offshore energy industries connect ships and oil rigs to computer networks, they expose considerable weaknesses that hackers can exploit. For example, it was discovered that pirates off the coast of Somalia and other key piracy areas hand pick their shipping targets by tracking online the navigation track of the vessel through AIS, ECDIS and radar. In the oil industry, hackers have committed much turmoil including the tilting of an oil rig, causing it to be shut down, as well as the penetration of the networked computing systems on another rig with malware that took trained personnel almost three weeks to clear. Other events have included smugglers hacking into networked systems to be able to locate containers with drug contraband and cleanly confiscate the drugs without being detected. They even went so far as attempting to delete the data for the shipment. While data on the extent of the maritime industry's exposure to cyber-crime is hard to come by, a study of the related energy sector by insurance companies recently indicates that much of it maybe insurable.

As the energy and oil industry has been targeted for some time, statistics are available that indicate this is already have a billion dollar impact on the world economy. In the maritime industry, the number of known incidents appears to be low due to either the companies being unaware of the cyber-attacks or because of the desire to keep such news from reaching the press with potential detrimental business impact to the company.

There are few documented reports that hackers have compromised maritime cyber security. But scientists indicate they have determined areas in three key systems that mariners use to navigate: GPS, Automatic Identification System (AIS), and the system for viewing digital nautical charts Electronic Chart Display and Information System (ECDIS).

Increasingly, the maritime domain and energy sector has turned to technology to improve production, cost and reduce delivery schedules. These technological changes have opened the door to emerging threats and vulnerabilities as equipment have become accessible to outside entities.

As vessels continue to increase in size, the crewing continues to decrease, with the paramount shift in vessel operations, ship owners and yards have increasingly added more automation and remote monitoring systems to vessels. This has led to a dilemma, as more systems and devices on vessels might enhance productivity and safety on one hand, but on the other it presents more systems for hackers to compromise and control. It is fairly well-known that a significant proportion of computing and network devices are connected to the internet using serial ports with poor security. Devices range from simple traffic items such as stop light which have been proven that they can be controlled remotely by hackers, to complex items for the oil and gas industry that monitor and control oil rigs.

It has been reported that some ships switch off their AIS systems when passing through waters where pirates are known to operate, or fake the data to make it seem they're somewhere else. Some shipping companies are now taking cyber risks as true credible threats and taking necessary measures to beef up network and telecommunications security. Recent studies of U.S. ports have determined that very few have conducted cyber assessments and even fewer have developed a response plan. Very little federal money has been allocated to the maritime industry for cyber security projects or training.

This lack of cyber security preparation by U.S. ports actually carries over to the shipping companies where it has been discovered that most have substantial security issues. However the good point is that the maritime industry has had limited compromising of its computing and network systems. This may be tied to the factor that they have not been a high priority and have not been on the radar screen of hackers.

What should concern many in the maritime industry is that the main ship navigation systems including GPS, AIS and ECDIS receive data via radio frequency transmission at sea and as such are extremely vulnerable to hacking. AIS and ECDIS are now mandatory on larger commercial and passenger vessels per the recent IMO 2010 Manila Amendments. This new requirement has increased the need for shipping companies to come with security measures and protocols to protect these devices from intrusion by outside sources.

It has also been known for some time

that ECDIS systems and the required software update downloads can be compromised by hackers with severe repercussions. This came to light last year with the grounding of a U.S. naval vessel in the Pacific Ocean where it was reported that the ECDIS charts were incorrect and may have had an impact on the accident. A related discovery has been the widespread abuse of AIS by the maritime sector. Many ships deliberately transmit incorrect AIS position data attributable to security reasons in certain parts of the world including off the coast of Somalia, in the Caribbean smugglers do it to avoid tracking and arrest by law enforcement and even fishermen do it for financial gain by fishing in areas that are not permitted. Of paramount importance is the need for the maritime community to understand the principles of information systems and cyber security and it how it applies to on-board equipment before they can implement changes and conduct training so that personnel are aware and can act accordingly. Several areas that the maritime industry will need to come to speed on are the following:

GPS SPOOFING

There are many recent stories portending to GPS spoofing, including the June 2013 project at the University of Texas where they employed GPS spoofing as they hacked and manipulated the software to disorient the navigation system on a luxury yacht. Upon cloaking the device and transmitting the false signal, the yacht changed course abruptly when it received the false signal. Although this occurred because a system linked to the ECDIS handled the steering and not a helmsman, it still did happen. This opened up a new dilemma for the world for navigation on how to verify the accuracy and correctness of GPS signals.

eLORAN

GPS has vulnerabilities that pose potential risks. In 2008 in response to presidential direction the U.S. government announced that they would establish a nationwide resilient terrestrial based system to augment GPS, and it would be named eLoran. This new system would build upon and modernize the old Loran-C system, while being less expensive to operate and be much more precise. The U.S. is not alone in recognizing GPS vulnerabilities; numerous other countries including most of Europe, India, Russia and China have installed or will install eLoran systems. Unfortunately the US government via the Department of Homeland Security had planned on dismantling the remains of the old LORAN-C infrastructure even though it is feasible to use it for the new eLoran. The good news is that there are currently plans in place to resurrect and enhance the old system and turn it into a state of the art electronic terrestrial based system that will complement and backup GPS.

eATON's

It was recently reported that prominent aids to navigation on the approach and within San Francisco harbor have now been added into the electronic aid to navigation (eATON) system. San Francisco has become the Beta port in the U.S. as it is the first one to begin using this unique system.

This is not a costly process to implement as it does not require the U.S. Coast Guard to install electronic transmitters on the aids to navigation. Due to the fact that the aids to navigation are located in fixed positions in the ocean or on land or fixtures such as the Golden Gate Bridge, they have their own electronic identification assigned to them which is added into the Automatic Identification System (AIS). With the Golden Gate Bridge the center span is marked by a RACON, and the bridge towers are marked by eATON digital markers.

This system in the San Francisco area is also being used in conjunction with reporting points in the Traffic Separation Scheme (TSS) including the San Francisco "SF" buoy that serves as the embarkation point for the Bar Pilots.

It has been reported by the USCG that eATONs will not replace the actual physical navigation aids but will supplement the existing technology as well as add a virtual layer of aids to navigation in areas that previously were physically impossible to do or impractical in nature. This now allows the USCG to place an eATON in the TSS where it was too deep before to do as well as mark a bridge tower that was practically needed most in reduced visibility not in day light.

This technology eventually will allow the USCG to install transmitters on buoys so that the prudent mariner will be able to track where the buoy actually is as opposed to where it should be per a nautical chart.

In a conflicting statement it was also recently reported that certain aids to navigation will be removed off the coast of California. This decision was tied to the presumption that all vessels are equipped with Electronics Chart Display and Identification System (ECDIS) which has been required by the IMO 2010 Manila Amendments to be installed on most vessels (tied to class and size) over a six year period starting in 2012.

This could lead to disastrous consequences because a significant segment of the maritime industry including towing, fishing and recreational are not required to be ECDIS equipped. Additionally even for the blue water international commercial fleet reliance on ECDIS and GPS alone can be dangerous especially in light of the recent GPS spoofing phenomenon. Prudence and situational awareness dictates that the professional mariner needs to rely on visual aids to navigation within sight of land. Additionally what happens when you have an electronics failure and loose an ECDIS or both of them on a commercial vessel?

ECDIS

It is thought that ECDIS has some underlying software security vulnerabilities that could lead to disastrous results for ships at sea.

The basis of ECDIS is a navigation based charting system that use a computing system to digitally display nautical charts along with the exact location and track of own ship. This is a dramatic alternative and improvement to paper charts and the current system of hand plotting positions. ECDIS's are installed on the bridge of a vessel and larger vessels are required to have two of them, one as a backup. When they are properly used with an ENC chart they can take the place of paper nautical charts. This is an increasing trend in the maritime industry. Where the problems arise is not when the ECDIS's are in standalone mode but when they are networked together and when data is downloaded via an external source, whether through a USB port via a memory stick or via the net. Through the recently released IMO 2010 Manila Amendments regulations were implemented that now requires EDCIS to be installed on all commercial vessels of a certain size. This will slowly eliminate the reliance on paper charts and take the maritime industry on a journey into the electronic world where the next evolution will be the use of portable smart devices by navigators. Safe guards need to be put in place for ECDIS data updates as well as external security breaches when they are operated in a networked setting.

AIS

When AIS is operated as intended it is a useful navigational aid that can be instrumental in collision avoidance. As has been published due to the configuration of the system much of the transmitted data can be manipulated or distorted. This has been confirmed recently by several sources including the Israeli's. They have noted that vessels transmitting AIS spurious signals were nowhere near their actual location and on other occasions they also had phantom ships appear that could not be found. This system along with GPS and the recent spoofing episode needs to be enhanced to include some type of signal authentication process so that erroneous signals will not be displayed.

Smart Ships

Smart ships are on the horizon and it has been predicted between 2020 and 2030 that we will see such a ship going about its normal business at sea without a crew and being totally monitored from shore. Shipyards are already constructing vessels that are fully sensored so that they can be monitored after it is delivered and while it is at sea for maintenance and servicing purposes. These vessels can take two forms either autonomous or unmanned. Autonomous is defined as a vessel primarily guided by automated on-board decision systems but controlled by a remote operator in a shore based control facility. Unmanned is one step beyond autonomous and is totally controlled from a shore based control station. Key features would be the standard maritime policy of having redundant systems and emergency backups on board. Where does this new technology take us in the maritime simulation world? Possibly as is done with USAF we will have ship drone training and certification. This could tie into the scenario with a fully integrated navigation suite of GPS, eLORAN, EATON and a digital visual sensor system that can be fully controlled and monitored 24/7/365.

Marine Simulation

Maritime simulation is important as it imitates the operation of a real-world vessel in a safe environment. The act of simulating cyber threats and scenarios will allow us to focus on these new cases of spoofing and jamming through the mariner's heavy reliance on Radio Frequency (RF) transmissions that can potentially be comprised. Simulation can be used to show the eventual real effects of alternative conditions and courses of action on the vessel. Simulation is of utmost importance specifically where we need to interact in congested waterways, narrow channels, dense traffic and many other restrictions including dangerous cargoes. What simulation will allow us to do is introduce many of these poten-

tial cyber threats in a real life environment and let the mariner interact with the exercise and respond in real time. In developing the next wave of maritime education it is a logical evolution to go beyond Vessel Security Officer (VSO) and create a new role for a Vessel Cyber Security Officer (VCSO) in a Maritime Cyber Security (MCS) program. This position could be an extension of the VSO or a new certification. In either direction it is necessary to have crew members with these skill sets who can act as the responsible officer(s) on each ship. As the go to personnel, they would be responsible for all levels and details of cyber security and defense. Through the recently released STCW 2010 Amendments IMO has already proactively moved forward with the introduction of the Electro Technical Officer (ETO) and an Electro Technical Rating (ETR).

How does the industry move forward and get to that logical level of training and preparedness? First it needs to review existing maritime simulation to determine the equipment and systems we are using. Next step is determine how they are integrated, as well as built-in security in place. From this we can start the journey on determining how cyber threats could attack, destroy or disable the equipment … or in the worst case scenario … take command of it. In the end it is through the awareness training and education that mariners will be able to thwart these infiltrations.

Another source of mariner awareness and training must be the use of the internet and the download of potentially corrupt data through viruses, worms, phishing, spoofing and hacking. This may happen due to improper or lack of training or some circumstances an oversight due to fatigue but nevertheless it must be avoided. A similar path applies to the use of vessel email and the threat of receiving spear phishing emails purported from reliable sources with clickable links to websites that are fraudulent and will take control of your computer back door or install a virus.

In summary as we move forward we need to incorporate in the syllabi of all maritime simulation courses the basics of Maritime Cyber Security (MCS) as it is and ever present threat that will not go away. It is only through diligence and proper training and awareness that seagoing mariners will be prepared and ready to take appropriate actions when warranted.

The Author

Emil Muccin holds the current position of Assistant Department Head, Maritime Business Division of Marine Transportation Department and is also an Associate Professor of Nautical Science at the United States Merchant Marine Academy. He previously was the Marine Transportation Department STCW Coordinator. Additionally he is the Faculty Advisor to the Cyber Defense and Propeller Clubs. Emil graduated from the USMMA with a BS in Nautical Science and from Pace University with an MBA in Information Systems. He sailed for many years as the Master of paddle wheelers on the Hudson River.

The 2015 Yearbook

Cyber Security

LNG

Shipbuilding

Brown Water

Offshore

Emissions Reduction

Dredging

U.S. Navy

Blue Water

Piracy

Green Water

Energy

Ballast Water Technology

The 2015 World Yearbook

Photo: Steven Nelson

Global Maritime Trends

"LNG is here to stay ...

LNG will get more and more widely used by ships, particularly on new construction. I'm not anticipating a big refit business. With new construction at this time, **if you're not looking at LNG as an option, you're not reading the tea leaves."**

In trying to make sense of the global, mobile maritime industry, there is no better 'go to' than Shashi N. Kumar, Ph.D., Master Mariner, Fulbright Senior Specialist Fellow, Emeritus Professor of International Business & Logistics, Academic Dean, United States Merchant Marine Academy (USMMA). Last month we met with Dr. Kumar in his office to put emerging global maritime trends in perspective.

by Greg Trauthwein

"The views expressed in this article are Dr. Kumar's own and not those of the U.S. Merchant Marine Academy, the Maritime Administration, the Department of Transportation or the United States government."

The World: When you look at the global shipping market, what do you see and why?

I'm one of those who thought that we would see clearer 'silver linings' in 2014 but obviously that did not quite happen for a number of reasons. The world economy did not shake out as well as I estimated. I believe the updated IMF estimate for 2014 world economic growth is 3.3% which is not too bad but certainly not good enough to energize the maritime industry out of its 2012/2013 slump. To me, status of the world economy is a very important driver of the ups and downs in global shipping. Isolated shipping markets are certainly doing a lot better than what was anticipated, case in point the market for VLCCs. But then you also have the other extreme, the dry bulk sector, where it couldn't get any more worse.

The Dry Bulk Market: What will get that sector moving again?

A very interesting question. As you know, this is a market with very low barriers to entry and one which we maritime economists often postulate as being close to the classic perfect competition model. Anybody can enter the dry bulk market if you have one ship. It's not difficult for an entrepreneur to find the right type of financing to get that one ship to make market entry. And if you are an established owner or operator in this market, expanding your fleet with the "right" type of financing became easier in the last few years. And of course, there are many shipyards especially in China offering excellent incentives for building new tonnage. Then, there are the hedge funds and equity investors who have contributed in their own ways to the black swans haunting dry bulk shipping today. What a perfect recipe for market destruction (from the owners' perspective)!

Correspondingly, in the last couple of years, trade volumes have not kept pace with the increase in supply of shipping capacity. The Chinese have cut back on their commodity imports, notably coal, and even iron ore to some extent. We also have a serious issue with ship sizes, in particular the gigantic Valemax 400,000DWT dry bulk carriers, each of which replaced several smaller ships in the Brazil-China trade. Unfortunately, the displaced smaller ships do not go away; they remain part of the tonnage until their lifespan is complete.

There is obviously too much surplus tonnage in the dry bulk market. We are witnessing some of the more innovative owners switching over their bulk carrier newbuilding orders to tankers, but this alone will not solve the (dry bulk overcapacity) problem. It is really refreshing to see the recent decline in dry bulk newbuilding orders. I am hoping that this market will turn around by 2017.

U.S. Shipbuilding is firing on all cylinders, driven primarily by the construction of new Brown water and Green water vessels, with a few Blue water vessels as well. Dr. Kumar said the the role of the United States as a swing player in world energy markets should create a buoyant U.S. Maritime Market for the next 20 to 30 years.

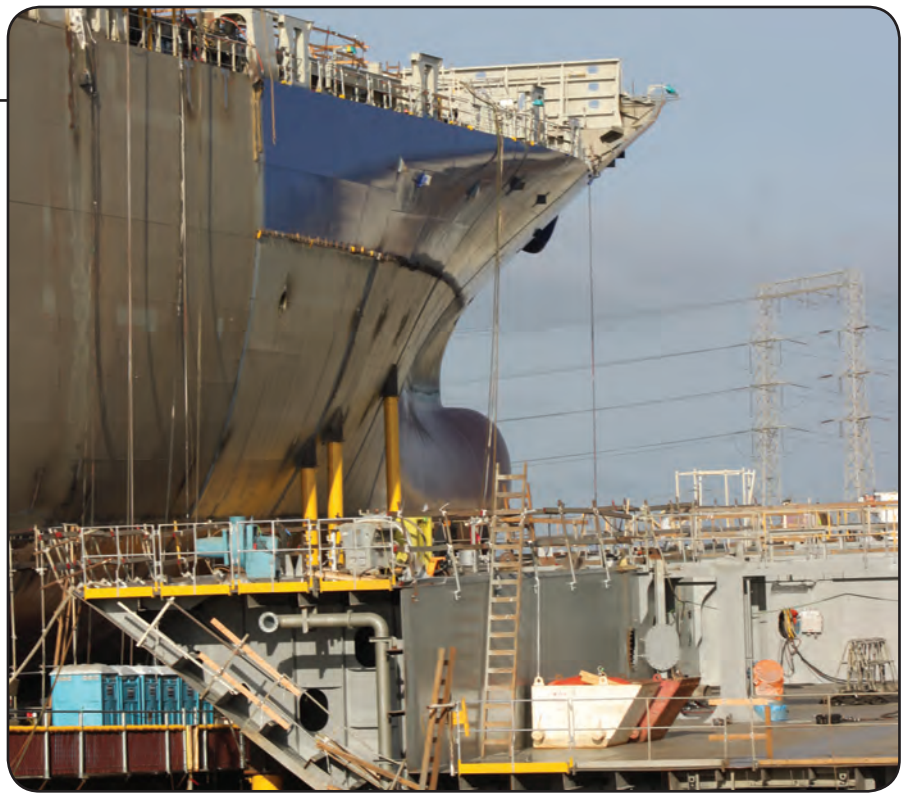


Photo: Greg Trauthwein

In your opinion, what was the genesis of private equity money in the shipping industry.

There was a big influx of private equity investment in shipping. My simple theory is that they were looking for quick returns. Now, upon seeing the outcomes, they are attempting to limit their exposure through consolidation or even market exit strategies. I think they have learned that shipping is not the easy bonanza they expected.

What are the key economic and statistical indicators that you monitor to gauge the health of the shipping industry.

We touched on the GDP factor, which is number one. There is a rough rule of thumb that if you know the GDP growth, the consumer goods being traded is roughly twice that level. That was the historic yardstick, but now it's more like 1.5 times the GDP.

Why is that?

Global economic growth is like a rising tide that lifts all nations and their trading requirements. So, over the years, world trade patterns have changed and also what are being traded. These dynamics have impacted the variables that dictate world trade, and we have to make adjustments to our historic assumptions based on evidence and market outcomes. This is one such adjustment.

OK. Getting back to the economic and statistical indicators, which are most important?

Certainly GDP, particularly what is going on in the OECD and non-OECD countries, and most certainly what is going on in China and the other BRIC nations. This is from a broad macro level.

From a micro level, supply and demand data are fundamental to analyzing any industry, shipping included. I review these regularly at the sub-market levels to get a good grasp of what to expect and make my own projections.

One other important factor I keep track is ship's speed. The impact of changes in ship's speed on tonnage supply is phenomenal and often doesn't get the recognition it deserves. Look at oil tankers. There's a recently released report that says if VLCCs increase their speed from 11 knots to 14 knots you are putting 18% of the current VLCC fleet out of business (assuming the cargo volume does not change.) Containerships are operating at 16 to 18 knots right now. What happens if they decide to go back to 21 or even 24 knot speeds based on the lower oil price? I think the current woes of liner companies would only multiply if they were to speed up their ships.

Do you see them starting to speed up again?

That is my concern whenever there is a drop in bunker prices – particularly in the liner market where one may be tempted to seek a market niche or service differentiation. What is to stop them from marketing "faster services" as a competitive strategy? It all comes down to market discipline, and this industry has shown that discipline is not our strong point1 It is rather ironic by the way because when I speak with budding mariners (my students) my mantra is always the importance of "self-discipline" for a successful career at sea.

As you mentioned, supply and demand is a basic for any industry, yet for the shipping market as a whole there always seems to be perpetually out of balance. Is there anything you see that could bring it back to balance.

I see Adam Smith's "Invisible Hand" here perhaps more than most other in-

Photo: Jan Berghuis

dustries. It is human nature to be greedy; the more we have, the more we want. I am sure every shipowner believes that s/he is the smartest one and everyone else is dumb. They invest in new tonnage, in most cases, a better ship but by the time she is delivered, the others have joined the bandwagon too. The thought that they will alone succeed and everyone else will go broke is far from reality and totally irrational. The role of some equity investors who have pumped in a lot of new funds in a market that they don't quite understand hasn't helped the situation either. The shipping milieu and market sense which were very much a hallmark of traditional ship owners is no longer the case in the industry but for some rare exceptions. The shipping industry is not about making a quick buck, and it seems many are destined to learn this the hard way!

So it sounds like, with all of the various business and political factors that affect shipping, long-term success really still lies in knowing the business.

I strongly believe that this is the most essential ingredient to succeed in this business. Are we really all that different? No! Just like other success stories, to succeed in shipping, one must know what works here, why it works, how it works, and when changes must be made. It is very easy to go around advocating changes without knowing the fundamentals; to me, that is a recipe for disaster. Undoubtedly, a company must be profitable to remain viable but its passion must not be limited to making a quick buck. They need to understand the business they are in and its core values, and have some of the traits that good traditional shipowners have demonstrated over the years--their passion for ships and the industry, their trust and respect for their employees and yes, their love for the oceans and everything maritime … I think these are largely missing today.

GDP, Supply & Demand, Ship's Speed … are there any other factors that you consider crucial to studying this market?

There are numerous statistical indicators that one can monitor. Many trade journals and research organizations provide copious data today if one is interested in keeping up with the markets. So, to study shipping markets, one should religiously follow what is happening in individual trades and markets. Then, there are the random political events that seem to be happening with unusual regularity these days; being generally aware of the global political economy is vital in our business. Eventually, it all comes down to simple economics—nothing is as crucial as basic supply and demand information. By the way, one has to dig deep into the sub-markets. For example, studying the tanker market entails analyzing the VLCC market, the Suezmax market, the Aframax market as well as the markets for product tankers. And of course, today, it would also include the market for LNG tankers, VLGCs, chemical tankers, and so on. The same applies to the other two fundamental shipping markets. Once you are armed with all the supply statistics, plug in your data on current and projected trade volumes. There are qualitative variables that one should be aware of such as new environmental regulations and their likely impact on markets, and also the state of industry expectations measured through "shipping confidence" estimates. In my opinion, shipping markets are fairly easy to analyze and today we have sufficient readily available data. Before I forget, you need one more vital ingredient—the passion to follow these markets religiously on a day-to-day basis, which again leads to my earlier comment on self-discipline.

The Tanker Market: An Overview

The big ships, the VLCCs, are doing very well and are in a very good position. Remarkably, even the Suezmaxes are finding good opportunities, and so are the product tankers with several new refineries opening up around the world, in the Gulf region as well as in South Asia. This is a good time to be in the tanker market, but obviously there are some ominous signs looming on the horizon.

What has been the driver for the tanker market?

Turbulence Offshore

& in the global energy markets as a whole has left many sectors of the maritime market shaken. While the industry settles into the reality of the $60 barrel, general consensus is that oil will resume its march upward over the coming few years.

The number one reason has been the supply of ships. Tanker owners have shown good market discipline, and they have stuck to their newbuilding strategy. The trade volume has picked up a little bit, and also the distances involved have lengthened which again increases the demand for tonnage. The ongoing contango situation with the low price of oil has created opportunities for some older VLCCs to be used as storage tankers, keeping them off the trading market. The storage tanker option is a smart money-making operation for those owners although no one knows how long this will last. We have already talked about slowing down ship's speed. All these have helped the tanker market make a good rebound. But 2016 may be a different story with dry bulk operators and some equity investors seeking greener pastures here--newbuilding orders are gradually climbing. So, I am skeptical how 2016 will shape up by the end of the year.

Switching gears from the tanker market, what do you see when you look at the liner market?

Sir Yue-Kong Pao, the storied Chinese shipping tycoon and patriarch of the World Wide Shipping group which at one point owned 500 ships, was once asked, 'Why are you not investing in liner shipping?' His response: 'Joining the liner market is like playing Russian Roulette; you know for sure you are going to die."

I guess he had a point. I know Maersk Line is doing quite well now; they have cut down their unit cost by building bigger ships and enhanced their system-wide operating efficiency. But my question is: "How long will a shipping service strategy based solely on cost reduction sustain?" There is a limit to cost reduction strategies beyond which they will impact the quality of services provided.

So how about the Liner Market today?

High barriers to entry and concentration of market power. This market is very dear to me as it was the topic of my doctoral dissertation in 1993. I made a pretty elegant case then that the liner markets were contestable and new entry was feasible; I will have a tough time making that argument today. It's not the game you want to play unless you belong to one of those giant liner alliances. It's a tough market

Photo: HHI

"I remain very concerned about ships getting bigger.
The insurance industry estimates that if one of these 20,000 TEU ships gets into a serious accident, the likely salvage operation would last a year, and incur a billion dollar liability."

out there and the scale of investment required is truly major league!

When we spoke previously, you floated the notion that there should be a cap on the limit of the size of ships. Obviously, bigger ships present a host of new challenges, particularly on the salvage and recovery side of the business, which must invest in new technologies to be able to effectively help one of these behemoths in peril. When you look at the rapidly escalating size of ships, what do you think?

You raise a very good point. I remain very concerned about ships getting bigger and bigger. The insurance industry estimates that if one of these 20,000 TEU ships gets into a serious accident, the likely salvage operation would last a year, and incur a billion dollar liability. The other thing to consider: Where will these ships go? They can't simply call at any niche port of their choice; all these big ships are going to congregate in the same ports—share the same restricted waters, and transit the same channels. This means more close quarters situations. Even though the industry is more safety conscious today and we provide a far superior education than ever before, the number of ships are also going up in addition to their size. I have known the sea for too long—it is not a very forgiving place when something goes wrong.

The Environment. Can you put in perspective initiatives in the maritime sector as compared to any other time period of your career.

I am so proud to be part of this industry in terms of all the great things we have accomplished environmentally. My affiliation with shipping began in the late 1970s as a deck cadet, and the difference today from those years is like night and day. The MARPOL regulations were just coming into effect during those years. We have come a long way since then in every which way I can think—be that the way the ships are constructed today or the myriad environmental regulations we comply with. The use of low-sulfur fuel, the impressive gains made in lowering CO2 emissions, the introduction of ballast water treatment systems, the use of LNG as a propellant--looking back 40 years ago, I could not have possibly imagined these paradigm shifts in how we operate commercial ships today. My only disappointment…if only the world could come to a consensus on environmental standards…it will be a lot easier to march to one tune, and the industry could deliver even more!

And the likelihood of that ever happening is …

Highly unlikely!

Concluding on the international side, where do you see strength and balance in shipbuilding?

The shipbuilding sector is going through its own pains and agonies. 2014 was not a good year overall. Many owners have cut back on their newbuilding plans, especially the owners of dry bulk carriers. China is emerging as the world leader in this market thanks to strong government support although many of its yards are in various stages of difficulty. There will be continued consolidation of the Chinese yards and they will slowly make an entry into building the more sophisticated ships such as LNG carriers. They are certainly aggressive with their promotional policies for shipbuilding, and the entire scenario involving the Valemax bulk carriers is a classic case study of successfully leveraging national political and economic interests.

Shipbuilding has become a highly specialized sector now. LNG ships worth almost $15 billion were ordered in 2014, almost twice as much as what was spent on the next highest—$7.8 billion on Capesize bulk carriers. It is believed that many of these LNG ships will be employed in carrying U.S. exports to

the Far East and South Asia. In addition to the South Koreans, the Chinese and the Japanese, other new players are also likely to enter the highly sophisticated LNG shipbuilding market—a case in point is the ongoing discussion between shipyards in India and Korea to build LNG ships, supposedly to carry U.S. LNG exports to India.

Let's switch gears and look at the U.S. market, which has been as vibrant as I've ever seen in my 21 years in this position. When you look at the U.S. maritime industry today, what do you see?

There is a lot of optimism and enthusiasm, something that has been missing for the last three or four decades. This is most visible in shipbuilding with virtually all the U.S. yards staying busy, building vessels for the brown water and the green water, and also some blue water ships. The recent delivery of the TOTE container ship from NASSCO is certainly a phenomenal moment to cherish. Overall, quite refreshing and long overdue.

What are the key drivers in this market today?

It is driven by the energy sector; there's no question about it. We have become a pivotal swing factor in the global petroleum market. The drilling for shale oil and natural gas has created a variety of opportunities. I am not talking about just the transportation of those products but also about the whole host of support industries that they have generated and the associated project cargo movements. Then there are the investments in the petrochemical industry that has attracted a significant amount of foreign direct investment because of our low energy costs. Many of these activities are based in the south; in fact, my message to those seeking maritime career opportunities in the U.S. today is to "head south." I believe our role as a key swing player in the energy market will last well into the next 20 to 30 years, which makes me conclude that our maritime rejuvenation and optimism is here for the long haul.

But won't the current low oil prices effectively hurt the U.S. maritime business?

I do not believe that is the case. See the world market for oil tankers; it is a shining star right now despite the low oil prices. So, the American market should only be doing even better than the international market; that's what my numbers confirm. The Saudi Arabian squeeze play is not going to affect our maritime business although there will be some temporary disruptions. Case in point, a reduction in the number of rigs in use. But then, recent figures indicate that those numbers have bottomed out. Overall, the U.S. production of oil has not decreased despite the OPEC strategy.

When you look at U.S. shipbuilding. Are there any specific drivers you see that will impact the business in the near term?

I think the focus will remain on the smaller ship sizes we discussed, with occasional orders for the bigger ones. The smaller ship market is very attractive, and will remain so for the foreseeable future. That's where the business is right now, from the Coastal Fleet to the Offshore Supply Vessels and Drill Rigs. As for construction of blue-water ships, it will be driven by the fleet replacement strategy of our key Jones Act operators.

The Final Word.

Shashi N. Kumar's thoughts on these 'hot button' topics.

• LNG as Maritime Fuel

"Here to stay. LNG will get more and more widely used by ships, particularly on new construction. I'm not anticipating a big refit business. With new construction at this time, if you're not looking at LNG as an option, you're not reading the tea leaves."

• The Future of Slow Steaming

"I'm praying like hell for the shipowners to maintain their speed. Don't raise your speed. They need to show discipline."

• Maritime Piracy

"Piracy will go down. The Malaysia market is once again becoming a hot bed, but that's more of the garden snake variety, siphoning fuel and selling it off. That's a nuisance factor, and it has to be controlled. At the same time I'm concerned about unplanned disruptions to shipping through terrorism."

Oil's Downward Spiral Stalls LNG's Ascent

As industry embraces gas, emissions regulations loom large and bunker logistics options develop, LNG's fortunes nevertheless get a boost.

By Patricia Keefe

For every gleeful consumer at the pump, and stockpiling tanker anchored offshore, there's a corresponding trail of businesses that are struggling to ride out the worst price drop in crude since the mid-1980s. As oil giants slash CapEx, Halliburton and other industry players layoff thousands and record numbers of oil rigs go offline, less obvious is the impact of the latest oil market blow out on the growth of liquefied natural gas (LNG). But, LNG's fortunes are very much tied in ways both positive and negative to the ups and downs of pricing and regulation of its heavier cousin.

"At the moment, we're not really seeing a big degree [of use] in LNG," says Jim McCaul, founder and managing director of International Maritime Associates, consultants in the maritime, offshore oil and gas. McCaul, who has a PhD in economics from the University of Maryland, an MS in business administration from Pennsylvania State University and a BS in marine science from the State University of New York Maritime College, spoke with *Maritime Reporter & Engineering News* recently about how issues such as crude pricing, demand, emissions regulations and bunker pricing and infrastructure are influencing the business plan for LNG.

Hammer Time

The most evident impact has been in pricing. Crude oil prices have been dropping precipitately since mid-2014, from $115/barrel in June to $70 by December to as low $48 and change last month – a roughly 57% drop in price. While some observers expect prices will stay at or under $50 a barrel throughout 2015, the most recent pricing at press time was bouncing in the $60 range, and a report released last month by JP Morgan insists the worst of the crash is over.

On the LNG side of the energy coin, gas prices are half of what they were a year ago. Natural gas hit a late November 2014 six-month high of about $4.50/MMBTU, before dropping to a 52-week low of $2.59 in early February. Frigid temperatures are helping to push prices upward, resting at $2.95/MMBTU at press time. The 52-week high, which is also the five-year high, is $6.16/MMBTU, driven by last year's icy temperatures. Record demand and prices in 2014 accelerated record output, resulting in an oversupply, which in turn drove down pricing to the lowest levels in over 2 years, as seen in early February. The Henry Hub natural gas spot price was $2.75/MMBtu as of Feb. 17, down from a high of $5.54, representing slightly more than a 50% drop from a year ago.

"LNG prices have fallen quite a bit over the last few months. They have fallen in January on delivered price – probably at 50 or 40% – over the last six months," notes McCaul.

Where Crude Goes, LNG Follows

No one knows when pricing will turn around, but in the meantime, McCaul points in particular to two factors depressing LNG pricing: an imbalance in supply and demand, and the fact that LNG prices are tied to the price of crude. "There is a formula in these big, long-term contracts that when the price of crude goes up or down – the contract price for LNG goes up or down based on a fixed number, and then it's tied to the price of crude, the index of the price of crude on a long-term basis internationally, so the drop in LNG is always slightly less than what happened on the crude side."

The formulas differ, according to McCaul. For example in India and Korea, LNG pricing is tied to the Japan Crude Cocktail, which takes the average price of seven different crudes and works it into an aggregate average price, which is used for indexing to come up with the LNG price. So LNG pricing – even in a 30-year contract – will still go up and down based on the price of crude at specified points in the contract.

This creates a fixed factor of LNG pricing not moving as fast as the price of crude, says McCaul. If crude falls by 50%, for example, LNG will probably fall by 30% –and lag a bit. The scenario is the same when the price of crude goes up. "What complicates all this is the export of LNG is not tied to that formula," says McCaul. "It's tied to the price of Henry Hub – plus some fixed amount for liquefaction and delivery. It's totally different from the international way of doing this.''

In addition to pricing, LNG as a fuel is also affected by regulatory pressures and the environment.

In the U.S., the first two variables are close to equal, says McCaul. "I don't think anyone cares about the environment." In Europe, he sees the reverse in terms of importance. "I think the environment might be important, regulations, then pricing. LNG is a little pricey there. They don't have the benefit of this country – the tremendous amount of gas here. It's coming out of everywhere. Gas is almost free in some cases."

The one thing most people fail to realize when looking at the impact of crashing crude oil prices on LNG, is that the U.S. market is unique, in great part because it's isolated, and more recently, because it has become the biggest producer of shale gas.

Emissions Rules Stoke Interest in Gas

The price of crude oil has more than halved in the last six months, taking the shine off the allure of going "green," but there's a more compelling, and pressing reason to think at least a little bit green. Emissions regulations slated to go into effect in 2016 are forcing the industry to consider using LNG as bunkers. Gas is a cleaner fuel than oil, and helpfully, it's cheaper. A byproduct of switching over to gas is a cleaner environment.

In the U.S., LNG is seen as a way to eliminate "quite stringent" emission regulations, he says. "The difference between the U.S. and elsewhere," he notes, "are tougher SOx and NOx rules, and the cheap supply of gas. It's a good situation. So things are being driven a little differently here. Elsewhere., I am not sure what they will do."

Using LNG as bunkers, however, will require significant investment. While there are already dual-fuel engines on the market, vessels that want to run on LNG need storage, and they need supply. "Unless you put gas into LNG form and have a pipeline going across borders, it's hard to export gas. It's not like oil, which you can just dump [as is] into a ship."

In regard to the engines, big suppliers, including MAN Diesel of Germany, have built low-speed diesel designs that enable switching between diesel and bunker fuel and using methane from an LNG tank in the ship. "They got a bunch of orders for these types of engines – mostly in the U.S.," says McCaul.

The real problem with fueling ships with gas is the need for really big storage tanks. "When it comes down to BTU per volume, you get more out of oil than gas, because you have to carry a bit more gas than volume in the ship, and it's an awkward volume too," says McCaul.

It's complicated enough that McCaul says the solution calls for mostly newbuilds, designed to accommodate very large, "peculiar" tanks that occupy a lot of space. And options are limited. You can't, for example, put the tanks under crew housing. In some cases, the tanks end up tacked on the back end, displacing containers, which cuts into revenues over time. "You have to ask yourself, 'Would someone build a ship like that under normal circumstances if the emissions requirement was not there?' I doubt it."

Movement is already underway in the U.S. "There's a whole pile of ships being built here under the Jones Act. Most cargo ships built recently were designed to use LNG as fuel, and they are all being built in the U.S., for example Puerto Rico and Matson in Hawaii, and all that is being driven mostly by the fact that gas is cheap here," says McCaul.

An alternative response to emissions rules is the deployment of stack emissions scrubbers. For vessels that are always in and out of U.S. ports with access to cheap gas, an LNG-powered ship makes more sense. But higher gas prices in places like Japan, means scrubbers may be a better deal there, in McCaul's view.

Royal Dutch Shell

The 488-m hull of Shell's Prelude FLNG plant floating out of the dry dock at Samsung Heavy Industries.

If You Build It, How Will You Fill it?

Running on empty only works in a song. Infrastructure for LNG bunkering barely exists. There's plenty of gas, there just aren't a lot of LNG refueling stations. It's particularly difficult for vessels plying an international trade, to find LNG fueling depots.

The problem is more that the current LNG universe is small overall, and concentrated in a few areas, both in terms of sourcing and buyers. LNG is largely consumed in Japan, Korea and Asia – and to a lesser extent in Europe, says McCaul. There is very little demand in the U.S., South America or Africa. The product primarily comes out of the Middle East, places on the Mediterranean, and Yemen. "There's relatively few places where [LNG] comes from and relatively few places where it is going," observes McCaul, and even that may shrink. Japan has significantly increased its use of LNG since closing down its nuclear power plants, but those plants are expected to come back on line, lowering LNG worldwide demand.

Even in the U.S., points out McCaul, there's no need for a huge number of LNG refueling terminals. A lot of LNG was supposed to come to the U.S., which six or seven years ago, had built maybe five or six terminals to receive imported LNG, with applications to build 40 more. But the discovery of gas here quickly flipped the focus to exporting gas, starting next year, to help fill growing demand in China and India.

Bunkering options will be created, says McCaul, noting that LNG-fueled ships are being built in the Gulf, as well as in Holland. He estimates that the U.S. could get by with less than 10 refueling facilities. But there's little demand at the moment, he adds, "Because not enough people want it yet." On the plus side, LNG bunker fuel costs, meanwhile, have declined much like gasoline prices in this country. "There's one airline talking about how much money they expect to make this year based on lower fuel costs – ships are the same."

One place where LNG is hot right now is the Gulf of Mexico, for supplying offshore support vessels. "There's a lot of interest to having those things powered by LNG, and it's got nothing to do with the environment – it's just plain cheap."

LNG Hurt Locker

In the meantime, oversupply, underpricing and slashed budgets are exacting a toll. When crashing oil prices force a major oil company like Shell to defer or cancel 40 projects and cut back on exploration, LNG can't escape the blowback. For instance, LNG export projects are being canceled, delayed or put on hold, including a $32 billion LNG plant slated for Canada's Pacific coast, and in all likelihood, at least some of the 15 pending applications for LNG export terminals in the U.S. In another example, McCaul points to a project to build a barge with a liquefaction plant on it to be

placed in Columbia, S.A., by Pacific Rubiales. A month away from completion and the company decided it didn't want the vessel any more. "They put it on hold two weeks ago because the economics of the mix is just not working; in this new situation they probably will not break even," says McCaul, "so the question at this point is what might they do with it? I don't think they know either."

The drop in crude pricing is significantly impacting LNG pricing worldwide, but particularly in the U.S., where producers seeking returns of up to $12 per mmbtu were facing $8.40 per mmbtu once crude fell to $60, and even less when it hit the lower depths of $50. Asian projects too are undermined by LNG prices, which have dropped under $10 MMBTU there.

A report from Cowen & Co. estimates that spending on exploration and production has dropped by more than $116 billion during oil's freefall. Indeed, exploration and drilling has been very hard hit. Projects worth funding at $100 a barrel are being shuttered and put on hold. In the last two weeks of February alone, 177 U.S. oil rigs were idled, according to Baker Hughes, bringing the total rig count down 25% since October, its lowest level since August 2011.

"The drilling business is horrible right now – no one wants to drill for low-cost oil," says McCaul. "There's a lot of drilling on land that they aren't completing, where they have a hole dug and are walking away from it. Why take it out at $50/barrel when a year from now it could be $100/barrel? They'll just leave it in the ground [until then]." Drilling for shale faces a similar dilemma.

Driving LNG Futures

The current situation of weak demand, oversupply and record low pricing meeting up with limited bunkering options and stalled drilling and building projects is going to bring change to the LNG market, starting with project planning and structures.

LNG projects have typically been tailor-made for a specific situation, and would encompass contracts to build the LNG import terminal, build the LNG liquefaction facility wherever the gas is and to build all the ships needed to carry the stuff. Everyone involved would have to commit to a 30-year proposition. The trend is toward building facilities that are not tied to a long-term contract, nor a specific use.

The use of gas as a fuel for ships is all part of a much bigger picture. Cheap gas, it turns out, is one of the major reasons for the economic turnaround in the U.S., according to McCaul. "It's just a phenomenal thing to have happen." It's driving the demand for new factories and new industry. "A lot of petrochemical businesses that had been outside the U.S. – or were here and moved out – are now coming back. German companies in particular find this a very attractive place to put up a plant." The U.S. has also become extremely competitive for factories where gas is part of the production process. And then, there is the worldwide movement toward gas-powered power plants.

As to when the industry might see a price recovery in oil and gas, and to what levels, well, that's anybody's guess. "Everyone pontificates but no one knows what and when the price of oil will be. Eventually it will have to go back up.

"In order to go find and develop and deliver crude oil, you have to have some price that gives you return on investment – otherwise you won't do it – $55 is at that level," explains McCaul. "It will constrict the supply and drive the price back up again – how much, and when, is another question, but it's probably not too far off in the future."

While some point to a future market of $75, McCaul says he's been using a price range of $60 to $80 for his work. "It could be next week or a year from now before we get to that amount." When exactly, is the multi-billion dollar question. McCaul says to watch for "imbalances." As the surplus falls off and demand grows, "as soon as a slight imbalance occurs, we'll see pricing changes. It's just supply and demand. It [pricing] has nothing to do with OPEC or the impact of regulations. Things just got out of whack."

Longer term, the future is bright for gas, according to the International Energy Agency. Its *"World Energy Outlook for 2014"* report projects that natural gas will continue to increase its share of the global energy mix, growing at 2.4% per year until 2018, eventually growing to represent a quarter of the global energy mix – oil, gas, coal and low-carbon sources – by 2040. Oil and gas will continue to make up about half of global supply in 25 years' time.

With conventional supplies often taking years to bring online, and unconventional supplies requiring potentially lengthy changes in infrastructure or regulation, the industry must think about how it must develop supply over the years to come.

The 2015 Yearbook

Offshore Outlook

Courtesy SBM Offshore

As we are now one year along on the great oil and gas price swoon of 2014, MR examines the energy market – and its impact on marine business – going forward.

As the reality of the sub-$60 barrel of oil starts to settle in, reaction from the offshore sector is predictable: slashing of costs, mainly in the form of reductions in E&P budgets (we've heard, in some cases, by as much as almost 40%), and employee layoffs by the tens of thousands. Offshore oil production, particularly in high-cost regions such as the Norwegian North Sea and in deeper waters, has started to slow considerably.

As our own Tish Keefe reported in the April 2015 Offshore Annual edition of Maritime Reporter & Engineering News, many oil majors have approached key suppliers and demanded 30% cost reductions … to start the negation.

In truth it is foolhardy to nobly procrastinate on the future direction of oil and gas pricing, as we have seen many 'experts' on the industry take vastly different views on the direction and speed of the recovery. In the report released in Spring 2015, "Global Offshore Projects 2015" from Wikborg|Rein, Gavin Stachan wrote that OPEC believes the oil price will rise in a few months; many Western oil companies anticipate low prices for 12 to 18 months while BP is planning on low prices for three years, while the IEA sees the price 'bumping along' in the $75 range for many years.

The Norway Way

Norway is a high cost country, from a beer at the bar to manufactured ships and everything in between. Oil produced from the Norwegian North Sea is certainly no exception. Oil is a precious commodity globally, but perhaps even more so to Norway, which depends on the productivity of its offshore oil wells for its very financial footing, today and in the future.

With oil being central to the Norwegian way, its outlook on the current price crisis, delivered courtesy of "Maritime Outlook 2015" from the Norwegian Shipowners Association (NSA) is telling. While the precipitous plunge is problematic, it really only tells a portion of the story. Norway considers prolonged stagnation in the global economy, growing political tension and instability in several world regions, and a general breakdown in international cooperation all factors making the path ahead a perilous one for this wealthy oil nation of five million.

Norway is also a global leader in the design, outfit and production of Offshore Service Vessels (OSVs) with a fleet exceeding 600 vessels, second largest in the world behind the United States. Norwegian OSV owners expect turnover to fall by 4.2% in 2015, the first fall in turnover in the OSV segment since 2002.

Conversely, a winner on the maritime side of the equation has been the tanker market. When OPEC essentially refused

Courtesy SBM Offshore

Complex designs: The FPSO Cidade de Ilhabela

to prop up global oil pricing by reducing production, its strategy created a big demand in the tanker sector, improving rapidly in the second half of 2014 and continuing through the beginning of 2015. According to the Platou Report 2015, cheaper oil meant longer trading distances, as the U.S. shale revolution pressured more cargos toward Asia. In step with this increased demand, tanker fleet growth was largely stagnant and overall utilization flew north of the 85% mark.

Going Deep with Floaters

Despite industry gloom about the offshore market, orders for production floaters continue to flow, according to Jim McCaul, IMA/World Energy Reports and a noted, long-time expert in the Floating Production field. When speaking McCaul at press time, he said that over the past few weeks a speculatively-ordered FLNG found use off Africa, negotiations began to convert a third LNG carrier to an FLNG, an FSRU was ordered and a modified LNG tanker has been leased for storage use.

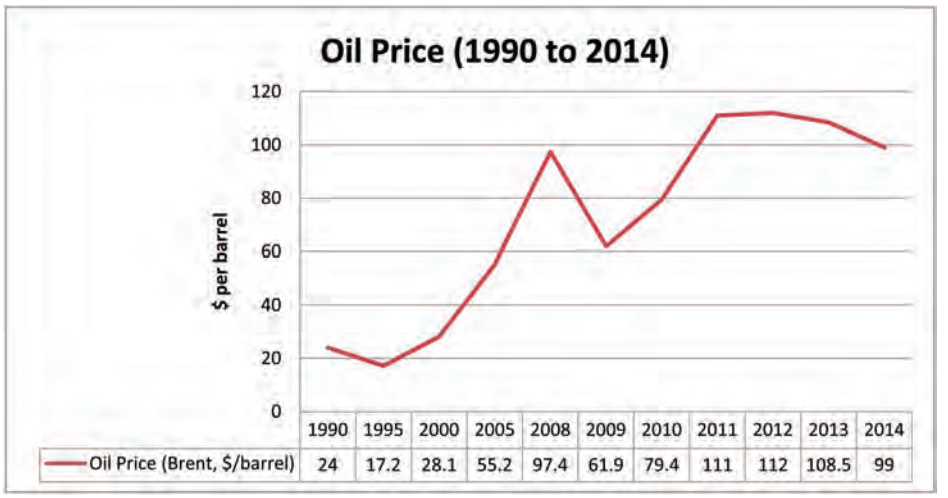
"Looking forward, we are tracking 30 projects considered likely to generate contracts for floating production units over the next 18 months," said McCaul." Among the likely awards are 18 FPSOs, two production semis, five LNG liquefaction or regasification units and five FSOs.

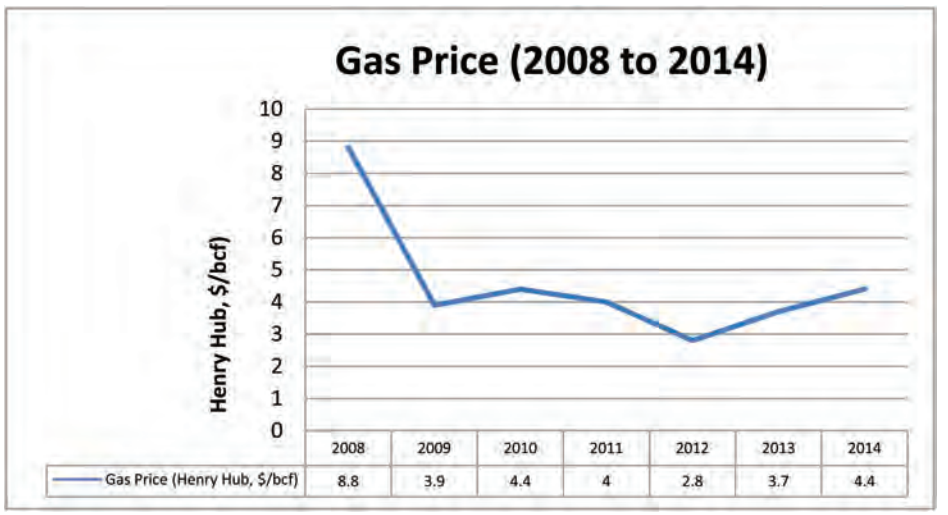
"We continue to view the downturn as a bump in the road," said McCaul. "Oil supply got a bit ahead of demand, oil prices collapsed – abetted by financial market speculation – and the industry pulled back on investments. Orders for new systems suddenly slowed. This has happened before, and will recur again."

A major differentiator in this energy storm is the simultaneous implosion of Petrobras, creating in McCaul's words a "perfect storm through the floating production sector. The storm appears to be an event of the past."

"The most likely scenario is for oil prices to hover in the $70s over the next few years – with spikes above and below. This price level will support many deepwater project starts, particularly as development costs fall as a result of surplus supply capacity," McCaul concluded.

A detailed review of the future market and forecast of production floater orders is in the March IMA/World Energy Report, including a forecast of floater orders through 2019. For full details visit: **www.worldenergyreports.com**.





U.S. Navy photo

A Landing Craft Air Cushion transports a Logistic Vehicle System Replacement ashore from the Military Sealift Command mobile landing platform USNS Montford Point (MLP 1) as part of offload operations held during the Montford Point's post-delivery test and trials.

U.S. Navy

Navy is "where it matters, when it matters"

By Edward Lundquist

If you pick up a naval or defense–related magazine from ten years ago, the stories would look pretty much the same as they do today. "These are uncertain times." "We have to do more with less." "We have to transform our military." "We can't afford as much, so what we do buy has to be better." "We need to adapt faster than our adversaries."

The more things change, the more the headlines stay the same.

With the budget-balancing device known as sequestration looming over the Pentagon, there is no end to the security challenges faced by the armed forces. North Korea and Iran continue to pose a threat that is shrouded in mystery in unpredictability. China may or may not be a threat, but based on the growth of its military and its growing claims of territorial waters and control of airspace have its neighbors worried. Those who thought the Cold War was over now see a revanchist Russia annexing the sovereign territory of Ukraine and fomenting armed separatists there. Russian ships and aircraft are now conducting patrols that harken back to the days of the Soviet Union. One threat most people didn't see coming was the jihadists trying to reestablish the caliphate of centuries ago. Piracy, contraband smuggling and human trafficking have spurred an international naval response.

With limited resources and lots of threats, the Navy is trying to recapitalize and be the sea service it needs to be for the next several decades. That includes modernizing existing ships and aircraft and building new ones.

This summary provides an overview of some of the sea service's major ship programs. It doesn't include all details about all classes of ships; is not in any order of priority, and is admittedly brief.

And what's "new" is open to interpretation. The newest and most modern destroyer ever built, the DDG 1000, has been a line item in the federal budget for more than 20 years. The LCS program was kicked off more than a decade ago. The Navy just christened the USS John Finn (DDG 113), the latest ship in the Arleigh Burke class of guided missile destroyers, the first of which was commissioned in 1991.

And something that is relatively new and different can't shake the past. LCS was developed as a platform for systems to deal with three specific threats in a littoral environment. Critics continue to decry the lack of firepower or survivability in a shootout, and ignore the real threats in the littoral that can't be fully addressed by existing platforms.

Ballistic missile defense is on one end of the warfare spectrum, while from the

U.S. Navy photo by Mass Communication Specialist 3rd Class Jonathan B. Trejo

Landing Craft Air Cushion (LCAC) 27, assigned to Assault Craft Unit (ACU) 4, prepares to embark aboard the amphibious transport dock ship US New York (LPD 21) during the on-loading of the 24th Marine Expeditionary Unit (24th MEU). New York, part of the Iwo Jima Amphibious Ready Group along with the embarked 24th MEU, is deployed in support of maritime security operations and theater security cooperation efforts in the U.S. 5th Fleet area of operations.

asymmetric threats in the littoral and humanitarian assistance, disaster response and theater security cooperation are on the other. Aegis guided missile cruisers and destroyers have proven they can track and engage ballistic missiles and warheads in space. They're so good at it that the president has ordered four DDGs to the Mediterranean as part of the European Phased Adaptive Approach. The ships—three of which are now based in Rota, Spain and another will be arriving soon—are joined by the first shore-based Aegis system now established in Deveselu, Romania.

Places and bases

In recent Senate testimony, Chief of Naval Operations Adm. Jonathon Greenert talked about the importance of forward presence. "Last August, the Bush Carrier Strike Group relocated from the Arabian Sea to the Arabian Gulf, it's about 750 miles, in less than 30 hours, immediately flew 20-30 combat sorties per day. And for 54 days; that was the only coalition strike option to project power against ISIS. The destroyer Truxtun arrived in the Black Sea within a week after Russia invaded Crimea. And the littoral combat ship Fort Worth and the destroyer Sampson were among the first to support the search effort for Air Asia flight 8501 in the Java Sea. So, we have been where it matters, when it matters."

Greenert has talked about being "where it matters, when it matters," especially when disaster strikes. He points to the Asia Pacific region and the "ring of fire" that spawns volcanic eruptions, earthquakes and tsunamis.

The events of the past year have also underscored the importance of operating and prevailing the littoral environment. The littoral is vastly different than open ocean operations.

According to Prof. Kalev Sepp, director of the Littoral Operations Center (LOC) at the U.S. Naval Postgraduate School (NPS) in Monterey, Calif., "The littoral is where hydrography, geography, commerce, fishing, mining, political boundaries and claims, and military maneuver and sustainment issues converge, to complicate both the offense and the defense, and to place exceptional demands on naval, aerial, and land forces that must operate, fight, and influence events there."

"Very little in the world today escapes the involvement of the littorals," said retired U.S. Navy Cmdr. Steve Benson, Saab Electronic Defence Systems program manager for the Littoral Operations Center. "The global littorals are and have been since time in memorial the dominant geographic feature in human existence. An increasingly interconnected world becomes increasingly reliant on stable conditions in the littorals. In the future we have to prepare well for joint and combined operations compressed into the complex, congested and contested littorals."

Sequestration

Greenert said, the continuing resolution and the sequestration of 2013 has degraded the Navy's readiness and capabilities. "Budget reductions have forced reduction of afloat and ashore operations, generated maintenance backlogs, and have compelled us to ex-

Aircraft Carriers Update

USS Nimitz	(CVN68)	Undergoing 16-month maintenance availability	Bremerton, WA
USS Dwight D. Eisenhower	(CVN 69)	Final stages of DPIA at Norfolk Naval Shipyard.	Newport News, VA
USS Carl Vinson	(CVN 70)	Transit in the U.S. 3rd Fleet area of operations	San Diego, CA
USS Theodore Roosevelt	(CVN 71)	Deployed in the U.S. 5th Fleet area of operations.	San Diego, CA
USS Abraham Lincoln	(CVN-72)	Undergoing RCOH at Huntington Ingalls Industries, Newport News Shipbuilding.	Newport News, VA
USS George Washington	(CVN-73)	Deployed in the U.S. 7th Fleet area of operations	Norfolk, VA*
*Home port: Yokosuka, Japan. Homeport shift to Norfolk, VA following FDNF turnover with CVN 76.			
USS John C. Stennis	(CVN-74)	Pre-deployment work ups	Bremerton, WA
USS Harry S. Truman	(CVN-75)	Pre-deployment work ups	Newport News, VA
USS Ronald Reagan	(CVN-76)	Pre-deployment work ups in preparation for homeport shift to Yokosuka, Japan	San Diego, CA
USS George H.W. Bush	(CVN-77)	Preparations for June 15 Availability	Newport News, VA

Aircraft Carriers Under Construction or Proposed

Gerald R. Ford	(CVN-78)	Scheduled to be commissioned in Spring2016.
John F. Kennedy	(CVN-79)	Keel Laying planned for August 2015.
Enterprise	(CVN-80)	Scheduled to be commissioned in 2027.

U.S. Navy Ship & Submarine Update

Hull Number	Hull Name	Shipyard	Most Recent Key Milestone	Milestone Date
AGOR 27	NEIL ARMSTRONG	Dakota Creek	Christening	29-Mar-14
AGOR 28	SALLY RIDE	Dakota Creek	Christening	9-Aug-14
DDG 1000	ZUMWALT	BIW	Christening	12-Apr-14
DDG 1001	MICHAEL MONSOOR	BIW	Keel Laying	23-May-13
DDG 1002	LYNDON B JOHNSON	BIW	Start Fabrication	4-Apr-12
DDG 113	JOHN FINN	HII	Keel Laying	18-Nov-13
DDG 114	RALPH JOHNSON	HII	Keel Laying	12-Sep-14
DDG 115	RAFAEL PERALTA	BIW	Keel Laying	18-Oct-14
DDG 116	THOMAS HUDNER	BIW	Start Fabrication	15-Feb-13
DDG 117	PAUL IGNATIUS	HII	Start Fabrication	30-Sep-14
DDG 118	DANIEL INOUYE	BIW	Start Fabrication	31-Oct-14
JHSV 4	FALL RIVER	Austal	(Delivered)	15-Sep-14
JHSV 5	TRENTON	Austal	(Delivered)	13-Apr-15
JHSV 6	BRUNSWICK	Austal	Launch	19-May-15
JHSV 7	CARSON CITY	Austal	Start Fabrication	9/14
JHSV 8	YUMA	Austal	Start Fabrication	2/15
LHA 7	TRIPOLI	HII	Keel Laying	20-Jun-14
LPD 26	JOHN P MURTHA	HII	Christening	21-Mar-15
LPD 27	PORTLAND	HII	Keel Laying	20-May-13
MLP 3	LEWIS B PULLER	NASSCO	Launch	7-Nov-14
T-AGS 66	MAURY	VT Halter	Christening	27-Mar-13
LCS 5	Milwaukee	MM	Builders trial	May-15
LCS 6	Jackson	Austal	Builders trial	May-15
LCS 7	Detroit	MM	Christening	18-Oct-15
LCS 8	Montgomery	Austal	Christening	8-Nov-14
LCS 9	Little Rock	MM	Keel Laying	27-Jun-13
LCS 10	Gabrielle Giffords	Austal	Launch	25-Feb-15
LCS 11	Sioux City	MM	Keel Laying	19-Feb-14
LCS 12	Omaha	Austal	Keel Laying	18-Feb-15
LCS 13	Wichita	MM	Keel Laying	9-Feb-15
LCS 14	Manchester	Austal	Keel Laying	May-15
LCS 15	Billings	MM	Start Fabrication	8-Dec-14
LCS 16	Tulsa	Austal	Start Fabrication	11-Sep-14
LCS 17	Indianapolis	MM	Start Fabrication	May-15
LCS 18	Charleston	Austal	Start Fabrication	May-15

Submarines

SSN 785	John Warner	Block III	Under construction
SSN 786	Illinois	Block III	Under construction
SSN 787	Washington	Block III	Under construction
SSN 788	Colorado	Block III	Under construction
SSN 789	Indiana	Block III	
SSN 790	South Dakota	Block III	
SSN 791	Delaware	Block III	
SSN 792	Vermont	Block IV	
SSN 793	Oregon	Block IV	
SSN 794		Block IV	
SSN 795	Hyman G. Rickover	Block IV	
SSN 796	New Jersey	Block IV	
SSN 797		Block IV	
SSN 798		Block IV	
SSN 799		Block IV	
SSN 800		Block IV	
SSN 801		Block IV	

U.S. Navy photo by Mass Communications Specialist 1st Class William Larned

The Virginia-class attack submarine USS California (SSN 781) returns from its maiden deployment to its homeport at Naval Submarine Base New London. Under the command of Cmdr. Shawn Huey, California is returning from the European Command areas of responsibility where the crew executed the Chief of Naval Operation's Maritime Strategy in supporting national security interests and Maritime Security Operations.

tend unit deployments. Since 2013, many of our ships have been on deployment for 8 to 10 months or longer, and that exacts a cost on the resiliency of our people and service lives of our ships."

Our science and technology investments are really the source of our war fighting advantage," said Greenert at the Naval Future Force Science and Technology Expo in February. "That's where it's going to come from. You invent it, adapt it, employ it, and put together an emerging technology into something that is functional and useful."

Directed energy weapons—including lasers and electro-magnetic rail guns—were examples of the kind of game-changing technologies the Navy needs. "Get us off gun powder and rocket propellant at sea," Greenert said. "We will have an incredibly deep magazine when we can bring those in. Probably the biggest vulnerability of a ship is its magazine because it's where all the explosives are. Imagine getting rid of that."

Greenert said these energy weapons will be safer, will reduce the logistics chain, and cost lea. "The cost of one of these shots on today's laser is about a dollar. And we've demonstrated it on the Ponce. Rail gun, $25,000 a round. You say that's a little pricey. Well, a missile half its range is a million dollars a round."

Greenert's term as CNO will end this year. His replacement, Adm. John Richardson, is currently the director of Naval Reactors.

CVN 78

A new class of aircraft carrier, Gerald R. Ford (CVN 78), is being built at Huntington Ingalls Industries Newport News Shipbuilding. She was christened on Nov. 9, 2013 and is expected to be commissioned in 2016.

Gerald R. Ford offers many performance improvements over the Nimitz-class aircraft carrier. The ship is nuclear powered with an integrated electric propulsion system. It has the Dual Band Radar system, incorporated in the superstructure. The "island" is 40 feet shorter in length, approximately 11 feet taller, and situated further aft on the flight deck than its predecessors. The flight deck is more efficient. Electromagnetic Aircraft Launch System (EMALS) will replace the traditional steam catapults and associated hydraulics. EMALS can launch more aircraft per day using fewer Sailors. The new system has not been without its problems, and is not yet fully reliable.

Newport News Shipbuilding is also performing the carrier refueling complex overhauls (RCOH) for the Nimitz-class carriers, as well as deactivation of nuclear carriers. The first CVN to be decommissioned is USS Enterprise, and thus the first to go through the process.

SN 774

The U.S. Navy's USS Virginia (SSN 774) class of nuclear-powered attack submarines (SSNs) are being built at a rate of two per year, with greater capability; are being built faster, with higher quality, able to operate more, and actually cost less. The Virginia class was created to provide a lower-cost alternative to the Seawolf (SSN 21) class, an ultra-quiet, high-performance, large submarine designed for a Cold War missions. Two yards are building the Virginia class boats— Huntington Ingalls Industries – Newport News Shipbuilding (NNS) Division and General Dynamics Electric Boat (EB) Division. Working with its suppliers, the Navy's "Design for Affordability" process has helped to bring the latest group of Block III boats for less cost without reducing capability, while also reducing the construction time by over two years from an 86-month span for the first ship down to 62 months.

According to Jim Hughes. Huntington Ingalls Industries vice president for submarine programs at Newport News Shipbuilding, predictable and fully funded production line block buys enables advanced procurement for both design and economic quantity ordering of materials and components.

Design for Affordability made some significant changes to the bow of the ship. The air-backed spherical array was replaced by a water backed Large Aperture Bow (LAB) array. This change allowed the original design 12 single purpose Vertical Launch System (VLS) missile tubes to be replaced with two large diameter Virginia Payload Tubes (VPTs), each capable of launching six Tomahawk missiles utilizing the same Multiple All-Up-Round Canisters (MACs) currently used on SSGNs.

"There were a number of other projects like that and, quite frankly, when you implemented a 20 percent redesign, you would expect that building the first boat of Block III, which was North Dakota, you would take a step back on the learning curve," Hughes says. "But we were immediately able to see improvements in cost from what we had been building on the previous block."

"Each Virginia-class submarine has higher quality and is a more complete ship at initial delivery, says Capt. David Goggins, program manager for the Virginia-class submarine with Program Executive Office Submarines (PEO Subs). "And by having a shorter construction span, we can now install the latest combat system during construction, making these boats ready for mission tasking immediately at delivery."

The next group of ships, Block IV, will have a longer hull to make room for four more VPTs, and thus more missiles. The Navy awarded a 10-ship $17.6 billion

contract in April of 2014 for the Block IV Virginia-class attack submarines.

"The Block IV award is the largest shipbuilding contract in US Navy history in terms of total dollar value," said Rear Adm. Dave Johnson, program executive officer for submarines at Naval Sea Systems Command (NAVSEA).

The newest ship in the class, USS John Warner (SSN 785), just competed sea trials.

Ohio Replacement

The Navy is looking ahead to the next decade when the Trident ballistic missile submarines (SSDNs) reach the end of their service life. The first four of the 18-ship class were going to be retired to save money on the expensive mid-life refueling overhaul. Instead, the Navy went ahead with the refueling and converted them to carry Tomahawk land attack missiles (TLAMs) instead of nuclear-tipped ballistic missiles. To replace the remaining 14 SSBNs, the Navy is working on the Ohio Replacement Program. The cost of this effort dwarfs other shipbuilding programs so a special shipbuilding budget for this strategic deterrent program to protect the program and keep other shipbuilding programs moving ahead at the same time.

DDG 51

The USS Arleigh Burke (DDG 51) class of guided missile destroyers, equipped with the Aegis Combat System, provide the full spectrum of naval warfighting capabilities in multi-threat air, surface and subsurface environments. The ships are powered by four General Electric LM 2500 gas turbines to produce 100,000 total shaft horsepower with twin screws for speeds of 30 plus knots in open seas. The first in the class, DDG 51, was commissioned in 1991, and is still in service and has been modernized.

There different versions of the ship known as flights. DDG 51 through 71 represent the original Flight I design; DDG 72-78 and are Flight II ships; and DDG 79-122 are built to the Flight IIA design, most notably different with the addition of a hangar facility for two MH-60 helicopters. The Navy had ended production of the DDG 51, but with the truncation of the DDG 1000 program the production line was restarted. The new ships are referred to as Flight IIA restarts. A new Flight III variant is planned for introduction beginning with one ship in FY16, and will feature the Air and Missile Defense Radar (AMDR). In place of the SPY 1-D radar.

The Navy wants a multiyear procurement of 10 Flight III Arleigh Burke-class guided-missile destroyers starting in 2018, and eventually build as many as 27.

The DDG 51 class are built by Huntington Ingalls Industries in Mississippi and General Dynamics Bath Iron Works in Maine.

A DDG Modernization program is providing a comprehensive mid-life upgrade for both the combat system and hull, mechanical and electrical systems. Many of the DDGs have received ballistic missile defense (BMD) capability upgrades.

DDG 1000

The USS Zumwalt (DDG 1000) lass of guided missile destroyers is very different from the DDG 51 and CG 47 surface combatants. It has sophisticated stealth qualities and sensors optimized for operating in the littoral environment and capable of strike operation with the two advanced gun systems (AGS), which can fire the long-range land attack projectile, capable of reaching targets 63 miles away.

DDG 1000 employs an all-electric Integrated Power System (IPS) that makes power available for propulsion, ship's service or combat systems as needed from the four Rolls-Royce MT 30 gas turbines.

It's big (more than 14,000 tons), but is highly automated allowing the ship to be operated with a crew of 130 and an aviation department of 28 personnel.

General Dynamics Bath Iron Works (BIW) is responsible for design, construction, integration, testing and delivery of the three ships, along with Huntington Ingalls Industries, Raytheon and BAE Systems.

The first two of the three ships have an all-composite deckhouse and hangar. Steel was used for the third ship.

CG 47

The Ticonderoga-class guided missile cruisers are multi-mission surface combatants featuring the Aegis combat system. The original five ships of the class have been retired, but the remaining 22 ships have been or are in the process of being modernized. In addition to providing anti-aircraft defense for carrier battle groups, these ships have also assumed important BMD roles. They were built by Huntington Ingalls Industries and General Dynamics Bath Iron Works.

The modernization program has been problematic, and the navy and Congress have argued about how best to fund the upgrades and service life extensions.

LCS

The littoral combat ship is finally taking its place in the fleet. USS Freedom completed a deployment to the Seventh Fleet and presently USS Fort Worth is conducting a 16-month deployment to Singapore.

Production is ramped up, and new ships of both the Lockheed Martin monohull and the Austal USA trimaran variants will be commissioned at a rate of about four ships per year.

During her 16-month deployment, the Fort Worth crew will change several times. There are three crews to every two-ship pair. The off-hull crews conduct training and deployment prepara-

U.S. Navy photo by Mass Communication Specialist 2nd Class Conor Minto

The littoral combat ship USS Fort Worth (LCS 3) prepares to transit alongside the Military Sealift Command dry cargo and ammunition ship USNS Wally Schirra (T-AKE 8) during a replenishment-at-sea. Fort Worth is conducting routine patrols in international waters of the South China Sea near the Spratly Islands.

tions in San Diego, and get underway on one of the ships, while one of the three crews is deployed forward on the other.

Milwaukee (LCS 5), Detroit (LCS 7), Little Rock (LCS 9), Sioux City (LCS 11), and Wichita (LCS 13) are under contract to Lockheed Martin and are in construction at the Marinette Marine Corp. shipyard. Jackson (LCS 6), Montgomery (LCS 8), Gabrielle Giffords (LCS 10), Omaha (LCS 12), and Manchester (LCS 14) are under contract to Austal USA and are in construction at the Austal USA shipyard.

Billings (LCS 15), Indianapolis (LCS 17) and LCS 19 are under contract with Lockheed Martin and in the pre-production phase at Marinette Marine Corp, while Tulsa (LCS 16), Charleston (LCS 18), and LCS 20 are under contract with Austal USA and in the pre-production phase.

The last 20 ships of the 52-ship program will be built as multi-mission frigates instead of the reconfigurable focused mission LCS variants. The frigates will have more weapons and survivability features built in.

The Navy proved the value of having an LCS deployed to the region following the loss of the Air Asia aircraft in the Java Sea. Immediately after arriving Singapore, Fort Worth got underway to support the search and recovery effort. A mobile diving and salvage unit was embarked aboard Fort Worth, taking advantage of the ship's internal volume and ability to launch and recover offboard systems. Using Fort Worth's two 11-meter RHIBS allowed the divers they were to bring their remotely operated vehicles and side scan sonar onboard the 11-meter rib, and have two of them operating simultaneously to cover more area.

JHSV

Designed for high-speed intra-theater lift, the Joint High Speed Vessel (JHSV) is a1,515 ton catamaran made of all aluminum construction at Austal USA, in Mobile, Ala, where the ships are constructed on a production line alongside the all-aluminum Independence-class littoral combat ship.

USNS Spearhead (JHSV 1) just completed a deployment to Africa, and USNS Millinocket (JHSV 3) is now deployed in support of Pacific Partnership.

Construction on the lead ship began in 2010, and she was delivered and placed in service in December of 2012. Four of the ships are operational and the fifth has just been delivered. Four more are under construction, and the tenth ship is under contract. The production line is now producing a new ship every six months. The last ship in the class, the USNS Burlington (JHSV 10), is expected to be delivered in July 2017.

"Our JHSV is an amazing cargo hauler, able to travel at 35+ knots for long distances carrying up to 600 tons of wheeled and tracked vehicles that come aboard using a large stern ramp. Airline-style passenger seats allow up to 300 troops to embark," said Rear Adm. Tom Shannon, commander of Military Sealift Command. "Berthing for up to 100 people is available. Add to this a shallow draft of 15 feet and you've got austere port capability. And we get all of this at a reasonable cost."

LPD 17

The USS San Antonio (LPD 17) class of amphibious transport docks can operate independently or as part of a task force to embark, transport and land Marine expeditionary forces. Each LPD 17 class ship has more than 23,000 square feet of vehicle storage space and well deck design which to carry and operate landing craft air cushioned (LCAC) vehicles or conventional landing craft. It can also operate helicopters and MV-22 Osprey tilt-rotor aircraft. The LPD 17 class are being built at Huntington Ingalls Industries.

LSD 41

The Navy has 12 USS Whidbey Island (LSD 41) class and USS Harpers Ferry (LSD 49) class dock landing ships—built at Lockheed Shipbuilding, Seattle, Wash., and Avondale Shipyards, New Orleans, La.—are smaller than the LPDs, and can also carry cargo, Landing Craft Air Cushion (LCAC), conventional landing craft and helicopters, to support Marines and expeditionary operations. These ships are receiving mid-life modernizations.

LCAC

The Landing Craft, Air Cushioned (LCAC) is a high-speed, fully amphibious landing craft capable of carrying a 60-75 ton payload, such as an M-1 tank, at speeds of more than 40 knots and deliver its load "feet dry" onto the beach. The LCAs are undergoing a service life extension program (SLEP) to keep these craft in service until replaced by the new ship-to-shore connector. Of the 91 LCACs originally built, 73 are to receive SLEP improvements.

SSC

The Ship to Shore Connector (SSC) will replace the existing LCAC fleet. Like the LCAC, the SSC is an air cushion vehicle that can operate from amphibious ships and mobile landing platforms to travel at high speed to land vehicles, heavy equipment, and supplies for a variety of expeditionary missions.

The Navy plans to procure 73 SSC craft, with deliveries starting in 2017 and initial operational capability projected for fiscal year 2020. Textron, Inc., New Orleans, La. has the detail design and construction (DD&C) contract.

"Big Deck Amphibs"

The Navy operates several versions of the large deck amphibious warfare ships known as LHAs and LHDs. The Tarawa-class LHAs and Wasp-class LHDs provide the Marine Corps with the ability to deliver Marines ashore by either helicopters or landing craft such as the LCAC. The LHA Replacement (LHA(R)) is intended to replace the aging Tarawa class. The newest of the "big decks" is USS Makin Island (LHD 8) and USS America (LHA 6). The LHA (R) class are optimized for aviation and capable of supporting current and future aircraft such as the tilt-rotor MV 22 and the Joint Strike Fighter (JSF).

LHD 8 and LHA 6 are 844 feet in length and displace about 45,000 tons. Both were built by Huntington Ingalls Industries. USS Tripoli (LHA 7) is currently under construction at HII.

T-AKE

The USNS Lewis and Clark class (T-AKE) of dry cargo/ammunition ships have replaced Military Sealift Command's single-mission ammunition and combat store ships. They are a welcome sight for U.S. and allied combatants be-

An aerial view of the future littoral combat ship USS Gabrielle Giffords (LCS 10) during its launch sequence at the Austal USA shipyard. The launch of the Gabrielle Giffords marks an important production milestone for the littoral combat ship program.

U.S. Navy photo

cause the T-AKEs provide ammunition, food, fuel, and other dry cargo at sea.

The 689-foot T-AKE has the most cargo capacity and the biggest flight deck of any combat logistics ship. Three of the 14 T-AKEs will be assigned to the Maritime Prepositioning Ship squadrons. They ships were built by General Dynamics NASSCO in San Diego, Calif.

MLP

The Mobile Landing Platform (MLP) is based NASSCO's existing commercial design for the Alaska class crude oil carrier. MLP has a huge deck low to the water so when the ship ballasts down, LCACs and other craft can come and do to carry vehicles and cargo ashore. The MLP can connect alongside with ships like the JHSV and LMSR to discharge their cargos for transfer to connectors that can bring it ashore.

A Core Capabilities Set (CCS) provides modules to support a vehicle staging area, vehicle transfer ramp, necessary mooring fenders and vessel lanes for LCACs. The first two MLPs, USNS Montford Point (MLP 1) and USNS John Glenn (MLP 2), with get the CCS. The third, USNS Lewis B. Puller (MLP 3), will be equipped as an Afloat Forward Staging Base (AFSB) variant. The AFSB role is currently being carried out by USS Ponce (AFSB (!) 15, which formerly served as an amphibious transport. Ponce supports MH-53E Sea Dragon mine-sweeping helicopters in the Arabian Gulf, as well as other patrol and mine-clearance assets. Ponce has a combined Navy and Military Sealift Command civilian mariner (CIVMAR) crew.

PCs

Once scheduled to be disposed for want of a mission, the smallest combatant in the U.S. fleet has had a resurgence.

The Navy has stationed ten coastal patrol boats (PCs) in Bahrain to operate with the Fifth Fleet. The PCs are an older and small platform, but are assuming a bigger role in maritime security. Today they carry out missions that might have previously been carried out by an Oliver Hazard Perry-class frigate, or are not appropriate for an Arleigh Burke guided missile destroyer. That doesn't mean the DDGs will not be deploying to the Arabian Gulf, because they still have a mission there well suited for a ship with its tremendous capabilities, such as ballistic missile defense. In fact, the PCs and DDGs together are a useful and formidable combination.

The 380-ton PCs have a small crew (four officers and 25 enlisted); are fast (they can achieve speeds of 35 knots), and well-armed for their size.

The 25mm Bushmaster guns have been replaced with the remotely operated small arms mount (ROSAM), a stabilized version of the Mk 38 25mm gun, controlled from within the skin of the ship. There are also .50 caliber machine guns that can be mounted. And now the PCs are being "upgunned" Griffin missiles for use against small surface targets.

The PCs can operate the RQ-20 PUMA AE unmanned aircraft system (UAS) while underway. PUMA is a battery powered, man-portable, hand-launched unmanned aircraft system made by AeroVironment of Monrovia, Calif.

The system not only provides better situational awareness for the crews, especially when conducting a boarding, but also for operational commanders ashore. Because PUMA is battery powered, the ships don't have to store dangerous aviation gasoline on board.

PCs also have a vital role closer to home. Three of them are now based at Mayport, Fla., and will be available for operations in the U.S. Fourth Fleet area of operation in support of U.S. Southern Command.

Five Minutes with

Paul Holthus

CEO, World Ocean Council

Recently in its New York City office Maritime Reporter sat with Paul Holthus, CEO of the World Ocean Council, for a discussion of the trend toward corporate ocean responsibility and his organization's contribution to that end.

by Greg Trauthwein

Can you tell us a bit about your meeting at the United Nations?

The U.N. has an annual briefing for governments on ocean issues that has been going for 16 years, but industry hasn't usually been well represented. As the World Ocean Council has become recognized as the comprehensive connecting point for the international maritime industries to these kind of global processes, we were invited to give the business perspective in the opening panel with the governments. This year there's a U.N. process for creating "Sustainable Development Goals", the next generation of the big, broad, global targets for development. One of the goals is on the ocean, and people have realized, 'We need to be talking to industry about sustainable development.'

So let's start from the beginning: The World Ocean Council. What is your mission? What do you do?

The WOC brings together the diverse ocean business community, which includes shipping, fishing, oil and gas, aquaculture, offshore renewables, seabed mining, and more, as well as supporting industries, such as shipbuilding and marine technologies. Our mission is to get the leadership companies from the diverse, global, ocean industries thinking about their long term relationship, role and responsibility with regard to ocean health, science and stewardship - what we call "Corporate Ocean Responsibility". We are facilitating collaboration amongst these companies to address the risks and opportunities affecting the future of ocean business operations.

From your perspective, what's the driver?

The driver is the fact that many of the sustainability-related issues, such as environmental impacts, are multi-industry in nature or their implications. So, for example, look at the marine sound issue, such as the possible impacts of sound on marine mammals, or the issue of biofouling and the transfer of invasive species. These are not just shipping

issues. They are issues for the oil and gas industry, as well for many other sectors. No single company, much less one sector, can solve those problems because they're interconnected. We need a critical mass of the whole range of companies working on these issues to address them. So we are creating a means for a collective effort by ocean-user industries that lead to business benefits through synergies, economies of scale and strength in numbers.

Tell us a bit about the membership of WOC.

The WOC is a multi-industry "leadership alliance". So it's about getting these different industries together to tackle shared, cross-sectoral issues. The different sectors live in different silos, but within each of the sectors there are companies – big and small –that think more about the ocean sustainability challenges. We have more than 80 members now, a mix of some of the biggest shipping and oil and gas companies in the world and other large companies from seabed mining, fishing and other sectors, as well as many medium and small enterprises. The WOC continues to grow steadily as more companies join and more participate in our network, which has over 34,000 ocean industry stakeholders.

How did you personally get involved in this?

I've been working on international ocean environmental issues all of my career, became more and more interested in the business of ocean use. I came from a marine science background way back, but I was always more interested in the human use and management of the ocean. It became clear that if we're really going to tackle ocean sustainability issues, the business community has got to lead the way.

As I was getting to know the many good, smart people in good, smart companies that care about the ocean, I saw that there was a need and opportunity to connect them with each other, particularly across the sectors. As we began creating this global 'ocean business community' that became the WOC, many companies expressed their interest in building an ocean industry leadership organization that was a bridge between the group and governments, intergovernmental bodies and the environment community.

So what are your biggest challenges today?

People's top priority is running their business. We want to help companies to ensure the success of their business by helping them realize and address the risks that ocean sustainability issues create to future operations. We are working to help shape the ocean sustainability agenda and turn possible threats into opportunities. For example, with the marine spatial planning that is going on in many parts of the world, there is a potential upside if industry gets involved early in a constructive way that helps shape how the ocean zoning is developed and implemented.

As an organization, how do you address those challenges?

We are creating the means for companies to collaborate for the good of business - and the good of the ocean - that has not existed before. A prime example is our "Smart Ocean-Smart Industries" program which builds on the concept of 'ships of opportunity.' There are 50,000 plus merchant vessels and another 1.3 million fishing boats out there, not to mention thousands of oil platforms, aquaculture facilities, wind farms, etc. These have the potential to host instruments that collect data to better understand the ocean and improve safety and sustainability. We are working to compliment the ocean observation programs at NOAA and others around the world by creating a systematic, comprehensive effort to engage companies in collecting data. Companies like Maersk, which is co-chairing the WOC working group on Smart Ocean-Smart Industries, are essentially saying, 'Look, we could do a lot more to possibly host instrumentation and collect data if someone made it easier for us to get involved.'

It's a matter of 'match-making' between the scientists and interested companies to host instrumentation that can collect data. This is one of the most cost-efficient ways to better understand ocean, weather and climate conditions and trends. More and better data from ocean areas can lead to better modeling and forecasting, which leads to better safety and sustainability. So there's a virtuous circle here that is a real win-win for the ocean business community.

So is WOC doing this from the stratosphere, or digging in and getting dirty?

We're asking scientists to "Tell us, what are the priority areas of ocean, which parameters and variables do you need more data on to improve your modeling; what's the instrumentation available, what are the operations, maintenance issues and costs". Then we are reaching out to the ocean business community and saying, for example, 'In the southern ocean, the science community is telling us there's a significant gap in data because it's so expensive to get their regularly with scientific vessels and there is so little commercial activity down there". But, there are more cruise ships traversing the area, as well as fishing boats from New Zealand and Australia, for example. If we had instrumentation on those vessels, we could help the scientists understand what's going on in the Southern Ocean, which is important to understanding weather and climate, as well as for improving forecasting, which will be directly and immediately valuable for the companies with vessels operating in the area . It's a matter of building those connections and creating the collaboration.

So what's 'in it' for the marine technology community?

In relation to marine technology, the "Smart Ocean - Smart Industries" program creates a much bigger market for the people who build the sensors and other instruments. Instead of selling solely to the world's scientific vessels, you could have a huge market even with a small percentage of the merchant fleet hosting instruments, perhaps many

Photo Credit: DNV GL

thousands of instruments. This kind of market opportunity can then drive innovation, for example, for making the equipment and sensors smaller, making them more efficient, making them easier to use.

So can you point to an example or two of how you have connected those dots in the real world?

One of the areas where we have been successful concerns the Arctic. As you know there is a lot of concern from governments and the environment community about industry Arctic interests and the difficult, operating conditions and sensitive environment.

Based on the interest of World Ocean Council members, we pulled together shipping, fishing, oil and gas, tourism and mining companies a couple of years ago for a first-ever multi-industry Arctic business leadership workshop to get the companies talking to each other across the sectors about shared Arctic challenges and opportunities and creating a business community interface with the Arctic Council. Going back a few years before that workshop, when Sweden began chairing the Arctic Council, so I showed up to meet with the Arctic Ambassador in Stockholm, Sweden, essentially saying, "WOC has this group of companies that wants to help build a constructive, proactive relationship with governments and other concerned people about industry interests in the Arctic."

And their response?

Simple. It was "Great! Developing a more active working relationship with the private sector has been a priority for the Arctic Council." WOC came back a few months later with a delegation of oil and gas, shipping, and other industry folks, and they said, "You know, the World Ocean Council is the first entity that's actually delivered on creating this kind of coordinated Arctic industry interface with the Arctic Council."

We had that first workshop in Rejkavik, Iceland and the following day we had the first ever informal 'business dialog' between industry and Arctic Council, via their Sustainable Development Working Group. That effort sparked a process of engaging the business community, connecting the diverse business community, and then connecting business with the governments through their intergovernmental body.

It's a big world, it's a big ocean.

Photo Credit: iStock

Prioritization is, I assume, one of your major challenges. So if you had to prioritize the ocean issues, what would be the top three, and how is the World Ocean Council participating to be a part of that solution?

First I would say it's creating this business presence and input into ocean policy, governance and planning. This is playing out at all different levels, such as the U.N., the Arctic Council, national marine planning efforts. WOC convened the first-ever Business Forum on Ocean Policy and Planning here in New York in September 2014. We are working to make sure the business community is informed and aware of where ocean management regulations, policy and planning are being developed and already moving forward, usually with a lot of input from everyone except the ocean business community.

A second priority area is a series of cross-cutting, operational environmental issues that need to be addressed on an international, multi-industry scale. These include marine sound, as I mentioned, and issues such as bio-fouling and the transfer of invasive species, which is also not just a shipping issue, as there are oil rigs fishing boats, dredging equipment, etc., moving around the world.

Another major operational issue we are getting asked by our members to address is marine waste and the need for adequate port reception facilities. For example, there are new regulations for the sweeping and the washing of bulk carriers carrying mining products that mandate the testing residues to determine if they're harmful to the marine environment. And so that begs the questions: "Are the testing facilities available? How do the testing facilities work? How much do they cost? How much time does it take? Are the reception facilities available? So you have this well-intended regulation, and then you have an industry operating in this big gap between intention and reality. And you have reputable companies that want to do the right thing, but there are a whole series of conditions to sort out to make it possible to comply.

Is that it for the challenges?

A third priority I would emphasize is the need and opportunity to engage vessels and platforms in data collection.

We're really working hard to move forward with the "Smart Ocean-Smart Industries" program as a positive, win-win situation for industry. We encourage companies that are interested in participating in data collection to get in contact with us.

When you look at the broad scope of the businesses that serve the ocean industry, how do they view ocean issues today versus only a few years ago? Have attitudes changed, and if so, how?

Yes, I would say that attitudes are continuing to change. It is a mix of the regulatory and societal pressures that have really forced people to think and act.

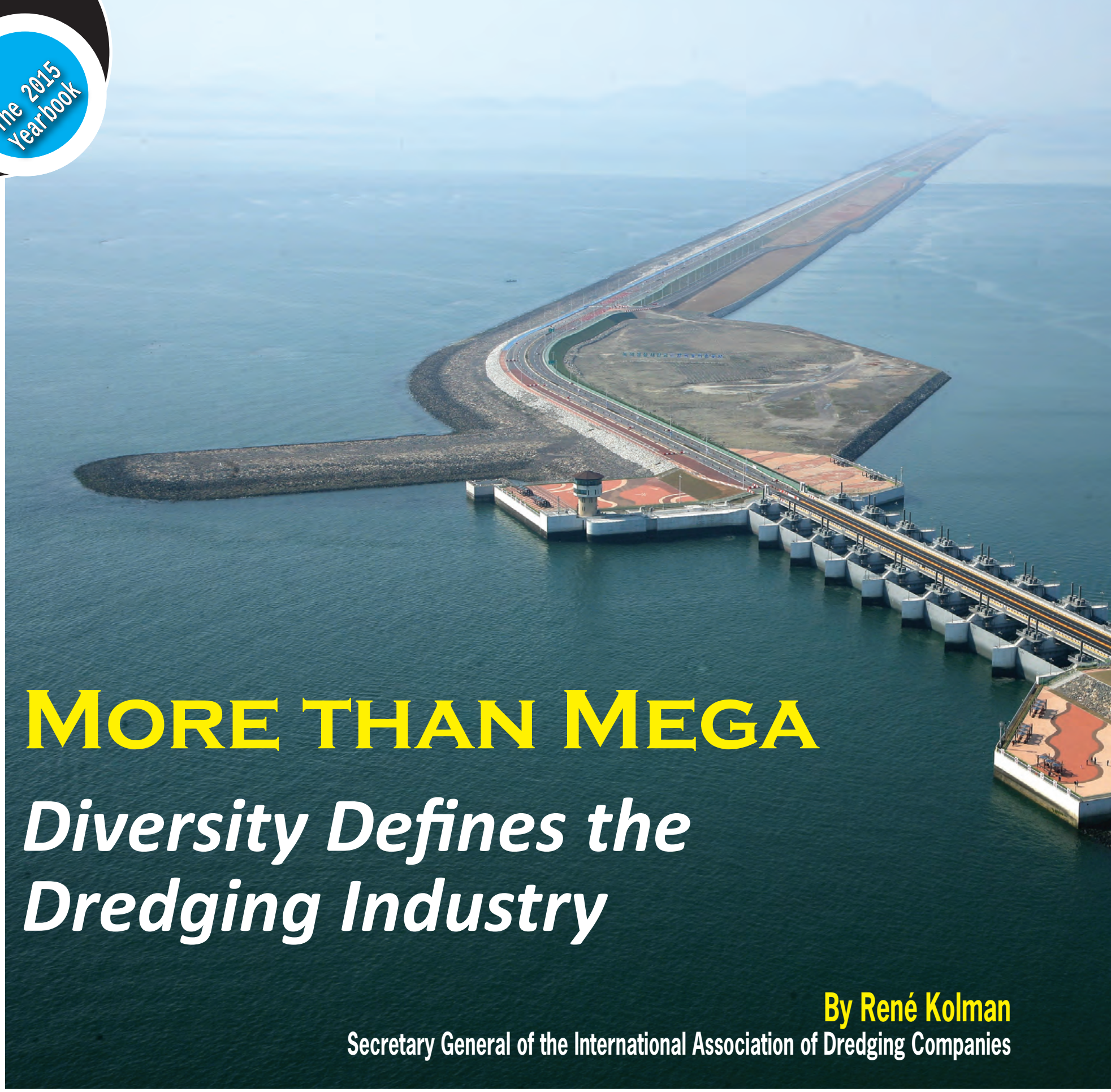
There are companies that will get out in front, others that will comply as the rules show up and others will be say, "Let's just keep our head down and hope that this issue goes away."

Our focus is finding the leadership companies, the ones that really see the business value of identifying and addressing an issue early on. I think another aspect of the attitude change is the concept of corporate responsibility, particularly for the bigger companies.

It's not about writing a check, it's about focusing on the effects of company policies, practices and operations, and determining the best thing to do for business and for the ocean.

And you're starting to see this done?

Yes we are. Smart, leadership companies are connecting with each other and with the science and technology, the safety aspects and the business drivers for responsible business. There is huge, fruitful ground here for really tackling the ocean sustainability challenges affecting the future of ocean business and that's what we're trying to do through the WOC. A key time and place where this all comes together is at the two-yearly WOC "Sustainable Ocean Summit" (SOS), the next of which is in Singapore, 9-11 November 2015.



More than Mega

Diversity Defines the Dredging Industry

By René Kolman
Secretary General of the International Association of Dredging Companies

The mantra of recent times has been the worldwide trend to 'mega'. Mega container ships created the need for mega ports which required mega dredging projects. These in turn demand mega dredging vessels. All this is true but disregards another development: the consolidation of the major dredging contractors into larger companies with long-term strategies that have resulted in diversification.

Today's major dredging contractors do more than dredge. They are partners in the development of a project. More and more often they work as EPC (engineering, procurement, construction) contractors, where the contractor designs the installation, procures the materials and builds the project. Besides land reclamations for port expansions, airport platforms and artificial islands, their activities include salvage, pipe laying and stone dumping for offshore gas, oil and wind energy as well as civil engineering projects. Diversification has helped the international dredging contractors satisfy a wide range of market demands.

Enormous equipment

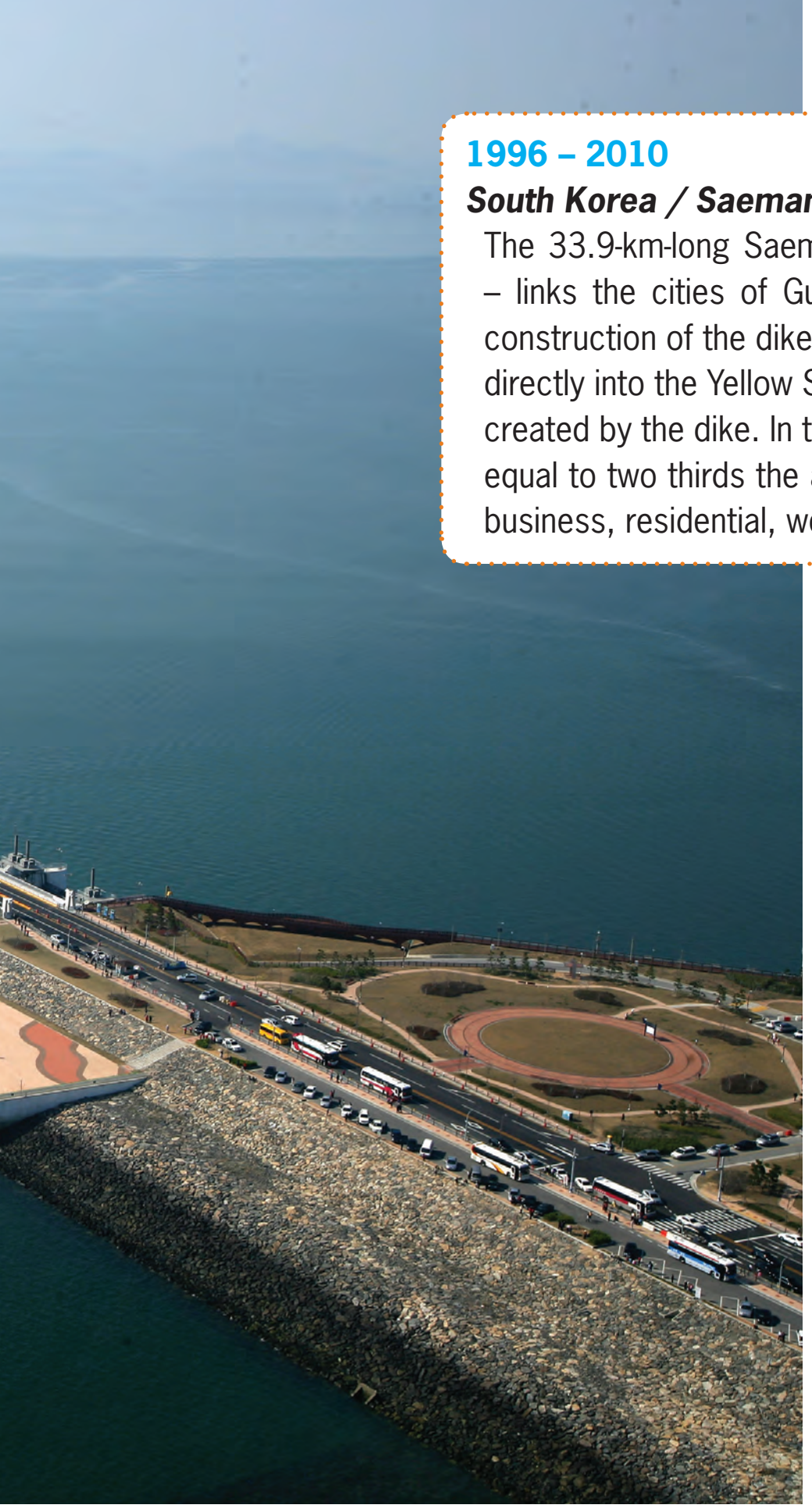
No denying that mega projects demand mega vessels. And indeed the major international dredging contractors have invested in larger equipment. In 1994 a trailing suction hopper dredger (TSHD) with a hopper capacity of 17,000 m3 was huge. In contrast, a recently constructed mega-TSHD has a 46,000 m³ hopper capacity. Cutter suction dredgers (CSD) and backhoes show the same growth spurt. The biggest CSDs can reach to more than 35 meters underwater and mega-backhoes are 60 to 70 meters in length with buckets up to 40 cubic meters.

Both the Panama and Suez Canal expansions indicate that this trend will continue – which means that ports, especially on the U.S. East Coast, are scrambling

1996 – 2010

South Korea / Saemangeum

The 33.9-km-long Saemangeum Sea Dike – the longest dike in the world – links the cities of Gunsan in the north and Buan in the south. Before construction of the dike, two rivers, the Mangyeon and Dongjin, discharged directly into the Yellow Sea. Now these rivers flow into a 400-km2 reservoir created by the dike. In the future this reservoir will be transformed into land equal to two thirds the area of Seoul to be used for agricultural, industrial, business, residential, wetland and ecotourism.



to deepen and widen access channels and berths. That said, new vessels on order are not just about size; they are about technology, as contractors confront other challenges like fuel emissions and environment.

Going "green"

Since ships move across vast international bodies of water, their fuel emissions during sailing know no boundaries. The International Maritime Organization (IMO), a United Nations agency, is therefore responsible for legislation that addresses the reduction of greenhouse gases caused by fuel emissions. This is not easy: emissions from freight ships differ from dredging vessels even if some dredgers are self-propelled and seagoing. But dredgers are also workboats. Standing still while at work, they are still expelling emissions. A worldwide reduction in emissions of SOx, NOx and Particulate Matter plus the introduction of Emission Control Areas (ECAs) has culminated in new limitations on SOx for parts of the North Sea and the California coast as of January 1, 2015.

One way to meet these requirements is with "green" dredging vessels, built with environmentally sound technologies like dual fuel engines and LNG tanks. Dual fuel technology is sustainable, allowing engines to operate on either diesel or LNG while limiting the CO2, Nox and SOx emissions to the strictest minimum.

Protecting natural habitats at dredging sites is also a necessity and a priority. Research for technologies to more accurately monitor the effects of dredging on marine fauna and flora is ongoing. One of these efforts, "Building with Nature," grew into a knowledge institute supported by an industry-government partnership (**www.ecoshape.nl**).

It emphasizes building hydraulic infrastructures that utilize natural processes and provide opportunities for nature. Another industry effort is focused on the "Ecosystem Services" concept, in which the value of infrastructure construction and that of natural assets can be evaluated.

Climate change awareness

More than 80 percent of the world's population lives near water. From Bangladesh and the Maldives to Miami, New York and the Netherlands, these populations and property are vulnerable. With the threats of climate change and consequent risk of flooding caused by rising sea levels now in full focus, the dredging industry has a crucial role to fulfil in coastal protection. Preventing shore erosion requires vigilance and innovative maritime solutions now and in the future.

Old markets, new markets

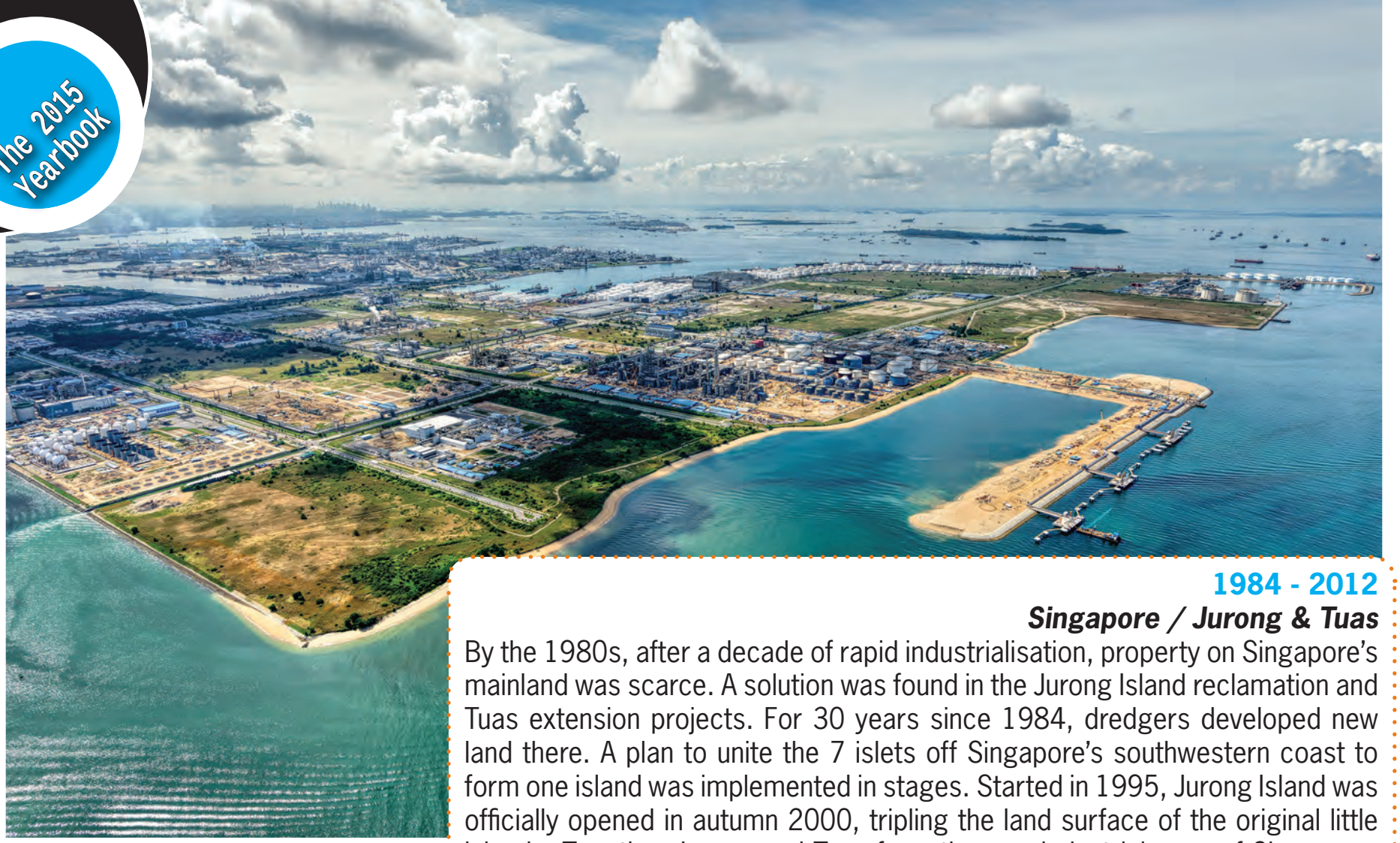
China has clearly emerged as a formidable force in maritime construction. Trade routes from east to west, from Asia to Europe, are plowed by the largest container ships ranging from 18,000 to 19,000 TEUs. But this has created another trend of north-south cascading trade routes taking advantage of smaller container ships heading to African ports. If this trend continues these ports will require modernization.

After the legendary works in Asia and the Middle East, the construction of artificial islands through land reclamation has expanded exponentially. It remains an economically viable means to meet the need for more land for a variety of uses. Brazil's Superporto do Açu and other South American ports testify to this. Not to forget the burgeoning Caribbean cruise industry with its floating skyscrapers that need ever-larger berths. Artificial islands are even being used to replace traditional gas and oil platforms.

Indeed, the offshore energy sector continues to be an important client for dredging contractors. Also in the renewable energy sector, where the popularity of offshore wind parks in Northern Europe has gained momentum and utilizes the expertise of the dredging companies to install wind turbines.

Remediation of contaminated sediments in certain regions, especially the U.S. and Canada, remains important. The Great Lakes clean-up and Superfund river projects are crucial to reversing earlier industrial pollution and ensuring clean water. Sweden has also committed to the remediation of its pristine fjords.

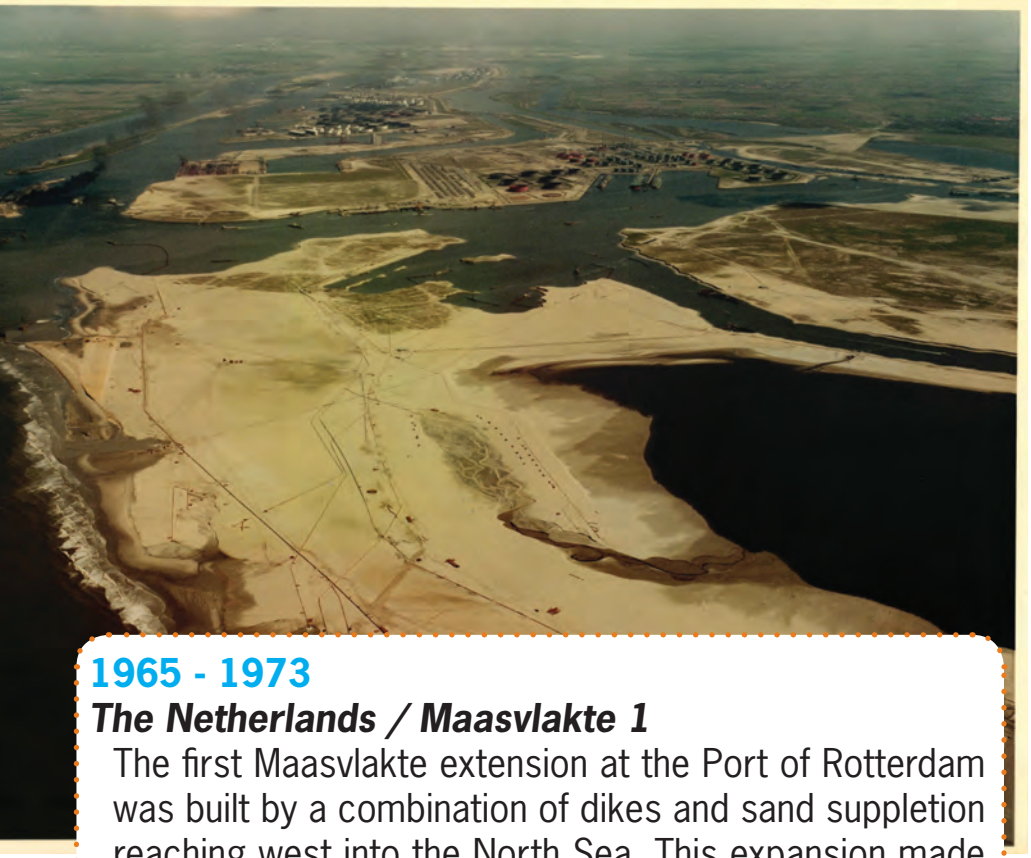
And finally, the opening up of the Russian and Canadian Arctic shipping passageways are creating opportunities



1984 - 2012

Singapore / Jurong & Tuas

By the 1980s, after a decade of rapid industrialisation, property on Singapore's mainland was scarce. A solution was found in the Jurong Island reclamation and Tuas extension projects. For 30 years since 1984, dredgers developed new land there. A plan to unite the 7 islets off Singapore's southwestern coast to form one island was implemented in stages. Started in 1995, Jurong Island was officially opened in autumn 2000, tripling the land surface of the original little islands. Together Jurong and Tuas form the new industrial zone of Singapore, with 987 hectares for the construction of a petrochemical complex.



1965 - 1973

The Netherlands / Maasvlakte 1

The first Maasvlakte extension at the Port of Rotterdam was built by a combination of dikes and sand suppletion reaching west into the North Sea. This expansion made it possible to receive larger ships and build numerous container terminals directly connected by train lines to the hinterlands of the rest of Europe, especially Germany. The extension also created space for the storage of toxic waste and polluted sand in an area called the Slufter and provided better protection for the environment.

for the dredging industry as well. Deep sea excavation systems are being developed that allow dredging to take place at depths varying from 100 to at least 1,000 meters.

Strengthening safety standards

Though it sounds obvious, safety is the highest priority within every project. The goal of achieving no incidents/no accidents on every job demands training programs, management participation and internal and external auditing. The international dredging contractors are instituting more and more programs to meet the highest standards of quality, health, safety and environment (QHSE).

IADC's communication challenge

For the International Association of Dredging Companies (IADC) the challenge is to explain the hows, whys and benefits of dredging. It is not amazing but most people have no idea what dredging is. Then again, how often does a dredging project occur in your neighbourhood? The tendency of stakeholders to react with 'NIMBY' attitudes ('Not in My Backyard') is still too prevalent.

The IADC aims to dispel the mystery and misunderstandings, helping stakeholders understand the engineering complexities and balanced approach of maritime construction projects. While representing the private dredging industry, the IADC is always ready to promote dredging in general. A high tide lifts all ships. Through its webinars and seminars, networking with other maritime organizations and by supporting scientific research and publications, the IADC reaches out to clients and communities. Terra et Aqua Journal and the IADC's Facts About series offer technical dredging information as do reference books like Hydraulic Fill Manual and Environmental Aspects of Dredging co-published by the IADC. The annual IADC publication Dredging in Figures compiles global statistics on all dredging endeavours, private and public, in open and closed markets.

A dredging project is an engine for social and economic progress. The IADC and its members strive for sustainable maritime construction that improves people's quality of life. This is not a trend – it is a permanent long-term goal.

2005 - 2015
Panama / Panama Canal

One hundred years after its opening in 1914, extensive operations are taking place at the Panama Canal. Whilst improvements have always been ongoing, recent works encompass the construction of two major lock complexes at the Atlantic and Pacific entrances, widening of a 14.2-km stretch of canal to 225 m and deepening to – 16.3 m, and deepening of the Pacific entrance and southern approach channel. Some 40 million m^3 of soil and rock have been excavated and 5 million m^3 of concrete are being poured. The notoriously hard subsoil was drilled and blasted. In total 25 million m^3 of Atlantic muck and Gatun rock were dredged.

Offshore Renewables
The Future is Now

Credit: London Array Limited

The London Array off the coast of Kent is the largest offshore wind farm in the world.

By Josh Keefe

While the recent swoon in world oil and gas prices has predictably cooled a number of offshore renewable projects, there is a palpable change regarding the way in which the world views renewable energy. Renewable energy projects, at one time merely serving as window dressing, are slowly weaving their way into the mainstream energy mix, with European countries, namely the U.K., leading the way.

In November world leaders will arrive in Paris to negotiate a new global agreement on climate change, one that is scheduled to go into effect in 2020, a measured designed to prevent the world's temperature from rising. The U.S. has already submitted its Intended National Determined Contribution to the UN Framework Convention on Climate Change in advance of the meetings in Paris, and in that document the Obama administration has set a formal goal of reducing emissions by 26% to 28% below 2005 levels by the year 2025.

While government targets for carbon emission reductions are a useful framework, the grunt work comes down to the researchers and engineers that are working tirelessly to tap this abundance of natural energy and deliver it efficiently and cost effectively to market.

Land based solar and wind technology have made huge gains in recent years, especially in Europe, but the ocean remains, for the most part, a vast untapped resource. This is, starting to change as offshore wind, tidal and wave technologies are in various stages of development and poised to soon become factors in the effort to reduce carbon emissions. But offshore energy also provides a host of challenges, including harsh conditions for installation and maintenance. Below we look at the three main offshore renewable energy options and examine their past, present, and future.

Wind

Offshore wind energy is by far the most developed offshore renewable energy resource. According to the Global Wind Energy Council's (GWEC) annual report, 8,771 megawatts (MW) of electricity was generated by global offshore wind resources in 2014, which is enough to power between 2 and 2.6 million U.S. homes.

The first offshore wind farm was installed off the coast of Denmark in 1991. Since then, the growth of offshore wind has been almost exclusively in Europe. Of the 8,771 MW of energy capacity from global offshore wind in 2014, 8,045 MW of it was generated in Europe, mostly in the North Sea. And within Europe, the UK dominates, accounting for 55.9% of all installations. That includes the London Array, currently the largest offshore wind farm in the world, which is comprised of 175 turbines covering an area of 100 sq. km with a capacity of 630 MW, or enough to power 500,000 UK homes a year. In February, the Dogger Bank Creyke Beck project was approved by the UK's energy secretary. The project will feature an array of up to 400 turbines and could fulfill 2.5% of the UK's electricity needs (while costing £6bn to £8bn). Denmark is the next largest producer of offshore wind energy, followed by Germany (Denmark, the UK, and Germany comprise 84.7% of all European offshore wind capacity). Outside of Europe, the remaining capacity exists in Southeast Asia, with China (669.9 MW) leading the way. China has made a huge commitment to offshore wind in the past year, adding 61 offshore wind units with a total capacity of 229.3 MW in 2014, compared to 39 MW added in 2013 (that's a 487.9% increase). Japan (49.7 MW) and Korea (5 MW) also have offshore wind capacity.

The U.S. does not currently have a commercial offshore wind farm, although the U.S. Department of Energy's recent Wind Vision Report say that the U.S. has 4,200 GW of offshore wind technical resource potential. Developing just a quarter of that capacity would be enough to power the entire U.S. That development is in its infancy, but it has started: in April construction began on the Block Island project 18 miles off the coast of Rhode Island, which is scheduled to start supplying power by the end of 2016.

"What we really need to see is project number one," said John Rogers, Senior Energy Analyst at the Union of Concerned Scientists. "That's what I'm most excited about, whatever project is the first to get steel in the water and get electrons into the wires. It is really important for people in the U.S. to see one of these projects, to be able to kick the tires on it and appreciate offshore wind's value."

Tide

While the technology used to capture energy from offshore wind has more or less been established, capturing the power of the tides is a bit trickier. In total, the world has about 500 MW of power generating capacity and that could rise to 800 MW by 2020. But tidal energy's worldwide capacity has been estimated to be 80 GW. Several different methods have been used to capture the power of the tides, which has the advantage of being consistent and predictable compared to other renewable energy sources, but none has become the clear standard, in spite of the fact that the first large-scale tidal power station, the Rance Tidal Power Station in Brittany, France, will be 50 years-old next year.

Rance uses a form of technology called a tidal barrage, which is a structure placed across a river or bay that captures the energy from the flow of the tides. Sihwa Lake Tidal Power Station in South Korea, which opened in 2011 and is the world's largest tidal power station, also uses tidal barrage technology to create a 254 MW capacity (Rance's capacity is 240, which, combined with Sihwa, accounts for just about all of the world's capacity).

The future tidal lagoon generation, a new form of harnessing the power of tides, may be largely dependent on one

project, the Swansea Bay tidal project on the coast of Wales. Swansea is likely to cost $1.6 billion, and is entering the final stages of government approval. The project will be a 4.4 square mile lagoon. When the tide rises, the lagoon will fill, turning turbines, and when the tide lowers, the water would stay in the lagoon, before eventually being released, again turning the turbines.

Besides tidal barrages and lagoons, there are a great deal of tidal stream generator designs that are both currently in the field and under development. Many of these devices are different configurations of turbines that operate according to the same principles as wind turbines and are either anchored to the ocean floor or to a floating platform. Construction has just recently started on what is being called the largest tidal energy project in the world, the MeyGen project off the northeast coast of Scotland. The project will use seabed-anchored turbines to generate a nearly 400MW capacity by the early 2020s.

Wave

Wave energy is created by harnessing the up and down, rollicking energy of the waves, and is more challenging to capture than tidal energy. The potential, however, is enormous: the Electric Power Research Institute (EPRI) published a study in 2011 that estimated that the recoverable wave energy potential along the U.S. shelf is one third of the entire U.S. electricity usage.

There was a small installation of wave energy converters launched off the coast of Portugal in 2008, but that was shut down due to financial difficulties, and the company that was developing the technology, Pelamis Wave Power, went under last year. Even heavy hitters like Lockheed Martin have failed to produce wave energy solutions: the company's partnership with Victoria Wave Partners to build what was called the world's largest wave energy project off the coast of Victoria, Australia appears to be dead. And in December of last year, the UK's Offshore Renewable Energy Catapult (ORE) warned in a report that the wave energy market "is strategically important to the UK but is on the brink of foundering."

Current wave energy designs include oscillating water columns, (a device that uses waves to push air upward through a turbine), attenuators (think of a long snake that slithers on top of the waves), overtopping devices (which create reservoirs that are filled with waves), and point absorbers, which are floating buoys that have internal parts that move up and down independently from one another to create energy.

In spite of all of this uncertainty around design, Australia switched on its Carnegie Perth Wave Energy Project in February, which is now feeding energy into HMAS Stirling, the largest naval base in Australia. The project deploys Carnegie Wave Energy Limited's CETO technology, which uses the motion of fully submerged buoys to drive seabed pump units.

While offshore wind, tidal, and wave energy all have enormous potential, it may be that the future of offshore renewables rests in the consolidation of these technologies to streamline maintenance and transmission costs.

"The best potential eventually might be a combination grouping different technologies," Rogers said. "You could imagine an offshore wind farm that also has wave generators stationed around it."

A chat with John Murray, Chief Executive, Society of Maritime Industries

The Society of Maritime Industries is the voice of the U.K. maritime engineering sector, and its Chief Executive John Murray is the very public and indelible face of the organization. SMI promotes and supports the interests of organizations with activities and interests in this sector both to its membership and the wider world. In total it is a trade association of more than 150 organizations across the maritime, offshore energy, subsea, naval and academic sectors, and the society has been busier than ever, as a number of drivers have buoyed the prospects of all matters maritime in the U.K.

Four Key Drivers

The issues driving the maritime and offshore sectors in the U.K. are similar to many drivers to the larger global maritime world, as Murray points to four key drivers as keys to business, present and future:

- *Autonomy*
- *Climate change (and the need for 'green' ships and renewable energy)*
- *Research & Development, and*
- *The U.K. Navy business.*

"(When I say autonomy, I mean) autonomy both in terms of automation in the operation of ships and other maritime equipment and autonomous devices and systems in respect of the demand to lower the cost of ocean surveys and de-risk defense and security operations," said Murray. "Furthermore there is the requirement to extract mineral resources from the ocean, such as deep sea mining, which can only be feasible through the extensive use of autonomy."

While SMI, its leadership and member companies are well in tune with the cyclical nature of the various markets they serve, Murray is quick to point out that the four big drivers are all 'big picture' items, meaning that while they will fluctuate due to near term events, they are all solid pillars for growth, citing renewable energy and the current low price per barrel of oil as leading examples.

"Those who believe that the rapid fall in the price of oil will put a damper on the need to seek more environmentally sustainable sources of energy are deluding themselves," said Murray. "In Europe there is a legislation to ensure governments take steps to raise the share of energy consumption produced from renewable resources to 20% by 2020. Currently there are huge developments taking place in UK waters and by 2020 there will be around 10GW installed providing 8-10% of the UK's annual electricity requirements."

While investment in the U.K. Navy is far from tops in the world, Murray maintains that the UK still has a substantial naval ship and submarine build program. More importantly, perhaps, has been the realization in political circles of the depth and breadth of the Navy shipbuilding program to all of England, and not simply the coastal areas. "We have made tremendous inroads" (into the minds of government), said Murray. "Politicians now are realizing the economic impact as well as the jobs impact." He noted that it was only five years ago that there was a real threat to the progression of the U.K. aircraft carrier program. To aid the education effort, SMI produced a map of Britain illustrating supply chain constituency. "There were lots of red dots all across Britain, and that really hit home with a lot of our Parliamentarians," said Murray.

Globalization and legislation has been the impetus for many of the drivers, producing opportunity and challenge in nearly equal measure. "If I take just one example, prior to the global financial shock shipbuilding was in the ascendency in many regions, at unsustainable levels it has to be said, which opened up market opportunities," said Murray. "This has slowed substantially but increasing environmental legislation is creating a new opportunity which many UK companies are in a position to exploit. Innovative technology is the key and the need to increase R&D investment has been recognized in recent years by the UK government which has been supporting the maritime sector through technology funding competitions."

Long Endurance Maritime USV

Image courtesy ASV

Areas of Growth

Those engaged in any aspect of maritime and offshore are always keeping an eye on the horizon, courtesy of the inherent cyclical nature of the business. When talk turns to growth opportunities in the context of the U.K. market, Murray says Defense specifically and the utilizing the full spectrum of the marine environment broadly as two areas that look strong today.

"This is controversial in some quarters but in the U.K. there is the successor program to renew the nuclear deterrent fleet and the NATO requirement for member countries to allocate 2% of GDP to defense spending," said Murray. "Both topics will be ones a new UK government will need to address. However, as always this decision cannot be taken in a vacuum from the political tensions threatening global and UK security. I may be a simple engineer but the current tensions in the Middle East, dealing with illegal immigration in to the European Union across the Mediterranean Sea, Russian expansion in Eastern Europe and protecting UK territories in the South Atlantic will surely point to the need for more ships and maritime technology."

While defense spending is relatively easy to identify and quantify, the much broader notion of the full exploitation of the marine environment for transport, food, energy and minerals is a concept that is being taken up by groups large and small around the globe, as companies and governments strive to balance investment and return on matters maritime.

"This is where I could get on my soap box," said Murray. "There are just so many circumstances in which the maritime sector impinges on the lives of every single human being and, yet even in this small island, few appreciate the scale of it now or its potential for the future as the opportunity to exploit our land based resources become scarce. The ocean has it all and it will need marine scientists and engineers to exploit the opportunities in a sustainable way."

A prime example of this, he believes, is the stature and growth of the offshore wind industry. "One of the things we have going for us is the huge expansion of Offshore Wind, which requires many of the maritime skills (people and vessels) that the offshore O&G."

The $39B Conundrum

Forming relationships is a big part of John Murray's job, and recently one was formalized with another group which, in step with government, is geared to drive the collective industry further faster. "The marine manufacturing and engineering sectors represented by four groups in the UK, one of which is the Society, formed an alliance, called the UK Marine Industries Alliance, in 2010," said Murray. "This brought together shipbuilding, ship repair and marine equipment for the commercial market, offshore renewables, naval defense, leisure and small workboats, maritime engineering consultancy and design, maritime security and marine science and technology."

Together with the government was developed an industrial strategy for the sector with the objective of growing its value to the UK economy from $26.5 billion to $39 billion per annum by 2020. "All of this is only the beginning of a long process to place before policymakers and the general public the message that our industry is as relevant as ever to the country's well-being as when Britain ruled the waves 200 years ago."

Who is John Murray?

A graduate chemical engineer, Murray commenced his career in the oil industry. An active period of trade association involvement in another sector, while John he ran his own company, ultimately led to Murray deciding to become a trade association professional and he was appointed Chief Executive of the Society of Maritime Industries in April 2001. Murray currently represents the industry on a number of external bodies including the UK Department for Business, Innovation and Skills sponsored Marine Industries Leadership Council, of which he is a Vice Chair and also the Chairman of the Council's Technology and Innovation Group. He also serves on the Board of SEA Europe, based in Brussels; a member of the Advisory Council of the National Oceanography Center; a member of the UK Government's Marine Industry Liaison Group of the Marine Science Coordination Committee; and a member of the Transport Advisory Group of Innovate UK's Knowledge Transfer Network.

Growing with Government

When the topic turns to government John Murray comes alive in discussing the inroads and its impact on the industry as a whole. "When I came into this sector and I mentioned the word 'maritime' to anybody in government they immediately assumed 'sun-set industry' seeking a hand-out. The reality was that they were 30 years out of date and because industry had got used to going it alone they had become self-sufficient. The U.K. maritime engineering sector had evolved, helped in part by the boom in North Sea oil, but also by developing their technology in response to global trends and becoming exporters in a big way. Many of our members count exports as being responsible for 75% of their turnover." The key to this renaissance is not accountable to any one entity of group, rather an increasing willingness for the plethora of marine and maritime business interests to work together and produce a united front. "Although we got the ball rolling around six years ago there was a quantum change when the marine manufacturing and maritime services sectors produced an authoritative study articulating the economic benefit of the sector to the UK in terms of gross value added, employment and tax revenue. The figures made government sit up especially as it placed us higher than aerospace."

This has manifested itself in a number of ways.

- **There has been a substantial increase in government support for R&D through a series of competition calls.**
- **There is a marine export strategy, supported by the government's export agency, UK Trade and Investment, plus there has been an increase in the number of government officials charged with assisting with the sector's growth strategy, particularly in getting the message across the plethora of government departments and agencies.**
- **The government announced a Maritime Growth Study with the purpose of 'keeping the U.K. competitive in a global market.' The report is scheduled to be finalized in the summer of 2015, and has been buoyed by "tremendous response" from all parts of the industry.**

While there has been tremendous growth in the relationship between industry and government inside the country, Murray and colleagues know that foreign governments are beyond its sphere of influence, thus he categorizes the industry's chief challenge going forward as such.

"Put simply (the biggest challenge today are) barriers to trade," he said. "I am concerned that there is an increasing tendency for developing nations to insist on ever more stringent 'local content' rules in order to develop their own indigenous industry. This is a challenge for more advanced nations and drives the need for continuous innovation in technologies and business processes to meet those challenges."

U.K. Seeks Maritime Dominance of Yore

By Joseph R. Fonseca

"Britannia rules the waves" paid a glowing tribute to the maritime past of the United Kingdom. Over the past three centuries as the sun began to set on the British power, resilient U.K. with its pioneering characteristics began its voyage of transformation to become a world-class maritime services center, with one of the largest clusters of marine insurance, ship finance, law, classification societies, ship broking, education and consultancy organizations.

Significantly, two factors were responsible for this change. The first being marine transport, since it was the only point of access to the British Isles, and the second was the maritime trade and naval power that have had a great impact on the maritime sector influencing the country's economy for several centuries. Thus building, equipping and maintaining the fleet became an immense operation, and entire industries grew up around it. The country's marine industries are known for their strength and vibrancy built on a global outlook coupled with an expertise in advanced engineering and the ability to adapt and to innovate.

Around 95% of U.K.'s trade is carried on by sea through nearly 180 ports annually handling cargo totaling 512 million tons. Shipping has been a major source of growth for U.K.'s economy over the last decade, following a dynamic revival of the U.K. fleet. Latest data shows that shipping, ports and the maritime business and services sectors:

- **contribute £31.7bn to U.K. GDP**
- **support 537,500 U.K. jobs and**
- **provide £8.5bn in tax receipts to the U.K. exchequer.**

Shipping is a high-productivity industry requiring a stable and competitive environment in order to continue to thrive. The Government's continued commitment to tonnage tax is crucial to ensure that the U.K. remains an attractive location for maritime investment.

The diversity of the U.K. Maritime Industry is immense. In fact it covers everything from shipping to sub-sea technology, ports to aquaculture, and maritime legal and financial services to leisure. It directly employs approximately 410,000 people, making a massive contribution to the country's economy. Today, it boasts of being the largest maritime sector in Europe.

The country's technological leadership is well-established in offshore oil and gas extraction, marine manufacturing; yacht designing, building and racing. The U.K. has some of the most prestigious cruise companies in the world; and London is the world's center for maritime financial and legal services.

Broadly, U.K.'s maritime industry can be classified into four important sectors:

▪ Naval

While the Royal Navy is the principal end customer for this sector, U.K. companies also look to the export market for growth opportunities, based on the strong foundation of domestic success. Export expansion is a priority for the naval sector with support from U.K. Trade & Investment Defense & Security Organizations, and the government. Key initiatives include the Global Combat Ship export drive and the 'Exportable naval technologies' innovation theme. U.K. NEST (Naval Engineering Science & Technology) provides a forum for common development such as developing the next generation of engineers. Heading the list of U.K.-based companies in this sector are Babcock Marine, BAE Systems Maritime, BMT, Rolls-Royce SEA, SELEX, Thales, Ultra Electronics to mention a few.

▪ Commercial

Merchant shipbuilding has traditionally been the country's forte. U.K. companies

retain strong intellectual capabilities and physical infrastructure. The expertise and facilities are now being used for new markets such as offshore renewable energy, and are also being adapted to new client needs. Marine systems and equipment form a major element of U.K.'s exports. While the naval equipment sector is important, the global merchant shipping industry provides a massive market for commercial systems and equipment. A&P Group, Alicat, Babcock Marine, Cammell Laird, Chemring Marine, Hamworthy, Kelvin Hughes, Rolls-Royce, SELEX and South Boats are some of the major U.K. players in this field.

▪ Leisure

On a growth trajectory the leisure marine sector is driven by mostly of SMEs, with nine of the major operators representing 25% of the market. The U.K. spearheads the world's manufacturers for quality powerboat production and for building a range of high value sailing yachts. The U.K.'s growing superyacht industry, with a turnover of around £420m a year and over 3,600 employees, is globally recognized for maintaining high standard in production. The leisure sector mixes service and manufacturing, from surveyors and charterers to specialist equipment manufacturers and three world leading marine leisure clothing brands. Many leading international yacht designers are based in the U.K. Raymarine, Sealine, Avon Inflatables, CJR Propulsion, Fairline, Halyard Marine, Sunseeker are established leaders in the field.

▪ Offshore 'Renewables' Sector

The past decade has seen a surge in demand for secure, sustainable low carbon energy sources. This has created a new market in offshore renewable energy in the U.K. The primary customers are electricity providers such as Scottish and Southern Energy and Scottish Power Renewables. The U.K. leads the world in licensing offshore wind energy sites, and developing wave and tidal energy devices. It is home to world class testing centers such as EMEC, NAREC and Qinetiq. Important opportunities lie in optimization for manufacture and installation, and in through-life operation of offshore energy farms. Companies such as Marine Current Turbines, Pelamis Wave Power, Royal Haskoning and Tidal Generation Limited (owned by Rolls-Royce) have carved a niche for themselves among renowned offshore renewable operators.

Maritime Ireland Comes of Age

By Joseph R. Fonseca

Even though the struggle for independence from Britain finally resulted in Ireland being declared "a sovereign, independent, democratic state" in 1937 there was little interest being shown in the maritime affairs of the country. This, despite Ireland being seen as having opportunities to derive added value from its vast marine resources.

Up until a few years ago, sporadic endeavors failed to achieve optimum economic benefits. Ireland's ambition to create a maritime cluster gathered momentum only during the last few years. It began with the introduction of the tonnage tax regime in 2003. This made Ireland an attractive destination for shipping. The immediate effect was that it reversed the trend of Irish shipping companies flagging out to foreign registries. Most banks started to provide ship finance readily, thus drawing renowned ship owners from Norway, Canada and other European countries to invest in Ireland's shipping sector.

Today, the maritime industry is diversified and operates in a globally competitive marketplace, while providing jobs and benefits for both skilled and entry level employees. The most important categories of economic activity in the Irish marine sector can be classified under three heads:

1. **Water-based Tourism and Leisure:**
   a. This includes leisure activities such as sea angling (boat and shore); Water sports (sailing, boating, water skiing, jet skiing, surfing, kayaking, scuba diving etc); Seaside resorts/trips (Swimming, bird watching, whale/dolphin watching, nature reserves, eco tourism etc).
2. **Shipping and Maritime Transport:**
   a. There are several large well-established firms in this area, that are involved in freight services only, or in both freight and passenger services (e.g Stenaline. P&O Ferries, Irish Ferries). Besides, private ship owners also operate in this sector. The cruise industry is probably offers the most exotic career in this sector. Although no cruise liners embark from Irish Ports, more than 150 dock regularly at the larger Irish ports every year, and they are becoming increasingly magnificent in size and scale.
3. **Seafood:**
   a. An extensive sector, it involves fishing & aquaculture, seafood processing, seafood marketing, etc.

All three are well established or 'traditional' segments of this sector. Associated marine related career areas include the cruise industry, boat building, marine construction, engineering & manufacturing activities, offshore E&P activity.

The government vision is to aim to target these opportunities, by becoming a research and commercial cluster of world standing; and by realizing Ireland's potential in the global, maritime and energy markets of tomorrow. The Maritime Market Opportunity Ireland's maritime economy comprises of a large number of companies operating in sub sectors such as shipping and transport, seafood production, hydrocarbon exploration, boat building, bio-discovery and technology. Ireland's share of the global maritime industries market is small. However, opportunities exist if Irish companies can capitalize on research to target niche, high value growth areas.

Oil & Gas Exploration

Ireland has been a producer of gas since the first Irish offshore well was drilled in the Celtic Sea in 1970. Activities in this area include exploration for oil and gas, and the extraction and production of gas. The State has opened new areas for exploration licensing off the West Coast, and the oil and gas industry is again turning its attention to Ireland with greater vigor. In addition, recent discoveries of both oil and gas in the Celtic Sea, while not yet declared commercial, have underscored the potential of this area.

The Marine Renewable Energy

A major opportunity for Ireland lies in the marine renewable energy sector, including wave, offshore wind and tide. For example, Ireland has one of the best wind and wave resources in the world, as well as significant hotspots for tidal energy on the east coast. It is expected that the ocean energy sector (wave and tides) will potentially yield 52,000 new jobs by 2030 as well as contribute to the future security of energy supply.

The government has set a target of 500 MW of wave and tidal derived energy by 2020, while the recent Ocean Renewable Energy Development Plan has identified the feasibility of at least 1,500 MW from wave and tide, and 4,500 MW from offshore wind sources by 2030. Technological advances are required to adapt onshore designs for wind turbines to deeper and more challenging marine environments. There is also a need for research into areas such as modeling and control of wind microgrids, forecasting, and storage.

At the same time, the largest market in the world for offshore wind is currently in the UK. As a result, there are huge opportunities for Irish companies to target this sector. IMERC is perfectly positioned to help with the challenge of training and capacity building, for example by providing conversion courses and innovative products and services into the UK marketplace.

In comparison to wind, wave and tidal technology is at a nascent stage of development. However, deployment targets indicate that the growth in the sector will

accelerate rapidly over the coming decade. A number of Irish wave convertor device developers have undertaken prototype demonstration (e.g. Ocean Energy Ltd, Wave Bob Ltd) and are in transition towards early commercial array demonstration. It is imperative that this early mover advantage be maintained to ensure Ireland's place as a global centre of excellence in this area. To this effect, the Westwave project, under development by the ESBI, will be supported by IMERC as an associate partner.

Significant potential also exists in the offshore hydrocarbon industry. Studies by the Department of Communications, Energy and Natural Resources indicate that a substantial gas yield located in the South Porcupine basin off the West Coast of Ireland could yield €5 billion over its lifetime in taxes. According to the Irish Offshore Operators Association (IOOA) such discoveries would improve the international markets' view of Ireland's economic prospects, while resulting in significant job creation, and the establishment of spin-off industries. Furthermore, the potential to transfer knowledge from the offshore hydrocarbon sector to the marine renewable energy sector is not to be underestimated.

1

RibCraft

RIB powered by Yamaha exceeds 50 mph

Ocean Falcon is part of a $300-million fleet modernization program.

2

USNS Brunswick emerges from Austal.

3

Austal

1 Ribcraft Delivers to Decatur Police Department

Ribcraft deliverd a specialized Ribcraft 7.8 for patrol and enforcement operations to the City of Decatur, Alabama. The 25-ft. purpose built mission specific RIB will be used by the Decatur Police Department for tactical operations and on water patrols. Featuring a center console with a front bench seat, leaning post, custom aft seating and tow post, the 7.8 provides a large open deck to offer versatility. Equipped with twin Yamaha 150 hp engines, the RIB reaches speeds in excess of 50 mph.

2 Ocean Falcon Delivered

Atlantic Offshore Rescue unveiled its third new vessel in the past 12 months as part of its fleet modernization program, an investment program of more than $300m. Ocean Falcon is a new Class A Multi Role and Emergency Response and Rescue (MRV/ERRV) vessel. Atlantic Offshore Rescue will provide emergency recovery, rescue cover, tanker assistance and general field support for offshore operations at the Curlew Field, in the North Sea. The ship can accommodate 21 and has the amenities to rescue up to 300 people. As well as incorporating the very latest technology systems including a towing capacity of up to 65 tons, it measures 66.8 x 16 m and features two MAN main engines with a power of 1935 kW each. Ocean Falcon is a new H820 design from Havyard Ship Design. It was built and developed in Passai, Spain by Zamakona shipbuilders, in close collaboration with Atlantic Offshore Rescue over an 18 month period.

3 Austal Launches USNS Brunswick

Austal launched the recently christened USNS Brunswick (JHSV 6) at its manufacturing facility in Mobile, Ala. The 338-foot Joint High Speed Vessel will undergo final outfitting and testing before sea trials and delivery to the U.S. Navy later this year. USNS Brunswick is the sixth JHSV Austal has launched as part of a $1.6 billion 10-ship block buy contract.

4

Smit Lamnalco

5

Damen

LNG-Proof

Fifth in RAstar 3400 series delivered.

6

Sinopacific

4 LNG-proof Tug Delivered to Smit Lamnalco
Smit Lamnalco took delivery of the SL Wiggins Island, the fifth and final 80 metric tons bollard pull terminal support escort tug built at Sanmar Shipyard. The first of the five-ship RAstar 3400 series is SL Curtis Island. The BV-classed tugs measure 34 x 14.5m and have a maximum draft of six meters and have FiFi 1 notation. Powered by a pair of Wärtsilä 8L26 diesel engines, each developing 2,720 kW at 1,000 rpm.

5 Damen MultiCat for Scotmarine
Damen Shipyards Group delivered a Multi Cat 2613 to Orkney, Scotland-based chartering company Scotmarine to be used for offshore tidal activities in Scotland's Northern Isles The hull of the new vessel was in stock and customized for the client earlier this year. The 50-metric-ton bollard pull vessel has a large crane and will replace the stock vessel Multi Cat Orcadia Scotmarine purchased three years ago.

6 SINOPACIFIC Christens Newbuild Bulker
Sinopacific Shipbuilding Group held a christening ceremony at its Dayang Shipyard for a newly built Ultramax Crown63R dubbed Sinica Graeca, which is written in Latin (SINICA means China in old Greek) and symbolizes the Chinese and Greek cultures. Sinica Graeca is the first of a series of four bulk carriers contracted by Angelakos (Hellas) S.A., a Greek shipping company.

Trelleborg Floatover Tech

Trelleborg's engineered products operation has completed its supply of floatover equipment for Phase 3 of the DSO Escravos Gas Project; the operation's first floatover in West Africa. Contracted by Hyundai Heavy Industries (HHI), Trelleborg provided Leg Mating Unit (LMU) pads for the floatover process, as well as surge fenders, shock pads and rub strips to constitute the project's boat landing systems.

Trelleborg's elastomeric pads were incorporated into HHI's LMU steel structures. The pads are designed to take up static and dynamic forces of the topside structure, as well as the horizontal forces of open sea motions during the floatover mating operation. Due to the large amount of load placed on the elastomer pads during the process, they must be carefully engineered to provide optimum protection of the jacket and withstand environmental impact.

Photo: Trelleborg

Additionally, particularly adverse weather and sea conditions for this project meant Trelleborg engineers had to account for especially high sea swell and unpredictable winds when customizing floatover technology for DSO Escravos.

www.trelleborg.com

Strainstall Intelligent Fender System

Strainstall reports it has completed an Intelligent Fender System trial with energy companies SSE and RWE at the Suffolk based wind farm, Greater Gabbard.

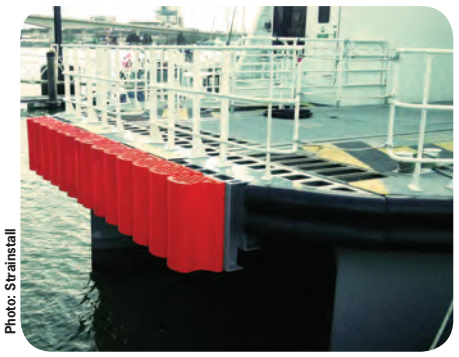


Photo: Strainstall

The Intelligent Fender System is an in-house developed technology designed to provide accurate and recordable data to improve safety and increase operational efficiency for vessel and offshore wind farm operators during transfer operations. The Greater Gabbard trial enabled Strainstall to verify IFS's performance in the accurate monitoring and reporting of vessel push-on forces against offshore wind turbines. IFS also supports the ongoing challenge for cost-reduction in offshore wind by allowing optimization of fuel consumption during operations as well as helping to ensure the integrity of the turbine structures. The live data allows the skipper of the vessel to manage the pushing forces onto the assets and stay within the optimum force, opposed to over exerting forces and therefore burning excess fuel and potentially causing damage to assets. Trials were carried out using James Fisher's offshore support vessel, Dart Fisher, which was retrofitted with IFS earlier in 2015. Addressing key issues within the offshore wind industry, IFS will be able to provide clarity and understanding of the live and cumulative impact forces exerted during transfer operations through vessel push-ons. IFS measures and records all forces being applied onto the turbines providing a warning signal when a vessel is going over the optimal pushing force, which is outlined by the offshore wind farm operators, enabling the protection of people and assets offshore.

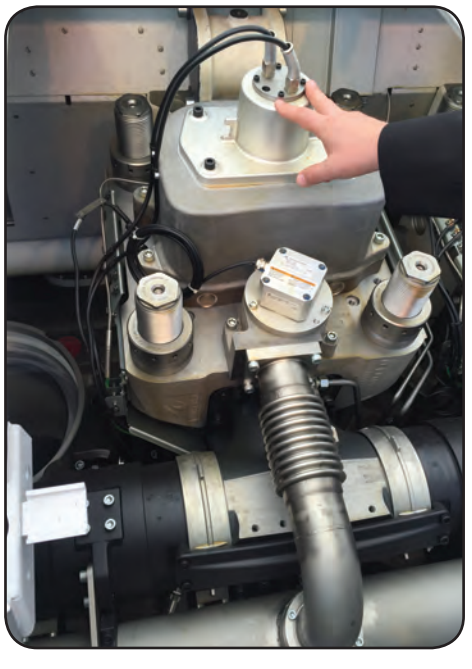
World Record

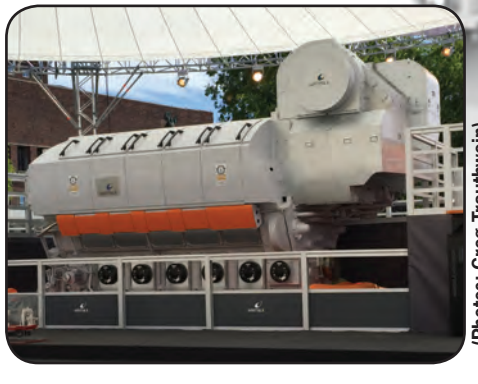
Wärtsilä 31 'Game Changer' Debuts in Oslo

At press-time in Oslo at Nor-Shipping 2015 Wärtsilä gave a lavish launch to the new Wärtsilä 31 engine. While 'game changer' may be overused in many instances, this is not the case here as the engine has achieved a Guinness World Records title for the most efficient four-stroke diesel engine, verified on May 26, 2015. The listing is based on the Wärtsilä 31 engine's highest fuel efficiency levels, with its diesel fuel consumption being as low as 165 g/kWh. The Wärtsilä 31 engine is designed to serve various types of vessels in the offshore, cruise and ferry, and other marine segments where the power range requirement is from 4.2 to 9.8 MW. The engine can be operated using a range of different fuels, and comes in three alternative versions; Diesel, Dual-Fuel (DF) and Spark-Ignited Gas (SG). The multi-fuel capabilities that the Wärtsilä 31 brings to the market extend the possibilities for operators to utilize different qualities of fuels, from very light to very heavy diesel, and a range of different qualities of gas.

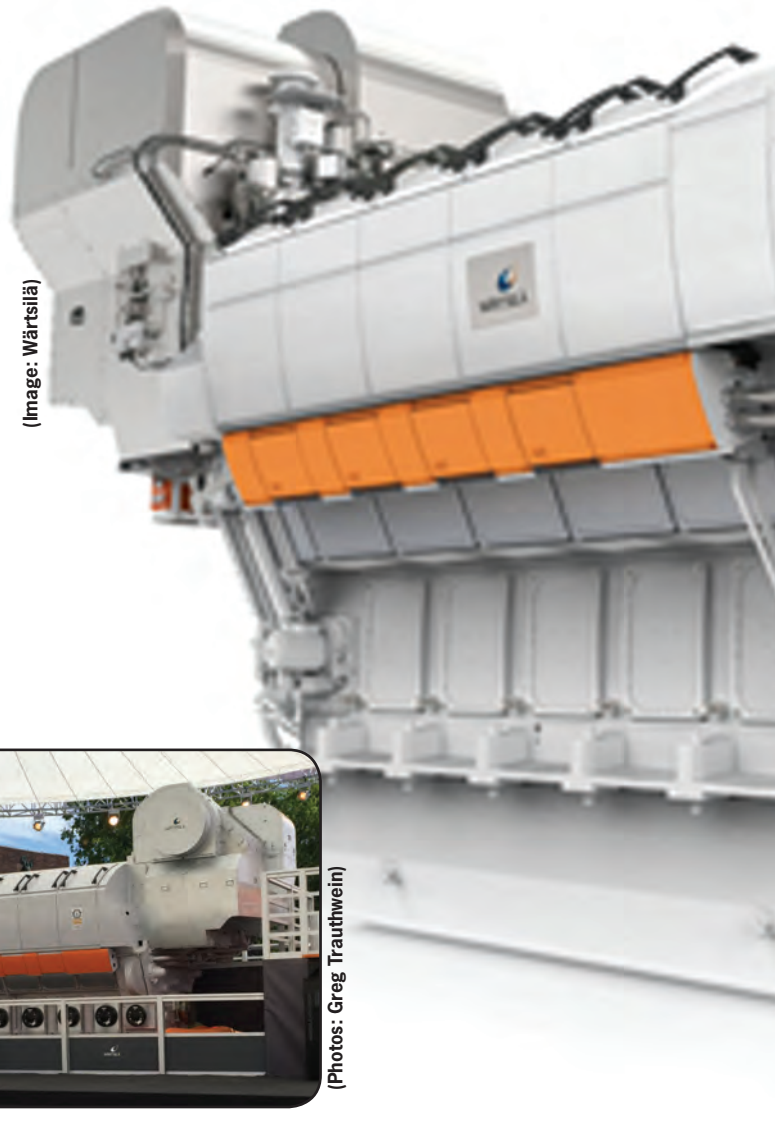
In Oslo *Maritime Reporter & Engineering News* had the opportunity for an interview with Björn Rosengren, President and CEO of Wärtsilä. This interview, and full technical specification on the new Wärtsilä 31 will publish in the July 2015 edition.

The Wärtsilä 31 comes in three versions: Diesel, Dual-Fuel (DF) (pictured below) and Spark-Ignited Gas (SG). The engine was a 'show stopper' at Nor-Shipping, unveiled in a special display on the Aker Brygge on the waterfront in Oslo.





(Photos: Greg Trauthwein)



(Image: Wärtsilä)

Motion Compensated Gangway

Van Aalst Group introduced a new motion compensated gangway system under the brand name Safeway. Developed and built in the Netherlands, the Safeway gangway bridge is designed to make it possible for vessels to land at a broad range of offshore constructions, varying from small unmanned installations in the Southern North Sea to large offshore production units in the Northern North Sea. The first Safeway unit is currently under construction under way unit expected to be available for the rental market by the end of 2015. Safeway claims workability in up to 3.5-m wave heights. Van Aalst's planned introduction adds roll compensation, vertical height adjustment and a weight balanced boom construction to the gangway types now dominating the market. These innovations aim to increase the uptime of staff and equipment on any offshore installation.

www.vanaalstmarine.com

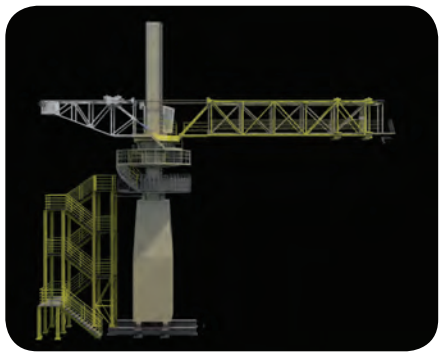


Photo: Van Aalst

Nitto Chemical Industry: Plaseal NF-23

Nitto Chemical Industry Co., Ltd. is a specialized sealing compound maker which has been producing sealing products that comply with 2010 FTP Code. Plaseal NF-23 is a high-spec fire-tight compound for ships, passing IMO FTP code for A-class cable transits. Plaseal NF is a one-component type of sealing compound, designed for ease of use with a comparatively low specific gravity of approximately 0.8, helping to save weight. Plaseal NF-23 is flexible in that when using the solution, cables can contact each other, meaning that cables can be arranged freely.

E: y.hasegawa@nitto-kasei.co.jp
www.nitto-kasei.co.jp

Photo: Nitto

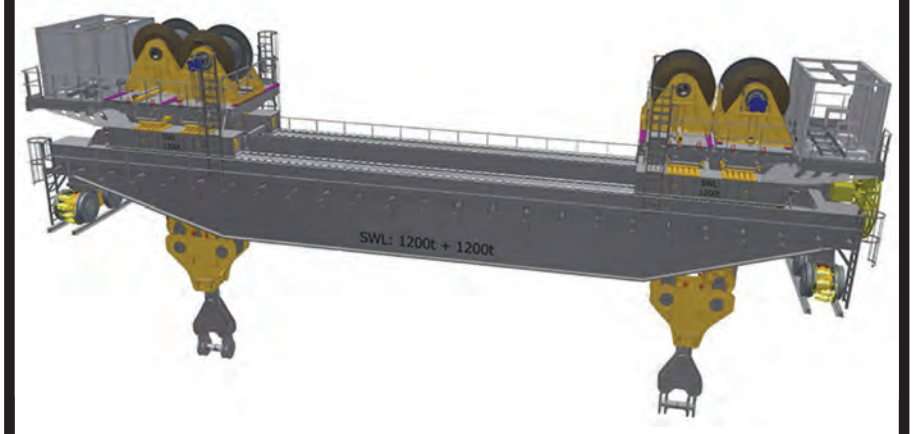
New Automatic Survivor Locator Light

ACR Electronics, Inc. released the next generation of its survivor locator life jacket lights. The new ACR HemiLight 3 is designed to be a more affordable and compact, featuring an LED light which illuminates brighter than its predecessors. The HemiLight 3 is automatically activated when it comes into contact with water. The high-intensity flashing LED light exceeds the IMO SOLAS battery life regulations by providing more than 10 hours of functionality upon activation. It can also be deactivated simply by pressing the OFF button.

www.acrartex.com

PHoto: ACR Electronics

World's Largest



Offshore Overhead Gantry Crane
for Offshore Highway

Above: Enerpac is building the world's largest, offshore overhead gantry crane for construction of the Reunion Island offshore highway.

Enerpac won a contract to build what is reported to be the world's largest offshore overhead gantry crane for French consortium Bouygues Travaux Publics, VINCI Construction and Demathieu Bard Construction. The crane – with a lifting capacity of 4,800 tonnes - will be used to install the pre-cast viaduct columns for a new coastal highway around Reunion Island, located east of Madagascar in the Indian Ocean. The 5,400 m coastal highway (Route du Littoral) will connect Saint Denis - the administrative capital of La Réunion - with La Possession. It replaces the existing coastal road, which is exposed to falling rocks and flooding from swells and tropical storms.

The Bouygues Travaux Publics, VINCI Construction and Demathieu Bard Construction consortium is building a barge to construct the offshore highway. Enerpac is supplying an offshore crane with 4,800-tonne lifting capacity for the barge. The barge will be used to pick up concrete precast foundation elements (gravity base, pile head and segments) at the harbor of Reunion Island, and position them on the seabed. The Enerpac offshore crane will be used to make at least 200 foundation block lifts.

Construction of the 4,800 ton offshore crane has already started at Enerpac Integrated Solutions manufacturing facility in Hengelo, The Netherlands.

www.enerpac.com

Right: Artist's impression of the Reunion Island offshore highway. (Source: Vinci)

Below: Enerpac's overhead gantry crane on the offshore highway construction barge (rendered image).

CIMOLAI Technology spa
Special Equipment

Cimolai Technology SpA is an Italian-based company that specializes in the design, fabrication and installation of special lifting and transporting equipment for marinas, ports and shipyards.
Its flagships are:
- The biggest boat hoist in the world, lifting capacity 1100 ton., at work in Qatar
- Ten boat hoists capacity 820 ton., with an additional two units due for delivery by end of 2015
- Two shipyard cranes on tyres, capacity 1000 ton. each

Contact information
E-mail: info@cimolaitechnology.com
Website: www.cimolaitechnology.com
Telephone: +39 049 9404539

Success for a BWMS Newcomer

70 ballast water treatment systems in two years

MMC Green Technology has sold more than 70 ballast water treatment systems since it went commercial with its MMC BWMS two years ago. "With 40 systems installed, we are starting to get feedback from the operators," says Børge Gjelseth, sales and marketing director at MMC Green Technology. "Recently we signed ten orders, where the vessels and clients consists of two windmill support vessels for Bernhard Schulte built at Ulstein, two general cargo/container vessels for Royal Atlantic Lines built at Remontowa Shipbuilding, three live fish carriers built at Aas Mekaniske; two for Sølvtrans and one for Bømlo Brønnbåtservice. In addition one 2,800 passenger Ro-Pax ferry is being built at Meyer Turku for Tallink (pictured), one accommodation and work barge owned by Dalby Offshore to be retrofitted in Poland, and one live fish carrier to be built at Larsnes Mek."

SeaCor Thermoplastic Piping System

Georg Fischer Piping Systems has partnered with W&O to deliver commercially available USCG-approved marine thermoplastic piping system, SeaCor, which meets IMO and USCG requirements for flame spread, low smoke and toxicity. It also carries Type Approval from American Bureau of Shipping. SeaCor provides a myriad of benefits to ship owners and operators, in weight and cost savings. Weight savings can result in increased ship efficiencies, such as reduced fuel consumption.

Viega MegaPress

Do more with the Viega MegaPress system, the press fitting system for both water and gas applications in black iron pipe. Flameless and clean, Viega MegaPress fittings can be installed while the system is live, which means you don't need to shut a system down completely before making connections. Viega press technology joins black iron pipe reliably through the engineered design of the fittings and the use of the press tool.

Water Cannon Debuts New Pressure Washer Features

Water Cannon, Inc. announced new product developments for its eco-friendly Hot Water Diesel Pressure Washer Skid Package. The new series, tailored for the industrial, marine and rental markets worldwide, is powered by a Kubota Z602B1 or DH1005B1 engine roll-cage protected pressure washer built to prep surfaces and destroy even the most stubborn contaminants common in commercial settings. With up to 8.0 GPM and 4,000 PSI, the hot water pressure washer has a General or Annovi Reverberi pump and five-year manufacturers' warranty coverage, including an engine warranty, and five-year prorated coil warranty.

QuickVic Flexible Coupling

The Style 177 QuickVic flexible coupling is installation-ready, and joins 2-8"/50-200 mm standard roll grooved and cut grooved steel pipe. The coupling's unique design eliminates loose parts, ensures consistent installation and provides substantial gains in productivity. The Style 177 flexible coupling can accommodate pressures ranging from full vacuum (29.9 in Hg/760 mm Hg) up to 1000 psi/6900 kPa. The coupling's maximum pressure rating will depend on the diameter and wall thickness of the pipe. Performance data presented in this document is based on use with standard wall, carbon steel pipe. For use with stainless steel pipe, please reference document 17.09 for pressure ratings and end loads. When used on light wall stainless steel pipe, the Victaulic RX roll set must be used to roll groove the pipe.

Perma-Pipe Fuel-Gard and XTRU-THERM

W&O is the North American maritime distributor for Perma-Pipe pre-insulated and containment piping systems for LNG and other cryogenic systems. Perma-Pipe Fuel-Gard is an all-stainless double wall construction with complete testing and traceability on all materials, conducted in the company's ISO 9000 and class society approved factory. It is used in enclosed space applications. XTRU-THERM is a polyethylene-jacketed, polyurethane-insulated system used for above-deck applications.

Chibro

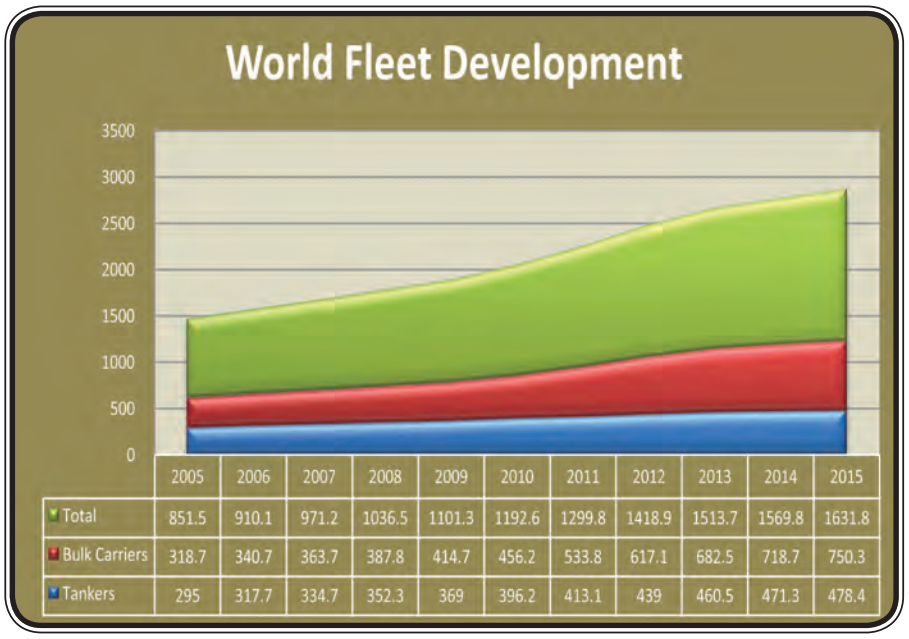
W&O offers Ilta/Chibro no-weld marine piping systems: Cunipress, Pressfitting and Steckdrain. Cunipress is a metric press-fit system composed of CuNi 90/10 alloy, suitable for class 3 piping systems in fresh and seawater applications. Pressfitting SS is a metric press-fit system composed of 316L Stainless steel, suitable for Class 3 piping systems in potable water, assorted fresh water, as well as condensate and compressed air systems. Steckdrain is a metric push-fit system composed of 316L stainless steel, designed for gravity as well as vacuum, grey and black water drainage systems. All are approved by major class societies.

Getting a grip on world trends defining the maritime sector can be challenging. Resources such as annual Platou Report strive to make it easy, delivering authoritative, comprehensive yet easy to sift market insights and overview statistics. Find on these two pages the statistical overview that our editorial team found most compelling. For the full report, simply visit www.platou.com.

Source: The Platou Report 2015, RS Platou Group, www.platou.com

World Fleet Development (Mill.dwt)						
Start	**Tankers**	**Chemical carriers**	**Bulk carriers**	**Combined carriers**	**Others**	**Total**
2005	295	25.7	318.7	11.6	200.5	851.5
2006	317.7	26.9	340.7	11.6	213.3	910.1
2007	334.7	29	363.7	11.2	232.5	971.2
2008	352.3	31.7	387.8	11.2	253.5	1036.5
2009	369	34	414.7	10.4	273.1	1101.3
2010	396.2	35.8	456.2	9.6	294.9	1192.6
2011	413.1	36.1	533.8	6.8	309.9	1299.8
2012	439	36.5	617.1	*	326.3	1418.9
2013	460.5	36.6	682.5	*	334.1	1513.7
2014	471.3	36.3	718.7		343.6	1569.8
2015	478.4	36.5	750.3		366.7	1631.8

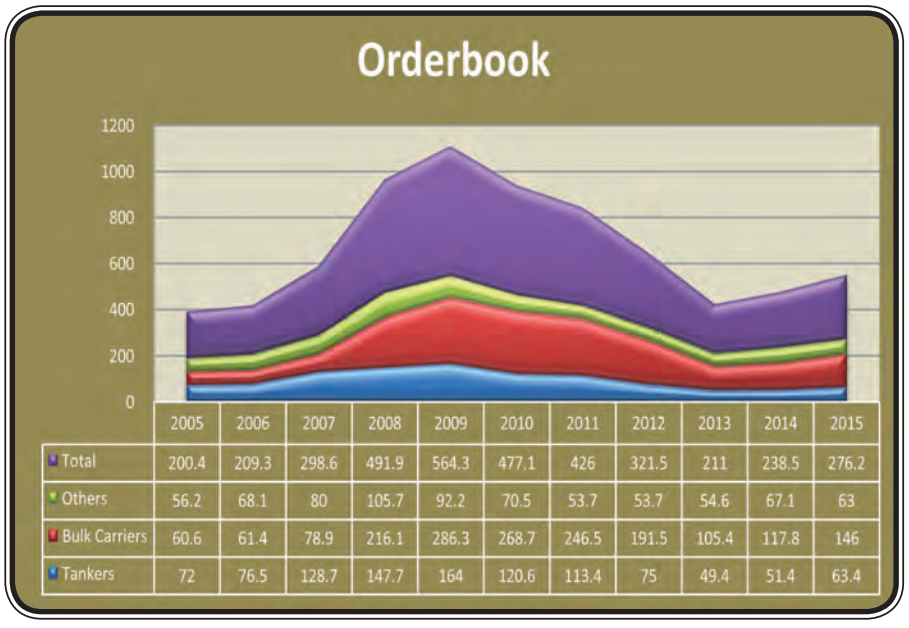
(Source: The Platou Report 2015, RS Platou Group • www.platou.com)



To put it simply, Bulk Carrier supply far outstrips cargo demand

Orderbook (Mill.dwt)						
Start	**Tankers**	**Chemical carriers**	**Bulk carriers**	**Combined carriers**	**Others**	**Total**
2005	72	11.6	60.6	N/A	56.2	200.4
2006	76.5	3.3	61.4	N/A	68.1	209.3
2007	128.7	11	78.9	N/A	80	298.6
2008	147.7	19	216.1	N/A	105.7	491.9
2009	164	18.4	286.3	N/A	92.2	564.3
2010	120.6	13.9	268.7	3.4	70.5	477.1
2011	113.4	9.7	246.5	-	53.7	426
2012	75	1.4	191.5	-	53.7	321.5
2013	49.4	1.6	105.4		54.6	211
2014	51.4	2.1	117.8		67.1	238.5
2015	63.4	3.9	146		63	276.2

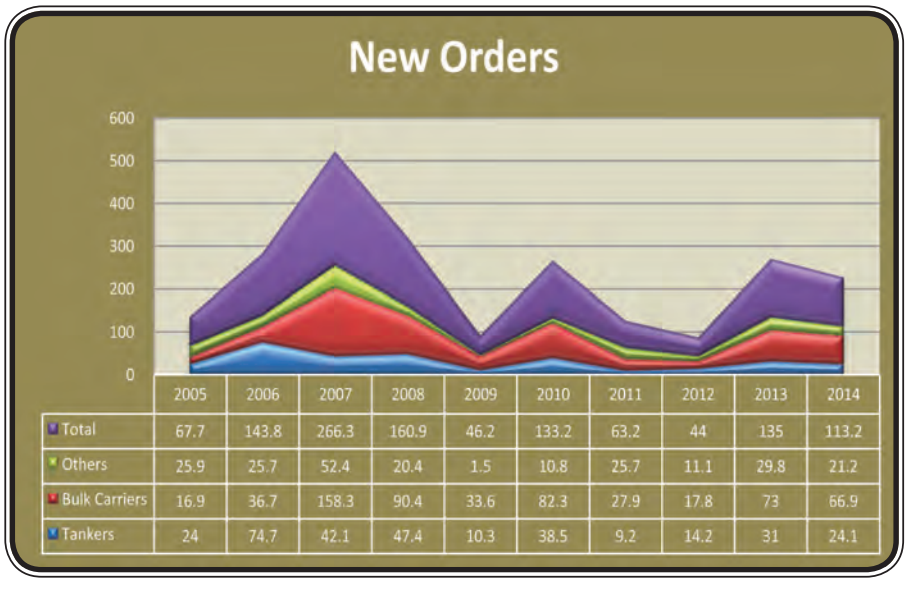
(Source: The Platou Report 2013, RS Platou Group • www.platou.com)



Some owners are starting to flip Bulk Carrier newbuilds to Tanker newbuilds

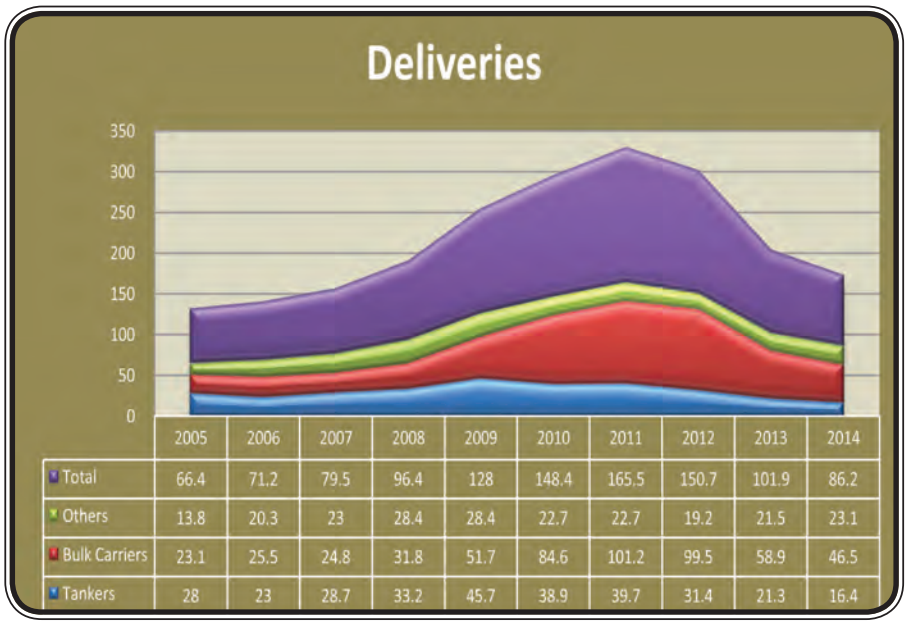
New Orders (Mill.dwt)						
Start	**Tankers**	**Chemical carriers**	**Bulk carriers**	**Combined carriers**	**Others**	**Total**
2005	24	0.9	16.9		25.9	67.7
2006	74.7	6.8	36.7		25.7	143.8
2007	42.1	10.1	158.3	3.4	52.4	266.3
2008	47.4	2.7	90.4		20.4	160.9
2009	10.3	0.8	33.6		1.5	46.2
2010	38.5	1.6	82.3		10.8	133.2
2011	9.2	0.5	27.9		25.7	63.2
2012	14.2	0.9	17.8		11.1	44
2013	31	1.2	73		29.8	135
2014	24.1	1	66.9		21.2	113.2

(Source: The Platou Report 2015, RS Platou Group • www.platou.com)



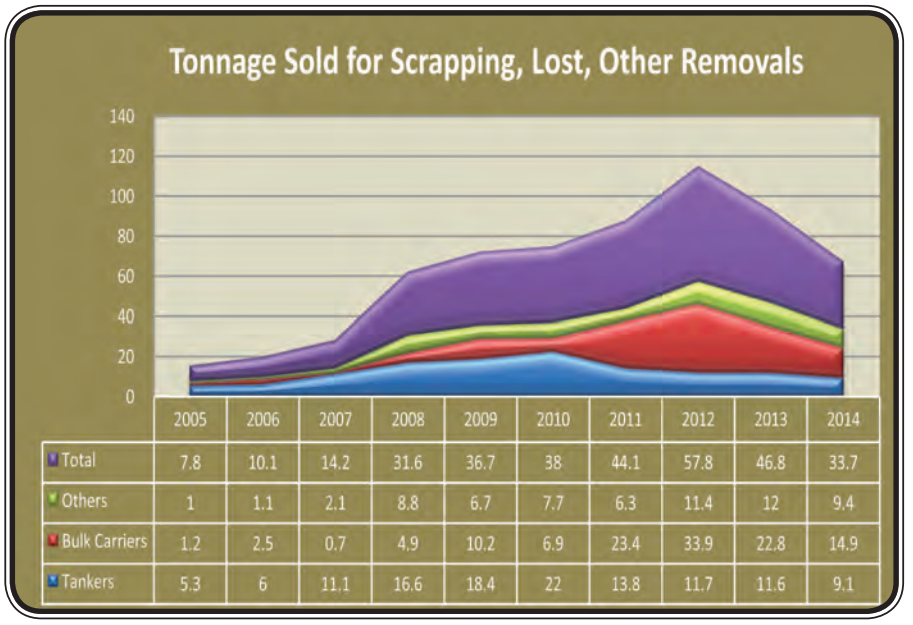
Deliveries (Mill.dwt)						
Start	Tankers	Chemical carriers	Bulk carriers	Combined carriers	Others	Total
2005	28	1.5	23.1		13.8	66.4
2006	23	2.4	25.5		20.3	71.2
2007	28.7	3	24.8		23	79.5
2008	33.2	2.9	31.8		28.4	96.4
2009	45.7	2.2	51.7		28.4	128
2010	38.9	1.7	84.6	0.6	22.7	148.4
2011	39.7	1	101.2	1	22.7	165.5
2012	31.4	0.5	99.5		19.2	150.7
2013	21.3	0.2	58.9		21.5	101.9
2014	16.4	0.2	46.5		23.1	86.2

(Source: The Platou Report 2015, RS Platou Group • www.platou.com)



Tonnage Sold for Scrapping, Lost and Other Removals (Mill.dwt)						
Start	Tankers	Chemical carriers	Bulk carriers	Combined carriers	Others	Total
2005	5.3	0.3	1.2	0	1	7.8
2006	6	0.2	2.5	0.3	1.1	10.1
2007	11.1	0.4	0.7	0	2.1	14.2
2008	16.6	0.5	4.9	0.8	8.8	31.6
2009	18.4	0.5	10.2	0.9	6.7	36.7
2010	22	1.3	6.9	0.1	7.7	38
2011	13.8	0.6	23.4	-	6.3	44.1
2012	11.7	0.8	33.9	-	11.4	57.8
2013	11.6	0.5	22.8		12	46.8
2014	9.1	0.3	14.9		9.4	33.7
2014	51.4	2.1	117.8	-	62.2	233.6

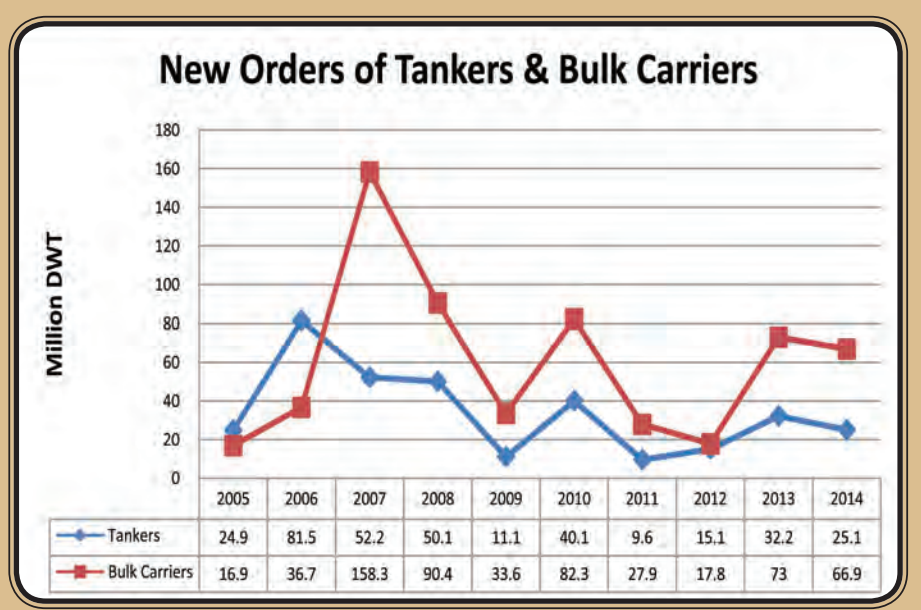
(Source: The Platou Report 2015, RS Platou Group • www.platou.com)



The Tanker market is hot; The Bulk Carrier market has never been worse

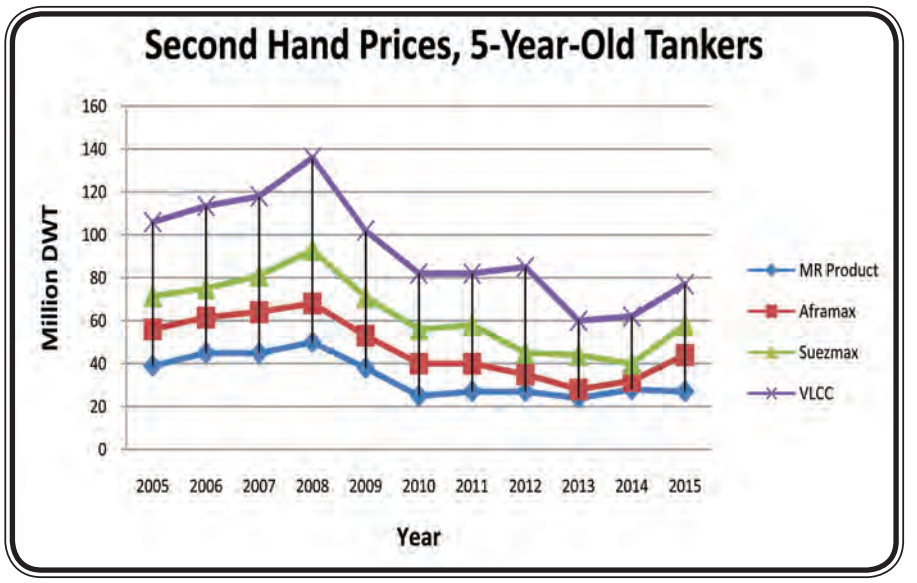
New Orders of Bulk Carriers by Size (Mill.dwt)						
Start	Handysize	Handymax/ Supramax	Panamax/ Kamsarmax	Post Panamax	Capesize	Total
2005	1.8	4.2	3	0.9	6.9	16.9
2006	4.8	7.5	5.5	0.9	18	36.7
2007	10.5	27.2	18.5	21.9	80.2	158.3
2008	12.8	19.7	8.5	9.2	40.2	90.4
2009	4	7.8	5	2.2	14.6	33.6
2010	8.3	12.7	28.1	5.7	27.5	82.3
2011	3.1	5.3	8.1	1.5	9.8	27.9
2012	3.7	5.4	4.4	0.4	3.9	17.8
2013	8.6	21.1	11.4	0.7	31.3	73
2014	6.8	21.8	9.7	0.2	28.4	66.9

(Source: The Platou Report 2015, RS Platou Group • www.platou.com)



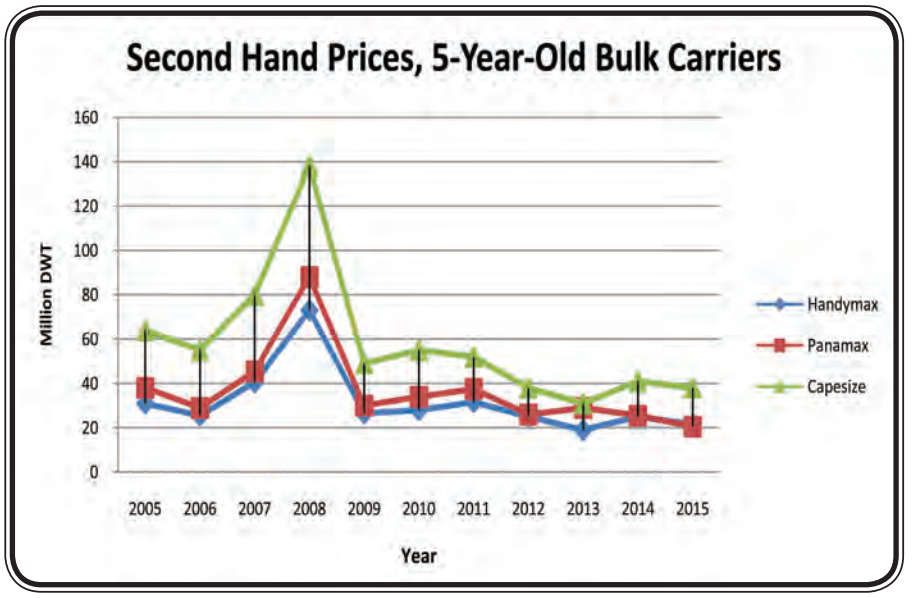
Second Hand Prices of 5 Year Old Tankers (Mil. $)				
Start	MR Product	Aframax	Suezmax	VLCC
2005	39	56	71.5	106
2006	45	61.5	75	113.5
2007	45	64	81	118
2008	50	68	93	136
2009	38	53	71	102
2010	25	40	56	82
2011	27	40	58	82
2012	27	35	45	85
2013	24	28	44	60
2014	28	32	40	62
2015	27	44	58	77

(Source: The Platou Report 2015, RS Platou Group • www.platou.com)



Second Hand Prices of 5 Year Old Bulk Carriers (Mil. $)			
Second Hand Prices of 5 Year Old Bulk Carriers (Mill. Dwt)	Handymax	Panamax	Capesize
2005	31	38	64
2006	25.5	29	55
2007	40.5	45.5	80
2008	73	88	138
2009	26.5	30	49
2010	28	34	55
2011	31.5	37.5	52
2012	25	26	38
2013	19	29	31
2014	25	25.5	41
2015	21.5	20.5	38

(Source: The Platou Report 2015, RS Platou Group • www.platou.com)



New Orders of Tankers by Size (incl. chemical carriers) (Mill.dwt)					
	10 to 69,999	70 to 119,999	120-199,999	200,000+	Total
2005	7	5.8	1.1	11	24.9
2006	16.2	21.6	13.3	30.3	81.5
2007	15.4	13.5	8.3	15	52.2
2008	6.3	5.3	5.8	32.8	50.1
2009	1	1	3	5.8	11.1
2010	2.1	6.8	11.3	19.9	40.1
2011	2.7	1.9	2.8	2.2	9.6
2012	6.1	1.1	2.5	5.3	15.1
2013	10.8	7.1	0.6	13.6	32.2
2014	5.5	5	6.2	8.5	25.1

(Source: The Platou Report 2015, RS Platou Group • www.platou.com)

The 2015 Yearbook

United States Flag Privately-Owned Merchant Fleet*

Oceangoing Self-Propelled, Cargo-Carrying Vessels of 1,000 GT and Above (As of March 9, 2015)

IMO #	Vessel Name	Vessel Type	Gross Tonnage	Deadweight	Year Built	Operator	MSP	VISA	VTA	Jones Act Eligible (Y/N)	Militarily Useful (Y/N)*
7515339	ADVANTAGE	General Cargo	18,296	27,750	1977	Sealift Inc	N	Y	N	N	Y
9244661	ALASKAN EXPLORER	Tanker	110,693	193,049	2005	Alaska Tanker Co LLC	N	N	N	Y	N
9244659	ALASKAN FRONTIER	Tanker	110,693	193,049	2004	Alaska Tanker Co LLC	N	N	N	Y	N
9271432	ALASKAN LEGEND	Tanker	110,693	193,048	2006	Alaska Tanker Co LLC	N	N	N	Y	N
9244673	ALASKAN NAVIGATOR	Tanker	110,693	193,048	2005	Alaska Tanker Co LLC	N	N	N	Y	N
9303546	ALLIANCE FAIRFAX	Ro-Ro	59,705	19,670	2005	Farrell Lines Inc	Y	Y	N	N	Y
9332547	ALLIANCE NORFOLK	Ro-Ro	57,280	21,500	2007	Farrell Lines Inc	Y	Y	N	N	Y
9285500	ALLIANCE ST. LOUIS	Ro-Ro	57,280	15,880	2005	Farrell Lines Inc	Y	Y	N	N	Y
9564578	AMERICAN PHOENIX	Tanker	30,718	49,035	2012	Seabulk Tankers Inc	N	N	N	Y	Y
9139713	APL AGATE	Containership	65,475	63,693	1997	APL Ltd	Y	Y	N	N	Y
9218686	APL BELGIUM	Containership	65,792	67,500	2002	APL Ltd	N	Y	N	N	Y
9074389	APL CHINA	Containership	64,502	66,520	1995	APL Ltd	Y	Y	N	N	Y
9139749	APL CORAL	Containership	65,475	64,145	1998	APL Ltd	Y	Y	N	N	Y
9139725	APL CYPRINE	Containership	65,475	64,157	1997	APL Ltd	Y	Y	N	N	Y
9074535	APL KOREA	Containership	64,502	66,520	1995	APL Ltd	Y	Y	N	N	Y
9139737	APL PEARL	Containership	65,475	64,050	1998	APL Ltd	Y	Y	N	N	Y
9077276	APL PHILIPPINES	Containership	64,502	65,642	1996	APL Ltd	Y	Y	N	N	Y
9074547	APL SINGAPORE	Containership	64,502	66,520	1995	APL Ltd	Y	Y	N	N	Y
9077123	APL THAILAND	Containership	64,502	66,520	1995	APL Ltd	Y	Y	N	N	Y
8124371	BLACK EAGLE	Containership	31,041	32,709	1983	Sealift Inc	N	Y	N	N	Y
9144926	CALIFORNIA VOYAGER	Tanker	30,770	45,656	1999	Chevron Shipping Co LLC	N	N	N	Y	Y
9123037	CAPT DAVID I. LYON	Containership	16,803	22,878	1996	Sealift Inc	N	N	N	N	Y
8313661	CAPT STEVEN L. BENNETT	General Cargo	29,226	41,151	1984	Sealift Inc	N	Y	N	N	Y
8109668	CHARLESTON	Tanker	31,452	48,846	1983	USCS Chemical Chartering	N	N	N	Y	Y
9243162	CHARLESTON EXPRESS	Containership	40,146	40,478	2002	Hapag-Lloyd Ag	Y	Y	N	N	Y
6806444	CHEMICAL PIONEER	Tanker	21,760	34,930	1968	USCS Chemical Chartering	N	N	N	Y	Y
9010498	COASTAL NAVIGATOR	General Cargo	1,904	1,500	1991	Coastal Transportation Inc.	N	N	N	Y	N
8213249	COASTAL NOMAD	General Cargo	1,920	1,200	1983	Coastal Transportation Inc.	N	N	N	Y	N
8855463	COASTAL PROGRESS	General Cargo	1,920	1,200	1988	Coastal Transportation Inc.	N	N	N	Y	N
5408491	COASTAL TRADER	General Cargo	1,823	1,825	1963	Coastal Transportation Inc.	N	N	N	Y	N
7119678	COASTAL VENTURE	General Cargo	1,301	1,383	1971	Stevens Transportation LLC	N	Y	N	Y	Y
8919922	COURAGE	Ro-Ro	52,288	29,213	1991	American Roll-On Roll-Off	Y	Y	N	N	Y
9457218	CRAGSIDE	Ro-Ro	29,429	11,325	2011	DFDS A/S	N	N	N	N	Y
9198501	DELTA MARINER	Ro-Ro	8,679	3,950	2000	Foss Maritime Co	N	Y	N	Y	Y
7408081	EAGLE FORD	Tanker	64,329	124,644	1978	Seabulk Tankers Inc	N	N	N	Y	N
7395351	EL FARO	Ro-Ro	31,515	17,915	1975	Sea Star Line LLC	N	Y	N	Y	Y
7506015	EL YUNQUE	Ro-Ro	28,137	16,144	1976	Sea Star Line LLC	N	Y	N	Y	Y
9408126	EMPIRE STATE	Tanker	29,527	48,635	2010	Crowley Petroleum Service	N	N	N	Y	Y
9121273	ENDURANCE	Ro-Ro	72,708	48,988	1996	American Roll-On Roll-Off	Y	Y	N	N	Y
8026799	ENERGY ENTERPRISE	Dry Bulk	28,250	33,373	1983	International Shipholding Corp	N	N	N	Y	N
8813025	EOT SPAR	Ro-Ro	2,762	3,095	1990	Schuyler Line Navigation Co., LLC	N	Y	N	N	Y
9408138	EVERGREEN STATE	Tanker	29,606	48,641	2010	American Petroleum Tankers LLC	N	N	N	Y	Y
9568469	FLORIDA	Tanker	29,242	45,760	2013	Crowley Petroleum Service	N	N	N	Y	Y
9118630	FLORIDA VOYAGER	Tanker	30,415	46,094	1998	Chevron Shipping Co LLC	N	N	N	Y	Y
9129706	FREEDOM	Ro-Ro	49,821	19,884	1997	American Roll-On Roll-Off	Y	Y	N	N	Y
7710733	GEYSIR	General Cargo	2,266	2,000	1980	Transatlantic Lines Shphldgs	N	Y	N	Y	Y
9407562	GOLDEN STATE	Tanker	29,527	48,632	2009	Crowley Petroleum Service	N	N	N	Y	Y
9181560	GREEN COVE	Ro-Ro	57,566	22,747	1999	LMS Shipmanagement Inc	Y	Y	N	N	Y
9158288	GREEN LAKE	Ro-Ro	57,623	22,799	1998	Central Gulf Lines	Y	Y	N	N	Y
9056296	GREEN POINT	Ro-Ro	51,819	14,930	1994	Sulphur Carriers Inc	Y	Y	N	N	Y
9177428	GREEN RIDGE	Ro-Ro	57,449	21,523	1998	Central Gulf Lines	Y	Y	N	N	Y
9126297	HONOR	Ro-Ro	49,814	19,844	1996	American Roll-On Roll-Off	Y	Y	N	N	Y
8419142	HORIZON ANCHORAGE	Containership	20,965	21,282	1987	Horizon Lines LLC	N	Y	N	Y	Y
7224306	HORIZON CONSUMER	Containership	25,644	25,651	1973	Horizon Lines LLC	N	Y	N	Y	Y
7617905	HORIZON ENTERPRISE	Containership	28,219	31,423	1980	Horizon Lines LLC	N	Y	N	Y	Y
7218462	HORIZON FAIRBANKS	Containership	20,987	22,086	1973	Horizon Lines LLC	N	N	N	Y	Y
8419166	HORIZON KODIAK	Containership	20,965	20,668	1987	Horizon Lines LLC	N	Y	N	Y	Y
7116315	HORIZON NAVIGATOR	Containership	28,212	31,203	1972	Horizon Lines LLC	N	Y	N	Y	Y
7617890	HORIZON PACIFIC	Containership	28,219	31,213	1979	Horizon Lines LLC	N	Y	N	Y	Y
7729461	HORIZON RELIANCE	Containership	34,077	45,895	1980	Horizon Lines LLC	N	Y	N	Y	Y
7729459	HORIZON SPIRIT	Containership	34,077	46,154	1980	Horizon Lines LLC	N	Y	N	Y	Y
8419154	HORIZON TACOMA	Containership	20,965	20,668	1987	Horizon Lines LLC	N	Y	N	Y	Y
7326233	HORIZON TRADER	Containership	28,212	31,495	1973	Horizon Lines LLC	N	Y	N	Y	Y
9331593	HOUSTON	General Cargo	7,002	7,491	2005	Teras BBC Ocean Navigation	N	Y	N	N	Y
8220761	HOUSTON	Tanker	21,471	32,689	1985	USS Chartering LLC	N	N	N	Y	Y
9070448	INDEPENDENCE II	Ro-Ro	55,598	15,199	1994	American Roll-On Roll-Off	Y	Y	N	N	Y
8919934	INTEGRITY	Ro-Ro	52,479	29,152	1992	American Roll-On Roll-Off	Y	Y	N	N	Y
9233167	JEAN ANNE	Ro-Ro	37,548	12,561	2005	Pasha Group	N	Y	N	Y	Y
7802718	KAUAI	Containership	25,640	26,350	1980	Matson Navigation Co Inc	N	Y	N	Y	Y
9642083	LIBERTY BAY	Tanker	62,318	115,000	2014	Seariver Maritime Inc	N	N	N	Y	N
9278753	LIBERTY EAGLE	Dry Bulk	28,762	51,812	2004	Liberty Maritime Corp	N	Y	N	N	Y
9228136	LIBERTY GLORY	Dry Bulk	28,836	50,601	2001	Liberty Maritime Corp	N	Y	N	N	Y
9228148	LIBERTY GRACE	Dry Bulk	28,836	50,601	2001	Liberty Maritime Corp	N	Y	N	N	Y
9448114	LIBERTY PRIDE	Ro-Ro	57,030	21,233	2009	Liberty Maritime Corp	Y	Y	N	N	Y
9448425	LIBERTY PROMISE	Ro-Ro	57,030	21,359	2010	Liberty Maritime Corp	Y	Y	N	N	Y
7105471	LIHUE	Containership	30,877	38,656	1971	Matson Navigation Co Inc	N	Y	N	Y	Y
8212714	LTC JOHN U.D. PAGE	Containership	57,075	58,869	1985	Maersk A/S	N	N	N	N	Y
7321087	LURLINE	Ro-Ro	30,506	22,030	1973	Matson Navigation Co Inc	N	Y	N	Y	Y
9164263	MAERSK ALABAMA	Containership	14,120	17,375	1998	Maersk A/S	Y	Y	N	N	Y
9348649	MAERSK ATLANTA	Containership	74,642	84,676	2006	Maersk A/S	Y	Y	N	N	Y
8820195	MAERSK CALIFORNIA	Containership	18,979	25,275	1992	Maersk A/S	Y	Y	N	N	Y
9155133	MAERSK CAROLINA	Containership	50,698	62,229	1998	Maersk A/S	Y	Y	N	N	Y
9332975	MAERSK CHICAGO	Containership	74,642	84,775	2007	Maersk A/S	Y	Y	N	N	Y
9332987	MAERSK COLUMBUS	Containership	74,642	84,704	2007	Maersk A/S	Y	Y	N	N	Y
9332999	MAERSK DENVER	Containership	74,642	84,771	2007	Maersk A/S	Y	Y	N	N	Y
9333034	MAERSK DETROIT	Containership	74,642	80,000	2008	Maersk A/S	Y	Y	N	N	Y
9333008	MAERSK HARTFORD	Containership	74,642	60,375	2007	Maersk A/S	Y	Y	N	N	Y
9193264	MAERSK IDAHO	Containership	50,698	61,986	2000	Maersk A/S	Y	Y	N	N	Y
9298686	MAERSK IOWA	Containership	50,686	61,454	2006	Maersk A/S	Y	Y	N	N	Y
9193240	MAERSK KENTUCKY	Containership	50,698	61,986	1999	Maersk A/S	Y	Y	N	N	Y
9348651	MAERSK MEMPHIS	Containership	74,642	84,868	2007	Maersk A/S	Y	Y	N	N	Y
9255244	MAERSK MICHIGAN	Tanker	28,517	47,047	2003	Handytankers K/S	N	N	Y	N	Y
9155121	MAERSK MISSOURI	Containership	50,698	62,226	1998	Maersk A/S	Y	Y	N	N	Y
9305312	MAERSK MONTANA	Containership	50,686	61,499	2006	Maersk A/S	Y	Y	N	N	Y
9298698	MAERSK OHIO	Containership	50,686	61,454	2006	Maersk A/S	Y	Y	N	N	Y
9278492	MAERSK PEARY	Tanker	25,487	38,177	2004	Maersk Line Ltd-USA	N	N	Y	N	Y

United States Flag Privately-Owned Merchant Fleet*

Oceangoing Self-Propelled, Cargo-Carrying Vessels of 1,000 GT and Above (As of March 9, 2015)

IMO #	Vessel Name	Vessel Type	Gross Tonnage	Deadweight	Year Built	Operator	MSP	VISA	VTA	Jones Act Eligible (Y/N)	Militarily Useful (Y/N)*
9342176	MAERSK PITTSBURGH	Containership	74,642	84,676	2008	Maersk A/S	Y	Y	N	N	Y
9305300	MAERSK UTAH	Containership	50,686	61,454	2006	Maersk A/S	Y	Y	N	N	Y
9193252	MAERSK WISCONSIN	Containership	50,698	62,441	2000	Maersk A/S	Y	Y	N	N	Y
7907996	MAHIMAHI	Containership	41,036	30,825	1983	Matson Navigation Co Inc	N	Y	N	Y	Y
8320559	MAJOR BERNARD F. FISHER	Ro-Ro	34,318	24,500	1985	Sealift Inc	N	N	N	N	Y
7907984	MANOA	Containership	41,036	30,825	1982	Matson Navigation Co Inc	N	Y	N	Y	Y
9244130	MANUKAI	Containership	32,575	38,261	2003	Matson Navigation Co Inc	N	Y	N	Y	Y
9273674	MANULANI	Containership	32,575	38,261	2005	Matson Navigation Co Inc	N	Y	N	Y	Y
9232979	MARSTAN	Containership	6,368	8,627	2000	Sealift Inc	N	Y	N	N	Y
7334204	MATSONIA	Ro-Ro	33,095	22,501	1973	Matson Navigation Co Inc	N	Y	N	Y	Y
7602338	MAUI	Containership	25,630	24,683	1978	Matson Navigation Co Inc	N	Y	N	Y	Y
9273686	MAUNALEI	Containership	25,324	34,027	2006	Matson Navigation Co Inc	N	Y	N	Y	Y
9268538	MAUNAWILI	Containership	32,575	38,261	2004	Matson Navigation Co Inc	N	Y	N	Y	Y
9232278	MIDNIGHT SUN	Ro-Ro	65,314	22,437	2003	Totem Ocean Trailer Express	N	Y	N	Y	Y
7929308	MISSISSIPPI ENTERPRISE	Dry Bulk	22,518	37,244	1980	US United Ocean Services LLC	N	N	N	Y	N
9131369	MISSISSIPPI VOYAGER	Tanker	30,415	46,069	1998	Chevron Shipping Co LLC	N	N	N	Y	Y
9100243	MOHEGAN	Containership	6,158	7,850	1994	Sealift Inc	N	N	N	N	Y
7908005	MOKIHANA	Ro-Ro	57,379	30,652	1983	Matson Navigation Co Inc	N	Y	N	Y	Y
8302246	NATIONAL GLORY	Containership	11,652	12,418	1988	National Shipping Company	N	Y	N	Y	Y
9232280	NORTH STAR	Ro-Ro	65,314	22,437	2003	Totem Ocean Trailer Express	N	Y	N	Y	Y
9213959	OCEAN CHARGER	General Cargo	7,252	8,034	2000	Intermarine LLC	Y	Y	N	N	Y
9258193	OCEAN CRESCENT	General Cargo	7,252	8,097	2002	Intermarine LLC	Y	Y	N	N	Y
9506722	OCEAN FREEDOM	General Cargo	12,810	14,359	2010	Intermarine LLC	Y	Y	N	N	Y
9437335	OCEAN GIANT	General Cargo	15,549	18,389	2012	Intermarine LLC	Y	Y	N	N	Y
9419008	OCEAN GLOBE	General Cargo	15,549	16,576	2010	Intermarine LLC	Y	N	N	N	Y
9144914	OREGON VOYAGER	Tanker	30,770	45,671	1999	Chevron Shipping Co LLC	N	N	N	Y	Y
9353591	OVERSEAS ANACORTES	Tanker	29,242	46,666	2010	Overseas Shipholding Group	N	N	N	Y	Y
9353565	OVERSEAS BOSTON	Tanker	29,242	46,802	2009	OSG Ship Management Inc	N	N	N	Y	Y
9475935	OVERSEAS CASCADE	Tanker	29,234	46,287	2009	OSG Ship Management Inc	N	N	N	Y	Y
9432218	OVERSEAS CHINOOK	Tanker	29,234	46,666	2010	Overseas Shipholding Group	N	N	N	Y	Y
9351062	OVERSEAS HOUSTON	Tanker	29,242	46,814	2007	Overseas Shipholding Group	N	N	N	Y	Y
9353527	OVERSEAS LONG BEACH	Tanker	29,242	46,911	2007	OSG Ship Management Inc	N	N	N	Y	Y
9353539	OVERSEAS LOS ANGELES	Tanker	29,242	46,817	2007	OSG Ship Management Inc	N	N	N	Y	Y
9353589	OVERSEAS MARTINEZ	Tanker	29,242	46,653	2010	OSG Ship Management Inc	N	N	N	Y	Y
9435894	OVERSEAS MYKONOS	Tanker	29,433	51,711	2010	OSG Ship Management Gr Ltd	Y	N	Y	N	Y
9353541	OVERSEAS NEW YORK	Tanker	29,242	46,810	2008	OSG Ship Management Inc	N	N	N	Y	Y
9353577	OVERSEAS NIKISKI	Tanker	29,242	46,666	2009	OSG Ship Management Inc	N	N	N	Y	Y
9435909	OVERSEAS SANTORINI	Tanker	29,433	51,711	2010	OSG Ship Management Gr Ltd	Y	N	Y	N	Y
9353606	OVERSEAS TAMPA	Tanker	29,242	46,666	2011	OSG Ship Management Inc	N	N	N	Y	Y
9353553	OVERSEAS TEXAS CITY	Tanker	29,242	46,817	2008	OSG Ship Management Inc	N	N	N	Y	Y
9408102	PELICAN STATE	Tanker	29,527	48,598	2009	Crowley Petroleum Service	N	N	N	Y	Y
9486958	PENNSYLVANIA	Tanker	29,242	45,760	2012	Crowley Petroleum Service	N	N	N	Y	Y
9243203	PHILADELPHIA EXPRESS	Containership	40,146	40,478	2003	Hapag-Lloyd Ag	Y	Y	N	N	Y
9244063	POLAR ADVENTURE	Tanker	85,387	141,740	2004	Polar Tankers Inc	N	N	N	Y	N
9206114	POLAR DISCOVERY	Tanker	85,387	141,740	2003	Polar Tankers Inc	N	N	N	Y	N
9193551	POLAR ENDEAVOUR	Tanker	85,387	141,740	2001	Polar Tankers Inc	N	N	N	Y	N
9250660	POLAR ENTERPRISE	Tanker	85,387	141,740	2006	Polar Tankers Inc	N	N	N	Y	N
9193563	POLAR RESOLUTION	Tanker	85,387	141,740	2002	Polar Tankers Inc	N	N	N	Y	N
9002037	R. J. PFEIFFER	Containership	32,664	28,555	1992	Matson Navigation Co Inc	N	Y	N	Y	Y
9080297	RESOLVE	Ro-Ro	49,443	13,548	1994	American Roll-On Roll-Off	Y	Y	N	N	Y
9118628	S/R AMERICAN PROGRESS	Tanker	30,415	46,103	1997	Seariver Maritime Inc	N	N	N	Y	Y
9356074	SAFMARINE NGAMI	Containership	25,904	35,119	2008	Safmarine Container Lines	N	N	N	N	Y
7517698	SEA TRADER	General Cargo	3,185	1,496	1976	Trident Seafoods Corp	N	N	N	Y	N
9131371	SEABULK ARCTIC	Tanker	30,415	46,103	1998	Seabulk Tankers Inc	N	N	N	Y	Y
7816551	SEABULK CHALLENGE	Tanker	29,763	49,636	1981	Seabulk Tankers Inc	N	N	N	Y	Y
7816549	SEABULK TRADER	Tanker	29,763	49,990	1981	Seabulk Tankers Inc	N	N	N	Y	Y
9143001	SEA-LAND CHARGER	Containership	49,985	59,961	1997	Maersk A/S	Y	Y	N	N	Y
9106182	SEA-LAND COMET	Containership	49,985	59,840	1995	Maersk A/S	Y	Y	N	N	Y
9143025	SEA-LAND INTREPID	Containership	49,985	59,840	1997	Maersk A/S	Y	Y	N	N	Y
9161168	SEATTLE	General Cargo	13,066	20,406	1997	American Overseas Marine Co	N	N	N	N	Y
7408093	SIERRA	Tanker	64,329	125,133	1979	Seariver Maritime Inc	N	N	N	Y	N
9383663	SLNC PAX	Tanker	5,713	7,985	2008	Schuyler Line Navigation Co., LLC	N	N	N	N	Y
8212673	SSG EDWARD A. CARTER JR.	Containership	57,075	58,943	1985	Maersk A/S	N	N	N	N	Y
9243186	ST LOUIS EXPRESS	Containership	40,146	40,478	2002	Hapag-Lloyd Ag	Y	Y	N	N	Y
8414518	STONE BUCCANEER	Tanker	1,576	3,549	1985	Stone Oil Distributor	N	N	N	Y	Y
9077044	SULPHUR ENTERPRISE	Tanker	16,771	21,649	1994	ISC-Sulphur Holding Inc	N	N	N	Y	N
9408114	SUNSHINE STATE	Tanker	29,527	48,633	2009	Intrepid Ship Management Inc	N	N	N	Y	Y
7821154	TEXAS ENTERPRISE	Dry Bulk	21,734	36,414	1981	US United Ocean Services LLC	N	N	N	Y	N
9148520	TRANSATLANTIC	General Cargo	4,276	5,055	1997	Transatlantic Lines LLC	N	Y	N	N	Y
9243198	WASHINGTON EXPRESS	Containership	40,146	40,478	2003	Hapag-Lloyd Ag	Y	Y	N	N	Y
9243174	YORKTOWN EXPRESS	Containership	40,146	40,478	2002	Hapag-Lloyd Ag	Y	Y	N	N	Y

United State Flag Fleet @ a Glance:

Total Ships

167

Jones Act

86

Non-Jones Act

81

	# of Vessels	Total GT	Total DWT
U.S.-Flag Fleet by Sector			
Jones Act Eligible	87	4,289,698	3,076,321
Non-Jones Act Eligible	81	3,450,094	3,652,266
Total U.S.-Flag Fleet	168	7,739,792	6,728,587
Jones Act Eligible			
Containership	23	694,511	647,770
Dry Bulk	3	107,031	72,502
General Cargo	7	10,604	14,319
Ro-Ro	9	170,627	357,487
Tanker	45	3,306,925	1,984,243
Total Jones-Act Eligible vessels	87	4,289,698	3,076,321
Non Jones Act Eligible			
Containership	44	2,535,238	2,311,861
Dry Bulk	3	153,014	86,434
General Cargo	9	150,732	114,729
Ro-Ro	20	414,479	1,020,659
Tanker	5	196,631	118,583
Total Non Jones-Act Eligible vessels	81	3,450,094	3,652,266


DNV GL
Eriksen


LR
Marsh


LR
Sadler


Seaspan
Reynolds


Furuno USA
Davis


Norwegian Trade Fairs
Liodden


Troy Container Line
Gimbert


HII
Farrell


HII
Jones


WSS
Shao


Schottel
Buch


Schottel
Lange

Eriksen to Head DNV GL

DNV GL Group appointed Remi Eriksen as the company's new Group President & CEO, succeeding Henrik O. Madsen, who is retiring on August 1. His current role is as DNV GL Group Chief Operating Officer, and his appointment follows an extensive executive search from both inside and outside the organization.

Marsh to Take Over as LR CEO

Alastair Marsh, current CFO at the Lloyd's Register Group Ltd. (LR), has been appointed as the successor to CEO Richard Sadler who has decided to step down at the end of 2015. Sadler will pass the CEO role to Marsh on October 1, 2015 and commence a formal handover period until the end of December 2015. Simon Nice, currently Group FP&A Director, will take up the role of Interim Group Financial Director during the transition.

Seaspan Marine Appoints Reynolds

Bart Reynolds has been hired to take over as president of Seaspan Marine. Appointed to lead Seaspan's Marine Division, Reynolds joins the company with more than 20 years of experience in leadership positions and senior management.

Theriot Lands at Conrad

Conrad Industries, Inc. announced the appointment of Scott J. Theriot as Executive Vice President and COO. Most recently Theriot was Executive Vice President of Sales and Marketing at Bollinger.

WPT Power Appoints De Hoyos

Robert De Hoyos joined WPT Power Corporation as the company's new engineering manager, bringing to the post 21 years of manufacturing experience as a mechanical engineer.

Furuno's Ed Davis Passes Away

Ed Davis, an industry veteran and longtime employee at Furuno USA, Inc., passed away on April 30. Davis was Furuno USA's Mid-Atlantic Regional Manager since September 1992, working closely with dealers. Prior to working at Furuno, Ed had his own marine manufacturer's rep company, where he represented Datamarine International, Audiovox and Shakespeare Electronics.

Liodden New Director of NorShipping

Norwegian Trade Fairs has appointed Birgit Liodden as the new Director of Nor-Shipping. Liodden, 32, holds a CV that includes tenures at Wilh. Wilhelmsen, external consultancy for OECD and SeaTrucks Nigeria, and numerous board level positions for, amongst others, Maritime Forum Oslofjord and the Norwegian Sea Rescue Academy.

Troy Container Line VP to Retire

Walter Gimbert, vice president of Troy Container Line, will retire from the company as of May 14, 2015, after more than 20 years of service.

Dr. Robinson Named Top Scientist

Dr. Harold Robinson, a physicist at the Naval Undersea Warfare Center (NUWC) in Newport, R.I., has been named a winner of the 2014 Assistant Secretary of the Navy (ASN) Top Scientists and Engineers of the Year Award. The award, presented by the ASN for Research, Development and Acquisition (ASN RDA), recognizes contributions that demonstrate stellar quality, technical excellence and have had an operational impact.

In 2014, Robinson demonstrated the effectiveness of utilizing single crystal arrays for small unmanned undersea vehicles, and he developed and tested a compact, low-frequency transducer for tracking ranges, which will enable small-diameter vehicles to be used at a wider variety of naval at-sea test facilities.

Ingalls Appoints Jones, Farrell

Huntington Ingalls Industries (HII) announced the appointment of two vice presidents at its Ingalls Shipbuilding division. George Jones has been appointed vice president of operations, and Tim Farrell has been appointed vice president of new Navy programs.

WSS Appoints Shao for China

Heading up Wilhelmsen Ships Service's (WSS) ships agency sales team in China, Emilia Shao brings both industry experience and an eclectic academic background to one of the company's largest agency markets. Located in Shanghai, Shao will manage WSS's agency business across its three offices located in Northern, Central and Southern China.

Schottel Launches New Service Divisions

Schottel announced the creation of two new service divisions, Automation and Systems Engineering as well as Repair International. Stefan Buch was appointed director of the division Automation und Systems Technology. The electrical engineer has been working in leading positions in the Schottel area of software development, engineering and switchboard engineering since 2001.

René Lange is responsible for the new division Repair International. The naval engineer has been working in leading positions in the Schottel service organization since 2006. Amongst others he worked in the service area of the North American Schottel subsidiary.

Delta 'T' Systems Appoints Gustafson

Delta "T" Systems has appointed Jon Gustafson as its application sales manager.

Laborde Power for Stone Oil Fleet

In January 2014, Laborde Products sold its first Mitsubishi engine to John W. Stone Oil for the vessel John W. Stone. Since then, Laborde has supplied the Gretna, Louisiana-based oil distributor with seven more Mitsubishis, repowering half of its fleet.

The John W. Stone, Olga G. Stone and Moose are now powered by a S12A2-Y2MPTK at 940 hp, while the Jennifer, Shell Fueler, Hiawatha and Custom each have a S6R-Y2MPTK at 630 hp. Stone Power utilizes a S12R-Y3MPTAW at 1,100 hp.

Laborde also repowered the Lil Susan S, a vessel chartered by John W. Stone Oil. In addition, Laborde provided the company with five fully mechanical 400 hp barge power units, and two Vapor 8.6 MBTU thermal fluid heaters.

Hempel

Pierre-Yves Jullien, Group President and CEO, Hempel

Hempel Celebrates 100 Years

Hempel kicked off the group's centenary celebrations and invited customers from Greece, Bulgaria, Cyprus and Romania to a party in Athens' Acropolis Museum on Saturday, May 9. Hempel has had a permanent presence in Greece since 1952 as Hempel Hellas General Manager, Keld Laursen explained, "For 63 out of the 100 years we have had our feet on the ground in Piraeus and Athens and we are very proud of this. We could think of no better way to celebrate Hempel's centenary than with our friends in Greece."

Hempel's Group President and CEO Pierre-Yves Jullien expanded, "It is fitting – and a real pleasure - that the first significant centenary event is here in Athens . . . Over 100 years the Group has changed significantly in size, in geographical coverage (we serve our customers in 110 countries today) and has expanded into new sectors such as protective and decorative coatings. In terms of earnings, we are in the top tier of our sector. But the marine paints business is where we started and is firmly embedded in our DNA and Greece is the biggest shipping nation in the world."

An entrepreneur with a vision to protect manmade structures from corrosion and fouling, Jørgen Christian Hempel founded marine coatings manufacturer Hempel in Denmark in 1915.

Registration for SHIPPINGInsight 2015 is Open

Now entering its fourth year, SHIPPINGInsight is an annual maritime technology forum in North America that brings together shipping companies, classification societies, regulatory bodies, consultancies and technology suppliers to address technical solutions for the challenges facing today's maritime industry. The 2015 event will take place Oct. 13-14 at the Stamford Marriott Hotel in Stamford, Conn.

Registrations made online prior to Sept. 15 get an automatic $200 Early-Bird discount.

www.shippinginsight.com

BUYER'S DIRECTORY

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

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

DCL Mooring and Rigging, 4400 North Galvez Street, New Orleans, LA , USA , tel:504 941-4116, fax:504 947-8557, codys@dcl-usa.com contact: Cody Schnuriger, www.dcl-usa.com

ANTI-CONDENSATION COATINGS

Mascoat Products, 4310 Campbell Rd., Houston, TX , USA , tel:(713) 465-0304, fax:(713) 465-0302, wconner@mascoat.com

ATTORNEYS

Blank Rome LLP - Admiralty & Maritime Law, 600 New Hampshire Avenue, NW, Washington, DC , USA , tel:(202)772-5927, fax:(202) 772-5858, Grasso@BlankRome.com contact: Jeanne M. Grasso, www.BlankRomeMaritime.com

AUTOMATIC IDENTIFICATION SYSTEM

Saab TransponderTech AB, SE-589 41 Linkoping , tel:46 13 180000, fax:46 13 182377, Info.transpondertech@saabgroup.com

COATINGS/ CORROSION CONTROL/ PAINT

Hempel A/S, Lundtoftegårdsvej 91 2800 Kgs. Lyngby , tel:45 4593 3800, fax:45 4588 5518, marine@hempel.com , www.hempel.com

Tri-State Coating and Machine Co. Inc., 5610 McComas Road, PO Box 296, Salt Rock, WV V4W 3S8, USA , tel:1-800-477-4460, fax:304-736-7773, brichmond@tscminc.com contact: Beverly Richmond, www.tscminc.com

COMMUNICATIONS

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

CORDAGE

Helkama Bica Oy, Lakimiehenkatu 4, KAARINA FI-20780, Finland , tel:+358-2-410 8700, sales@helkamabica.fi

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WQIS (Marine Pollution Insurance Policies), 60 Broad Street, 33rd Floor, New York, NY , USA , tel:1-800-736-5750, fax:(212) 292-8716 , www.wqis.com

WQIS (Water Quality Insurance Syndicate), 60 Broad Street 33rd Floor, New York, NY 18974, USA , tel:1-800-736-5750, fax:212-292-8716

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Brunswick Commercial & Government Products, 420 Megan Z Avenue, Edgwater, FL 80204, USA , tel:(386) 423-2900, kelsey.nemeth@whaler.com

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Patterson Company, 870 Riversea Road, Pittsburgh, PA , USA , tel:(412) 322-2012, fax:(412) 322-2785, russ.mayhew@pattersonmfg.com contact: Russ Mayhew, www.pattersonmfg.com

Pipeline Lead Engineer (Pipelines Delivery Team)
Customer Service Coordinator
Job Location: USA, Austin, TX

Responsible for customer service for east and west coast container terminals, including verifying the accuracy of documentation and proper handling of import and export cargo. Customer service experience in maritime transportation preferred. Must be available to work Monday through Friday, 10:00 a.m. to 7:00 p.m. and weekend coverage on a rotating basis.

Elena Salvatore
TraPac, LLC
630 W. Harry Bridges Blvd.
Wilmington CA 92807 USA
Phone: 310-513-7416
Fax: 310-513-7439
Email: elena.salvatore@trapac.com
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General Manager
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Richard Wigger
Compliance Systems, Inc.
26 East Bryan Street
GA 31401 USA
Phone: 912 233 7000
Email: rwigger@compliancesystemsinc.com

Shipyard Safety Coordinator
Job Location: USA, Brooklyn, New York

The ideal candidate will be responsible for training, coaching, continuously reviewing and promoting safe work practices during project activities in our Brooklyn, New York location. The Shipyard Safety Coordinator will be self-directed, and follow and enforce safety regulations in compliance with regulatory laws. Must have or be able to attain Shipyard Competent Person certification within six months. Shipyard Competent Person duties will include performing tests as directed. Must have understanding of appropriate OSHA Shipyard standards, and knowledge about vessel structure, location(s), and spaces in which work is performed. The ability to perform tests, calibrate and use test equipment, interpret test results, and maintain test records is required, along with the ability to inspect, test, and evaluate spaces. Must be able to determine the need for further evaluation by a Certified Marine Chemist. Applicants must be willing to submit to a pre-employment criminal, motor vehicle and employment background check. Use of personal protective equipment such as respirators, hard hats and safety footwear is required while on work sites. Work will involve visiting work sites both indoors and outdoors at all times of the year. Reasonable accommodations may be made to enable individuals with disabilities to perform the essential functions of this position. Must be able to work nights and weekends. High School Diploma required, college degree preferred. Three to five years of relevant experience in the marine industry preferred; or equivalent combination of education and experience that enables performance of all aspects of the position. Bilingual English/Spanish a plus. Pay commensurate with experience. For consideration, please e-mail résumé's to jobs@gmdshipyard.com with "Safety Coordinator" as the subject. Include salary history and salary requirements. Applicants that do not include salary history and salary requirements will not be considered. **NO PHONECALLS PLEASE.**

Human Resources
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63 Flushing Ave. Unit 276
Brooklyn NY 11205 USA
Fax: (718) 260-9284
Email: jobs@gmdshipyard.com
Web: http://www.gmdshipyard.com

Pipeline Lead Engineer (Pipelines Delivery Team)
Job Location: USA, California

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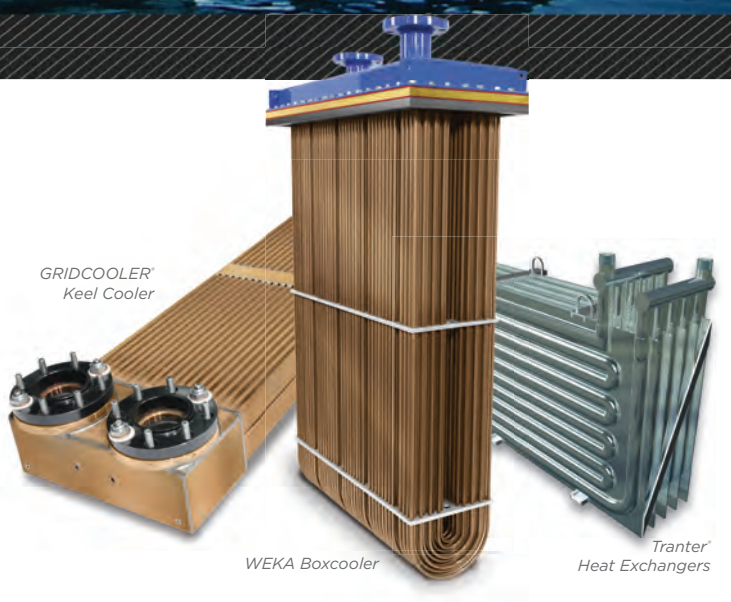

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