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July 2014

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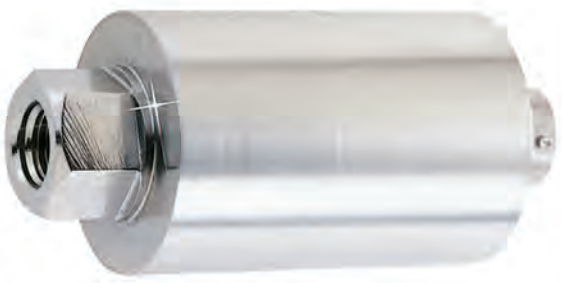

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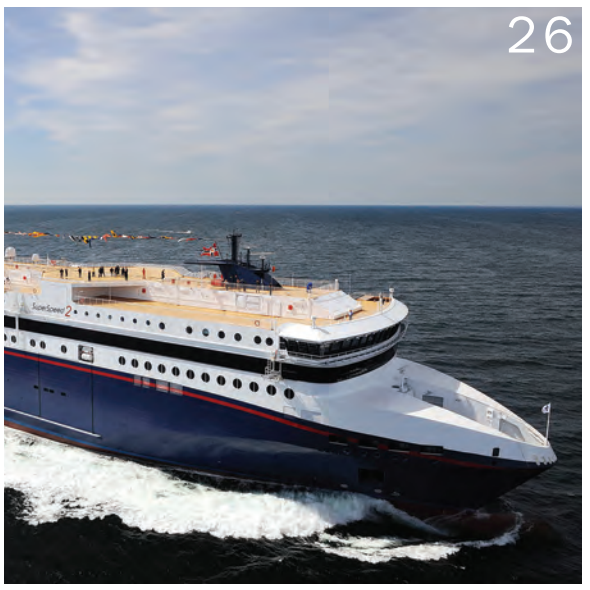

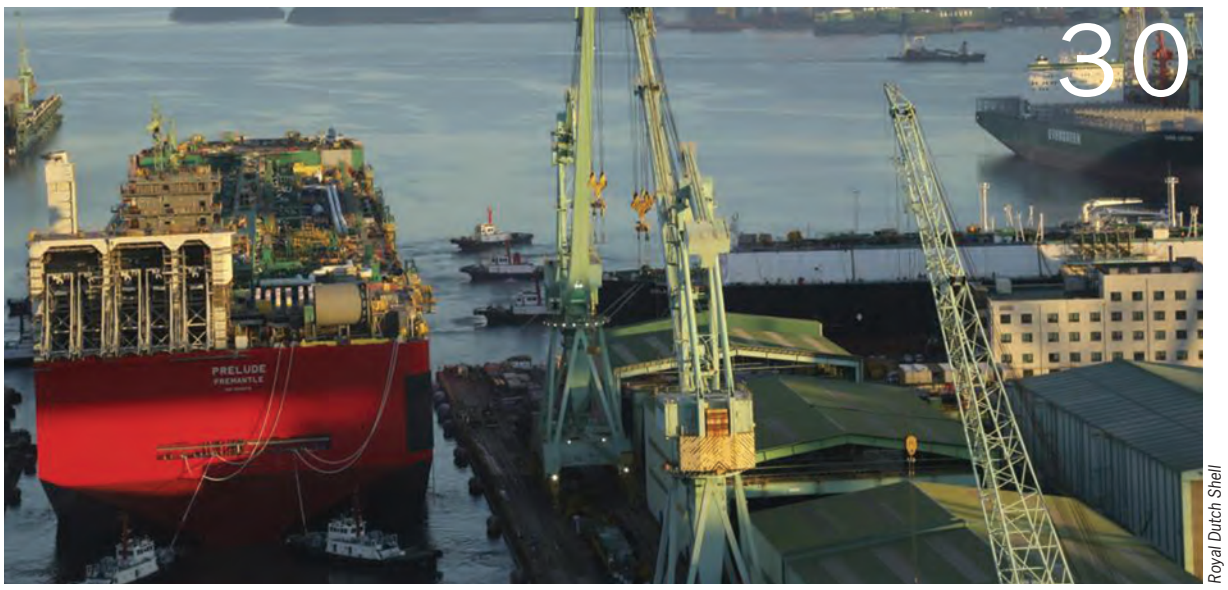

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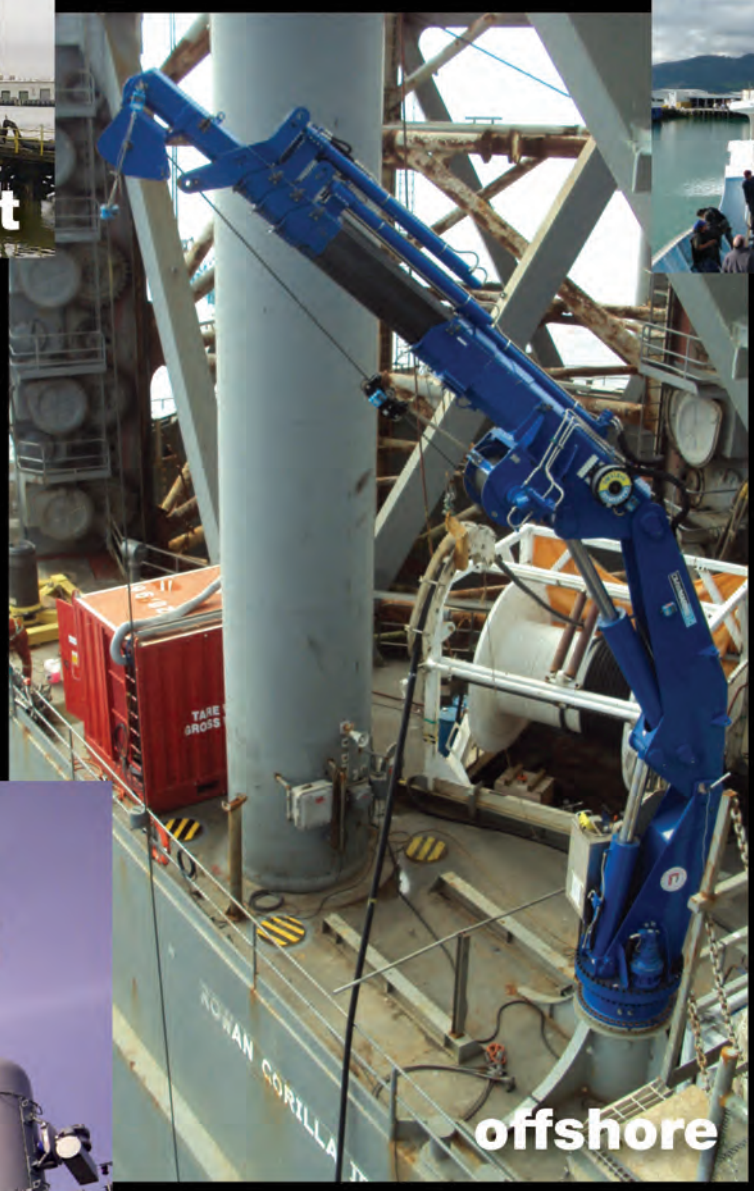

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Seemingly not an hour goes by without some announcement from somewhere around the world regarding the hunt for, processing, transport or use of gas in the maritime sector. Central to this edition is an update on the FLNG Prelude, starting on page 30.

Photo: Royal Dutch Shell

The Gas Revolution

FLNG Prelude is a maritime & energy project of epic proportion. With a price tag between $11-13 billion, the floating energy plant is breaking records and changing energy business forever.

By Patricia Keefe

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Photo: Jonrie

Photo: HHI

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Posidonia 2014

The marine industry convened in Athens for epic parties. There was an exhibition, too, and some interesting new technology introduced.

MARITIME REPORTER AND ENGINEERING NEWS

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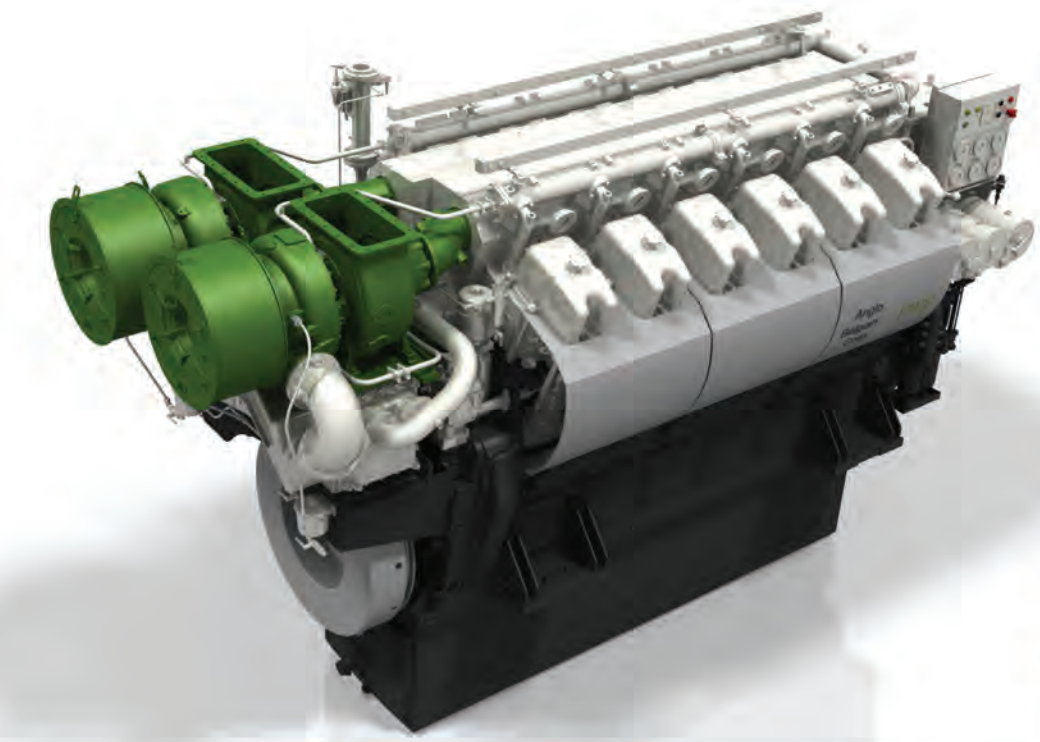

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gas ... it is both the question & the answer ...

GREG TRAUTHWEIN, EDITOR & ASSOCIATE PUBLISHER

When the time comes to pull an edition together, sometimes the content simply takes on a life of its own, as is the case with the July 2014 edition and the proliferation of 'gas' throughout. While the advent of gas and all that this little word encompasses is hardly breaking news, to put it in context we literally are in the infancy of a historic course correction that will last generations.

Following up on last month's interview with **Edward Scott**, COO of Excelerate Energy (www.marinelink.com/news/excelerate-energy-year371540.aspx) this month Patricia Keefe, via the seventh installation of her "75th Anniversary" series of features for our pages, provides a top to bottom, inside and out profile of the FLNG Prelude, a revolutionary technology taking shape in South Korea that raises the bar many times over in both the maritime and energy sectors. In a word this project is awesome in size and scope, as I think you will agree after reading the story which starts on page 30.

While historic, the FLNG market does not start and end with Prelude, as Keefe notes in her article there is plenty of competition lining up to make the next, biggest splash.

In fact, in Jim McCaul's monthly report on the burgeoning Floating Production sector, he reports that recently a $1.2B FLNG has been ordered on spec. While the Floating Production market has been dented with the proliferation of shore-based oil and gas finds, the sector remains vibrant and appears to have long legs as the technology has improved to discover and recover resources that previously were deemed impossible or uneconomical to develop. Find out more on this dynamic, growing and high-value sector courtesy of McCaul's insights, starting on page 38.

Now that it appears we have an abundance of cheap, clean fuel for the future, talk and action has turned to the use of LNG as a fuel for boats and ships. While the jury is still out on the breadth and depth that LNG will penetrate as a mainstream maritime fuel, it is plain for all to see (and feel, on the bottom line that is) that the mandate to make your marine operations cleaner and more environmentally benign is here, it is now, and it is only going to get more restrictive and expensive.

Peter Pospiech, our technical contributor from Germany delivers an insightful look (starting on page 26) at Color Line and its efforts in retrofitting its modern ferries with exhaust aftertreatment scrubber technology in its mission to meet and beat new emission rules.

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Lessons from the Sky

While the NTSB blames pilot error in the deadly Asiana airline crash, it also offered some interesting insights regarding the role of sophisticated new automated controls. The maritime market should pay heed.

BY GREG TRAUTHWEIN

In case you missed it, the National Transportation Safety Board (NTSB) on June 24, 2014, released its findings regarding the crash of Asiana Flight 214 last year in San Francisco (http://www.ntsb.gov/news/events/2014/asiana214/abstract.html). While the NTSB found that 'pilot error' was the primary cause of the crash, it also found fault with increasingly complex automated aircraft controls and apparently the pilot's unfamiliarity with them. In short, automation that was designed to improve safety apparently now is creating new opportunities for user error.

As anyone reading these pages knows well, there has been a dramatic increase in the incorporation of automated products and systems on the bridge of commercial vessels, as the industry leverages advances in computing and communication speed to enhance the safety and welfare of ship and crew.

While it can be assumed that all intentions are good, the crash of Asiana Flight 214 should serve as a warning that dependency on new technology is no substitute for solid mariner training, education and experience.

Earlier this year we had the privilege to interview **Tom Crowley** for the cover story of the Q1 edition of *Maritime Professional*, and Crowley offered an interesting and relevant insight regarding the evolving role of technology on the bridge. In a discussion of "technology," he both praised and lamented the modern marine electronics and the evolving wheelhouse, saying:

"There's a ton of stuff in the wheelhouse, but I don't think that anyone has done a really good job of making sense of all of that. You have so many new things in the wheelhouse, yet we haven't gotten rid of a lot of things in the wheelhouse. We just keep adding and adding all of this stuff, but we're not taking anything away. It's really overload on the crew and we have to figure a way to make that more streamlined. How do you really simplify the job in the wheelhouse and not just keep layering more things on them, and requiring more and more training?"

(Copyright Airbus S.A.S.)

Inside the Airbus 320 Simulator

For the full story, please visit:
http://digitalmagazines.marinelink.com/nwm/MaritimeProfessional/201403/

In the May 2014 edition of *Maritime Reporter & Engineering News*, in the wake of the tragic SEWOL Ferry accident in South Korea, we reached out to leaders in maritime training and education for their perspective, and again several salient points were made:

While technology in the maritime sector is arguably more capable than ever to help avoid this and other accident, they still happen and always will. A current catch phrase in the maritime and offshore sectors is "Risk Mitigation," and to this end it is agreed that there is no there is no technology can ever remove all risk from an inherently risky operations.

"Emphasis must be placed upon looking out the window," said **Captain Jeff Cowen**, who is a graduate of the California Maritime Academy with a diverse seagoing career. "What happens if the GPS, ECDIS or Radar goes out? Ships must still be able to navigate safely. At the bottom of U.S. charts there is a warning: Mariner should not to rely solely on any one means of navigation."

Captain Ted Morley, COO, MPT, agreed: "ECDIS, ARPA, AIS, for example have all greatly enhanced the amount of information that a watch stander has, but they have also increased the amount of time that person spends looking at all that information.

A balance between technology and first person observation is needed to ensure total situational awareness.

Technology and training are only two components; issues like crew size as compared to vessel size, ship's schedule, and the ability of the master and crew to act effectively are all components that need to be looked at," Morley continued. "We are seeing an increasing amount of vessels with a decreasing pool of experienced mariners sailing on ever decreasing crew sizes. Training and technology can't always "take up the slack" of smaller bridge teams or smaller deck crews."

For the full story visit:
http://digitalmagazines.marinelink.com/nwm/MaritimeReporter/201405/

While advances in technology are sorely needed in many sectors of the maritime chain, similar emphasis and resources must be paid to the familiarization, training and education of the new equipment.

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ECDIS

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Electronic Cartography

$20B Market

According to the report "Electronic Cartography Market by Application (Marine - Commercial and Defense, Aviation - Marine - Commercial and Defense), Components (Systems, Charts), Marine Electronic Navigation Systems (ECDIS, ECS), Aviation Electronic Navigation Systems, Marine Electronic Charts Licensing Mode (PAYS, Direct), Geography (APAC, Europe, North America, South America, Middle East and Africa) Forecast and Analysis, 2014-2020." published by Markets and Markets, the electronic cartography market is expected to reach $20.3 billion by 2020. The transition from paper navigation charts to electronic navigation charts is moving at a steady rate. The safety of life at sea and reduction in the risk of marine accidents are the major concerns which drive the electronic cartography marine market. The IMO, IHO and the regional hydrographic associations play a major role in electronic marine cartography. Similarly, the ICAO (International Civil Aviation Organization) and the Federal Aviation Administration are the key players for electronic aviation cartography. These organizations and various commercial players are conducting special training programs to impart knowledge about the benefits of electronic navigation. The use of electronic navigation charts has increased the accuracy and efficiency of navigation. The Electronic Cartography Market is witnessing huge investments in developments and demonstrations of electronic cartographic in the marine and aviation industry. All these developments have created a demand for better and more stable technology.

JONRIE WINCHES OUTFITTED ON NEW

Tug Buckley McAllister

(Photo courtesy of JonRie)

McAllister's new tug Buckley McAllister is a Jensen design and is named after the fifth generation of McAllister's and its new President Buckley McAllister. The vessel is a Tier III 5,150 HP along with an ABS Escort Service along with FiFi1. It measures 92 x 36 ft. and will be in service on the Cape Cod Canal. The vessel was built at Senesco Marine under the direction of Project Manager Richard Doughtry and Martin Costa VP of Engineering McAllister Towing. The fore deck features a JonRie Series 250 Full Render/Full Recover winch with a line pull of 70 metric tons. The Escort Winch is supplied with 600 ft. of 9-in. Samson Saturn-12 hawser and winch braking force of 300 tons with a line speed of 100 FPM. The winch also features an Active Heave Compensation System for controlled payout (Freewheel) of the winch and recover when needed with constant scope. The system also includes dual Tension Systems with dimmable side light tension meters and foot control for hands free operation. Also supplied is a line tension data system for predicting rope life and replacement.

On the stern is a JonRie Series 512 Towing Winch with 2,100 ft. of 2 ¼-in. wire boasting a line pull of a 140,000 lbs at 60 FPM.

A WORLD FIRST

RSD CNG Tug

Three companies have teamed up to bring the first ever Reverse Stern Drive (RSD) Compressed Natural Gas (CNG) tug to the market. Damen Shipyards of the Netherlands, German engine manufacturer MTU Friedrichshafen, a subsidiary of Rolls-Royce Power Systems, and Denmark's Svitzer have embarked on the project with the official launch of the new eco-friendly tug planned for 2016. The new RSD CNG tug aims to combine high power with lower fuel costs and lower emissions. The new 16-cylinder pure gas engine being developed by MTU is based on its workboat Series 4000 M63 diesel engine. It will be complemented with a multipoint gas injection system, a dynamic engine control and an optimized safety concept. "We are developing our new gas Series in order to meet the extreme load profile of the tugboat. The acceleration will be comparable to the level of our diesel engines. Due to the clean combustion concept, compliance with IMO Tier 3 emission legislation will be ensured without the need of additional exhaust gas after treatment. The 2,000 kW MTU gas engine is characterized by high power density combined with low fuel consumption," says Dr. Ulrich Dohle, CEO of Rolls-Royce Power Systems AG.

Svitzer again proves to be a leader in helping to bring to market new and emerging technologies seen to positively impact not only the environment, but the bottom line, too. "As a major harbor towage operator an important consideration is also that this tug will realize a considerable reduction in fuel costs and obviously fuel is a major cost concern for all operators," said Kristian Brauner, CTO, Svitzer. "It is important for us to stay innovative with regards to performing safe and eco-friendly operations and to reduce emissions."

FORAN Users Meeting (FORUM 2014)

The Eighth FORAN Users Meeting (FORUM 2014) took place June 11-13, 2014 in the Parador de la Granja, Segovia, and when it was over the organizers proclaimed it a great success, recording the highest number of participants ever.

On Thursday June 12, Rafael de Góngora, General Manager of SENER Marine Business Unit, welcomed the attendees and encouraged an open sharing of experience in using the FORAN System.

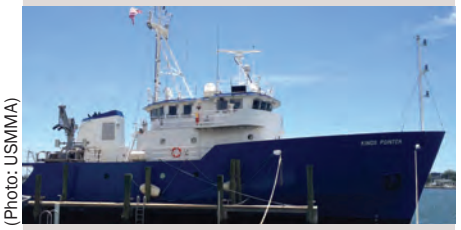
Miguel Ángel Rojí, from **Navantia** (Spain), presented about the optimization of the design and production in the Spanish shipbuilding group of reference. Following was Kevin Duckworth, from **BAE Systems Maritime Submarines** (UK), who discussed the optimization of FORAN in the Royal Navy´s Successor Program (nuclear submarine deterrence), particularly about the integration with the Product Lifeclycle Management (PLM) tool. The first conference session finished with Igor Shaposhnikov, from **Severnoye Design Bureau** (Russia) with a lecture about the FORAN integration with a PLM tool already developed by the design office.

The second session started with Aleksey Shadrov, from **Vyborg Shipyard**, and Sergey Tolstoguzov, from **Design Group Ricochet** (Russia), with a shared speech about the implementation in the shipyard of the consecutive FORAN versions from 30 to 70, and about their recent success in the development of a floating dock to put in the water a new series of icebreakers. Jim McLauchlan, from **BAE Systems Naval Ships** (UK), continued with a presentation about the challenges of the use of FORAN, especially the newly developed module for the P&I diagrams in the Type 26 new destroyers program. Prabjot Singh Chopra, from **SeaTech Solutions** (Singapore), spoke about the required functionality for the early design stage from their perspective as ship designers, and finally Ricardo Rozados, from **Abance** (Spain), demonstrated with precise figures the benefits of an outfitting module-oriented design and the way to achieve it with FORAN.

At Thursday's formal dinner, Verónica Alonso on behalf of SENER gave the FORAN Photography and Screen Capture Awards to **Babcock Marine** (United Kingdom) and **Asmar** (Chile).

On Friday, June 13, Juan Pablo Soto of **Asmar** (Chile) gave a presentation on the use of FORAN in the calculation of the electronic equipment precise positioning to minimize interferences. He was followed by Yiqi Song from **CSDDC** (China Development and Design Center). Fernando Alonso from SENER then spoke about the integration of FORAN with a PLM solution developed by SENER, and the final session ended with a presentation from Mon Seob Cho, from **SENER** Korea, delivering a paper on the options to customize FORAN to the demands of the Eastern shipyards.

DELIVERIES



(Photo: USMMA)

USMMA Gets its New Ships

King's Pointer

U.S. Transportation Secretary Anthony Foxx and Acting Maritime Administrator Paul "Chip" Jaenichen visited the U.S. Merchant Marine Academy (USMMA) to celebrate the rechristening of the Academy's new training vessel, the Kings Pointer.

"The new Kings Pointer is yet another example of this Administration's commitment to ensuring first-rate training and facilities for the Academy's midshipmen," said Secretary Foxx. "With this modern vessel, the USMMA will continue to produce the finest mariners in the world, helping ensure our national and economic security."

The Kings Pointer was retrofitted as a training vessel at North Florida Shipyard for $3.3m. Before being redesigned to serve as a training vessel for students, the former MV Liberty Star served as a solid rocket booster recovery vessel for NASA.

Propelled by two combined 2,900 horsepower diesel engines, the 176-foot long, newly-christened Kings Pointer has a 6,000 mile range and a maximum speed of 15 knots. The ship's controllable pitch propellers and auxiliary water jet thruster, combined with modern joy-stick dynamic positioning capability provide midshipmen a highly maneuverable training platform. The vessel has a 7,500 pound deck crane, which is an ideal tool for providing a basic understanding of modern cargo operations. It also has a fast rescue boat, which can provide midshipman critical experience in general launch operations. In addition, the vessel's double towing winch, substantial towing H bitts, and a massive towing fairlead add significant new towing training capabilities to the Academy's portfolio.

FOR A SHIP'S AUXILIARY POWER

Harnessing Wind Power

BY ERIC HAUN

Finnish marine engineering company Norsepower Oy Ltd. announced that it will bring to the commercial maritime market an auxiliary wind propulsion solution aimed at maximizing cargo ship fuel efficiency, with first sea tests on a Finnish cargo ship slated to begin later this year.

Norsepower's Rotor Sail Solution is an updated version of the Flettner rotor, a concept that dates back to Finnish engineer Sigurd Savonius in the early 1900s. The Flettner rotor gets its name from German engineer Anton Flettner, who was the first to build a ship which used spinning vertical cylinder rotor sails for propulsion.

Though the basis for this technology is not entirely new, Norsepower has modernized the concept with various improvements. Norsepower said its update uses improved technology, advanced materials and a leading-edge control system to allow the main engines to be throttled back when wind conditions are favorable, providing average fuel savings in the range of 5-30% and reduced emissions, while sustaining the power needed to maintain speed and voyage time.

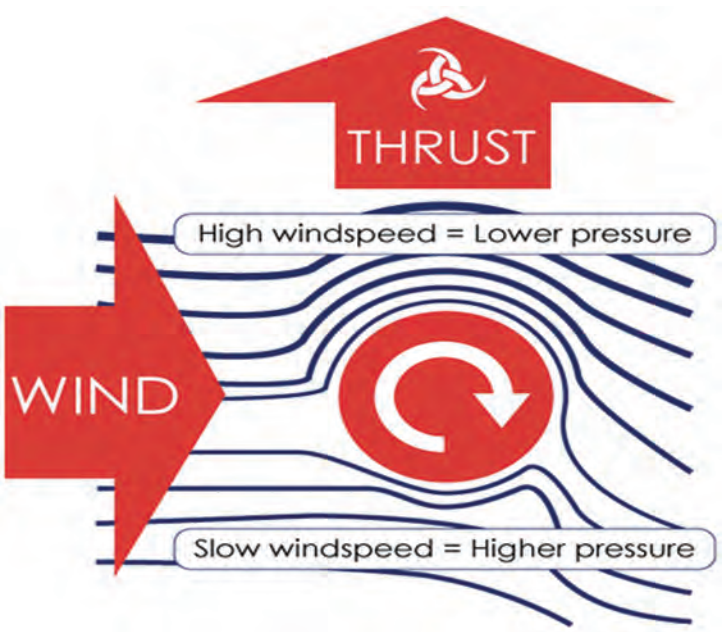
The principle on which the Norsepower Rotor Sail operates is known as the Magnus Effect. When wind meets the spinning rotor sail, airflow is accelerated on one side of the rotor sail and is restricted on the opposite side. The resulting pressure difference creates a force that is perpendicular to the wind flow direction – a lift force. The circulatory flow, created here by the skin friction, is the same phenomenon that creates lift for an aircraft wing. The same principle applies to rotating spheres and cylinders.

The thrust induced by the Magnus Effect can be utilized in ship propulsion by placing a cylinder on the open deck of the vessel and by rotating it around its main, vertical axis. An electric drive system that is powered by the auxiliary grid in the vessel is used for rotation of the rotor sail. Norsepower claims that this solution has potential to be 10 times more efficient than a conventional sail because more lift is produced with a much smaller sail area.

The solution is mainly intended for use aboard tankers, bulk carriers and

Photo: norsepower

The Norsepower R&D site in Naantali, Finland



> "Bore is in the forefront in using environmental and energy efficiency solutions for sustainable shipping. To pilot such a system on our vessel M/V Estraden is a natural step as we have supported the project from the start."
>
> Håkan Modig, CEO of Bore Ltd.

RoRo vessels and can be installed on newbuilds or retrofitted to existing ships.

According to Tuomas Riski, CEO and partner of Norsepower Oy Ltd., there are presently more than 20,000 merchant vessels worldwide that are suitable for retrofit of the Norsepower Rotor Sail Solution and can benefit from its reduced fuel consumption.

Sea tests will begin later this year on Bore's Finnish-flagged 9,700 dwt RoRo ship M/V Estraden after the completion of land-based testing on an assembled prototype of the Norsepower Rotor Sail at the developer's facility in Naantali, Finland.

"Norsepower aims at being the first company to have an industrially piloted and certified auxiliary wind propulsion product, which is delivered as a ready-made solution," Riski explained. "The pilot project with Bore is a significant step on our path towards the market leadership of cargo vessel auxiliary wind propulsion systems."

Håkan Modig, CEO of Bore Ltd. said, "Bore is in the forefront in using environmental and energy efficiency solutions for sustainable shipping. To pilot such a system on our vessel M/V Estraden is a natural step as we have supported the project from the start. Also, Bore is happy to encourage new entrepreneurs within this area in Finland and we are pleased to see that the project is ready for launch."

Essential parts of the Rotor Sail Solution include two or more rotor sail units installed on deck to deliver the forward thrust, wind and GPS sensors to provide the automation unit with real-time wind speed and direction information as well as ship speed and course data, control panel for the captain's full control of the operation and performance of the Norsepower Rotor Sail Solution, an automation unit for optimized forward thrust of the rotor sails and a power supply from the grid of the vessel to the electric motors that power each rotor sail.

The required number of Norsepower Rotor Sails and the size of each sail are based on the size, speed and operating profile of each vessel. Norsepower Rotor Sails are available in three sizes with different heights of 18, 24 or 30 meters. The Norsepower Rotor Sail Solution is typically delivered as a full-service solution that includes both delivery and maintenance of the hardware and software components. Norsepower said it has gathered nearly $3 million of funding since its establishment in 2012 for the development, testing and piloting of the Rotor Sail Solution. Main investors behind Norsepower are Lifeline Ventures Oy, Finnvera Oyj and Wate Oy; Norsepower is also funded by Tekes. Norsepower's website lists additional as partners ABB, Alandia Insurance, Beckhoff Automation GmbH, Bore, Elomatic, FY-Composites Oy, Lloyd's Register Group Ltd., LST Group, Paramet, SKF, SKS Group, Turku Repair Yard Ltd., VAF Instruments, Vaisala and VTT Technical Research Center.

OSRO

The Child of Necessity

BY DENNIS BRYANT

Most people in the maritime industry in the United States are familiar with the concept of the Oil Spill Removal Organization (OSRO). It is one of the many quiet successes of the Oil Pollution Act of 1990 (OPA 90) and has enhanced the prompt and efficient cleanup of spills of oil and hazardous materials into waters of the United States.

The curious thing about OSROs is that they are not mentioned in OPA 90.

OSROs, as a recognized industry, were created following enactment of OPA 90 and that statute's requirement that tank vessels (and now certain non-tank vessels) have written plans for response to oil spills in US waters adequate to respond to worst case discharges. Prior to adoption of OPA 90, entities capable and willing to respond to oil spills were mostly small businesses. Each port had one or more such entities, but few of them provided more than limited geographic coverage.

As part of the settlement of certain litigation arising out of the grounding of the tanker EXXON VALDEZ and the subsequent oil spill, the major oil companies and their shipping subsidiaries established the Marine Spill Response Corporation (MSRC). When the MSRC initially declined to provide spill response services to smaller tanker companies, the National Response Corporation (NRC) was created to fill the void. Subsequently, a number of companies and joint ventures have been established to provide the needed services.

The problem, which was not initially recognized, is that, because OSROs are not directly covered by OPA 90, the US Coast Guard and other federal agencies with responsibility for oil spill response, have no real authority to regulate them. OPA 90 places the onus for oil spill response on the spiller, under the concept that the polluter should pay for the response and damages arising therefrom.

In the real world, though, how is a vessel owner to know whether a company offering spill response services is capable of doing so? Does it have trained personnel? Does it have the right equipment? Is the equipment in good working order? Does each vessel owner have to independently examine each potential contractor to determine adequacy? Does each potential contractor have to subject itself to hundreds, potentially thousands, of separate examinations by the vessel owners?

Those were the issues that were presented to the US Coast Guard as it led the effort to implement OPA 90. The Coast Guard had created a special group at headquarters devoted to this massive implementation project, called the OPA 90 Staff. At the time, Mr. Norman Lemley, a member of the Coast Guard's Senior Executive Service, was the Staff Director; Captain Gerald Willis was the Deputy Director; and I was the Chief of Regulatory Development. We had about 40 military and civilian subject matter experts, lawyers, economists, environmentalists, and clerical personnel to draft the paperwork for forty separate rulemaking projects and a number of studies mandated by OPA 90.

The three of us met a number of times to analyze this particularly thorny issue. We quickly realized that we couldn't just mandate standards for OSROs. It would exceed the Coast Guard's statutory authority and open the agency to litigation. On the other hand, we knew that the complex and integrated program we were charged with developing would not succeed if the vessel owners and the OSROs were left to their own devices.

We jointly settled on a hybrid approach. We proposed a package deal. If the OSROs voluntarily submitted to examination and evaluation by the Coast Guard as to their personnel and equipment capabilities, we would free them from individual and separate examinations by the vessel owners. At the same time, vessel owners and operators who agreed to utilize OSROs that met our voluntary standards would not have to conduct an independent evaluation.

With expert assistance from various stakeholders, we created an evaluation program for rating the capabilities of each OSRO that elected to participate. The OSROs could elect to provide all or only some of the needed services and could also elect the geographic area within which they would make their services available.

At the same time, we inserted the following provision into the response plan regulations:

If an oil spill removal organization(s) has been evaluated by the Coast Guard and their capability has been determined to equal or exceed the response capability needed by the vessel, the [geographic specific] appendix [to the vessel response plan – VRP] may identify only the organization and their applicable classification and not the information [otherwise required by] this section.

It was an act of faith on our part that the various stakeholders would participate, but they did.

Now the Coast Guard has a detailed program addressing this issue. The current version was published on 24 April 2013 as CG-MER Policy Letter 03-13. The 64-page attachment thereto is entitled "Guidelines for the U.S. Coast Guard Oil Spill Removal Organization Classification Program". The guidelines note that the voluntary program was created so that plan holders could simply list OSROs in their response plans rather than providing extensive detailed lists of response resources. OSROs and plan holders participate in and use the classification program on a strictly voluntary basis. The guidelines further note that while classification provides a good indication of an OSRO's response capability, simply being a Coast Guard-classified OSRO does not guarantee performance during an actual spill. In this regard it should be remembered that the response plan regulations also include the following caveat: "The specific criteria for response resources and their arrival times are not performance standards. They are planning criteria based on a set of assumptions that may not exist during an actual oil spill incident."

OSROs, including salvage and marine firefighting companies, are important players in the overall spill response effort. Without them, the spiller, be it a vessel, an onshore facility, or an offshore facility, would have little capability to fulfill its legal obligation to remove the oil or hazardous material and restore the environment. The response to most spills into waters of the United States is now both prompt and efficient. There remains room for improvement, but the situation is far better than it was prior to enactment and implementation of OPA 90. I am not claiming that Norm Lemley, Jerry Willis, and I were geniuses, but we were creative and willing to think outside the box. Our charge was limited to drafting regulations, but we realized that the regulations alone would not get the job done. We also had superiors who were trustful of our efforts and willing to give us a certain amount of leeway. In addition, the industry stepped up and seized the opportunity provided.

The results speak for themselves.

The Author

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Electronic Navigation & Dispute Resolution: Coming of Age

ECDIS, AIS, GPS

Electronic navigation systems such as GPS, Electronic Chart Displays (ECDIS) and Automatic Identification Systems (AIS) provide great assistance to mariners and significantly contribute to navigational safety. Voyage Data Recorders (VDR) were specifically designed to collect data from these electronic navigation systems and other onboard sensors for use in accident investigation. These systems provide investigators with a wealth of data about a vessel's movements and status in the moments leading up to an accident. They also have what likely is an unintended consequence: electronic navigation data is now frequently presented as evidence in the litigation that often follows maritime accidents.

(Image courtesy Transas)

The Court's View on Electronic Navigation Evidence

By 2004, AIS and VDRs were in common usage on most vessels. Thus, by 2007, a court commented that AIS was a "notable development" that may affect the way vessels communicate in the future. Since 2007, although one court found that AIS data was "not conclusive evidence of individual vessel movements," the trend is for courts to increasingly rely on navigation data from AIS and VDRs. In a case in 2010, a court noted that the "authenticity and accuracy of the VTS/AIS recording was not disputed." Since that decision, recordings from electronic navigation equipment has been presented as evidence of vessel positions and movements in at least 11 reported cases. In each case, the court accepted electronically recorded evidence with little or no question. In large part, courts have accepted the reliability of electronic navigation data largely because the carriage requirements for electronic navigation systems are well established; their use is widely accepted by the maritime industry; and the systems are generally seen as an extension of existing technology. And importantly, counsel trying cases have themselves become comfortable with the technology and have learned how to effectively present electronic navigation evidence while convincingly explaining the inevitable anomalies and inconsistencies.

Accident Investigation & Litigation

Maritime cases were traditionally presented through paper log books and mariners' eyewitness testimony, with occasional printouts from course recorders and engine telegraph loggers. There are inherent limitations, however, in the reliability of the testimony of even the most truthful eyewitness. For example, determining a vessel's precise position in a channel or seaway by reference to shore side structures – even when based on fixes – is subject to considerable margin of error. In addition, witnesses often give conflicting versions of events. In the confusion that usually attends a maritime accident it is not expected that witnesses will exactly concur in their descriptions of what they observed. Thus, it is not uncommon for mariners, said to be traditionally loyal to their vessel, to give irreconcilable testimony with respect to their vessel's courses and speeds during the navigational maneuvers preceding every collision at sea or other maritime accident.

Data from e-navigation systems, however, can foreclose these typical disputes and resolve the so-called "irreconcilable testimony," often resulting in early and/or favorable resolution while avoiding litigation costs. Such data can also help reduce the costs of producing witnesses to testify as to events that are readily established by the electronic data. Producing data from e-navigation systems may also be critical to meeting a party's obligation to preserve evidence.

There are, however, some common problems that must be solved before electronic navigation data can be reliably presented in the court room. The most fundamental problem is data preservation. Some systems automatically preserve all data; others retain data only until it is overwritten by new data. Prompt action is always desirable, and counsel and the vessel owner must often work cooperatively at the earliest point in the investigation to preserve critical evidence. Another problem is preserving the data's chain of custody. It may often be necessary to hire electronic technicians to retrieve data who may not be familiar with the legal requirements for preserving evidence. Thus, the electronics technician, computer forensics expert, and lawyer may need to work together to avoid later questions about the data's authenticity, reliability, and accuracy. If the VDR data (or any data from the memory of an electronic navigational device) has been transferred to the vessel's computer, it probably would be advisable to image or otherwise preserve that computer hard drive. Finally, it may be necessary to correlate data sources and find an adequate explanation for anomalies. Different sensors may record the same data with differing accuracy and often will be running on different time standards. Reconciling these differences is necessary to satisfy the court that the data is reliable.

The Influence of E-navigation Evidence

Many commentators have observed that jurors and other fact-finders, especially those from the so called "MTV-generation," have come to expect to be entertained with computer-generated simulations and the use of technology during trial, just as it is used in their daily lives. As observed by Fred Galves in an article published in the Harvard Journal of Law and Technology, "if a 'picture is worth a thousand words,' then a computer-generated animation says a thousand words, sings a thousand songs, and paints with a thousand colors all at once."

Nevertheless, the use of computer ani-

mations in the courtroom remains one of the most controversial issues in the law of evidence. While some courts accept computer animations without question, particularly trials to the judge with no jury, others are wary that computer animations are more likely to pervert the fact-finding process than they are to enhance it. Many critics are skeptical that the purported desire to help fact-finders understand evidence is nothing more than an excuse to dazzle them with technological "whiz-bang" and paraphernalia used to "Disney-up" the evidence.

Electronic navigation evidence, however, is mostly immune from these criticisms. If properly preserved and authenticated, it is generally not simply a computer "animation" in the sense that it attempts to recreate what a witness thinks he remembers seeing or what an expert believes has occurred, but rather the actual data recorded on board the vessel at the time of the accident and, thus, a true visual representation of what the witness experienced. Properly presented, electronic navigation evidence can be an extremely powerful persuasive tool that can make the difference between winning and losing a case.

Two cases in which the authors represented the ship owners illustrate the effectiveness of electronic navigation evidence. In one case the crew of a commercial fishing vessel alleged that a ship inbound to New York in dense fog collided with and sunk the fishing vessel. The fishing vessel crew subsequently identified the ship from photographs. The ship's crew denied that their ship was in collision and testified that at or before the time of alleged collision no targets appeared on the ship's ARPA radar. The ship's ECDIS was interfaced with the ARPA and was equipped with a memory. Fortunately the ECDIS memory was preserved. This evidence established two crucial facts. The first was to confirm that no radar targets that could have been the fishing vessel appeared anywhere near the ship's track. The second was that the ship's track at all times was two miles or more away from any of the several reported positions of the fishing vessel. Still shots of the ECDIS and a playback of the ECDIS display in accelerated time (real time would have been too time-consuming) were presented to the jury. This evidence was instrumental in convincing the jury that the ship could not have been responsible for sinking the fishing vessel, resulting in a jury verdict in the ship owner's favor.

In the second case, while proceeding outbound from New York harbor intending to anchor in Gravesend, the port anchor of a bulk carrier prematurely deployed. When the anchor was winched up a cable was caught on one of the anchor's flukes. That cable was later alleged to be a fiber optics cable that ran from Staten Island to Brooklyn. The cable owner claimed that it laid the cable pursuant to an Army Corps of Engineers permit within a charted cable area that crosses the Verrazano Narrows and that the ship had negligently dropped her anchor in that cable area. However, the ship's SVDR recording of the ECDIS and GPS data, and its recording of the sound of the anchor chain running out (marking the exact time of the anchor release), established that the anchor was released at a position some 70 yards outside of the charted cable area. The judge relied on this data to dismiss the cable owner's claim. Significantly the court also denied the cable owner's request for depositions of the master and crew, finding that the recorded electronic data would be more accurate than the crew's observations. This decision was affirmed on appeal.

The role of electronic data in the resolution of maritime cases is now firmly established. It therefore is important for vessel operators and their crews to understand how to preserve this important evidence in a manner that ensures its admissibility in any subsequent legal proceedings.

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The Cause behind the Clause

Piers & Docks Insurance

BY ALEX KRIPETZ, MANAGING DIRECTOR, TRAVELERS OCEAN MARINE

As a maritime business owner, your day-to-day focus is on managing and growing your business. Understandably, thinking about and understanding the nuances of your insurance coverage is not likely to be among your top priorities. However, what if the unthinkable happens and your docks and piers are seriously damaged?

A review of the damage with your insurance claim adjuster will likely lead to discussions of "coinsurance percentage," "coinsurance penalty" and "insured to value." While these aren't terms you'll use very often, it's important to understand how coinsurance works, especially since a misunderstanding can impact how much you receive on an insurance claim versus how much you anticipated receiving.

How Coinsurance Works

If you've had any recent discussions with your insurance agent about coverage for your piers and docks, he or she may have told you to insure them for their full replacement cost if you want to avoid receiving a penalty on any potential claims. A common question among maritime business owners, however, is why they shouldn't just buy a limit of insurance based on how much damage they anticipate sustaining if something were to happen to their pier or dock.

For example, suppose it would cost $500,000 to replace your entire pier or dock system, but you don't believe you would ever sustain a complete loss. Why can't you just buy a policy with, say, a $200,000 limit if that is the most damage you believe you would ever sustain?

Technically, you could, but you would be putting yourself at financial risk. That's because, if your policy has a coinsurance clause, you would only be eligible to receive a percentage of the actual loss you incurred.

The two most likely ways that your insurance company will pay a claim settlement are called Replacement Cost Value and Actual Cash Value. Replacement Cost Value represents today's cost to replace the damaged pier. With Actual Cash Value policies, the insurance company will factor depreciation (any wear and tear conditions that have occurred over time to make your pier less valuable) into the amount you receive. When your policy has coinsurance terms, it will specify a percentage of either your Replacement Cost Value or your Actual Cash Value that you will be required to purchase.

For example, let's say you have a policy that has an 80% coinsurance clause and is based on replacement cost. In this case, your insurance limit would need to be at least 80% of the estimated $500,000 total replacement cost. So, the limit you buy would need to be at least $400,000. If you choose to purchase a limit lower than $400,000, you would incur a coinsurance penalty in the event of a covered claim.

If you believed that the most damage you are likely to incur in a single event would not exceed $200,000, you may be tempted to choose a coverage limit of that amount to lower the premium cost. But under the rules of coinsurance, you cannot simply buy 50% of the required coverage limit at half the cost. While you will pay a smaller annual premium, you will then only qualify to receive just 50% of the coverage.

In other words, if you were to purchase $200,000 of coverage and your dock was then damaged in a storm and it would cost $100,000 to repair the damage, you might assume you would be completely covered. However, since you purchased a limit that is only 50% of the required minimum limit of $400,000, under the rules of the coinsurance penalty you are eligible to receive just 50% of your claim – or $50,000.

Why a Coinsurance Penalty?

So why is there a penalty if you are not "insured to value" and what could it be? Insurance companies' rates are based on the need to have enough premium collected across all customers to pay the average, expected claims that occur in a typical year, whether from winter storms, small fires or damage from vessels, for example.

Additionally, insurers need to reserve enough funds to pay for the larger, more unusual events that may happen – such as Superstorm Sandy – and be able to meet their claim obligations.

Gaining Deeper Coinsurance Insights

To help you better understand the role coinsurance plays in determining the appropriate coverage and rates, here's an example:

- An insurance company has 100 hypothetical marine businesses that require insurance on their docks and piers. We will assume the average dock or pier system has a replacement cost of $500,000. This equates to a total of approximately $50,000,000 in the value of docks and piers insured.

- For the sake of this example, assume that the average claim paid for docks and piers damage is 10 percent to 15 percent of the replacement value, not including larger unusual events. This means the average claim will be approximately $50,000 to $75,000. History has also shown that a certain percentage of these 100 businesses will file claims each year.
- In order to sufficiently pay anticipated claim obligations while remaining a strong, solvent insurer, the average annual premium charged to each marine business in this hypothetical example is $7,500, assuming each business will be insured to value. Those with higher values will pay a larger premium, and those with lower values will pay less. Because the insurance company has collected an average of $7,500 for each policy and there are 100 policies being issued, they will have collected $750,000 in premiums. That is the amount, in our example, that has been determined to best position the insurance company to meet claim and financial obligations while still remaining competitive.

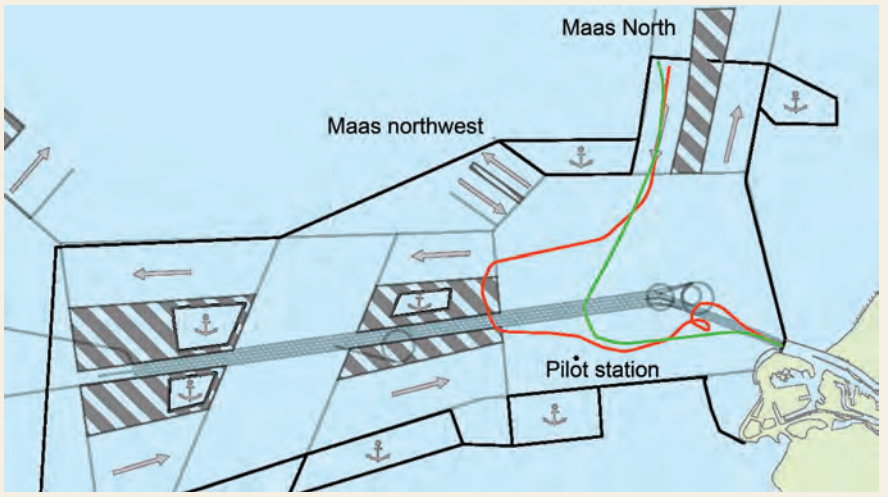
But what would happen if there were no coinsurance requirements? A large number of the 100 marine businesses could decide to purchase what is called a "compressed limit," meaning that they are buying a lower limit based on what they feel their average claim cost may be, instead of purchasing the higher limit required to insure to value.

- If a substantial number of these businesses decided to purchase a limit closer to $200,000 then to $400,000, the insurance carrier is now going to collect a much lower overall amount of premium for these 100 businesses, with the total premium collected being closer to $400,000 than $750,000.

- Although the insurer would be collecting fewer premium dollars, the estimated number of claims and the average claims costs are not expected to decline. As a result, the insurance company wouldn't be collecting enough in premiums to cover the average, anticipated losses that occur each year, much less have sufficient funds set aside to cover the large events that will inevitably occur from time to time.

- As a result, the insurer wouldn't be properly protecting its marine customers. Insurance carriers would then need to raise the rates substantially for these smaller "compressed limits" to still bring in the total funds necessary to properly insure their policyholders. In other words, customers would receive a smaller amount of coverage for the same premiums. It is for this reason that coinsurance requirements are necessary.

Insurance carriers want their customers to experience a satisfactory, hassle-free claims process. By working with your marine insurance agent or broker, you can ensure that your piers, docks and other marine properties are insured to value. Doing so will help you avoid unnecessary surprises and protect your business from potential financial pitfalls.



Study area with example of standard and non-standard voyage.

Emissions Reduction

With emissions reduction firmly on the industry's agenda, studies show that carrying out ship emission calculations, based on AIS data, can offer significant benefits.

A Port of Rotterdam vessel traffic planning program aims to share reliable information, minimize unnecessary delays and reduce shipping emissions. By sharing information between stakeholders, ships are able to plan their journeys more efficiently. For example, if they know exactly when a pilot is available, or when they can access a terminal, this pre-information can be used to optimise traffic flows and reduce unnecessary emissions from so-called 'non-standard behaviour' in the approach area of Rotterdam.

For liner shipping, non-standard behaviour happens when vessels wait to be serviced by a pilot, tugboat or terminal before they enter the actual port area. This behavior includes drifting, making turning circles, speed changes and anchoring, which is not necessary for the scheduled dispatch of the vessel. It leads to the unnecessary use of fuel and production of emissions.

MARIN quantified the potential emissions reduction by minimizing this non-standard behavior. To determine the potential effects of the vessel planning initiative, MARIN calculated the emissions for each voyage of the inbound liner vessels in the year before the introduction of the program. The emission calculations followed the method based on AIS data that has been developed for the Netherlands Pollutant Release & Transfer Register.

The study then focused on determining the standard or expected travelling time of inbound liner ships in the approach area to the port by analysing AIS data. This was done for different vessel sizes and locations.

To estimate the delays incurred when a vessel enters the port approach area, MARIN needed knowledge about the standard travelling times. In its calculations MARIN assumed that the vessel traffic planning program would remove this unnecessary maneuvering. Finally, MARIN replaced the emissions of voyages with non-standard behavior with the emissions of voyages with standard behavior to calculate the potential emissions reduction. A potential emissions reduction of as much as 3% to 5% was feasible, showing how ship emissions calculations - based on AIS data - can help in future policy making.

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BY DR. ANATOLY MEZHERITSKY, P.ENG. M.A. TURBO/ENGINE LTD.

Turbocharger Modification

Cost Effective Solution for Fuel Saving and Emission Control

A turbocharger's efficiency significantly influences diesel engine performance. For example, a turbocharger (TC) efficiency increase of one percent results in the following improvements, under constant engine power:

- Supercharged air pressure increases 1% - 2%
- Fuel consumption decreased 0.4% - 0.6%
- NOx emission decreased 5% - 8%
- Exhaust gas temp. down 2% - 4%

Operational turbocharger maximum efficiency is achieved by the accurate coordination of turbocharger and diesel cylinders characteristics during the design and the engine's test-bed trial stage. Usually such coordination is performed by engine manufacturers for design point only (for MCR). But in the real world, marine turbocharged engines operate on loads less than MCR. Based on practical experience, we can conclude that main marine engines are generally operated between 70% - 85%, and auxiliary engines operated between 50% - 75% of their MCR. It means that an operational turbocharger's RPM are much less than optimum RPM. Figure 1 represents general influence of turbocharger's RPM on its efficiency based on Caterpillar 399 engine example (M/V Seaspan Greg).

As shown, the maximum turbocharger efficiency is around design RPM (near 20,000 RPM), where as the actual operational turbocharger's RPM is around 12,000 RPM **(red zone in Fig.1)**; thus the turbocharger's efficiency is less by approximately 20% compared to the maximum efficiency.

This problem became more important during slow steaming, which today is used by shipping companies to reduce fuel consumption and cost. Under slow steaming conditions, main engines operated at significantly reduced output: 40% - 60% of MCR.

To address this, M.A.Turbo/Engine Ltd. developed turbocharger modification technology to increase turbocharger efficiency while the engine is operating

Fig.1. TC relative efficiency versus RPM

Fig.2. Existing VTR-400 turbocharger's nozzle ring with blocked turbo nozzles

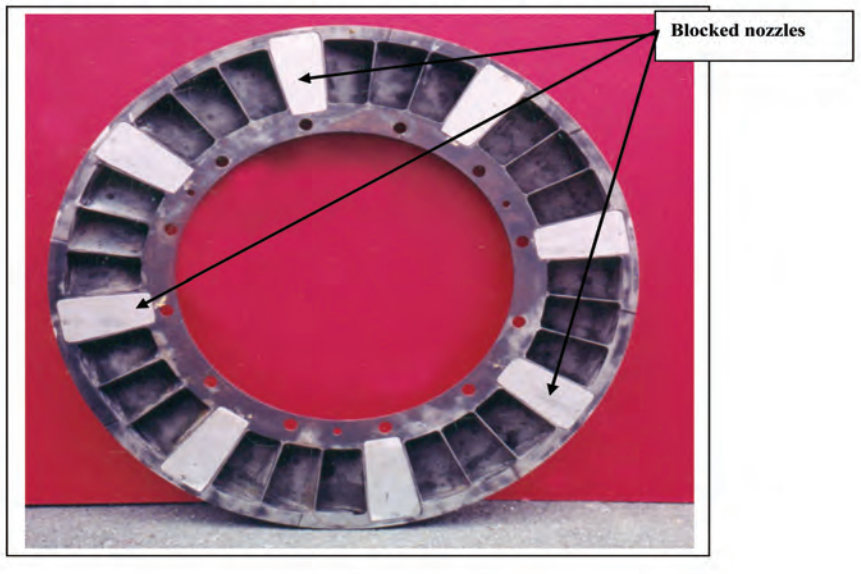


Table 1 Two Stroke Engine (Test Results)

VESSEL	Main Engine	Boost pressure Pk, bar	E.G. Tem-re T, °C	d(Pk) %	d(T) %	d(Fuel) %
PAPAGO	B/W 7L67GF	2.142/2.355	432/400	9.96	7.40	4.10
MANDAN	B/W 8K90GF	1.823/2.016	348/315	10.6	9.48	3.16
PAWNEE	B/W 7K90GF	1.89/1.9874	455/420	5.15	7.69	3.19
ARAPAHO	Sulzer. 9RND90	1.542/1.62	480/460	3.77	4.16	3.48
SAMSUN	B/W 6K63EF	1.336/1.423	391/350	6.51	10.48	2.40
CHOCTAW	Sulzer. 6RTA76	2.607/2.682	457/444	2.88	2.844	2.85

Table 2 Four Stroke Engine (Test Results)

VESSEL	ENGINE	Sc. Pressure bar	E.G. Tem-re C	d(PK) %	d(T) %	d(Fuel) %
Samsun Honor	Yanmar 6MAL	1.348/1.484	401/367	9.8	8.48	
	Yanmar 6MAL	1.232/1.381	430/372	12.88	13.49	
Peace River	Yanmar 6LGDT	1.484/1.697	394/342	14.35	13.2	4.5
	Yanmar 6LGDT	1.474/1.677	422/374	13.77	11.67	4.3
	Yanmar 6LGDT	1.503/1.716	405/355	14.2	12.35	4.4
PAWNEE	B/W 6T 23 LH	1.70/1.88	423/383	10.64	9.49	
MANDAN	Nohab SF 18VS	1.513/1.532	410/390	1.28	4.88	3.8
	Nohab SF 18VS	1.561/1.629	403/389	4.35	3.47	3.1
	Nohab SF 18VS	1.513/1.532	387/378	1.28	2.32	2.7
PAPAGO	Daihatsu 26H	1.27/1.36		6.86		3/0
	Daihatsu 26H	1.27/1.41		10.67		3.2
CHISKASAW	Yanmar 260 ST	1.92/2.016	322/290	5.0	10.08	5.0
	Yanmar 260 ST	1.89/1.97	296/275	4.1	7.1	4.9
	Yanmar 260 ST	2.065/2.23	322/285	7.97	11.49	4.85
SEASPAN GREG	Caterpillar 399	1,95/2.11	398/373	8.2	6.4	3.64
	Caterpillar 399	1.98/2.14	400/379	8.3	5.25	3.34
SEASPAN DORIS	Caterpillar 3508	385/366	385/366	4.78	4.93	2.45
APL Jude	Wärtsilä 8R22	1.465/1.63	343/302	11.2	11.9	2.2
	Wärtsilä 8R22	1.56/1.73	357/330	10.5	7.6	2.2

Notes: 1) Parameters before/after nozzle modification; 2) d(PK), d(T), d(Fuel) - relative increments in scavenging pressure ratio, in exhaust gas temperature and in fuel consumption accordingly. It is notable that no turbocharger or engine of all those modified experienced any operational problems related to the modification. The foregoing observation makes us confident that proposed modification is a cost-effective and reliable method of improving engine performances. Detail example of turbocharger modification influence on engine parameters are shown in Table 3.

at reduced load. The modification comprises computer program analysis, the method of reducing the area of the turbine's nozzles; and "waste gate" (WG) arrangement.

The computer program establishes the optimum nozzle ring area FOPT for the given engine output and type of turbocharger. The difference between the existing nozzle ring area F and FOPT gives the new nozzle ring area required to achieve the improvement in engine performance at a reduced load. The computer program determines a new boost air pressure, corresponding to the reduced nozzle ring area, and this new increased air pressure is compared with the design boost air pressure at the engine's MCR.

To avoid possible surging, the new increased air pressure cannot be higher than the design air boost pressure at MCR. As a rule, the reduced nozzle ring area is in such proportion that increased scavenging air pressure at operating load is 10% - 15% less than the design scavenging air pressure at engine's MCR. That means that any engine with a modified turbo nozzle ring can be loaded, if necessary, at up to 85% of MCR without sacrificing turbocharger reliability.

A turbo nozzle's area reduction is achieved by blocking a few nozzles on existing nozzle rings: nozzles, which should be blocked, are covered by flat stainless plate (Figure 2). The plate is secured by stainless screws. If required reduction of nozzle ring area is less than 10%, simple bending of nozzle blades can do it. There is no need to buy a new nozzle ring.

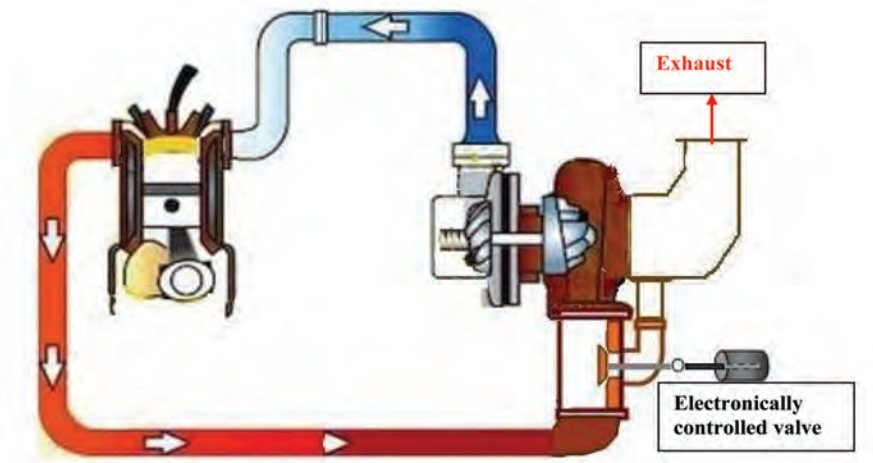
The described method of reducing the existing nozzle ring area does not generate any additional stresses to the nozzle or rotating blades.

On the contrary, the thermal stresses become less, due to reduced exhaust gas temperature. Both bending and tensile stresses in the blades are less than at design engine load because the turbocharger RPM remains lower than admissible RPM at MCR. It means that there is no potential danger to the normal turbocharger operation.

M.A.Turbo/Engine Ltd. (in cooperation with Vicmar Ltd.) has implemented the turbo nozzle ring modification on 64 different engines worldwide. Some results attributed to the nozzle ring modifications are shown in Table 1 and Table 2. As can be seen, the fuel savings ranged from 2.8% to 5.0%. Simultaneously, exhaust gas temperature and NOx emission was reduced. The actual boost air pressure is much less than at MCR point: 62% compared to MCR and only 58% of what turbocharger is capable to provide. Accordingly, the turbocharger can supply much more air than it supplies at reduced load, thus reducing exhaust gas temperature and specific fuel consumption.

However, it is obvious that sometimes the main or the auxiliary engine needs to be operated at MCR. For these cases M.A. Turbo/Engine developed the WG arrangement shown in Figure 3. As shown, an electronically operated WG valve is installed before turbine inlet. This valve receives signal from either turbocharger's RPM or scavenging pressure and maintain turbo RPM around optimum efficiency during any load.

Fig. 3. Waste Gate principal schematic



Benefits of Turbocharger Modification include: Reduced operational expenses due to less fuel consumption of up to 5%; Less maintenance cost; Greenhouse gas emissions reduction; TC modification cost is 3 – 5 times less than turbocharger replacement; Pay-back period is usually 1 – 1.5 year.

Cazzulo

As Roberto P. Cazzulo, RINA, steps down as the Chairman of the IACS Council, Maritime Reporter caught up with him to discuss the current state and future direction of global class.

By Greg Trauthwein, Editor

Given your experience, aside from the creation of IACS, what has been the most important change to the way in which "class" has conducted its business in the past 20 years?

In my view, it is the Quality System Certification Scheme (QSCS) adopted by IACS in 1991. Quality is a pillar for IACS. The scheme adopted by IACS is based on ISO standards but substantially modified to take into account the specific job carried out by classification societies. Developing and putting in place a substantial scheme such as QSCS has not been a small undertaking.

The scheme has been 25 years in the making and it continues to be dynamic, evolving and serving the industry well. The scheme includes the verification that classification societies actually apply the set of technical and procedural requirements that represent the result of IACS' activities since its foundation, in 1968. Without the QSCS initial and periodic audits there would be no feedback about the effective implementation of these requirements.

The changes in 2011 made the QSCS available also to classification societies which are not members of IACS, assessed by independent certification bodies.

Consolidation within the classification society world has brought together great strengths, but also centered power and influence in fewer organizations. From the IACS perspective, what are the positives for the maritime industry? What are some potential drawbacks? Do you see the potential and / or need for future consolidation?

The consolidation of two classification societies founding members of IACS, DNV GL, has not changed our way of working. It has not created a monopoly or lack of competition among classification societies, which remains very high, as well as cooperation between classification societies within IACS, which remains very high too.

Just think about the amount of work and time (more than 10 years) required for developing the common structural rules for oil tankers and bulk carriers, intended to comply with the IMO Goal-Based Standards. From IACS perspective, it is important that classification societies keep their capability to invest in research and rule development, and consolidate these efforts, in a collaborative way, whenever there is an identified need and priority to develop rules, regulations and standards applicable by the whole industry.

All of class is obviously global in scope, and just as obviously there are perpetual global "tensions" that could conceivably impact the important role that class does on a daily basis. Looking at the global geo-political picture today, where do you see "hotspots" or areas of concern for your members?

Class is global in scope. It has to think global, about international rules and regulations applied to ships trading worldwide, and to act local, in any port or yard around the world. Classification societies had to expand their international network, establishing regional offices, technical and operational centers, with exclusive personnel, worldwide. The center of gravity today is in the Far East, due to shipbuilding in Japan, South Korea, China, Vietnam, Indonesia, as well as shipping mainly to and from China. The role of class is to maintain its own standards regardless of the country in which we operate. It is a challenge. From this point of view, there are less areas of concerns today than when the market was really very good but perhaps too dynamic. Let's think about shipbuilding when new ship demand was very high, raising questions about quality of shipbuilding in some parts of the world for newly established shipyards. Nowadays the market is mature and all stakeholders pay a lot of attention to the quality of shipbuilding, facilitating our job.

The role of classification societies has evolved. In your estimation, what has been the biggest evolution of class in the past five years? What is next?

Classification societies are continuously evolving. The job is never the same even if you apparently do the same job for more than 30 years, like myself. Classification societies have evolved to become global providers of testing, inspection and certification services. However, classification (for ships, offshore platforms and supply vessels, fishing vessels, pleasure craft and other marine units) remains a very peculiar business, quite special with respect to other industries. It has to verify compliance with rules and regulations during plan approval, surveillance during construction, periodic and occasional surveys, as well as a lot of efforts for continually developing these rules, based more and more on first principles, goals and functional requirements. This will help class, industry and regulators to assess safety, environmental, cost and benefit implications, during rule development, in a more systematic and transparent way.

What is the biggest development for so-called IACS quality classification societies in the past year? Are there any game changers looking large in the center porthole?

As said before, classification is a very serious and important job, requiring competence and experience over the whole ship life cycle. Some other players may wish to enter the classification business and some other classification societies may wish to join IACS. This is allowed, of course, but it is important that it is based on quality performance. The level of quality of the fleet classed should be monitored by key performance indicators, for instance based on Port State Control detentions and deficiencies and other internal monitoring schemes, in order to keep charterers and insurers confident on class.

As technology onboard ships quickly catches up with shoreside capabilities specifically the use of communication and software technologies to help maintain, monitor and even control shipboard systems – how is this evolution impacting the work and role of class?

Ships are a concentrate of technology and integrated systems. Most of these systems are nowadays run by computers. This has changed the man-machine interface quite dramatically. You can touch on a screen to operate any piece of equipment on board. Through the use of modern communication and software technologies, one could have real time monitoring of what is happening on board also ashore. For instance, more and more ships are equipped with real time monitoring systems which could measure ship energy efficiency and transmit this information ashore. Another important development is the so called e-window. It is a way to transmit certificates, forms, reports when ships arrive in ports to various authorities, without any need to take care about formal aspects, such as different forms required by different authorities in different ports. Information trustworthiness is important. Classification societies already allow access to ship information, certificates and survey outcomes to many interested stakeholders. Software technologies and internet communication will definitely impact on the work of class such as all the other stakeholders. Class may of course benefit from the e-window exchange of information too. For instance, planned maintenance and repair data, electronic logbooks, incident and failure data, ship energy efficiency and emission monitoring data etc.

Looking at technology in the whole, what technology over the past decade has made the job of class easier / more efficient / more effective, and why?

Information technology. Class survey reports, certificates, rules, instructions, procedures are available in any part of the world by simple access via internet to each classification society's live databases. This makes our job easier, for instance when planning class

"Ships are a concentrate of technology and integrated systems. Most of these systems are nowadays run by computers. This has changed the man-machine interface quite dramatically."

Roberto P. Cazzulo, RINA & Chairman of the IACS Council

surveys, looking at previous survey reports and gathering information relating to plan approval and survey activities. E-learning has benefited from information technology too. The work within IACS has dramatically changed. Every day hundreds of e-mail messages are exchanged among various working groups. It was very different just twenty years ago, when most decisions were taken at meetings or by correspondence.

What technology has made the job of class more difficult, and why?

Information technology. The amount of information accessible via internet and vis-a-vis all interested parties is huge. This creates a sort of information inflation and the most important information due to this noise might be overlooked. It is a problem for anybody today. It is very delicate for all people running ships or looking at ships, such as class. For instance, surveyors are required to look at hundreds and hundreds of thickness measurements. They may miss hot spots, which often come out from experience rather than thousands of gaugings.

We understand that ship technology does not evolve in a vacuum, and the recent history of the container shipping sector with economic factors driving real and significant technological change (ie. slow and ultra slow steaming and all of the accompanying changes to ship and machinery) serves as an example. But looking ahead, what do you consider to be the most significant technological changes in our industry being discussed / adopted today that will have the most dramatic impact on shipping in the next decade?

Environmental regulations, such as NOx Tier III, SOx 0.1% in ECA and 0.5% global and GHG EEDI phase 3 that are foreseen in the incoming years (2015-2020-2025), are requiring deep changes in ship design and use of innovative technologies.

Probably slow or extra slow steaming has been the easiest solution in the short term, fitting a depressed market, but in the long term it cannot be the answer. In the future the market may again require full speed steaming and what will happen to ships now built with minimum propulsion power? The power installed may perhaps be even lower than that required for maneuvering in heavy weather conditions, which is a serious safety issue. We need to look ahead, project ourselves to the future, look at innovative designs and technologies, such as alternative means of propulsion, alternative fuels, multi-hull platforms, other means for transferring cargo on board e.g. by transshipment, etc.

However, technologies do not evolve in a vacuum and ships cannot be seen in isolation. The use of LNG as alternative fuel is an example of where shipping has to be part of a larger chain of changes.

LNG as fuel continues to pick up support. Looking at the looming emission and fuel regulations to and through 2020, please comment on how you see "LNG as Fuel" evolving in the coming six years?

LNG could become a viable alternative in particular for short sea, coastal shipping and inland navigation. There are many projects coming out and IACS is actively participating to the development of the IMO IGF Code. The promise is to cut NOx, SOx and PM emissions, as give a certain percentage of reduction to GHG emissions too. Bi-fuel engines may provide the necessary flexibility to switch from traditional fuel to LNG when navigating in ECA or coastal waters. However, LNG requires a lot of technology and infrastructure facilities ashore. Not all countries are nowadays prepared to accept LNG fu-

elled ships and this put questions in the short term evolution of LNG to become the ship fuel of the future. It is an industry sustainability issue rather than ships alone issue.

The lines of demarcation between 'Class' and the regulatory community that they help serve, are becoming blurred. Classification Societies now routinely perform many tasks heretofore the exclusive domain of the flag state and the Coast Guard. As this practice widens, how do you maintain your objectivity and more importantly, who is checking now to make sure the job is being done correctly? Are there checks and balances still in place? If so, how?

Classification societies can carry out work delegated by flag States that falls within their field of expertise. But such a delegation of activities is not a delegation of responsibilities. Classification societies are subject each year to a number of audits for their own work, regularly scrutinized for tasks carried out on behalf of flag States, first of all by the flag Administrations themselves then by port States, for the European Recognized Organizations (that in fact are all IACS Members plus currently one, RINAVE, which although not an IACS member has been subsumed by BV which is) by the European Maritime Safety Agency and in the U.S. by the Coast Guard. The USCG plays a very important role both as port and flag State to assess the quality performance of classification societies. A representative of the US Coast Guard, John Hannon, is presently chairman of the IACS Quality Advisory Committee. In this role, he has the opportunity to observe audits carried out on the QSCS applied by all IACS Members and possible applicants. The Advisory Committee uses feedback from these audits and other information gathered from flag Administrations, port States and industry, to recommend IACS adopt measures for continual improvement of the QSCS requirements.

Are there roles that Class should not take on?

Class should not take on responsibilities from other interested parties and they do not wish to do it. For instance, class does not wish to replace shipowners' responsibilities for operation and maintenance of ships. Nor does class intend to replace shipbuilders' and manufacturers' responsibilities for ship design and construction. Class has an independent role to play, on behalf of insurers, charterers, flag and port States, to assess ship compliance with given rules and regulations. This does not prevent class and even invites class to follow the whole ship life cycle, including technical advice during the development of rules and regulations, design review and plan approval, surveillance during construction, type approval and testing, periodic and occasional surveys, and any studies or assessments that may be conducted for these purposes. The use of new technologies, development of new designs, improvement of ship energy efficiency and attention to the environment, towards zero-emissions, requires deep involvement by all parties and their best competences put at disposal of the shipping industry.

It is what classification societies and IACS aim to do.

Desulfurization of Exhaust Gases in Shipping

Are ship owners prepared to enter SECA zones?

By Dipl.-Ing. Peter Pospiech

Due to existing regulations on air exhaust emissions from the International Maritime Organization (IMO), and with the European Union working towards an alignment with IMO MARPOL Annex VI, the marine industry will need to choose a path on how to achieve compliance, a choice that will have tremendous impact on shipping.

Legislation has already had an effect on the fuel markets in regulated areas, as fuel prices are expected to increase even further in 2015 when the 0.1% fuel sulfur limit enters into force.

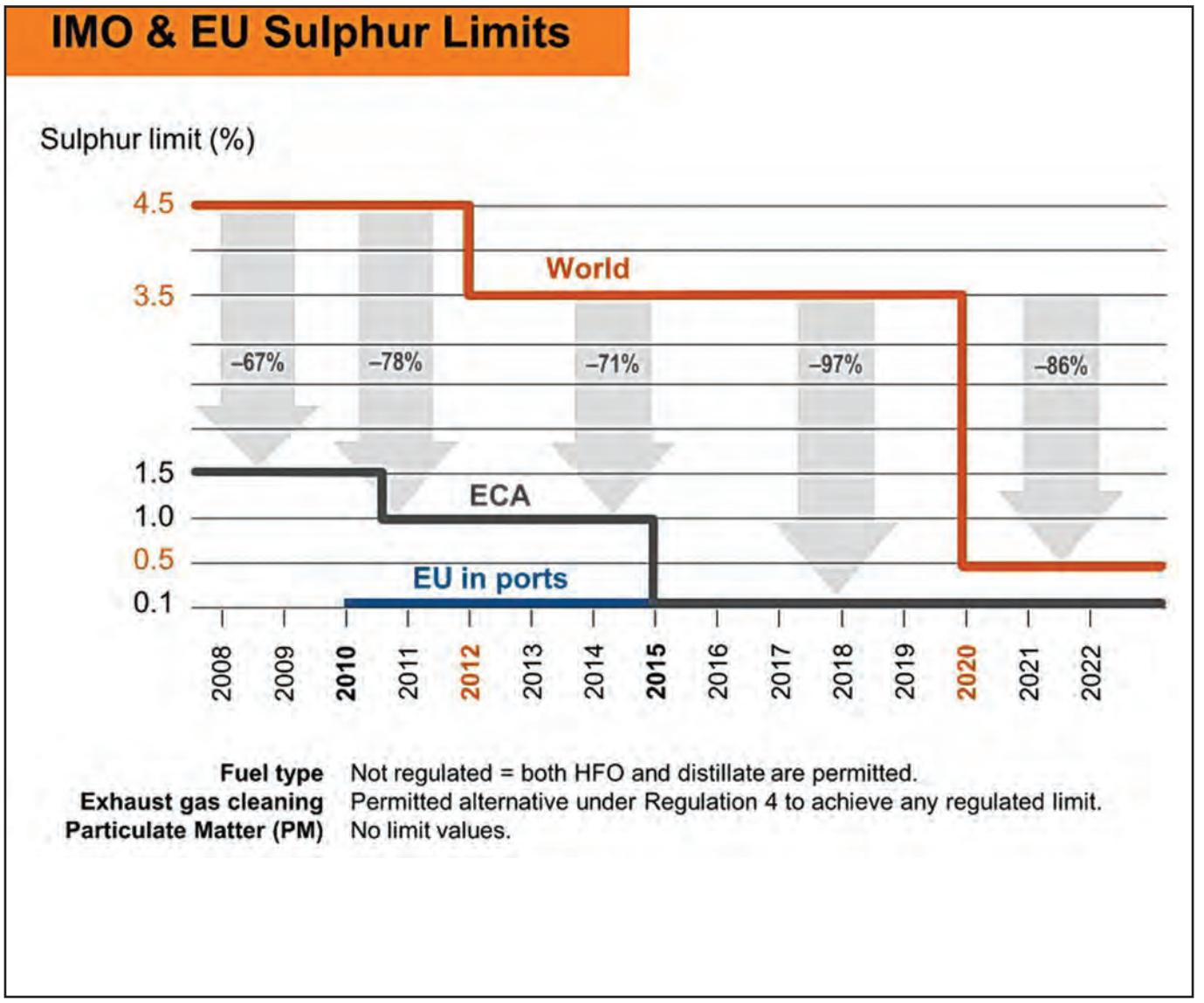
As an alternative to use low sulfur fuels (Diesel or Natural Gas), the Finnish company Wärtsilä, as well as others, has developed exhaust after treatment systems which are already in use.

January 1, 2015

By this date all diesel engines of all sea-going vessels in the area of the entire North- and Baltic Sea, the English Channel and as well in a 200 nautical miles zone along the U.S. Atlantic and Pacific coast line, must be operated either with fuels whose sulfur content is equal to or less than 0.1 percentage by weight, or equipped with an exhaust after treatment device which ensure a corresponding low sulfur emission. Unlike most other adopted portfolios from IMO, this regulation is valid not only for new but also for all in use existing seagoing vessels.

The sulfur content in ship fuels has been defined at 3.5 percent and it is intended to be reduced to 0.5 percent by 2020. With a view to “availability,” the mineral industry still has loopholes, and the binding introductory date of this limit can be shifted to 2025.

The 0.1 percentage by weight sulfur content within the SECA’s will come in force in the beginning of 2015, and the resulting technical consequences for die-



Left
The first ferry to be retrofitted is the Color Line Super Speed 2, which will be carried out in April this year.

Right
IMO and EU sulfur limit values.

sel engines have been discussed widely during the last several years. To what extent shipping companies have now adjusted is not easily known. However it is clear that no matter which technical solution is chosen, ship operation in the SECA's will be significantly more expensive.

The Norwegian cruise and transport shipping company Color Line together with Wärtsilä recently introduced its fleet retrofit program with scrubbers to reduce the sulfur emissions.

As the Color Line's vessels operates solely on the Baltic Sea, they focused on three alternatives before they ordered scrubbers from Wärtsilä:

- Conversion of the engine operation from heavy fuel to gas oil, which may be the simpliest but, because of the significantly higher fuel price, is an expensive solution.
- Conversion of the engine operation from heavy fuel to natural gas: This is an available technical solution and gas supply in Norway is plentiful, but it is ahigh investment costs to convert the engines and the infrastructure on board.
- Continue engine operation with in-

expensive heavy fuel which means installing a scrubber systems.

Each of the solutions have their pros and cons, and at this stage it is not possible to make a fair comparison, particularly given the historical and likely future fluctuation in fuel pricing. But in the big picture, the fuel price certainly has a considerable effect on the decision.

With respect to the scrubber solution Wärtsilä says "this leads to the lowest lifecycle-costs, however the amortization depends of the price differences between heavy fuel and gasoil with a low sulfur content of 0.1 percent."

Development of Scrubber at Wärtsilä

Wärtsilä has a long and noted history in the development of its scrubber system, which was working as a closed loop systems with freshwater and caustic soda. In fact it was a pioneer among engine manufacturers in the ability to supply certified equipments.

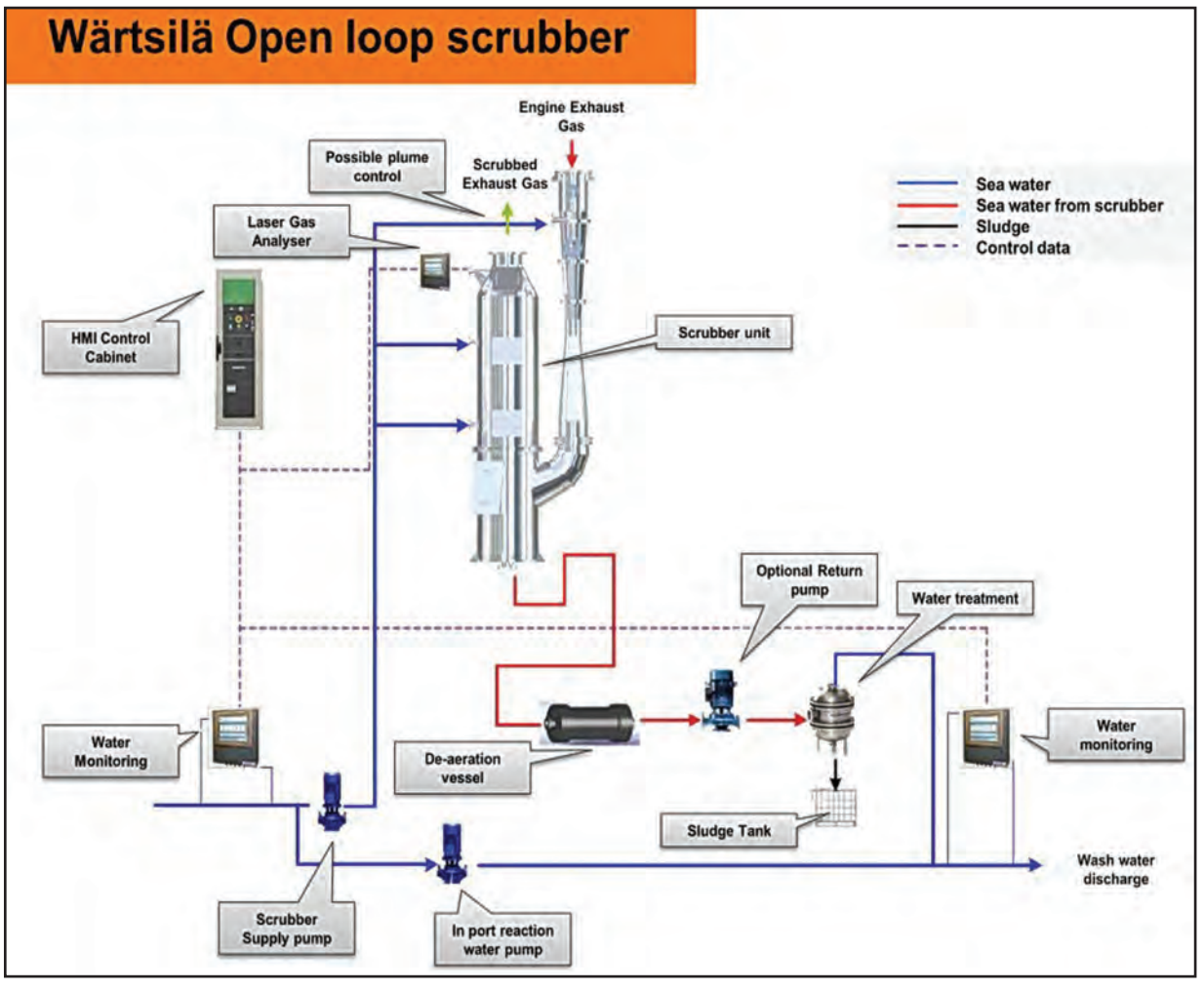
After Wärtsilä took over Hamworthy it was then able to own a scrubber system which works on a open loop method, without any chemical additives, operating with sufficient alkaline seawater. The decisive factor for the use of the open loop system are the alkaline properties of the respective seawater. If this is not sufficient, a hybrid system must be used. Indeed, this is a flexible, but at the same time also a complex and corresponding solution, which is only relevant for vessels whose area shows big differences in respect to the alkalinity of the seawater. As of March 2014 Wärtsilä had goods on order to equip 45 vessels for a total of 94 exhaust gas cleaning systems for both newbuild and retrofit projects –representing more than one-year of production.

The Color Line Decision: Seawater

Color Line opted in favor of scrubbers, which oper-

Left
Wärtsilä In-Line Scrubber for new buildings and retrofit installation.

Below
Wärtsilä Open Loop Scrubber System works with seawater.



ates with seawater in the open loop system, representing an investment of nearly $40.7m. The goal is a reduction of the harmful emissions. However, the installation of scrubbers from Wärtsilä removes up to 98% of SOx from vessel emissions and reduces harmful particulate matter by up to 85%, meaning that the ferries can operate using conventional bunker fuel. The four separate Wärtsilä open loop scrubber systems will ensure the ship's full compliance with the International Maritime Organization's (IMO) MARPOL Annex VI regulations, and with EU Directive 2055/33/EC.

The first ferry to be retrofitted is the Color Line Super Speed 2, which will be carried out in April this year. In January 2015 follows the Color Line Super Speed 1, Color Magic and Color Fantasy. All works will be carried out in a Danish shipyard.

The viability of scrubbers has been acknowledged by the IMO, the European Union, and in February 2012 by the U.S. Environmental Protection Agency and most recently by the British Parliament. In addition, extensive testing is performed upon each newly installed scrubber system to ensure that they are able to meet the demands placed upon them by the varying operational conditions that they will be working in. As increasing numbers of scrubbers are being installed and the industry's understanding of their ability to achieve compliance develops, confidence in scrubbers continues to grow.

In the following a short view on the ferries main propulsion system, which will be retrofitted with scrubbers: Color Magic and Color Fantasy feature each four 8-cylinder diesel engine of type 46B (output 4 x 7.800 kW @ 500 rpm). Both the ferries are of CCP propeller design. Each shaft features two engines which are mounted on both sides of one Renk MAN gearbox. Each main engine will get one own scrubber. The diesel engines of the on-board gensets will stay as they are – without exhaust gas cleaning system. They must therefore operate on gas oil, not only in ports where there is no shore-power supply available, but also during sea voyage. The Super Speed ferries feature the same propulsion system: each two twin-diesel engines from Wärtsilä of the same type.

The Color Fantasy will be modified in January 2015.

FLNG Pr

A New Dawn in the Age of M

Prelude to Maritime & Energy

By Patricia Keefe

"You have to have the idea, you have to have the engineering solution and you have to have the guts to put it into reality"

Matthias Bichsel, Royal Dutch Shell's director of projects and technology, to the *Wall Street Journal*

Longer than four football fields, as big as six Nimitz-class aircraft carriers and almost as tall as the Taipei 101 skyscraper, Royal Dutch Shell PLC is hoping that its record-setting, game-changing floating liquid natural gas (FLNG) facility will serve as a prelude to a killing in the offshore LNG market.

It's not alone. Many industry observers believe FLNG will do for gas offshore what fracking has done for shale or natural gas trapped in the ground on shore.

"This is revolutionary technology …[that]… has the potential to change the way we produce natural gas," said Neil Gilmour, Vice President of Development-Integrated Gas, Shell International. While LNG has been around since the early 60s, Shell's concept will take it a step further by taking the gas out of the pipes and moving the LNG processing out to sea.

Aptly named Prelude, at 488 meters long, 74 meters wide, and clocking in at 600,000 tonnes when fully ballasted, the FLNG facility, which is under construction at the Samsung Heavy Industries shipyard in South Korea, will be the largest object ever floated on the ocean. Designed to last 50 years, withstand level 5 cyclone winds and liquefy gas to minus 162 degrees Celsius, the estimated $13 billion "shipzilla" will enable Shell to produce, liquefy, store, and offload natural gas from a single vessel. The cost-saving and environmental implications are almost as staggering as the facility itself.

It is scheduled to go into service in 2017, spending the next 25 years tapping the Prelude and Concerto gas fields in the Caswell sub-basin of the northern Browse Basin, about 200 kilometers off the coast of Broome, Western Australia. Once in place, it is expected to produce 3.6 MMt/a of LNG, 0.4 MMt/a of LPG and 1.3 MMt/a of gas condensate annually, enough gas to fuel Hong Kong for a year. Once it drains those fields, it will head to dry dock for repairs and updates before moving on, likely to the Concerto, Crux and Libra fields.

(Photo: Courtesy Royal Dutch Shell)

The 488 meter long hull of Shell's Prelude FLNG plant floating out of the dry dock at the Samsung Heavy Industries (SHI) yard in Geoje, South Korea, Nov. 30, 2013.

(Photo: Courtesy Royal Dutch Shell)

Tugs assisting launch of Shell's Prelude FLNG plant on Nov. 30, 2013.

The basic idea driving this mix of new and old technologies is simple: Some if by land, way more – way cheaper – if by sea.

If successful, Shell's FLNG is expected to have a significant impact on reducing the cost, environmental impact and political risk associated with standard offshore gas exploration. This would be hugely timely for both Shell, which produced more gas than oil for the first time in 2012, and for the burgeoning demand for gas worldwide.

Hence, FLNG pre-launch is being lionized as a game-changer. Some observers scoff at the idea of using a hugely expensive facility to extract gas from small fields. But one of the beauties of FLNG facilities is that they are mobile and can flit from gas field to gas field, servicing one or many wells at the same time, while pipelines to onshore processing plants are essential tied to one field. Once its targeted field is sucked dry – the expensive pipeline has no further use. The plant can still receive LNG for processing, of course, but at that point it's coming in on tankers from various distances and the facility will have to be able to accommodate those ships and the necessary offloading process.

There are a number of factors driving LNG demand right now, including :

- Climate change, which has energy producers and customers alike seeking to reduce their carbon footprints in order to meet emissions standards.
- Growing middle classes in India and China, two of the largest and increasingly energy-hungry markets in the world.
- Japan's desire to minimize its reliance on nuclear energy.
- Market factors: Natural gas is expected to be almost four times cheaper than oil through 2040, according to the US. Energy Information Administration's *Annual Energy Outlook 2013.*

Knowing where the gas is, and getting to it, however, are two different things. There are many so called "stranded" deep water gas reserves that have been considered either too small in terms of likely productivity or too far out, to tap into in an economical manner. According to Gilmour, there are a lot of such undeveloped gas reserves out in the deep blue, of which he estimates that so far, several hundred trillion cubic feet have been found.

Currently, extracting gas from offshore gas fields requires expensive pipeline systems and cost-overrun-prone onshore processing plants. Increasingly, development onshore is not being seen as an economical option.

"There is always so much talk about these big LNG [shore] projects around the world, but only a small fraction of them will get built," said Matthias Bichsel, Royal Dutch Shell's director of projects and technology, in an interview with Reuters.

Instead, if Prelude is successful, FLNG plants will get the nod instead. Among the numerous factors driving LNG processing offshore, include:

- Geopolitical instability – FLNG plants can shield producers from a lack of shore-based infrastructure, civil unrest and terrorist activity.
- Reduced environmental impact on fragile coast lines and reef ecosystems by avoiding the need for dredging, jetties and the laying of pipelines. FLNG plants would also reduce the risk of interfering with aquatic life and migration patterns.
- Significant savings by eliminating the need for purchasing land and its attendant permitting processes and infrastructure requirements, and installing pipelines, compression platforms, jetties and onshore infrastructure, as well as from the resulting increased efficiency, and lower production, transportation and delivery costs.
- "Immunity" to onshore cost inflations that can leave FLNG platforms as much as 30% cheaper, according to Shell. This despite estimates by a McKinsey & Co. in its "Extending the LNG boom: Improving Australian LNG productivity and competitiveness" report, that says LNG projects in Australia were

> "This is revolutionary technology …{that}… has the potential to change the way we produce natural gas"
>
> Neil Gilmour, VP of Development-Integrated Gas, Shell International

now 20% to 30% more expensive than competitors in emerging regions such as North America and East Africa.

Factors such as geographical proximity, slowing oil production rates, technological advancement, abundant supply and unprecedented demand growth in Asia point towards a locus of FLNG development in Australian waters, according to Murray Dormer, an analyst with Douglas-Westwood.

"Shell FLNG can help develop resources earlier and faster, and extends our exploration reach," enthused Gilmour in remarks last year. "It can be a cheaper, and development risk-reduced way to monetize single gas fields, a cluster of smaller fields or a large field with multiple facilities, as the FLNG facility can be redeployed at the end of field life to another gas field."

For those reasons, Douglas-Westwood expects the market for construction of FLNG vessels to increase from $3.7B in the period 2007-2013 to $64.4B over 2014-2020, according to its report, *World FLNG Forecast.*

Which is why Shell and its competitors are willing to bear the huge upfront costs of building FLNG plants. Shell, for example, has more than 1.6 million man hours invested in the front end engineering and design phases of the project. After first announcing the concept in 2009, after a decade of research and many design steps, the completed Prelude Hull took its maiden voyage Nov. 30, 2013, to another part of the shipyard, where more components will be installed.

If You Build It They will Follow

As its name implies, Prelude won't be alone for long. Nor will it remain the world's largest floating offshore facility. There are at least three other similar projects following in its wake. One of these, from Exxon, and others in the planning stages at Shell, will pump up the size equation even more.

Bruce Steenson, Shell's general manager of integrated gas programs and innovation, has been widely quoted as confirming that Shell is working on an even larger design. "That next one will be off the rails," he told Reuters.

Competitors include:

- Exxon Mobil may beat Shell to it. Exxon in partnership with BHP Billiton is looking to install what would be the world's largest FLNG – a 495 meters (1,624 feet) long facility – in its Scarborough

A scale model of the FLNG measures 8 meters long and weighs 4.5 tons.

To celebrate Maritime Reporter & Engineering News' 75th Anniversary, each edition in 2014 will offer a specially commissioned feature article which examines a historical topic.

This month we look at the evolution and impact of the offshore energy business.

The "75th Celebration" continues in earnest in the August 2014 "SMM" edition, with a comprehensive review and report on the role and evolution of SOFTWARE SOLUTIONS on the modern shipubuilding and maritime market.

> "It can be a cheaper, and a development risk-reduced way to monetize single gas fields, a cluster of smaller fields or a large field with multiple facilities, as the FLNG facility can be redeployed at the end of field life to another gas field."
>
> Neil Gilmour, VP of Development- Integrated Gas, Shell International

gas field off the Australian coast. Design specs call for it to produce an estimated 6 million to 7 million mt/year of LNG from five trains, and to hold 10 storage tanks with a capacity of 380,000 cubic meters.

- Malaysia's PETRONAS plans to launch an FLNG plant in 2015, and has already announced plans for a second FLNG plant. It's PFLNG 1 is expected to be the first such facility in operation, beating Prelude by two years. It will be 365 meters long, about 60 meters wide, weigh approximately 125,000t when fully loaded and is expected to produce 1.5 million tonnes of LNG per year.
- GDF Suez of France and Santos, which are looking to put an FLNG plant in the the Bonaparte project off northern Australia.

No Pain, No Gain

Before Shell can hope to reap FLNG's many anticipated advantages, it must first surmount some very big challenges, not the least of which is force-fitting an entire LNG processing plant onto what some have likened as a "barge" in the middle of the ocean.

Shell had to find a way to adapt its shore-based technology for a much smaller, floating platform. This was solved in part by stacking components on deck vertically to save space.

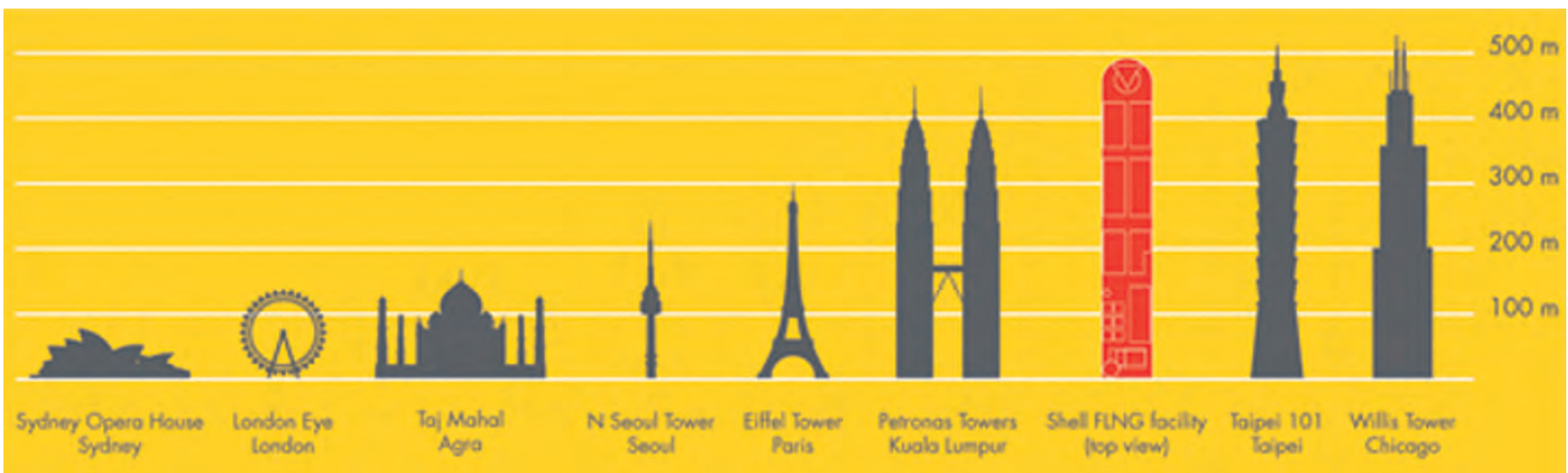
A related solution kills two birds with one stone. Shell plans to eliminate the need for some components on deck by extending eight one-meter-diameter pipes to a depth of 150 meters, in order to pump frigid seawater up to help cool the gas – 50 million liters (50,000 cubic meters an hour.

Safety is a huge big concern on multiple fronts, and Shell executives have stressed that Prelude's design centered on minimizing risk. Its environmental approval requires it to have a oil spill contingency plan for a potential uncontained spill that would last 11 weeks, as well as a monitoring plan in the event of a spill, to determine the impact on ecosystems. The design addresses other risks.

First, gas is explosive. Shell will deal with this in part by using inert (non-flammable) gases in its processes, by separating each of the modules a set distance apart to limit chain reactions in the event of an incident, and by putting the accommodations on the opposite end of the ship away from the turret where gas is brought in.

Once the processing plant moves offshore, "sloshing," which creates a force that can significantly damage the walls of the storage tanks, becomes a major concern. Since the tanks aren't always full, and the ship is always moving up and down in the water, sloshing can be a constant concern. Shell is addressing this via a special membrane LNG tank designed to help predict, and help en-

So ... How big is Prelude? You be the Judge.



(Photo: Courtesy Royal Dutch Shell)

Artist's impression of Prelude FLNG.

dure, the force of sloshing.

Movement also comes into play when trying to transfer the liquefied gas into an LNG carrier tank. To aid offloading there are three 6,700 hp thrusters, which can adjust the position of the FLNG in relation to the carrier.

Shell also had to marinize process equipment such as absorption columns and the main cryogenic heat exchangers to ensure their operation under marine conditions, and ability to accommodate movement in the structure.

And there's the fact that Prelude will be sitting out in the middle of nowhere in 'cyclone alley' central. Shell has no intentions of untethering the facility every time a bad wind blows and towing it to shore. Instead, a number of factors are supposed to ensure that Prelude sits tight in savage seas. First there is its sheer size and weight. But more important, Gilmour claims Prelude's mooring system can stay on station even in the face of a category 5 hurricane.

Four groups of mooring lines will be attached to the world's largest (93 meters) mooring turret on one end, anchoring the facility, via connections to suction pile anchors, to the ocean floor on the other. The swiveling turret turns slowly with the wind, reducing the impact of water and weather conditions. Meanwhile, the offloading of LNG onto an LNG carrier required the design of a special loading arm system with swivel joints and quick connect/disconnect flanges, capable of offloading both LNG and LPG.

How It Works

The Prelude plant will include 7 wells, four flow lines approximately 4 km in length, umbilicals and flexible risers, as well as the FLNG facility. The management of subsea wells and manifolds is carried out via the umbilicals, which are connected to a control room. The plant itself is comprised of liquefaction units, production storage (with capacity of 436,000 cubic meters of LNG, plus LPG condensate) and loading facilities, utility systems, control room, maintenance facilities and accommodation.

It will sit on top of the gas field where a series of wells will feed gas and condensate from the reservoirs via four flexible risers into the facility that will draw gas up into the turret for processing. Next, the LNG has to be separated from a mix that included condensate, LPG, water and CO2. After which the LNG will be liquefied, using Shell's Dual Mixed Refrigerant (DMR) process, which uses steam-driven refrigerant compressors and ultra-cold seawater to chill the gas to –162°C, shrinking the volume by 600 times. Stored in tanks in the hull with an overall capacity of more than 430 million liters (114 million U.S. gal.), it will be transferred by special loading cryogenic arms to tankers moored next to the facility.

A key feature of Shell's FLNG design will be its flexibility. It will be able to process a wide range of gas compositions, accommodate a wide range of subsea configurations, offer multiple solutions for hydrate management, export LPG as well as LNG, and will use a dual-mixed refrigerant liquefaction cycle.

The FLNG facility to be used for Prelude is generic in design, following Shell's "design one, build many" approach, meaning that the facility can be easily replicated for other projects, and more importantly, customized for different gas field conditions and contents.

Although Shell likes to say it has innovated using tried and true technology, in fact, the FLNG concept remains untested. Certainly the market can look to the FSOP sector to get an idea of the process, but for the most part, Shell's competitors and partners will be watching closely to see how closely Prelude hews to budget and hype.

If all goes to plan, however, the FLNG market is set to explode.

Prelude By the Numbers

Out at sea, look! It's a ship! It's a floating rig! It's SuperFLNG!

By Patricia Keefe

While not "faster than a speeding bullet," Shell's shipzilla Prelude is certainly more powerful than a speeding locomotive, and will be able to leapfrog in size, many of the world's tallest buildings. By any definition, the super-size Prelude floating liquid natural gas (FLNG) vessel is gargantuan. And yet it is designed to cram everything you'll find in a full-size, shore-based processing plant into roughly a quarter of the space.

Longer than four soccer fields and displacing six times as much water as the largest aircraft carrier, the FLNG facility will be the biggest floating production facility in the world when it debuts at some point in 2017 at an estimated cost of nearly $11 to $13 billion.

Investors in the Prelude Project include operator Royal Dutch Shell (67.5%), Inpex 17.5%, Korea Gas Corp. (Kogas) 10%, and Taiwan's CPC 5%.

It can be hard to grasp the breadth and depth of a project of this scope but a picture is still worth a thousand words, so here are a few to help put things into perspective:

- **Contents of 175 Olympic Swimming Pools** – Amount of liquefied gas that can be stored in the facility's storage tanks below deck.

- **Six Nimitz–Class aircraft carriers** - The amount of water the 200,000-tonne Prelude will displace fully loaded. The facility will weigh in at around 600,000 tonnes fully loaded, or six times as much as the largest aircraft carrier.

Prelude will consume more than 260,000 tons of steel, more than **5 times the steel used on the iconic Sydney Harbour Bridge** and 3 times the steel used on the Golden Gate Bridge.

- **Four soccer fields Plus** – Equivalent length of the vessel, which will measure nearly half a kilometer in length (488 meters/1600 ft.), making it a few meters longer than the biggest oil tankers and almost as long as the fourth largest building in the world – the Shanghai World Financial Center, which stands at 492 m. The facility is also 74m wide.

- **Arc de Triomphe** - A structure that size could fit inside Prelude's 93-meter (305-foot) high mooring turret, which will run through the facility.

- **Two iconic bridges** - Prelude will use 260,000 tons of steel, about five times more than was used to build the Sydney Harbour Bridge, and three times as much steel as was used to build the Golden Gate Bridge in San Francisco.

Other numbers that help illustrate the story:

- **3 trillion** Estimated number of cubic feet of liquids-rich gas in Shell's combined Prelude and Concerto fields.

- **$30 billion** The amount Shell is willing to spend up to in development, in the Australian region over the next five years.

- **50 million liters** The amount of cold water that will be drawn from the ocean every hour, to help cool the natural gas.

- **$45 million** Expected boost to the local economy, including 1,000 jobs.

- **5.3 million tonnes** The amount of liquids Prelude is expected to produce on an annual basis: 3.6 million tonnes of LNG, 1.3 million tonnes of condensate and 0.4 million tonnes of LPG.

- **117%** The amount of Hong Kong's

220

220 km of piping will be installed on the Prelude FLNG

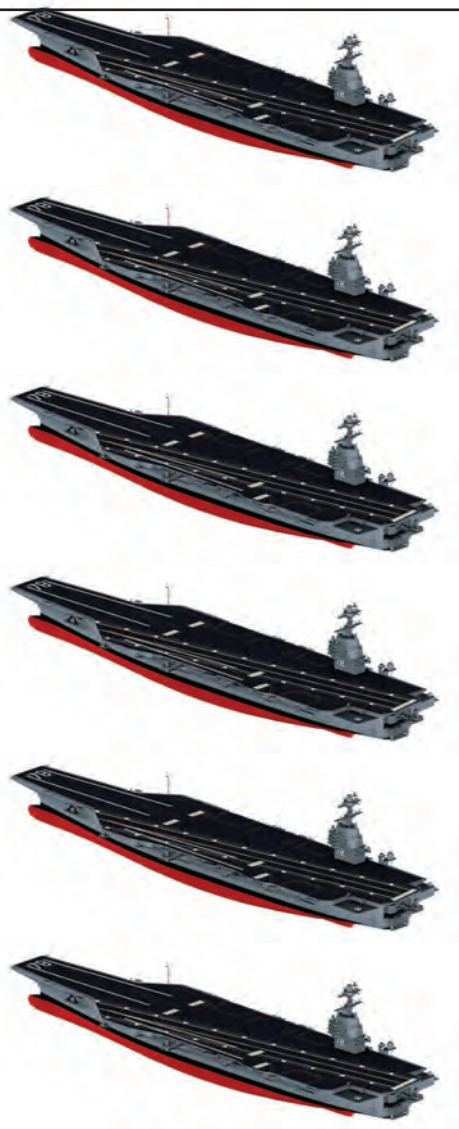
1.6

million ... the number of engineering man hours in the FEED phase.

annual natural gas demand that Shell estimates could be met by the facility's annual LNG production.

- **1.6 million** the number of engineering man hours invested into the front end engineering and design (FEED) phase of the development.
- **110,000** The number of natural gas equivalent 110,000 barrels of oil per day that Prelude will be capable of processing.
- **5,000** The number of workers who will build the LNG facility.
- **About 3,000** The number of engineering drawings done for the project.
- **3,000 km** Total length of electrical and other cabling installed on the facility, the distance from Barcelona to Moscow.
- **600** The number of engineers worldwide that have worked on the development phase of the Prelude FLNG project to define, design and evaluate plans.
- **220 km** Amount of piping used in the vessel.
- **6,700 hp** The power of each of three thrusters located in the rear of the Prelude FLNG; only two will operate at any one time.
- **-162° Celsius (-260°F)** the temperature at which natural gas turns into liquid natural gas (LNG).
- **1/600th** the factor by which a volume of natural gas shrinks when it is turned into LNG
- **200 km (125 miles)** The distance from the Prelude field in the Browse Basin to the nearest land.
- **7** The number of Prelude development wells.
- **4** The number of competitors particularly hot on Prelude's heels with their own FLNG plans, including Petronas, ConocoPhillips, GDF Suez and Exxon- BHP.
- **20-25 years** – The length of time Prelude is expected to stay moored over the gas fields before heading to dry dock for updates and repairs.

Six Nimitz–Class Aircraft Carriers:
Prelude , around 600,000 tonnes fully loaded, or six times as much as the largest aircraft carrier.



U.S. Navy photo illustration courtesy of Newport News Shipbuilding/Released)

Milestones

Key milestones, Royal Dutch Shell's FLNG facility to date:

- January 2007 – Discovery of gas in Prelude well.
- March 2009 – Discovery of gas in Concerto well.
- July 2009 - Shell awards the contract for the design, construction and installation of multiple FLNG facilities over a period of up to 15 years to a consortium of Technip and Samsung Heavy Industries, based upon Shell's proprietary design.
- November 2010 – Environmental approval received for the project.
- May 20, 2011 - Prelude FLNG Project was announced as Shell takes Financial Investment Decision (FID) on the Prelude project.
- September 9, 2011 - Fabrication of Prelude well heads, marking the first ever steel cut for the Prelude Project.
- May 2012 - The first steel cut for the turret.
- October 2012 – First steel cut for the hull.
- January 2013 – Cutting of first steel for the the topsides.
- June 2013 - Construction started on the Prelude Darwin Onshore Supply Base.
- September 2013 - First Turret module shipped to Geoje.
- September 2013 - Development well drilling started.
- November 30, 2013 – Hull floated for the first time.

Source: Shell Australia

Floating Production

$1.2B Speculative FLNG Ordered

BY JIM MCCAUL, IMA

The floating production business continues to be very strong, particularly in the LNG gas processing sector. Last month saw a speculatively ordered floating liquefaction plant – a $1.2 billion contract – as well as several regasification vessel contracts. Here's a snapshot of what's happening in the business.

Current Inventory

In total, 320 oil/gas floating production units are now in service, on order or available for reuse on another field. FPSOs account for 65% of the existing systems, 78% of systems on order. Production semis, barges, spars and TLPs comprise the balance. Total oil/gas inventory is the same as last month – but three units on order were completed and are now in the active inventory.

Another 29 floating LNG processing systems are in service or on order. Liquefaction floaters account for 17%, regasification floaters 83%. No liquefaction floaters are yet in service – all 5 are on order. Total LNG inventory has increased by two units since last month.

In addition, 102 floating storage units are in service, on order or available.

Production Floater Order Backlog

Sixty-five production floaters are currently on order, a reduction of three units since last month. The figure includes 38 FPSOs, 11 other oil/gas production units and 16 LNG processing units. In the latter are 5 floating liquefaction plants and 11 regasification terminals.

The backlog includes a speculatively ordered liquefaction floater – the first such order since the ill-fated FlexLNG multiple FLNG contract with Samsung in 2007. In late May Golar LNG contracted with Keppel Shipyard to convert the 39 year old LNG carrier Hille to an FLNG. The converted unit will have capability to produce 2.2 to 2.8 million tonnes of LNG per year and have storage for 125,000 m3 of LNG. Keppel has subcontracted with Black and Veatch to design and engineer the topsides plant utilizing B&V's PRICO technology.

Capex for the FLNG, including conversion and site commissioning, is expected to be in the range of $1.2 billion. This works out to an initial cost of $430 to $545 per tonne of annual LNG capacity. Given the estimated capex, Golar expects to realize an EBITDA payback of 3 to 5 years on a 5 to 8 year contract. Funding of initial milestone payments will be from the proceeds of a June 2014 public offering of 12.7 million shares of common stock. For the overall project Golar plans to raise 10 percent of the project capex from vendor participation. The Golar FLNG is scheduled for delivery within 31 months from contract signing – which would be at end 2016.

Golar has been looking at various projects for the new unit. The firm is focusing on offshore fields with relatively small reserves of clean natural gas and sites that enable use of the unit with relatively small infrastructure investment. According to Golar, multiple MOUs for the unit have been executed and definitive agreements are under discussion in North America and Africa. But the firm says the "execution model remains relatively complex."

Also now in backlog are two new floating regasification projects. One of these involves use of an LNG regas carrier as a terminal in Egypt. The unit will be positioned at a jetty in Ain Sukhna, an industrial port on the Red Sea. Hoegh LNG will lease the newly built Hoegh Gallant to EGAS for 5 years for the project. Finalization of the deal is still pending as of beginning July.

The second regas floater is being supplied to Petrobangla for use as a regasification terminal in Bangladesh. It will be moored offshore Moheshkhali Island in the Bay of Bengal. Excelerate will design and construct the facility and supply the FSRU under a 15 year charter.

The backlog of units on order has declined over the past two years. But the current backlog is still very strong in the context of the past two decades. As shown below, it is the fourth highest mid-year backlog since 1996.

Backlog of Planned Floater Projects

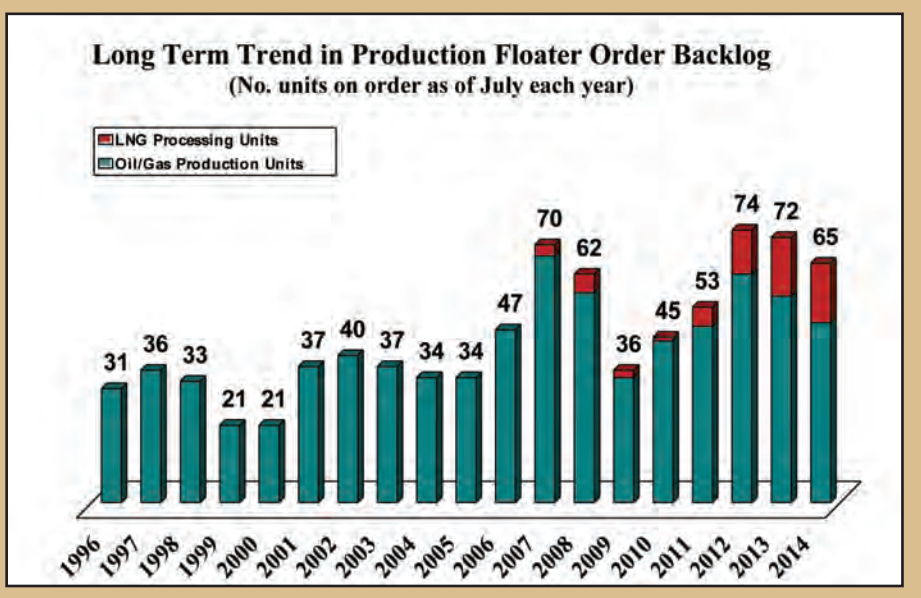
In total 226 floating production projects are in various stages of planning as of beginning July. Of these, 58% involve an FPSO, 13% another type oil/gas production floater, 23% liquefaction

Chart 1

Number of Floating Production and Storage Units In Service, On Order or Available for Reuse

(As of July 1, 2014)

	Total	Active	On Order	Available
Oil/Gas Production				
FPSO	213	159	38	16
Production Barge	10	8	2	0
Production Semi	47	40	3	4
Production Spar	22	20	2	0
TLP	28	24	4	0
Total	320	251	49	20
LNG Production				
FLNG	5	0	5	0
FSRU	24	13	11	0
Storage Systems				
FSO	102	92	9	1



Capex for the FLNG, including conversion and site commissioning, is expected to be in the range of $1.2 billion. **This works out to an initial cost of $430 to $545 per tonne of annual LNG capacity.**

or regasification floater and 6% storage/offloading floater. Among the new projects emerging since last month is a possible FLNG project in the Russian sector of the Barents Sea. The proposed FLNG would have 2.6 mtpa LNG production capacity and be used to liquefy/export gas from the Nenets region in northern Russia. A land plant in Indiga plus barge offshore with LNG storage/offloading capability is an option to the FLNG.

Brazil, Africa and SE Asia continue to be the major locations of floating production projects in the visible planning stage. We are tracking 44 projects in Brazil, 48 in Africa and 39 projects in SEA – 58% of the visible planned floating production projects worldwide. Several large projects in Brazil and (less so) Africa will require multiple production units. Around 13% of the 226 visible planned projects are likely to advance to the EPC contracting stage within the next 12 to 18 months. These near term projects typically have either entered the FEED phase, pre-qualification of floater contractors has been initiated or bidding/negotiation is in progress.

Another 50% of the visible projects are at a stage of development where the EPC contract for the production unit is likely within the next 18 to 60 months. The remaining 37% of projects are less advanced in planning, with the EPC contract likely 5 to 10 years out.

We looked into the type mooring system likely to be utilized on projects in the planning stage. Based on what is known at the moment, around 30% will utilize a spread mooring system, 20% will utilize an external turret, 15% an internal turret. Another 20% could utilize a spread mooring or turret system. The remaining 15% will be jetty moored FSRUs, tendon tensioned TLPs, a few DP FPSOs and several relatively simple SPM, yoke or chain mooring systems.

Near Term Outlook

The ordering pace to date this year has met expectations. Orders for 11 units have been placed through mid-year. They include 2 FLNGs, 5 FPSOs, 1 gas/condensate barge and 3 FSRUs. On an annualized basis, the ordering pace equates to 22 units per year. This is within the order forecast we made in January – where we forecast orders for 20 to 30 units annually over the next five years. The second half of 2014 looks even stronger. At least a dozen projects are ready to move to the EPC contract stage by year end – and underlying market drivers for the investment commitment are very positive.

In particular, crude pricing remains strong. Prices are being supported by increasing energy demand and uncertainty about supply sources. Brent is trading around $112 on the spot market, $98 at the end of the decade in the futures market. This pricing level provides solid commercial support to all but the most marginal deepwater projects. Rystad Energy, for example, has estimated that the 30 major deepwater projects coming online between 2014 and 2020 will require an average Brent price of $65 to breakeven. The least economic project among the 30 will require $72 to breakeven.

Breakdown of Planned Projects by Type of Production System

(As of July 1, 2014)

Type System	# of Projects
FPSO	131
Other FPS	30
FLNG	31
FSRU	21
FSO	13
Total	226

Breakdown of Planned Projects by Location of Field

(As of July 1, 2014)

Project Location	# of Projects
Africa	48
Brazil	44
SE Asia	39
GOM	22
No. Europe	23
Aust/NZ	15
Medit	10
SW Asia	10
Other	15
Total	226

Private Equity Drives New Ship Buys

Ship Registries are an excellent bellwether of industry health and trends, and when Maritime Reporter & Engineering News sought answers to some topical questions, it went to two of the top organizations in the world, speicifically ***Theo Xenakoudis****, Worldwide Business Operations Officer, International Registries, Inc. &* ***Christian Mollitor****, Vice-President, Liberian Registry/ LISCR, LLC.*

By Greg Trauthwein

Give a brief description of the market you serve.

TX Greek shipowners have historically been very supportive of the RMI flag. Today Greek shipowners represent nearly 25 million gross tons of the RMI fleet. They are the largest group of owners in the Registry, followed by U.S. and German owners. According to a recent paper published by the Greek Shipping Cooperation Committee, the RMI Registry gained approximately half of the vessels purchased by Greek owners and more than 40% of the gross tonnage added to the Greek fleet in 2013. That same paper shows that 16% of Greek owned vessels fly the RMI flag and the RMI flag is the fastest growing in the market. Greek shipowners invested around $13 billion in 2013, and already $5 billion in Q1 2014 for newbuilding tonnage according to a report by The TOC.

CM The Liberian Registry is one of the world's largest and most active shipping registers, serving quality ships engaged in international trade. Liberia recently surpassed all-time tonnage records and the registry continues to grow. The fleet now stands at approximately 4,000 ships, aggregating 136m gt and more than 207m dwt.

What has been the trend or market condition that has most affected business in the past year?

CM Owners are ordering ships again, and there is a great deal of private equity funding entering the market, in the U.S. and elsewhere, which is filling the shortfall created by a reduction in traditional bank finance for shipping. Liberia has the second-highest share based on market capitalization of shipping companies listed on the U.S. stock exchange, behind only the U.S. We expect that the use of private equity capital will continue to fund newbuilding and secondhand ship purchases throughout 2015 and 2016.

TX Our business is to register ships, while at the same time ensuring that vessels under the RMI flag are in compliance with national and international rules and requirements. If you look at RMI registrations within the last five years, it is clear that more than 60% of the vessels registered were newbuildings. A report published in the fall of 2013 which was based on the Korean Shipyards' orderbook showed that the RMI flag was the second largest flag represented. It is anticipated that the average age of the fleet will continue to stay below ten years of age based on the known orderbook.

One area that really began to change as early as 2012 was the activity of private equity funds and their investment into shipping. This has resulted in a number of acquisitions that entered the RMI fleet. This trend has continued into 2014.

Considering the legislative and financial considerations, what do you consider to be the biggest challenge to your business in the coming few years?

TX One of the major challenges that all flag State administrations face today is the proliferation of regulation. Flag States must employ people with the knowledge, experience and capacity to ensure that their flagged vessels operate in accordance with international rules and regulations. Furthermore, Flag States must be adequately and effectively represented at the International Maritime Organization (IMO), where all international conventions and regulations are introduced. The RMI has a strong IMO delegation including a permanent representative. The delegation liaises with industry stakeholders and receives appropriate feedback from owners, operators and other Marshall Islands Quality Council (MIQC) members and its advisory groups. Another major challenge is providing support and assistance to owners and operators that have suffered due to market conditions.

> "Owners are ordering ships again, and there is a great deal of private equity funding entering the market, in the U.S. and elsewhere, which is filling the shortfall created by a reduction in traditional bank finance for shipping."
>
> Christian Mollitor, Liberian Registry/LISCR, LLC

"Greek shipowners invested around $13 billion in 2013, and already $5 billion in Q1 2014."

Theo Xenakoudis, International Registries, Inc.

Balancing commercial responsibility with regulation is absolutely essential to ensure proper maintenance and safe operation of ships, despite a decrease in vessel earnings. Having surpassed 100 million gross tons earlier this year, one of the challenges we face is managing our fleet growth while maintaining the same level of quality, reputation and service.

CM In shipping, as in other industries, innovative companies can turn challenge into opportunity. An example of that can be seen in the Liberian Registry's response to continual pressure exerted on German shipowners by their national association (VDR) to register 30 percent of their fleets under an EU flag. Most German owners prefer the Liberian flag, and a large percentage of the Liberian fleet is linked to German owners. So, as part of its commitment to supporting its clients in all circumstances, YCF Maritime, the parent organization of LISCR, LLC, has created a Luxembourg-resident sister organization - EuroFlag Services S.à.r.L - to carry out ship registration and management services for shipowners seeking to register vessels under the Luxembourg flag.

This option allows owners the status of having an EU flag, while still retaining LISCR's service, expertise and technical know-how.

How has your organization invested recently?

TX As mentioned above, one of our recent challenges is managing fleet growth while maintaining the same level of quality, reputation and service. While the RMI Registry's robust network of offices, the largest among any registry, allow for service 24 hours a day, seven days a week, we are always keenly aware of enhancing and leveraging technology so we are able to maintain, and if possible, improve service overall. The RMI Registry first decentralized its registration services, and since has decentralized all aspects including regulatory affairs, technical, marine safety and seafarer's identification to worldwide offices. This was done through an electronic platform and database that keeps all of the offices interconnected. Since we live in an age of constant technological change, it is imperative that we review and monitor the technology we utilize and make updates as quickly as possible to ensure all worldwide offices are able to operate in a timely fashion, and where possible, provide clients with better access to information. One of the most recent initiatives is to further decentralize the production of Officer Certificates (OCs) and Seafarer Identification and Record Books (SIRBs). While all offices are able to accept documentation and issue a Certificate of Receipt of Application (CRA), only the Reston, Piraeus, Hong Kong, Ft. Lauderdale and Mumbai offices are able to issue OCs and SIRBs. It is anticipated that the London office, in the fall of this year, will also be able to issue OCs and SIRBs.

CM: Recent investments to enhance our services and expertise can be seen in a number of recent initiatives:

• **Harmonized Audit Program**. Liberia is the only flag state that provides shipowners with the option of harmonized audits, combining vessel certification for the ISM and ISPS Codes and the annual safety inspection into a single visit, with important cost and time savings for owners and operators. It eliminates the need for engaging three different auditors.

• **Detention Prevention Program.** This is to screen advance notice of ship arrivals as part of a detention prevention plan. The objective is to maintain and strengthen the already excellent safety record of the Liberian flag, and to further reduce detention rates, especially in Australia, China, the EU and the U.S.

• **Maritime Labor Convention 2006 Compliance**. Ninety-seven percent of qualifying Liberian-flag ships had achieved successful Maritime Labor Convention 2006 compliance just weeks after the convention entered into force. The Liberian-flag fleet is the second largest in the world and includes 3,173 ships to which MLC 2006 applies. Liberia was the first flag state to ratify MLC 2006, and one of the first to adopt in-house measures to anticipate implementation of the convention.

• **Maritime Labour Complaint Resolution Form.** This is for seafarers prior to the entry into force of MLC 2006. Liberia is committed to ensuring that seafarers who serve on Liberian-flag ships have decent working and living conditions, a safe and secure workplace and fair employment. Seafarers are encouraged to use the ship's onboard complaint procedures to resolve complaints at the earliest possible opportunity in accordance with MLC 2006. However, in the event that a complaint is unable to be resolved on board, Liberia has provided the online Maritime Labor Complaint Resolution Form (accessible from the homepage of the registry's website at www.liscr.com) to help seafarers resolve all genuine and valid complaints.

• **The Liberian Registry App**. A mobile application to enable owners, managers and operators to communicate and interact with the registry. The Flag-State App builds on Liberia's commitment to provide innovative technology and services to owners and managers worldwide. From an iPhone, iPad or an android device, users can read up-to-the-minute news and developments; access a comprehensive Global Maritime Events Calendar and, with the click of a button, add events to their calendar and share upcoming events; verify the authenticity of certificates and documents for Liberian-flagged ships; search Liberia's global network of inspectors and ISM/ISPS/MLC auditors; validate seafarer credentials; submit an MLC Complaint Resolution Form; track the daily vessel positions on an interactive world map of all Liberian-flagged ships; browse photos of Liberia's quality fleet; and access the registry's Facebook, Twitter and LinkedIn profiles. Available for download in both the Google Play (http://bit.ly/NQnwgV) and Apple's iTunes App Stores (http://bit.ly/1q0gKnS).

Top 25 Flag of Registry, Privately-Owned Vessels by Type, 2013

Oceangoing Self-Propelled, Cargo-Carrying Vessels of 1,000 Gross Tons and Above / As of January 31st, 2013 (Source: MarAd)

TOTAL

Flag of Register	No.	GT (000)	Dwt (000)
Panama	6,158	210,661	328,206
Liberia	2,974	124,207	193,408
Marshall Islands	1,876	82,484	136,328
Hong Kong	1,855	76,474	127,077
Singapore	1,776	59,814	92,513
Bahamas	1,029	42,430	63,125
Malta	1,587	42,165	69,065
Greece	704	39,909	72,480
China	1,416	30,780	49,384
Cyprus	788	19,580	31,438
Japan	577	15,780	22,696
United Kingdom	397	15,145	17,661
Isle of Man (British)	332	13,813	23,343
Italy	483	13,753	20,254
Norway (NIS)	383	13,236	17,657
Germany	288	12,716	14,622
Antigua & Barbuda	1,221	10,672	13,798
South Korea	764	10,634	17,232
Denmark (DIS)	307	10,596	13,373
Indonesia	1,396	8,650	12,856
Bermuda (British)	118	8,597	10,874
United States of America*	187	7,073	7,902
Malaysia	269	6,087	8,188
Turkey	546	6,059	9,388
Netherlands	749	5,453	7,171
Top 25 Registries	28,178	886,744	1,380,025
Total	36,307	975,176	1,508,939

DRY BULK

Flag of Register	No.	GT (000)	Dwt (000)
Panama	2,604	108,980	199,557
Liberia	785	34,726	63,205
Marshall Islands	753	32,478	59,229
Hong Kong	930	41,845	76,864
Singapore	349	16,871	31,191
Bahamas	256	8,389	14,794
Malta	549	19,130	34,527
Greece	250	12,897	24,289
China	553	16,094	27,898
Cyprus	290	10,398	18,781
Japan	183	7,047	12,988
United Kingdom	37	2,252	4,219
Isle of Man (British)	80	5,241	9,947
Italy	111	4,666	8,624
Norway (NIS)	66	2,504	4,358
Germany	2	158	326
Antigua & Barbuda	40	916	1,534
South Korea	180	6,767	12,475
Denmark (DIS)	4	204	401
Indonesia	120	1,712	2,894
Bermuda (British)	26	2,062	3,986
United States of America*	6	159	260
Malaysia	8	150	258
Turkey	105	2,875	4,978
Netherlands	9	403	693
Top 25 Registries	8,296	338,926	618,276
Total	9,307	360,301	654,966

ROLL-ON/ROLL-OFF

Flag of Register	No.	GT (000)	Dwt (000)
Panama	414	15,612	5,970
Liberia	34	1,298	454
Marshall Islands	22	869	309
Hong Kong	14	308	159
Singapore	76	3,224	1,242
Bahamas	75	3,526	1,266
Malta	50	1,274	664
Greece	10	127	79
China	28	341	132
Cyprus	14	213	84
Japan	108	2,190	884
United Kingdom	52	1,968	743
Isle of Man (British)	11	143	46
Italy	70	2,641	1,329
Norway (NIS)	48	2,587	1,065
Germany	3	50	21
Antigua & Barbuda	19	225	131
South Korea	22	433	231
Denmark (DIS)	12	328	131
Indonesia	51	234	133
Bermuda (British)	0	0	0
United States of America*	34	1,611	692
Malaysia	13	149	74
Turkey	24	508	241
Netherlands	19	367	229
Top 25 Registries	1,223	40,229	16,310
Total	1,684	47,480	20,163

CONTAINERSHIP

Flag of Register	No.	GT (000)	Dwt (000)
Panama	706	34,295	38,105
Liberia	1,010	40,834	47,839
Marshall Islands	237	7,351	8,700
Hong Kong	330	15,773	17,910
Singapore	378	13,323	15,451
Bahamas	57	1,553	1,748
Malta	130	5,306	6,015
Greece	33	2,196	2,392
China	160	4,986	5,985
Cyprus	208	4,090	4,894
Japan	2	101	101
United Kingdom	153	9,103	9,842
Isle of Man (British)	8	739	743
Italy	15	710	820
Norway (NIS)	0	0	0
Germany	218	11,965	13,518
Antigua & Barbuda	390	5,359	6,723
South Korea	82	808	1,053
Denmark (DIS)	90	6,570	7,430
Indonesia	156	1,108	1,461
Bermuda (British)	17	676	745
United States of America*	75	3,079	3,357
Malaysia	23	170	225
Turkey	44	592	747
Netherlands	57	927	1,084
Top 25 Registries	4,579	171,613	196,889
Total	4,909	179,875	206,547

GENERAL CARGO

Flag of Register	No.	GT (000)	Dwt (000)
Panama	1,103	7,802	10,846
Liberia	235	2,883	3,779
Marshall Islands	92	1,404	1,894
Hong Kong	219	3,183	4,476
Singapore	121	1,881	2,473
Bahamas	247	3,094	4,245
Malta	321	1,732	2,356
Greece	28	49	65
China	286	1,955	2,662
Cyprus	153	993	1,344
Japan	37	185	243
United Kingdom	75	415	580
Isle of Man (British)	56	377	540
Italy	45	366	502
Norway (NIS)	59	1,160	1,634
Germany	41	218	269
Antigua & Barbuda	751	4,042	5,241
South Korea	259	1,147	1,576
Denmark (DIS)	34	65	82
Indonesia	671	1,968	2,770
Bermuda (British)	4	55	56
United States of America*	22	192	238
Malaysia	66	233	316
Turkey	261	921	1,419
Netherlands	575	3,176	4,353
Top 25 Registries	5,761	39,497	53,959
Total	9,908	55,226	74,617

TANKER

Flag of Register	No.	GT (000)	Dwt (000)
Panama	1,331	43,971	73,728
Liberia	910	44,467	78,132
Marshall Islands	772	40,381	66,196
Hong Kong	362	15,365	27,668
Singapore	852	24,514	42,156
Bahamas	394	25,868	41,072
Malta	537	14,723	25,503
Greece	383	24,639	45,655
China	389	7,404	12,707
Cyprus	123	3,885	6,335
Japan	247	6,258	8,480
United Kingdom	80	1,407	2,277
Isle of Man (British)	177	7,312	12,067
Italy	242	5,370	8,980
Norway (NIS)	210	6,985	10,600
Germany	24	325	487
Antigua & Barbuda	21	129	169
South Korea	221	1,478	1,897
Denmark (DIS)	167	3,429	5,328
Indonesia	398	3,628	5,597
Bermuda (British)	71	5,804	6,086
United States of America*	48	2,010	3,340
Malaysia	159	5,386	7,315
Turkey	112	1,162	2,003
Netherlands	89	580	812
Top 25 Registries	8,319	296,479	494,591
Total	10,499	332,294	552,645

Business is Brisk at Posidonia in Athens

In early June, the shipping community met in Athens, Greece for Posidonia 2014. While the focus in Athens tends to be skewed more toward the night life and after hour parties, Maritime Reporter was able to dig out some relevant product and service news from the exhibition center.

Wilhelmsen Ship Service (www.wilhelmsen.com/shipsservice) introduced its fuel oil treatment range and integrated welding safety products and services at Posidonia. Engineered to maintain vessel performance and engine efficiency even when slow-steaming or burning low sulfur fuel, WSS's Fuel Oil Treatment products have been developed in response to these recent significant operational changes.

"Fuel quality is a major problem and it is becoming more complex," said Jonas Östlund, Product Marketing Manager from Marine Chemicals division. "Our Unitor FuelPower range applies the most advanced technologies to make certain that residual fuels can be used with confidence. For ships sailing in the Emission Control Areas, Unitor DieselPower has been developed specifically for distillate fuels, resulting in fewer problems and lower costs in operation."

WSS also showcased its new series of welding packages at the exhibition. Combining the latest Unitor welding equipment with professional support from product specialists and onboard welding safety inspections, WSS' enhanced welding solutions are perfectly in tune with the current challenges customers face while maintaining their vessels.

Always the innovator, **Damen Shipyards Group** unveiled a new mobile ballast water treatment (BWT) unit in Athens. The new in-house technology bolsters Damen's Ballast Water Center of Excellence, which advises fleet managers on total BWT solutions for retrofits and newbuilds worldwide.

Developed in-house, the fully containerized, mobile Damen InvaSave BWT unit provides ship owners with an alternative to retrofitting fixed BWT systems. Damen says it has also developed the world's first mobile treatment vessel to operate in ports and support ship deballasting operations. The first of these customized Damen barges, fitted with Damen InvaSave units, is now under construction for service in the Dutch ports of Eemshaven and Delfzijl. An important (financial) partners in this project is the 'Waddenfonds,' the organization focusing on the preservation of the 'Waddensea,' which is listed as a protected UNESCO world heritage site.

As well as avoiding retrofit investments, Damen said the mobile solution means ballast water only needs treating at the point of discharge, in contrast to fixed onboard BWT installations that also need to treat ballast water at intake. Damen can deliver the system as a separate mobile container, which can be put on board or moved around the port on a truck. Each Damen InvaSave container unit is designed to handle 300 cu. m./hr., but it is designed to be easy to scale up by using multiple container units. The system has been tested in the challenging waters of the Wadden Sea and the IJsselmeer in the Netherlands and is currently being certified by the Dutch Flag State.

New Ballast Water Treatment Solutions = No Retrofit

Damen Shipyards Group unveiled a new mobile ballast water treatment (BWT) unit in Athens. The fully containerized, mobile Damen InvaSave BWT unit provides ship owners with an alternative to retrofitting fixed BWT systems.

(Photo: Oman Drydock)

GTT, Oman Drydock Get the Deal Done

ODC chairman Dr. Abdulmalik Al Hinai and GTT CEO Phillippe Berterottiere.

In addition to its own mobile BWT system, Damen can also advise on type-approved BWT systems for onboard retrofitting, as well as retrofit engineering and installation. Damen Shiprepair & Conversion has 16 repair and conversion yard facilities, with 40 dry docks worldwide.

Oman Drydock Company (ODC) claims it made a "giant leap" forward in its campaign to become one of the leading shipyards in the world for LNG repairs after it was awarded the Gaztransport & Technigaz (GTT) license at Posidonia.

ODC chairman Dr. Abdulmalik Al Hinai was joined by GTT CEO Phillippe Berterottiere at the ODC stand to make the announcement.

ODC is one of the newest and biggest shipyards in the world and is based in Duqm, Oman's planned new ports and logistics mega city. Following a soft opening in 2011 the $1.5bn shipyard,

News Flash!

Greek Shipowners Prefer Bulkers

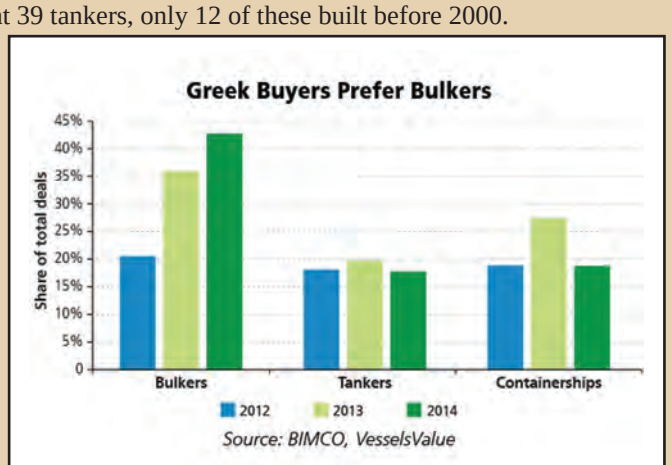
The buying interest from Greek ship owners is focused on bulkers to an increasing extent, BIMCO said. **Data from VesselsValue.com reveal that Greek owners were at the buying end of 43% of all bulker sales completed so far in 2014.** As of June 2014, the number of Greek bulker purchases so far is 91, compared to 81 for the full year of 2012. The level of activity seen so far in 2014 would suggest Greek owners are on target to top the 199 bulker purchases completed in 2013. "The interest is much centered on bulkers and has become more and more explicit over the past two years, whereas Greek buying interest in tankers and containerships is flat," said Peter Sand, Chief Shipping Analyst, BIMCO. The market share of Greek tanker purchases has averaged at 19% in the past 2.5 years. So far this year, Greek owners has bought 39 tankers, only 12 of these built before 2000.

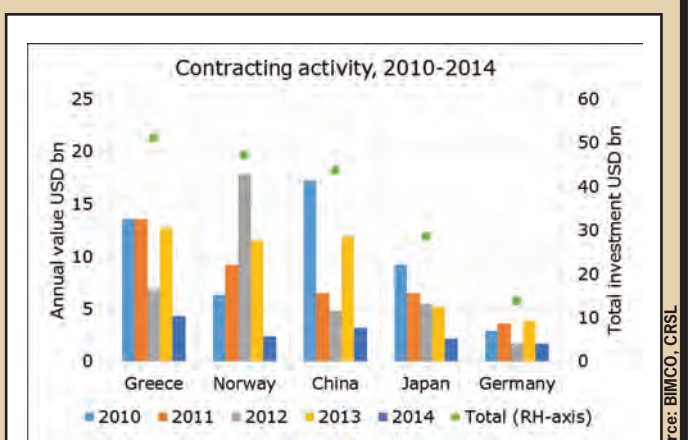
Newbuild Investment

Greek ship owners are not only the most active nation when it comes to sales and purchases, they are also investing the most in newbuilding contracts, BIMCO reported. Since 2010, contracts made by owners in Greece total $51B, dwarfing the likes of Norway and China as buyers.

"The Greek ship owners' interest in newbuilding contracts has continued into 2014, where 73 new contracts valued at $4.3 billion have been signed," said Sand. "Due to a focus on higher value ship segments, they consistently top China on value, despite losing out on the total number of contracts signed for all years but 2013".

China has signed a total of 98 newbuilding contracts in 2014. In 2013, ship owners in China signed 270 contracts, but Greek ship owners went up to 284.





Source: BIMCO, CRSL

which is 1.3m sq. m. in size, has drydocked more than 230 vessels.

Wärtsilä debuted a new Aframax tanker design offering that meets current and forthcoming emissions legislation. The new design emphasizes energy efficiency to provide lower operating costs and enhanced environmental performance. It features an optimized hull form to minimize resistance, and an optimized propulsion train with energy saving devices (ESDs) for greater efficiency.

Fuel savings have been the primary focus during the development of this design, and significant testing of the hull lines by both CFD and tank testing have successfully produced a highly competitive design.

Wärtsilä explains that it offers the Aframax design in three, fit-for-purpose versions; the Basic configuration using conventional HFO fuel, Environmental with the exhaust emissions cleaned using a scrubber and selective catalyst reduction (SCR), and the Green version based on dual-fuel engines using LNG. The design can also be adapted for Ice Class notation.

Danelec Marine showcased its new-generation VDR at Posidnoia on the SRH Marine Electronics stand, as the Danelec DM100 is the first VDR designed specifically to meet the new IMO Standard.

The Danelec DM100 features a fresh approach to simplifying shipboard service for marine electronics. The company's SWAP (SoftWare Advanced Protection) hardware platform provides for all system programming and configuration data to be stored on a hot-swappable memory card. If the VDR unit fails, the service technician can remove the memory card from the faulty unit and plug it into a new unit, which is immediately ready for duty.

The old unit can be taken ashore for repair at a Danelec-certified repair facility, and the ship sails on schedule without a costly port detention.

Evoqua Water Technologies presented technical information about its type-approved SeaCURE Ballast Water Management System and applicability to newbuilds and retrofits at Posidonia.

The SeaCURE system uses a patented process that first injects biocide into ballast seawater before it reaches the large surface filter intakes to reduce the growth of marine organisms that can clog the filters.

Next, Chloropac concentric tubular electrodes (CTE) generate sodium hypochlorite from the natural salinity in sea water which eliminates the need to purchase biocides and store or replenish them onboard. The SeaCURE system also features low energy requirements and low maintenance costs due to the self-cleaning feature of the CTE technology. Proprietary control logic monitors the biocide dose level necessary to provide the required efficacy depending on ballast water conditions. Chloropac electrodes have been proven in more than 2,500 installations worldwide over the past 40 years.

The efficacy of the SeaCURE Ballast Water Management System is in accordance with International Maritime Organization (IMO) Convention D-2 regulations and exceeds the G8 and G9 Guidelines for Approval of Ballast Water Management Systems. In February 2014, the Federal Maritime and Hydrographic Agency of Germany (Bundesamt für Seeschifffahrt und Hydrographie- BSH) granted type approval for the SeaCURE system which concludes the international approval process that began with the basic approval and then final approval granted by the IMO in 2012.

BMT SMART showcased its performance monitoring portfolio at Posidonia 2014. The SMART suite of services works by collecting vessel performance data and presenting key information to the crew via the ship's computer displays.

Real-time performance data is automatically relayed ashore where it is stored on secure servers, and merged with weather readings; while a web platform enables easy management and analysis.

A ship's energy consumption depends on a number of different parameters and identifying optimal vessel performance requires knowhow and the use of smart data.

Other notable news from Posidonia included:

- **PPG** launched SIGMAGLIDE 1290, a 100% silicone binder fouling release system that it said uses dynamic surface regeneration technology to eliminate slime problems and increase fuel savings compared to

Wärtsilä's New Aframax Tanker Design

emphasizes energy efficiency. It features an optimized hull form to minimize resistance, and an optimized propulsion train with energy saving devices (ESDs) for greater efficiency. Fuel savings have been the primary focus during the development of this design..

existing fouling release products. “Over the last two decades we have received many spontaneous confirmations from customers of fuel savings in values ranging between 3–13% delivered by our SIGMAGLIDE fouling release products,” said Sijmen Visser, PPG’s Global Marketing Manager Marine.

- **Globecomm Maritime** showcased the latest additions to its range of connectivity management solutions including Nimbus, a scalable platform solution for managing and simplifying ship and shore-based communications, enabling users to choose the applications and levels of user control that suit them best. Key Nimbus functionality includes acceleration, compression and caching for improved web browsing, a built-in email server enabling use of any email client and embedded PayPal for prepay crew access.
- **Marlink** highlighted improvements to its VSAT service plans and how the all new WaveCall Plus services can support the transport market to improve operations and crew welfare through better IP connectivity at Posidonia 2014. WaveCall Plus services are based on an extensive global VSAT coverage and come fully integrated with unlimited MSS back-up to provide a truly global connectivity service. Included in all WaveCall Plus packages, the XChange communications management platform from Airbus Defence and Space provides centralized VoIP, data and Internet access, and handles automatic fallback switching from MSS. XChange also supports Internet Cafés on board and enables the unique Bring Your Own Device solution, where crew can use their own smart phones and tablets on board for full privacy and convenience.
- Greek shipowner **W Marine Inc.** ordered a series of post-Panamax bulk carriers based on the Green Dolphin 84S design. The design was developed by the Shanghai Merchant Ship Design & Research Institute (SDARI) with support from DNV GL. The Green Dolphin 84S is the third design in the Green Dolphin series of bulk carriers designed by SDARI, with assistance from DNV GL in the development process. The shallow draft design is able to lift larger cargo lots on a shallower draft which, combined with a fuel efficient design, makes it more efficient in a highly competitive market, DNV GL said.

American P&I Club Rings in Posidonia

While Posidonia is well regarded for its exhibition, it is famous for its parties. The American Club held its traditional party on the evening of Thursday, May 29, to mark the start of Posidonia week, with more than 600 guests from the club’s expanding Greek membership, as well as club directors and representatives from the Greek maritime industry, attended a buffet reception on the rooftop of the Royal Olympic Hotel in central Athens.

Stuart Todd

Joe Hughes

The occasion proved to be an ideal opportunity for the club’s leading underwriter, **Stuart Todd**, to say his farewells to the Greek shipowning community, in which he has been a prominent P&I figure for more than a generation, ahead of his official retirement on June 30. He leaves the insurance market after more than 40 years’ distinguished service within the P&I world. However, he will continue as a consultant to Shipowners Claims Bureau Inc., based in London.

Todd joined SCB in the autumn of 2001, having previously held senior positions with a leading International Group P&I club and at Lloyd’s of London. He moved to head office in New York in early 2002 to assume chief responsibility for the American Club’s underwriting operations.

Speaking at the Athens reception, Joe Hughes, chairman and CEO of SCB, said that Stuart Todd commanded great respect within both the shipping and insurance communities, especially those in Greece. He had made a great contribution to the club’s strategy of growth and diversification. He left a legacy of considerable achievement, not only through the growth in premium and tonnage, but also in the diversity of membership, which gained impetus during his 13 years with the club. He had been instrumental in building a strong team to enhance the club’s underwriting capabilities both for the present and for the future.

(Photo courtesy of HII)

Petters

(Photo courtesy of DHT Holdings)

Harfjeld and Munthe

(Photo courtesy of Northrop Grumman)

Yerkes-Medina & presentor Jeff Holloway

(Photo courtesy of USMMA)

USMMA Grads

Petters Honored by Navy League

Huntington Ingalls Industries president and CEO Mike Petters was honored by the Navy League of the United States New York Council with the Rear Admiral John J. Bergen Leadership in Industry Award for his leadership of HII and the company's achievement in designing and building the ships that help maintain the sea power that assures the United Sates' security and economic prosperity. A native of Florida, Petters earned a bachelor's degree in physics from the U.S. Naval Academy in 1982, served aboard the nuclear-powered submarine USS George Bancroft (SSBN 643) and spent five years in the U.S. Naval Reserve. In 1993, he earned a master's degree in business administration from the College of William and Mary.

Harfjeld, Munthe Named Co-CEOs

DHT Holdings appointed Svein Moxnes Harfjeld and Trygve P. Munthe as co-CEOs of DHT. Harfjeld and Munthe have been CEO and President of DHT respectively, since joining DHT in 2010.

Midshipman Yerkes-Medina Honored

Northrop Grumman presented the 2014 Elmer A. Sperry Junior Navigator of the Year Award for 2014 to Midshipman Robert Francisco Yerkes-Medina in ceremonies at the U.S. Naval Academy.

The award recognizes a member of the graduating class who has demonstrated outstanding navigation skills and knowledge during his or her four years at the academy and is part of a naval support tradition at Northrop Grumman. This is the fifth year the company has sponsored the award.

Howard Delivers Kings Point Address

The class of 2014 from the U.S. Merchant Marine Academy (USMMA) included 225 new Merchant Marine and Military Officers graduated last month. Vice Admiral Michelle J. Howard, Deputy Chief of Naval Operations for Operations, Plans and Strategy, delivered the commencement address. USMMA is one of the five federal service academies. The school is funded by the Department of Transportation and has a mission to educate and graduate licensed Merchant Marine officers. Graduates from USMMA receive a Bachelor of Science Degree, an unlimited merchant marine officer license from the United States Coast Guard, and an officer's commission in one of the branches of the military.

Brown Appointed COO at LR

Lloyd's Register announced the appointment of Nick Brown, previously Director Business Development & Innovation, as the group's new Marine Chief Operating Officer. Reporting to Marine Director Tom Boardley, Brown will be responsible for LR's four global operating regions – Asia, Americas, Northern Europe and Southern Europe. David Barrow becomes Regional Marine Manager (RMM) for a new Northern Europe region while Apostolos Poulovassilis is RMM for Southern Europe, Middle East and Africa. Iain Wilson and Tim Protheroe remain in their Asia and Americas roles. Brown will retain leadership of the Business Development & Innovation team, including Luis Benito (Marketing), Hector Sewell (Sales) and Gwynne Lewis (Consulting) who will be joined by LR's other Nick Brown, the Global Marine Communications Manager.

Alfultis New Head of SUNY Maritime

Dr. Michael A. Alfultis, a retired U.S. Coast Guard captain, and the director and chief administrative officer of the University of Connecticut's Avery Point campus, has been named as the next president of the SUNY Maritime College. With more than 20 years of undergraduate teaching experience and 13 years of progressive academic administrative responsibility at both military and civilian institutions of higher education, Alfultis brings a uniquely diverse background to the presidency at Fort Schuyler. His background includes service as an operations officer and navigator on a U.S. Coast Guard cutter; maritime safety and security; Coast Guard Academy faculty member and academic department chair; and senior administrator at a flagship university.

OW Bunker Acquires WMF

OW Bunker, a physical distributor and reseller of marine fuels, acquired marine fuel broker Wilhelmsen Marine Fuels, a subsidiary of Norwegian Wilhelmsen Maritime Services, for an undisclosed sum.

GAC Appoints Group VP

GAC appointed Fredrik Nystrom as its new Group Vice President for the Asia Pacific region. He takes over from Dan Hjalmarsson, who has retired. Nystrom has been GAC's Regional Business Controller based at the Regional Office in Singapore since 2007, and he will work to expand the business.

Chin to Lead Wallem Ship Agency

Wallem Ship Agency has a new leader in Dickson Chin, who has been promoted to the position of Managing Director.

Chin has been with Wallem Ship Agencies since 2008, initially in the role of General Manger for the Hong Kong ship agency business, and in 2012 was promoted to Managing Director for Indo-China.

ZF Marine's Halavacs Dies at 59

AJ Halavacs, Pleasure Craft Product Line Manager, North and Central America at ZF Marine Propulsion Systems Miramar LLC, the North American arm of ZF Friedrichshafen AG Marine Propulsion Systems, has died after fighting illness for a number of years. He was 59.

"It's a devastating loss to our team and to the industry" said Wolfgang Schmid, Director, Industrial Technology, Head of Marine Propulsion Systems Region North and Central America. "The consummate salesman, AJ had a gregarious personality not soon forgotten."

No Memorial is planned. Individuals or organizations wishing to pass along thoughts and memories can email them to: martin.meissner@zf.com where they will be collected and included in a memoir for the family.

Gallaudet Relieves Brown

Rear Adm. Timothy C. Gallaudet relieved Rear Adm. Brian B. Brown as commander of the Naval Meteorology and Oceanography Command (NAVMETOCCOM) in a traditional change of command ceremony held June 18 at Stennis Space Center. Gallaudet was promoted to the rank of rear admiral (lower half) just prior to the ceremony.

Vatnehol Named CEO at Rapp

Helge Vatnehol has been appointed Group CEO of Rapp Marine. Vatnehol comes from the position of Senior Vice President Offshore Deck Machinery in Rolls Royce and takes over on September 1, 2014.

Wilson Joins American Club

John Wilson, a figure in the marine surveying and consultancy community in Asia, has been recruited by Shipowners Claims Bureau, Inc. (SCB), managers of the American Club. Wilson will join SCB's Hong Kong office as director – technical services, Asia, towards the end of July.

Fernstrum Owners Purchase WEKA

Netherlands' based WEKA Boxcoolers B.V., manufacturer of copper nickel boxcoolers, was recently purchased by Dunlap & McCullough Holdings LLC, a holding company owned by Paul Fernstrum, Sean Fernstrum, and Todd Fernstrum. Paul Fernstrum, Sean Fernstrum, and Todd Fernstrum also own R.W. Fernstrum & Company. The purchase of the Netherlands' based company was finalized April 30, 2014.

IHC Merwede to Become Royal IHC

His Majesty the King awarded the honorary title of Koninklijk (Royal) to IHC Merwede. In a special ceremony, the Mayor of Sliedrecht, Mr. van Hemmen, presented this accolade to IHC Merwede's CEO, Bram Roelse. In light of this honor, the company has decided to change its name to Royal IHC and will also include the royal crown in its revised corporate identity.

(Photo courtesy of Lloyd's Register)

Brown

(Photo courtesy of SUNY Maritime)

Dr. Alfultis

(Photo courtesy of Wallem)

Chin

Vatnehol

(Photo courtesy of the American Club)

Wilson

(Photo courtesy of Lloyd's Register)

van Hemmen & Roelse

Mammoet Opens New Offices

Mammoet has opened a new office in São Paulo, Brazil, replacing its previous premises in the city. The new office serves as main office for the whole Latin America region.Additionally, Mammoet opened a new crane depot in Europe at the Port of Antwerp.

GTT Membrane LNG Bunker Barge

Houston-based GTT North America (GTT NA), U.S. subsidiary of French engineering and technology company GTT (Gaztransport & Technigaz SA), has received an Approval in Principle from DNV GL for the design of a 2,200 cubic meter liquefied natural gas (LNG) bunker barge.

Australia $2B Patrol Boat Program

A new $2 billion Pacific Patrol Boat (PPB) Program was unveiled by Australian Foreign Minister Julie Bishop and Defense Minister David Johnston aims to significantly strengthen security in our region. “The current fleet of 22 patrol boats gifted to 12 Pacific island countries from 1987 to 1997 are now approaching their end of service life. This new program will involve the construction of more than 20 steel, all purpose patrol vessels that will considerably enhance the maritime security of our Pacific and regional partners,” Johnston said, adding, “Australia has a fundamental strategic interest in the security and stability of Pacific island nations.” Senator Johnston said the rugged Australian-made patrol boats are worth $594 million with through life sustainment and personnel costs estimated at $1.38b over 30 years.

Scania’s Annual Service Competition

Scania’s Top Team Engines competition-like training event for its service technicians has begun, bringing together participants from all over North America to develop their skills by combining training and teamwork while competing. And the resulting benefit for Scania customers is more effective service, the company said. Scania Top Team Engines is a competitive training event developed to continually enhance the skills, knowledge, professionalism and teamwork for Scania technicians all over North America. The competition also helps attract skilled professionals to the industry.

Bordelon Celebrates 35 Years

This year marks the 35th anniversary of Bordelon Marine. Established in 1979, the company said it has maintained a family-oriented culture and a positive presence in its community by continuing the long standing trust it has established with its vendors and employees alike.
Wes Bordelon, the company’s current President and CEO, took the helm of Bordelon Marine in 1999 at the end of a cycle of the family business that had seen several periods of growth and decline. Beginning in 2000, Mr. Bordelon implemented a program that ultimately rebuilt the fleet of vessels though newbuilds and acquisitions while simultaneously diversifying and solidifying the company customer base.

Kappel Propellers for New Bulkers

Lemissoler Navigation Co. Ltd., a Cyprus-based owner and operator, selected the MAN Alpha Kappel propeller design for a new series of 8 × 58,500 DWT bulk carriers planned for delivery during 2015 and 2016. The 6.8-m, slow-running, four-bladed Kappel fixed-pitch propellers will be tailored to the SDARI-designed bulk carriers and a drivetrain powered by an MAN B&W 5S60ME-C engine, economy-rated at 8,050 kW and 89 rpm. The eight vessels will be built by New Times Shipbuilding Co., Ltd. of the New Century Shipbuilding Group, Jiangsu Province, China.

Rowan Contracts With Damen

Damen Shiprepair Vlissingen (DSV), part of Damen Shiprepair & Conversion, has been awarded the contract by a subsidiary of Rowan Companies plcto remodel the Rowan Viking. The Rowan Viking is a Keppel Fels ‘N’ Class Drilling Rig. The rig, which at 124 (l) x 95 (w) x 170 (h) meters is one of the largest of its type, is active in the North Sea.

Caterpillar Win REMARSL Order

Caterpillar Marine was selected to provide an optimized tug package for a 55T ASD tug new build for Remolcadores Marracoi SL (REMARSL). Two Cat 3512C EPA Tier 2 propulsion engines will power the tug and two MTA 523FP azimuth thrusters. Each Cat 3512C marine propulsion engine will provide 2 x 1765 kW @1800 rpm of rated power. Auxiliary power will be delivered through 2 x Cat C9 engines. The vessel will be built at Freinaval in Spain.

Schottel & European River Cruising

About 40 European river cruise vessels are or will be equipped with a Schottel propulsion concept with four Schottel Twin Propellers STP 200. The concept was specifically designed for river cruise ships, offering numerous advantages such as low-noise, shallow draft, increased overall efficiency and energy efficient operation, according to the manufacturer.

MONITORING

(Photo: SKF Blohm + Voss)

Unified Emissions Monitoring

Turbulo Bluemon

Last month at Posidonia SKF Blohm + Voss Industries launched the Turbulo BlueMon emission monitoring system, a system that is designed to record all emissions on board ships via a single system. But the system takes the role of monitoring and control a step further, perceived necessary in today's climate of varied world emission zones, as the system couples these values with the vessel's position data based on GPS signals, facilitating compliance with regulations and makes possible auditing and verification of emissions from ships.

Sea areas that are subject to other regulations, such as the U.S. Vessel General Permit 2013, are stored in the system, and thanks to the GPS link it is clear (and recorded) where and when which emissions are emitted. The data remains available for at least 24 months.

SKF Blohm + Voss has engineered the system with a modular design so that it can be individually configured as needed. The standard specification of the system comprises a central data logger connected to a PC. Depending upon the customer's requirements a software package can be provided for each of the Annexes to the MARPOL regulations, which will monitor the respective emissions.

www.skf.com/marine
www.bv-industries.com

TOTE Ship Receives Powerplant

Doosan Engine delivers world's first dual-fuel, low-speed ME-GI engine to NASSCO

When TOTE announced plans to build the world's largest LNG powered containerships, it stood to reason that along the way many milestones would fall. The most recent came when Doosan Engine delivered the world's first dual-fuel, low-speed ME-GI engine to NASSCO in San Diego. The engine is built to operate on LNG and/or bunker C oil and will power the first of two 3,100-teu container ships ordered by TOTE.

The Korean engine maker originally won the order to build the ME-GI engines in 2013. On June 3, 2014, Doosan Engine completed the engine's official trial run in the presence of the shipowner, shipyard, and classification society representatives. Doosan Engine also tested the ME-GI's Fuel Gas Supply System (FGSS), which has 300 bar of operating pressure, at its Changwon plant. At the culmination of two months of testing, the gas system had passed all regulations and restrictions as regulated by ABS and USCG.

The TOTE ME-GI engine will primarily operate on LNG, and the ME-GI is positioned as a next-generation, eco-friendly engine, which reduces carbon dioxide, nitrogenous compound, and sulfur compounds compared to existing diesel engines.

The TOTE contract provides for the construction of two newbuilding, state-of-the-art containerships – with an option for three more vessels – for domestic services. Each ship will be powered by a single 8L70ME-GI dual-fuel gas-powered engine. The two 3,100 TEU vessels are powered primarily by LNG, and will operate between Florida and Puerto Rico.

(Courtesy Doosan Engine)

The MAN B&W 8L70ME-GI engine.

The ME-GI engine is designed to give ship owners and operators the option of using either HFO or gas – predominantly natural gas. An ME-LGI counterpart is also being developed that uses LPG and methanol. MAN Diesel & Turbo sees significant opportunities arising for gas-fuelled tonnage as fuel prices rise and modern exhaust-emission limits tighten.

Thrustmaster, DOEN ink Deal

Thrustmaster announced an agreement with DOEN which it says makes it the only U.S.-based manufacturer of commercial waterjets for marine propulsion. DOEN is an Australian-based designer and manufacturer of waterjet propulsion systems, one of five marine waterjet manufactures in the world building waterjets up to 5,364 hp (4,000 kW). Thrustmaster has introduced two new models to the DOEN waterjet product lineup: the 400/450 series Thrustmaster DOEN waterjets will extend the power range 8,582 hp (6,400 kW) to accommodate vessels over +45m with stainless steel jets using DOEN's axial flow design. Thrustmaster's agreement with DOEN enables Thrustmaster waterjets to be sold in Europe, North America and South America. The Thrustmaster DOEN waterjet lineup includes:

(Image: Thrustmaster)

- 100 Series: available in seven model sizes ranging from 134 hp to 900 hp (100kW to 900kW) to accommodate vessels from 6m up to 20m.
- 200 Series: available in four model sizes ranging from 536 hp to 3,352 hp (400kW to 2,500kW) to accommodate vessels from 15m up to 45m.
- 300 Series: available in two model sizes ranging from 1,743 hp to 5,364 hp (1,300kW to 4,000kW) to accommodate vessels from 30m up to 60m.
- 400/450 Series: available in two model sizes up 8,582hp (6,400kW) to accommodate large vessels with a complete range of electronic controls with joystick docking.

Remote Monitoring from Finning

Solent Towage Ltd (STL) reports that is has saved more than 60-man hours since December 2013 by installing gplink, the remote monitoring and tracking solution from Finning Power Systems (Finning) for Cat engines. The company operates a fleet of seven tugboats off the UK's south coast, two of which use Cat engines. Several vessels in Solent Towage's fleet are chartered for 186 days per year by the operator of a large oil refinery in the area, according to the charter, fuel consumed by the STL fleet is provided by the refinery. However, any fuel used by the fleet outside of this chartered period, when the vessels are available for outside work, becomes the responsibility of STL. This consumption has to be recorded and verified by both parties to ensure fuel supplied under the charter isn't being used for off-hire third party work.

Prior to the installation of gplink, this manual process involved a third-party surveyor visiting the vessels, photographing and recording fuel levels, before sending this information to the oil refinery where it would have to be once again verified for accuracy. gplink helped to eradicate this process, generating fuel usage reports automatically when the tugboats are in use.

"We initially trialed the gplink system as a means to prove fuel consumption during off-hire periods," said Simon Axcell, Chief Engineer, Solent Towage. "Since the trial, it has gone above and beyond our expectations in terms of how much time it has saved us, and the potential it has to help us optimize other aspects of our fleet management."

QSK60 C Power Emergency Genset

Cummins launched the QSK60 C Power (CP) emergency generator set for offshore applications. It is driven by the QSK60 marine auxiliary engine with MCRS fuel system. Cummins emergency generator sets feature a Cummins marine auxiliary engine fit with radiator cooling and two independent starting systems. The new genset also features an optional air shut-off valve (ASOV) to meet the emergency shutdown requirements of offshore applications including drill ships. Cummins will offer two power options on QSK60 C Power to meet the regional requirements of offshore operators: 1,440 kWe and 1,800 kWe at 1,800 RPM (60 Hz). Assembled in Singapore, the 1,440 kWe package features a set-mounted radiator and a STAMFORD PM743E alternator from Cummins Generator Technologies. To meet Brazil's local content requirements, the 1,800 kWe package is assembled at the Cummins facility in Rio de Janeiro and features a remote-mounted radiator and WEG GPA560 alternator.

Repowered Tug Tows Nonstop

Photo courtesy Laborde

For its third repower with Smith Maritime, Laborde supplied three Mitsubishi S12R-Y2MPTK Tier II engines rated at 5,000 hp for the tug Rhea. For its maiden voyage, Rhea towed a huge piece of oilfield equipment from Texas to Cape Verde Islands off of Africa before moving on to Nigeria, towing continuously for seven weeks. Rhea is a small, powerful, agile, sea-going tug capable of withstanding the rigors of ship and barge towing or ocean rescue service in all weather conditions. It's fitted and built for extended service at sea or in distant and remote locations. Smith Maritime's vessels operate primarily between the U.S., the Caribbean and South America. Its services include ocean and coastal towing, pipe and cable laying, submersible operations, cargo and dredge ops, demolition, harbor, anchor and buoy handling, and salvage and rescue.

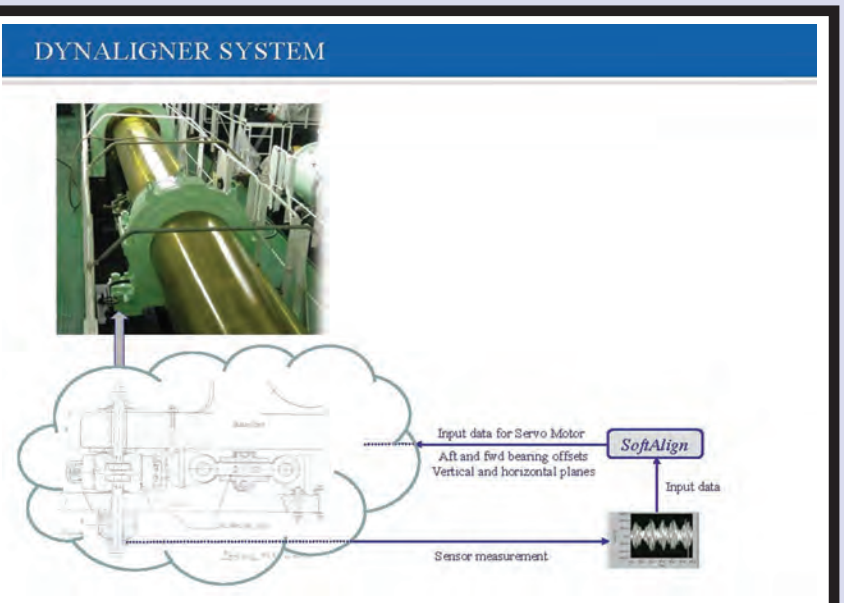
FPP Design
from Wärtsilä

Wärtsilä introduced the FPP Opti Design, a new fixed pitch propeller (FPP) design concept. According to Wärtsilä, the new design offers fuel savings of up to 4 percent and highly reliable full scale performance predictions.

The Wärtsilä FPP Opti Design was developed at the company's Technology and Service Center in the Netherlands. CFD calculations analyze not only the propeller performance but most importantly also, the interaction between the propeller and hull. This provides accurate information to achieve design and parametric optimization.

Image: Wärtsilä

Dynaligner Aims to Eliminate Shaft Misalignment



A Swedish and Dutch invention aims to eliminate misalignment, modernizing today's shaft alignment practice. The Dynaligner is said to offer trouble free operation of marine propulsion trains, irrespective of ship operation condition or hull deflections. Dynaligner 's developer said the propeller shafting is correctly aligned at all times during ship operation to avoid any mechanical behavior causing inappropriate bearing loads and wear/vibrations. The patented invention particularly focuses on, protecting the engine/gear, intermediate bearings and the stern tube bearings.

The Dynaligner solution aims to totally eliminate misalignment during ship operation. All problems related to misalignment will become history for the ship owning industry that until now has been helpless in the face of misalignment. For the shipowner, the most important economic advantage of using Dynaligners is saving all the costs brought about by misalignment, not least the class-required regular stops for tailshaft survey in dock. There are no delays during the new build phase due to shaft alignment procedure. The troublesome jack and sag & gap methods are not needed anymore. The propeller shafting can be installed before the superstructure is mounted on the hull, which will save a lot of time. It's a solution that makes sense: disengaging the propeller shaft bearings from the ship foundation and hull deflections. Dynaligner and the controlling software Softalign could well be the innovation that changes shipping.

Metal Thickness Gauge

Tritex NDT launched its new Multigauge 5700 Datalogger Metal Thickness Gauge. The new gauge, has all the advantages of the Multigauge 5600 but with the added benefit of storing readings on the gauge, the manufacturer said. The Multigauge 5700 Datalogger includes an onboard memory for recording measurements in either a grid or string format, or combination of both. The readings are then transferred to a PC or laptop using wireless technology, which also allows remote gauging if required.

tritexndt.com

New A/C Chiller

Webasto Thermo & Comfort North America announced the launch of its updated BlueCool C-Series marine air conditioners. The chiller-style units are suited for medium to large yachts with several independent areas requiring cooling. Furnishing continuous cooling capacity, even in tropical conditions, the BlueCool C-Series offers improved performance with up to 15% higher efficiency than in previous models, the manufacturer claims. Reduced compressor noise ensures quiet operation. A reverse cycle function is standard.

webasto-marine.com

MIG Gun Customization

Every industrial welding application is different. Bernard offers online configurators that allow for the customization of four semi-automatic MIG gun lines. These online tools result in an industrial-duty MIG gun customized for a specific application or preference. Users can tailor their gun by specifications such as amperage, cable length, handle style, trigger and neck type, contact tip and wire size.

www.bernardwelds.com

MEGAFIL Welding Wires

Hobart Brothers Company said it has addressed common industry concerns regarding weld cracking with the introduction of its new seamless flux-cored and metal-cored wires designed to offer resistance to moisture pickup and minimize this defect. The new Hobart MEGAFIL wires also have less than 4ml of diffusible hydrogen per 100g of weldment, which further mitigates cracking risks, Hobart said. Both the flux-cored and metal-cored versions of the MEGAFIL wires feature a copper coating to improve current carrying capabilities. A proprietary manufacturing process adds to the consistency of the MEGAFIL wires by ensuring a uniform flux filling, while the wires' uniform shape helps minimize contact tip wear. These properties make the wires a good choice for both semiautomatic and robotic welding applications, the manufacturer said. The MEGAFIL wires also offer robust mechanical properties, allowing the welds created with these products to withstand the harshest environments.

www.hobartbrothers.com

Safe & Efficient Lifting

The range of modern air operated hoists manufactured by J D Neuhaus offer safe and efficient lifting and handling facilities for a wide range of general engineering and industrial applications. The Profi TI hoist range has been upgraded to combine quieter operation, with faster lifting/lowering speeds while being more energy efficient as well as incorporating some lighter and more compact build qualities.

www.jdngroup.com

Floor Planer

CS Unitec's Trelawny Floor Planer tackles the most demanding surface preparation and material removal applications. The TFP 200 is ideal for the removal of coatings and corrosion from concrete and steel surfaces to prepare for recoating. In addition, this walk-behind planer produces a keyed or grooved profile for waterproofing and non-slip surface applications. The electric-powered Model 320.2004T features a 3HP, 220V-240V motor.

www.csunitec.com

Engineroom Ventilation

Marine engines require a continuous supply of fresh air. With moisture eliminators, dampers and control systems, Delta "T" axial fans form an engineered ventilation package. Designed for the marine environment, axial fans come with single and three-phase motors, in 50 and 60 Hz and in a range of voltages, to fit any application for worldwide use. I-EEE-45 certification is also an available option.

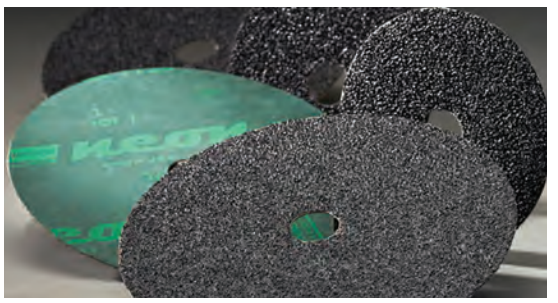
www.deltasystems.com

Aluminum MIG Push-Pull Welding Packages

The POWER MIG 350MP Trailer Manufacturing One-Pak includes all of the components and wire a fabricator will need to get started for premium push-pull wire feeding capability in sheet metal applications. Each of these targeted aluminum feeding systems take full advantage of the advanced, 3-in-1 multi-process POWER MIG 350MP wire feeder/welder.

www.lincolnelectric.com

Aluminum Oxide Fiber Discs



Norton / Saint Gobain Abrasives recently introduced a line of resin fiber discs — Norton Neon F726. The line of Aluminum Oxide (AO) fiber discs offers a proprietary aluminum oxide and organic grain blend, resulting in three times the normal AO cut rate, life and overall performance — at an economical price. An improved resin bond system and heavy-duty fiber backing provide enhanced grain adhesion.

www.nortonabrasives.com

Extra-Wide Shrink Wrap

Larger and oversized assets need just as much protection from the elements as smaller items. Now they can be shrink wrapped just as easily with Dr. Shrink's new 60' wide premium shrink wrap. With the large width, it's much simpler to cover extra-large machinery, boats, or other equipment during transport or storage. It also enables one-piece coverage, further streamlining the shrink wrap process.

www.dr-shrink.com

SCIGRIP Adhesives

SCIGRIP, a global supplier of smart adhesives, has been awarded the ABS (American Bureau of Shipping) certification for its SG230 HV (high viscosity) range of structural products. SCIGRIP bonding solutions are already used extensively by many US and European boat builders. SCIGRIP maintains ISO 9001 certification for all of its manufacturing facilities and has achieved multiple third party product certifications, including Lloyd's.

www.scigrip.com

New Water Jet Nozzle

The new RPN4009, a self-rotating water jet nozzle from NLB Corp., cleans pipes and tubes at pressures up to 40,000 psi (2,760 bar). Designed for a minimum pipe diameter of 0.75 inches (1.91 cm), it is the first nozzle in the Typhoon 10 series to operate at ultra-high pressure. Like other Typhoon nozzles, the RPN4009 is precision machined and coated with titanium nitride for long life. It can be ordered with cutting/cleaning or polishing heads. Just 4.75 inches long (12.1 cm), this nozzle works at a maximum flow of 9 gpm (34 lpm) and rotates at 7,000 rpm.

The Typhoon 10 series includes four other water jet nozzles for small tubes, operating at pressures from 15,000 psi to 24,000 psi (1,035 bar to 1,656 bar). NLB also offers the Typhoon™ 20 self-rotating nozzle for pipe diameters of 6 inches to 10 inches (15.2 to 25.4 cm) and the Typhoon™ 60 for pipes up to 50 inches (127 cm) in diameter.

www.nlbcorp.com

ENC Production Software

SevenCs GmbH released its new generation of the ENC Tools, which are available in a customizable solution and consist of seven individual modules, which allows clients to use individual software modules for data validation and optimization either within an existing chart production environment, or to utilize the entire software suite as a complete production environment. With successful capacity building, training concepts and the new generation of ENC Tools in place, SevenCs is ambitious to support all those contributing to a gap-free ENC coverage for a successful ECDIS implementation in accordance with the IMO requirements.

www.sevencs.com

Spoolmatic Pro from Miller

The Spoolmatic Pro spool gun from Miller offers reliability, easy maintenance, and smooth feeding for light and heavy applications. Two versions of the gun are available: the Spoolmatic Pro 15A (15') and the Spoolmatic Pro 30A (30' cable). Built for MIG welding in boatbuilding and general fabrication, it is designed for use with aluminum wire and soft alloys where wire feeding consistency is critical.

www.MillerWelds.com

Bernard's 'Best of the Best' Platform

Bernard has announced the availability of its most flexible and rugged semi-automatic air-cooled MIG gun offering to date. Users can build their ultimate MIG gun by choosing from an expanded list of the best features from the legacy Bernard Q-Gun, S-Gun and T-Gun MIG Gun lines. The company has consolidated the top features from each gun line into a single MIG gun offering and a single online configurator. The BTB Platform MIG Guns were designed for maximum configuration flexibility and industrial-grade performance.

www.bernardwelds.com

Combat Cold Corrossion via Condition Monitoring

Parker Kittiwake explains why frequent condition monitoring is the most effective measure in combating the recent cold corrosion phenomenon

The recent trend in favoring newer generation engines which offer improved fuel consumption by using a longer stroke reflects the marine industry's focus on energy efficiency. While this design does aid operators in reducing fuel consumption, it has also created the new issue of cold corrosion. The longer stroke allows the cylinder walls to cool more than with older engine designs, allowing water condensation to form on the surface which then reacts with the sulphur dioxide in the combustion gases to form sulphuric acid, a corrosive element which damages the liner surface. The iron compounds formed by this process are then flushed into the cylinder oil, leading to excessive wear of the cylinder liner with the cost of a replacement at an average cost of up to $150,000.

To benefit from the more fuel-efficient engines without creating a related issue that could potentially cause damage to costly engine parts, operators need to carry out effective and accurate condition monitoring. In recent service letters, MAN Diesel & Turbo has reiterated the importance of monitoring of the conditions within the cylinder chamber in order to minimize the effects of cold corrosion. Having conducted extensive research into the issue, Parker Kittiwake have concluded that identifying the level of damaging corrosive elements within the cylinder chamber and understanding the processes which lead to these levels building up is the most effective way of preventing wear. Frequent testing provides ship owners with a comprehensive overview of conditions within the cylinder chamber, allowing operators to avoid costly repair bills by addressing harmful levels of corrosive elements before they cause damage.

To obtain an indication of the level of corrosion within the cylinder operators can measure the concentration of iron compounds in used cylinder oil. Once the underlying causes have been identified and understood they can be eradicated or limited, preventing cold corrosion from causing damage. Most commonly available monitoring tests indicate the total iron figure in the cylinder oil, including both metallic and non-metallic compounds. These elements have differing properties and are caused by distinct processes. Iron particles worn from the cylinder liner by cat fines are metallic and can be detected by onboard ferro-analyzer tests. However, non-metallic compounds such as iron sulphate are caused by reactions in the cylinder liner during the combustion process, and these cannot be detected magnetically. In order to identify the causes of corrosion ship owners need to monitor the levels of both metallic and non-metallic elements separately so that preventative measures can be taken.

Cold Corrosion Test Kit

With accurate information key to preventing corrosion, shipowners need information. While there are onboard testing solutions available, these often take several hours to complete and do not provide separate data for the level of metallic and non-metallic iron compounds in the sample.

The recently launched Parker Kittiwake Cold Corrosion Test Kit is designed to give the most comprehensive analysis of corrosive elements in cylinder lubricants, providing a measurement of non-ferrous iron compounds present in a sample almost instantly, negating the need to send samples to a laboratory for analysis and avoiding the time and cost this incurs. By having quick and simple access to this information onboard, operators can identify where adjustments need to be made to alter the operating conditions within the cylinder in order to minimize corrosive wear and reduce cost. The test kit, when used in conjunction with ferromagnetic analyzers, will indicate the levels of both metallic and non-metallic iron compounds so that operators can isolate and address the different processes which result in these corrosive elements being formed. As the issue of cold corrosion increasingly gains recognition, OEMs are looking to identify ways to minimize the effects and prevent damage. As a result many OEMs are now advocating the use of higher Base Number (BN) lubricants in engines with a longer stroke, MAN Diesel & Turbo now recommend lubricants with a BN of 100 or higher, and so it becomes more important to monitor the cylinder oil to understand the effects of this change on the conditions within the cylinder chamber. Scrape down oil is continually exposed to acidic combustion products that need to be neutralised before they corrode engine parts. By frequently testing the residual BN of used cylinder lubricant, operators can ensure that alkaline reserve levels within the oil are sufficient to neutralize these acidic products, preventing unnecessary corrosive damage. Parker has recently updated the Digi TBN Test Kit which measures the residual BN levels in used cylinder oil, providing an onboard figure in minutes. This allows operators to monitor the efficiency of cylinder lubricants over a long period of time, maximizing the potential life of the product as well as saving both the time and cost incurred with repairs resulting from corrosive damage.

Innovative engine technologies offer attractive benefits to ship owners by simultaneously addressing two of the greatest challenges facing today's shipping industry; fuel reduction and emissions control. With immediate access to the necessary data through onboard condition monitoring tests, they are better armed against cold corrosion and can reap the benefits of eco-efficiency, minus the unwelcome consequences.

Mississippi Hosts Fourth Annual National SeaPerch Challenge

The University of Southern Mississippi in Hattiesburg, MS, and the Mississippi Regional SeaPerch Committee in mid-May hosted the Fourth National SeaPerch Challenge on the campus of Southern Miss. It was here that 108 teams of 451 middle and high school students – students from 19 states, the Commonwealth of Puerto Rico, and for a first time ever, and international team from New Zealand – convened at the University's Payne Center and Johnson Natatorium for a weekend of competition and fun.

The 2014 competition was notable in that it set new records, with a 30% increase in the number of teams and a 35% increase in student participation as compared to 2013. This fourth National Challenge was sponsored by the Office of Naval Research (ONR) and the Naval Engineering Education Center (NEEC) as well as ASNE, CISD, Lockheed Martin, Louisiana State University, Maritime Reporter & Engineering News, MathWorks, Mississippi State University, NRL, NAVSEA Warfare Center Division Newport, the Navy League, the Navy League STEM Institute, NDEP, SNAME, STEM2Stern and the University of Southern Mississippi.

Currently the AUVSI Foundation administers SeaPerch and ONR has funded this popular educational outreach program since the end of 2007, during which time SeaPerch has grown exponentially, with more than 180,000 students having participated in virtually every state. With more than 12,000 teachers and mentors engaged in the program over the past seven years, students have learned valuable life skills through hands-on activities and enhanced science curricula to discover the excitement of STEM (Science, Technology, Engineering and Mathematics) as a potential future career path.

This underwater robotics program supports teachers and provides curriculum enhancement in compliance with national standards to assist students in constructing this underwater Remotely Operated Vehicle (ROV) in an in-school, after school or out-of-school setting. Students build their own SeaPerch ROV following a curriculum that teaches science and engineering nomenclature, terminology and basic principles with an ocean and marine engineering theme. Because of its popularity and rapid rate of expansion, a natural goal of the SeaPerch Program has been to develop geographical districts and regions where top winning teams from qualifying competitions could earn a slot at the annual National event.

All teams arrived on campus on Friday to check in and care for several logistical details. After dinner they were invited to a presentation by the Science Brothers and were treated to an Ice Cream Social, to meet and mingle with fellow competitors.

The next day the day started early in Payne Center's auditorium. Susan Nelson, Executive Director of SeaPerch and Mistress of Ceremonies, welcomed the 108 teams, parents and friends and thanked the members of the Mississippi Regional Planning Committee.

108 teams of 451 students from 19 states, the Commonwealth of Puerto Rico, as well as a **team from New Zealand** competed in the Fourth National SeaPerch Challenge

2014 National SeaPerch Champions

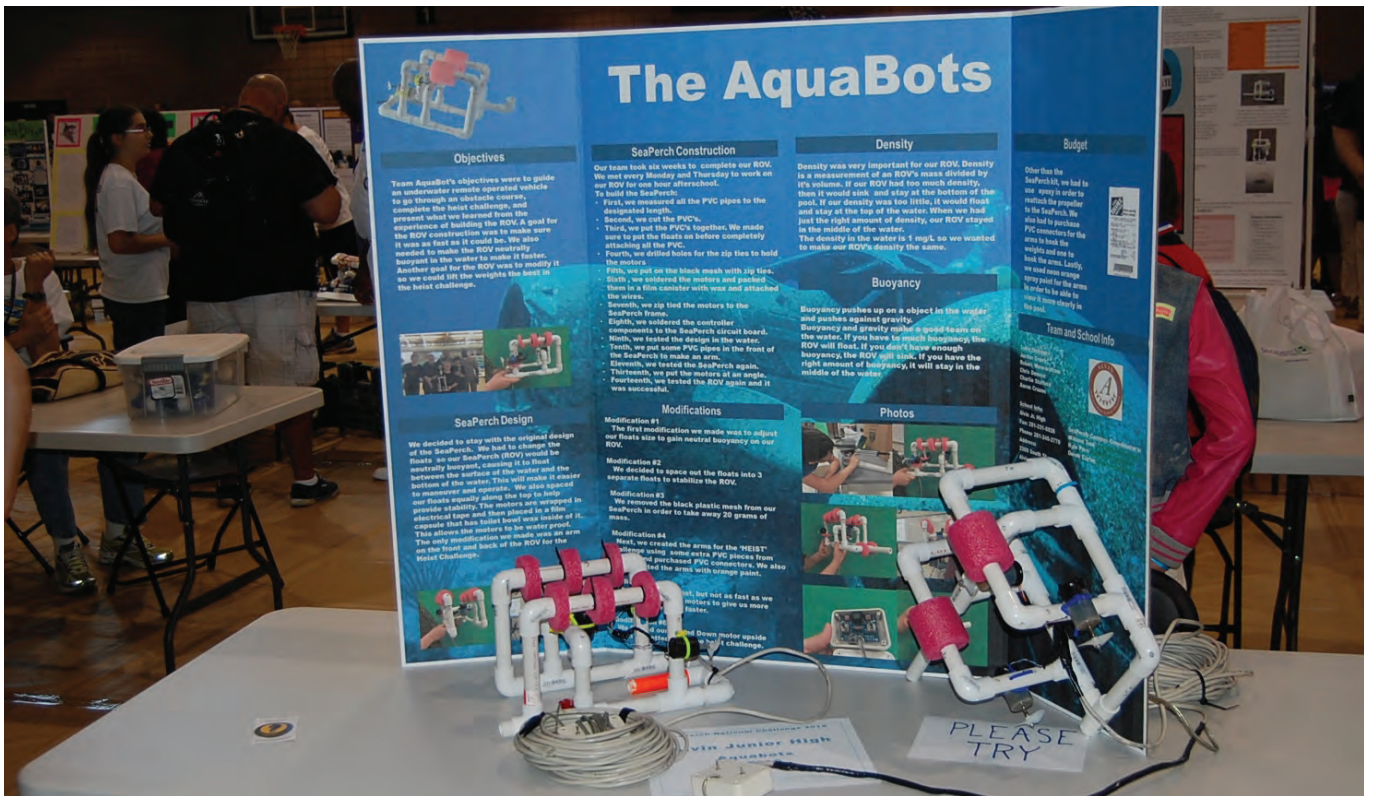
Gulf Coast Contenders Club
Saucier, MS

First runner-up
Atlantis
Charleston, SC

Second runner-up
Submersibles
Egg Harbor Township, NJ

Team	Time or Points
First Place – Obstacle Course	
Middle School Red October Newburgh, IN	0:41.63
High School Gulf Coast Contenders Club Saucier, MS	0:44.75
Open Class Bloomington North Barbarians Bloomington, IN	0:43.00
First Place – Heist Challenge	
Middle School Cynthia Heights Acro Evansville, IN	4:57.33
High School Gulf Coast Contenders Club Saucier, MS	2:53.27
Open Class Team Ageir Gloucester, VA	3:37.92
First Place - Poster Presentation	
Middle School Neptune's Nemesis Gambrills, MD	81
High School NZ Time Ruku Nelson NZ	85
Open Class Outside-the-Box Manassas, VA	80
First Place – All Events	
Middle School Submersibles Egg Harbor Township, NJ	9
High School Gulf Coast Contenders Club Saucier, MS	5
Open Class Bloomington North Barbarians Bloomington, IN	6

Two special awards were also made to student teams this year. The Creativity Award, given to the team that demonstrated multiple unique design elements, was presented to Team Outside-the-Box from Manassas, VA. The Engineering Excellence Award, demonstrating an innovative technical approach and execution, was presented to Team CPS TigerBots from Hanover, MD.



There was a roster of speakers, including CMDR David Arnold, Director of Diversity, Navy Recruiting Command, who spoke about the value of a STEM education and this country's need for scientists and engineers, as well as Dr. Herbert Eppert from the Naval Research Laboratory, Stennis Space Center, who applauded the SeaPerch Program and reinforced the value of a strong education in the sciences.

Throughout the day teams competed in three events including the Poster Presentation held in the Center's classrooms, and two underwater events at the Johnson Natatorium – the Obstacle Course and the Heist Challenge, on three levels: Middle School, High School and the Open Class. Of the 108 teams in attendance on Saturday, 55 were middle school, 43 high school and 10 in the Open Class.

The Poster Presentations: In the Poster Presentations the teams described their SeaPerch project to a panel of three judges consisting of engineers and educators. Each poster was scored based on appearance, objectives and summary, professional behavior, design explanation, engineering concepts and the team members' responses to the judges' questions.

The submerged obstacle course: The course consisted of five, 22-inch diameter hoops, oriented in different planes, through which the vehicles had to be maneuvered. Teams were required to navigate through the entire obstacle course, surface, then re-submerge and return through the course again to the end. Scores for this round were based on the shorter time of two runs successfully navigating the course within the 15-minute time allotment.

The Heist Challenge: A new underwater event this year, called the Heist Challenge, consisted of a mesh vault wall spanning the lane from bottom to the surface. Starting two feet below the surface was a vault door, located within a two-ft. square opening in the wall. In order to open the door operators had to manipulate a latch with their ROV and push open the vault door. On the far side of the wall was a series of six boxes to be retrieved, each of a different weight. Operators had to pick up as many of the boxes as possible within the time allotted and deposit them on an 18 x 24-in. lay-down area on the operator's side of the wall. Scoring was based on the number of boxes retrieved in 15 minutes.

This year 120 judges and volunteers helped to keep the busy day running smoothly.

The event was video-streamed live from poolside via the SeaPerch website so sponsors, supporters and team coaches could invite their companies and their schools' principals, superintendents, teachers, and fellow students as well as families back home to watch their teams in action.

Near the end of the day's events many invited guests and speakers were available to witness first-hand the excitement at poolside prior to the start of the banquet and award presentation program. That evening a total of 1008 were seated for dinner and another 50 spectators were on hand to witness the festivities at the Payne Center, a 50% increase over last year in Indianapolis, IN. Mistress of Ceremonies, Susan Nelson, began the program by making a special presentation of an Award for Distinguished Service, which was presented to Candida Desjardins, Program Manager, Educational Outreach, Naval Undersea Warfare Center Division Newport, in recognition of her outstanding service to the SeaPerch Program.

CAPT Robert E. Palisin, II, USN, Assistant Chief of Naval Research, ONR, congratulated the competitors and spoke about the need for students to follow science and engineering as a career.

Nelson introduced the person who started it all, Kelly Cooper, Program Officer, Sea Warfare and Weapons Department, ONR, who congratulated all of the teams and encouraged them to continue their studies in STEM subjects. The keynote speaker was RADM Brian Brown, Commander, Naval Meteorological and Oceanographic Command.

His 2500 engineers are involved in data collection and high performance computer systems that generate predictive models important to the Navy's strategic operations.

Admiral Brown emphasized that communication is a critical part of science and expressing one's ideas is important to scientific discovery, research and engineering development, and added that he felt at ease knowing that many of the student competitors in the audience today would become tomorrow's scientists and engineers.

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

ALUMINUM BOATS

Brunswick Commercial and Government Products, 420 Megan Z Avenue, Edgwater, FL 70518, USA , tel:(386) 423-2914, BCGPINFO@WHALER.COM

ANCHORS & CHAINS

Anchor Marine & Supply, INC., 6545 Lindbergh, Houston, TX , tel:(800) 233-8014, fax:(713) 644-1185, sales@anchormarinehouston.com

ATTORNEYS

Blank Rome - Admiralty & Maritime Law, 600 New Hampshire Avenue, NW, Washington, DC , USA , tel:(202) 944-3568, fax:(202) 772-5858, PBroadbent@BlankRome.com

AUTOMATIC IDENTIFICATION SYSTEM

Saab TransponderTech AB, SE-589 41 Linkoping , tel:46 13 180000, fax:46 13 180011, Info.transpondertech@saabgroup.com

BARGE FABRICATION

McDonough Marine Services, 1750 Clearview Pkwy. Suite 201, Metarie, LA 78634, USA , tel:800-227-4348, fax:(504) 780-8200, pstant@marmac.net

BATTERY CHARGERS

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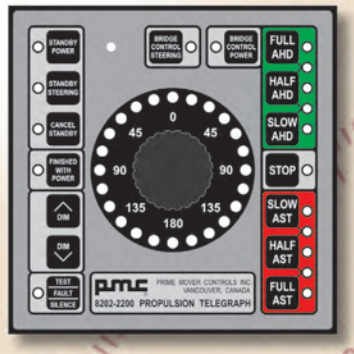

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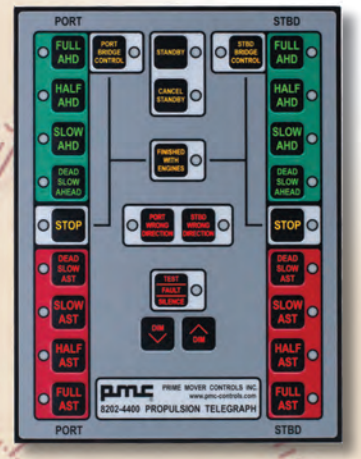

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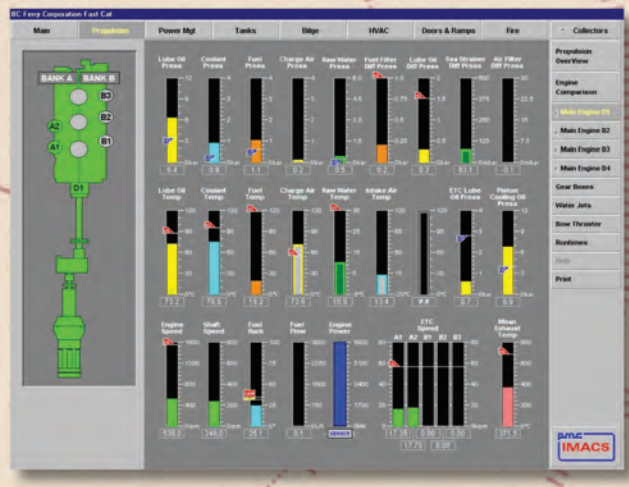

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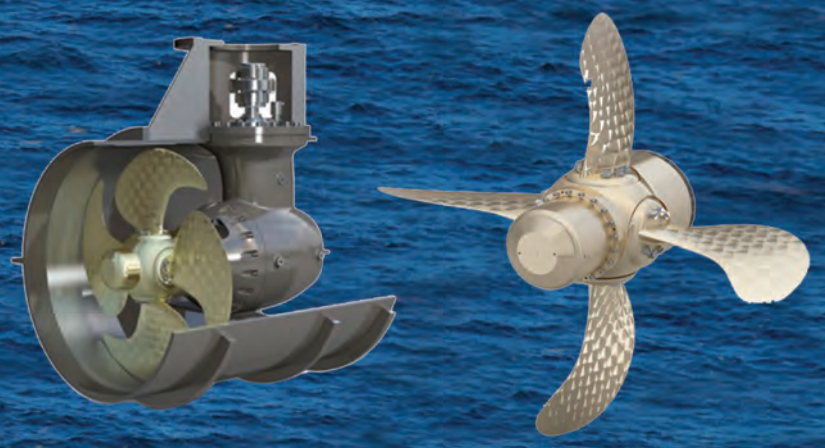

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