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September 2014

The Arctic
Some Answers, Many Questions

Marine Propulsion
The German-American Success Story

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The Portunus Concept
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Vice Admiral Hilarides
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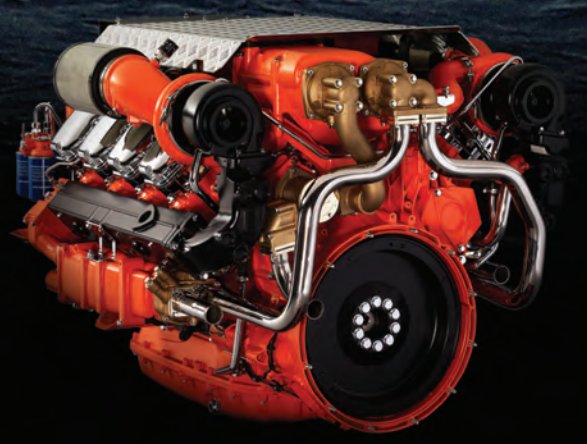

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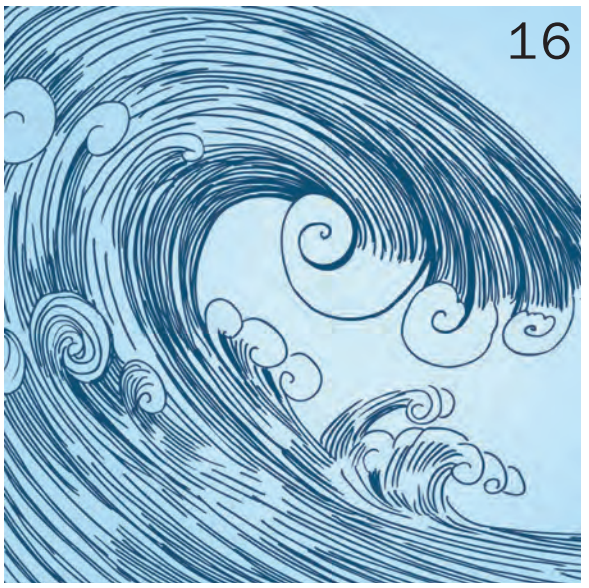

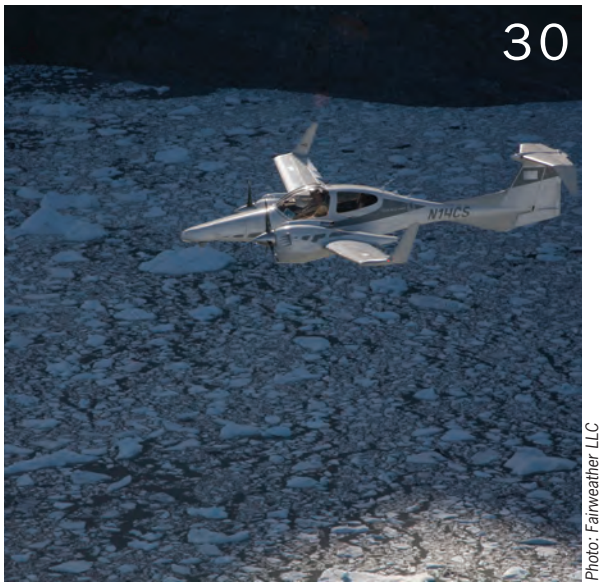

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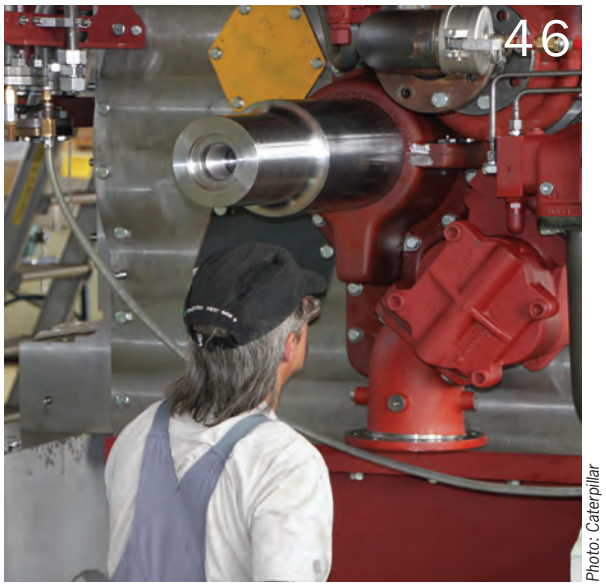

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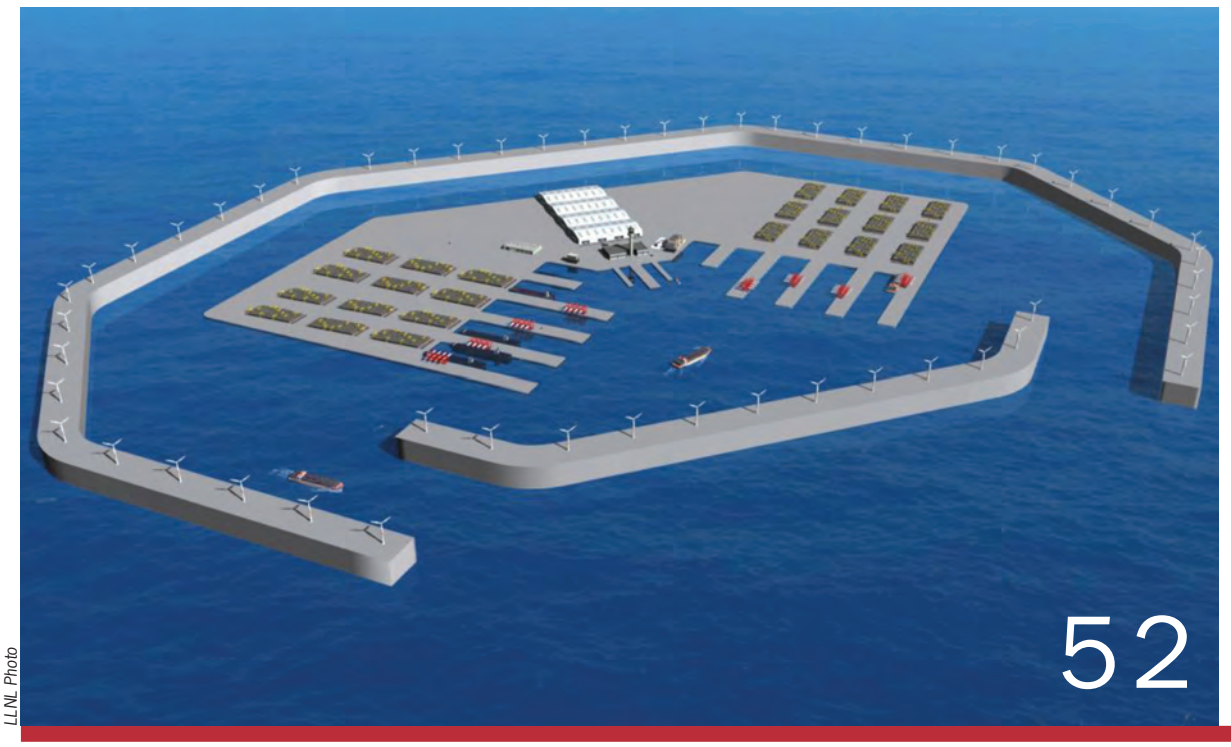

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Software solutions have helped to reshape the ship design, construction, outfitting and operation process.
Read more starting on page 40.

Cover Image: Courtesy SSI

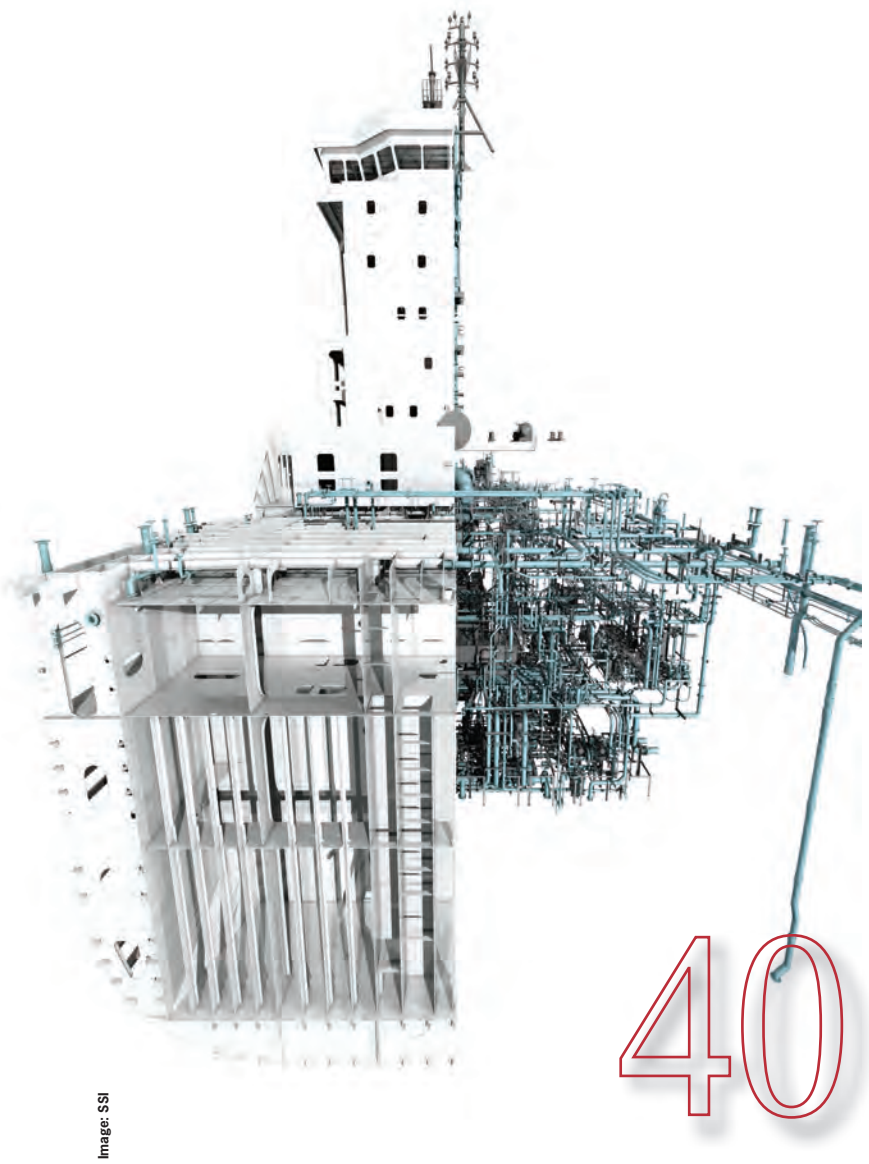

Image: SSI

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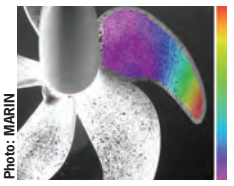
By Patricia Keefe

Photo: DeepFlight



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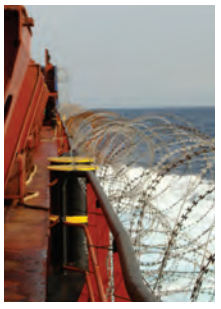

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MARITIME REPORTER AND ENGINEERING NEWS

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Come in
Out of the Cold

GREG TRAUTHWEIN, EDITOR & ASSOCIATE PUBLISHER

Utter the words *"The Arctic"* and it literally will mean 100 different things to 100 different people. While there are a plethora of shared visions of what the Arctic is – cold, icy, dark, remote … to name but a few – from a maritime and energy business perspective the Arctic is generally a mystery, particularly when evaluating the potential benefit (and peril) to be found.

This month we explore the Arctic in depth, and from a personal perspective I must admit that it is more than a little disconcerting to run through image after image of an icy environ in the middle of August.

Our coverage starts in our Legal Beat column from **James B. Ellis II** and **Joan M. Bondareff** of Blank Rome. This article asks a very simple question: *Is the U.S. prepared legally and operationally to protect its Arctic interests?* This article gives a very simple answer: a resounding ***NO***. Turn to page 24 for a more in-depth analysis of where we are at and what we need to do to secure our place in all matters Arctic in the future.

When it comes to investment and operations in the Arctic, the Russians arguably have the greatest breadth and depth of hands on experience. With this in mind, we reached out to **Georgiy Bedrik**, Head of Business Development at the Russian Maritime Registry of Shipping, for his insights on current activities and operating peculiarities of the region – in particular the mammoth Yamal LNG project which includes the construction of 16 innovative ice class gas carriers – starting on page 28.

The real mystery of operating effectively in the Arctic truly centers on risk assessment before endeavoring to operate in the region. Last month **Dennis Bryant** clearly laid out the potential peril of Arctic operations in his article *"Polar Code Afoot"* (MR, August 2014, pg. 18).

This month, we follow up with a feature entitled *"Out in the Cold"* starting on page 30 which taps leading Arctic experts from three distinct angles: academia, shipping and Arctic logistics, for their insights on proper assessment and mitigation of risk in the region.

Power is a topic of perpetual interest in the maritime sector, and the movement towards fewer, larger suppliers continues in earnest, particularly with the recent acquisition by Rolls-Royce of Rolls-Royce Power Systems (RRPS) – which previously operated as Tognum AG, and is headquartered in Friedrichshafen, Germany with around 11,000 employees.

Another ubiquitous name on the power front is Caterpillar, and the company is expanding in the maritime sector towards becoming a complete system solution provider. Peter Pospiech, our contributor in Germany, recently visited the Caterpillar Motoren GmbH manufacturing plant in Kiel, Germany, and this month offers, starting on page 46, his exclusive insights on the current path and future direction of the global manufacturing power.

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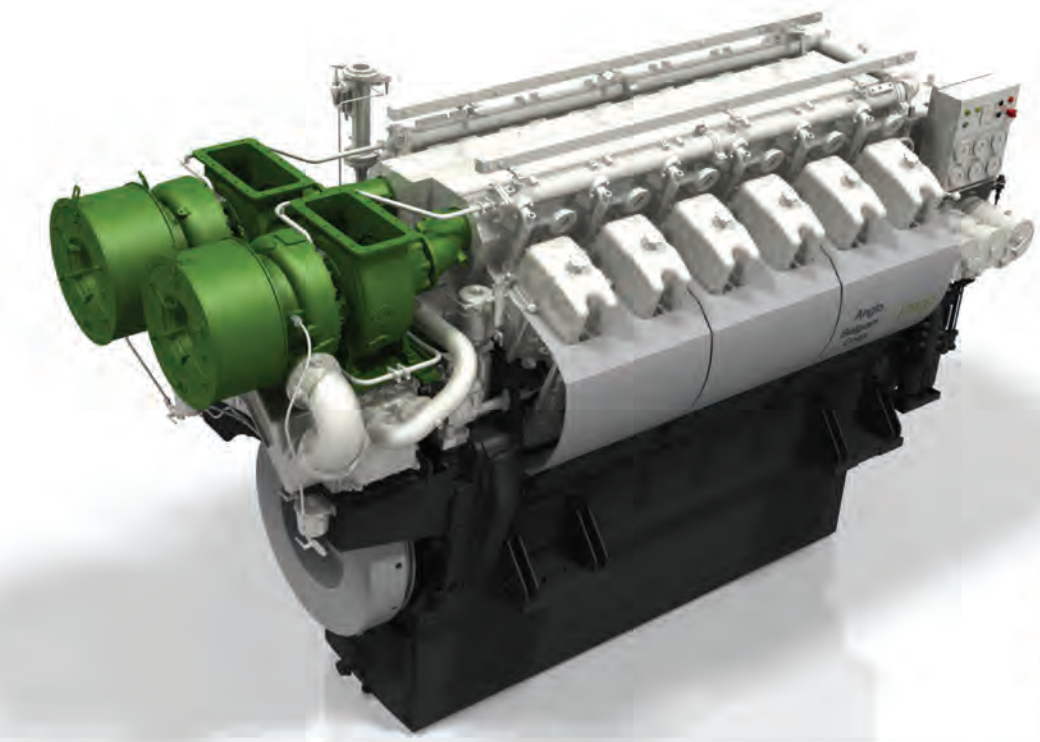

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Exporting Crude Oil

A "No-Brainer"

Joseph Keefe is the lead commentator of MaritimeProfessional.com, and is Editor of both *Maritime Professional* and *MarineNews* print magazines. He can be reached at Keefe@marinelink.com

As I watch the back and forth in Washington – and beyond – on the issue of whether to allow the export of crude oil and LNG, I can only shake my head and wonder why it is even a topic for discussion anymore. I honestly cannot think of a single reason why we shouldn't. Our European and Asian readers are probably laughing as I discuss the merits of changing a domestic policy that is clearly a remnant from a bygone era. Here at home, though, it's not really a laughing matter, is it?

National & World Security

For more than four decades, the biggest threat to American security was energy – or rather the lack of enough domestic supplies and the use of energy (by others, principally OPEC) as a geopolitical weapon. Those days, at least for North Americans, are long gone. The shale boom is upon us. Offshore, deepwater exploration is once again robust and more acreage is being brought into play. At least one major classification society, an oil major and many, many other so-called 'experts' tell us that America can be energy self-sufficient by the year 2020. Indeed, we're already almost there. That doesn't mean that the use of energy as a weapon has gone away. It hasn't. In case you weren't paying attention – and I am – Mr. Putin and Russia are using it to hold the Ukraine and Europe itself hostage. "Respond to my aggression," he all-but-says, "And we'll cut you off." Thankfully, the EU is responding. So, should we. And, still we wait. And debate.

How refreshing would it be for North America to be able to dictate the terms of the coming world order, for all the right reasons? From my seat, I don't think Russia can sustain what it trying to accomplish, but only if 'energy' is taken off the table.

Prosperity & the Economy

It's no longer undeniable. Energy (specifically, domestic energy) will be the lynchpin of the health of the U.S. economy: today, tomorrow, and for a long time to come. Pipelines, refining, exploration, the waterfront, railroads, technology and a hundred other sectors – they all come into play. It doesn't all have to be oil, but oil and gas will be the bridge to the future of sustainable energy. We can't get there without it. Even the most diehard environmentalist protester got to work today in an automobile, bus or train – burning fossil fuel. Those that didn't plugged their electric conveyance into the grid which, of course, downstream, probably produced that electricity with oil or gas. Even coal has a future. That's what scrubbers are for.

Energy and the innovative technology that brings that energy to market in a responsible fashion is what will also fuel this economy going forward. Energy also creates jobs; so much so that we can't fill the competency gaps that are emerging as senior oil & gas workers begin to retire. Energy also produces badly needed tax dollars. At some point, we're actually going to have to pay for all these domestic social initiatives. Energy will get us to the Promised Land.

Energy independence and crude oil exports also come with the added attraction of a marked reduction in our foreign trade deficit. And since energy makes up a large portion of that deficit, there is much to be gained by taking a new export policy out for a test drive. We're already a net exporter of refined products. Did you know that?

The Maritime Component

It's no secret that exporting U.S. crude oil and natural gas won't create jobs for the blue water sector of our merchant marine. Those liftings will be accomplished by registered, foreign flag tonnage. Before that can happen, however, the oil has to make it to that blue water port. Some of that, of course comes via rail and in certain places, pipelines can do the job. That said; the inland barge sector will also play a big role. That's because rail is already stretched to its limit and the complaints by Midwest farmers unable to get their grain to market because of all of the shale oil leaving the Dakotas via train is ample testament to that. Our brown water merchant fleet makes up virtually 99 percent of domestic tonnage. I like to bandy that statistic around, but it is also undeniably true. And if there is one sector that could respond to increased internal transport demands, then this would be it. That translates into jobs; afloat and ashore.

The Environment

One of the primary arguments against expanding our transport options for crude oil is the worry that the risk of pollution would increase. And yet, that's hardly the case. A recent compilation of pollution statistics assembled by Dagmar Etkin PhD for *MarineNews* magazine shows that the amount of oil being released by marine vessels into U.S. waters has dramatically dropped. Etkin adds, "The probability of tank vessel spills should be correlated with the amount of oil transported. Since the early 1980s, there has been a nearly 50% reduction in the volume of oil transported annually by tank vessels. But, this does not explain the reduction in spillage. There has actually been a 94% reduction in the amount of tank vessel spillage per oil transported in the US over the last three decades."

When and if the export of crude oil is allowed, and if shippers take advantage of America's Marine Highways to make that happen, it will be done in an environmentally correct fashion. The numbers simply do not lie. And, since the environmental footprint of shipping via barge (as measured by ton miles travelled per gallon of fuel) far outpaces its modal cousins, the reduction in air emissions alone by switching to water transport is an added bonus.

Calculating the Bottom Line

I've been told that a primary obstacle for not allowing the export of crude oil is the fear that, eventually, the practice will drive up domestic fuel prices for industry and consumers alike. I have a hard time believing that an increase in the amount of feed stocks and crude oils on the open, global markets will do just that. But, let's assume for argument's sake that it will. A better question to ask is: what price is too much to pay for economic prosperity, national and global security, higher employment, increased tax revenues and a markedly lower trade deficit? Or, what if we sent abroad a little bit of energy and brought home a few soldiers? I'll take my chances on lifting the export ban. What about you?

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The NSafe-Hull's highly ductile steel reportedly absorbs side impact to the hull three times more effectively than conventional steel plate, reducing the risk of cracks in the hull and significantly increasing the safety of the vessel. Construction of the new bulkship required a total about 3,000 tons of NSafe-Hull for sections such as the side plates of cargo holds and fuel tanks, where hull strength is especially critical. Improved puncture resistance helps to prevent flooding, protects cargo, and prevents environmental damage from oil leakage.

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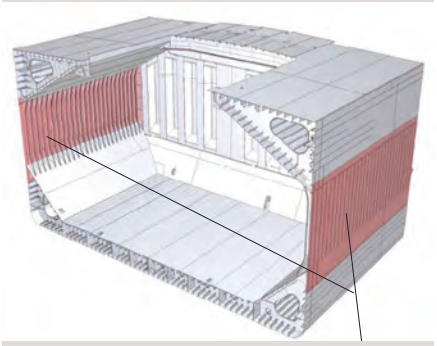

NSafe-Hull sections in red.

THE WORLD'S MOST EXPENSIVE

Jones Act Tanker

The series highlighting the world's most expensive active vessels from online ship intelligence and information service VesselsValue.com focuses this month on the most expensive tanker vessel, which is not a VLCC but a Jones Act aframax. The first-in-class double hull tanker Liberty Bay is an 820-foot, 115,000 dwt aframax tanker built this year by Aker Philadelphia and owned by Seariver Maritime. The tanker, which has an 800,000-barrel capacity and supplies crude oil from Alaska North Slope to refineries along the U.S. west coast, prices in at approximately $184.7 million. To put the ship's value perspective, VesselsValue.com created an infographic showing that Liberty Bay's price is equivalent to roughly:

Courtesy of VesselValue.com

- 1.8 x Floyd Mayweather's 2013 winnings ($105 million)
- 6.4 Super Puma helicopters ($29 million each)
- 23 minutes of Superbowl advertising time (at a value of $4 million per 30 seconds)

According to our calculations, for $184.7 million could buy more than 1.6 million copies of the complete series collection of Gilligan's Island on DVD ($115 each).

Mammoet Lifts Space Shuttle

Mammoet recently lifted a new attraction at the NASA Space Center Houston to a greater height. As thousands of onlookers watched, a 250-ft. tall Mammoet crane lifted a 122-ft. long space shuttle replica three stories high to its resting place atop the original Shuttle Carrier Aircraft (SCA) NASA 905, a Boeing 747. The delicate lift to the crown of the 63-ft. 747 took about 40 minutes. The crane lifted the replica to a height of 150 feet before lowering it onto the back of the SCA, sitting on a 15-inch concrete foundation.

"The lift was challenging because of the awkward weight distribution of the replica and the safety concerns for the thousands of spectators", said Pierre Mille, Mammoet USA's sales manager. "A space shuttle, even a replica, is designed to go straight, so it catches a lot of wind when lifted sideways. But we engineered the lift carefully and were well prepared for this effect. With our crane we were able to set the space shuttle exactly where it needed to be.

The crane was assembled at the site a week in advance. It took only 1.5 days to assemble it and another 1.5 days to disassemble it after the lift was completed.

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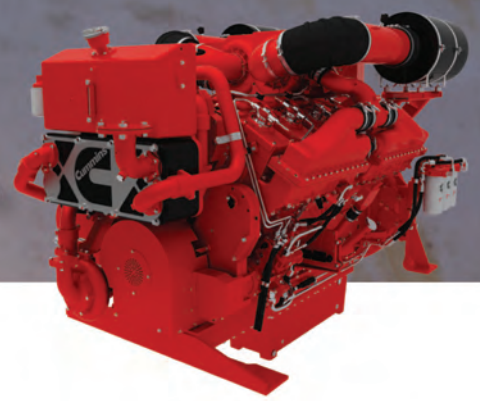

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New Drydock for Portland

Vigor's new floating drydock, the Vigorous, was headed for Portland at press time, final destination being Vigor Industrial's Portland shipyard on the Willamette River. Fully assembled, the drydock will be 960-ft. long. However, it is currently in three parts, which are stacked aboard a 738-foot heavy lift ship for delivery. The delivery provides unique opportunities to see both the new drydock and the specialized ship carrying it up river

Vigor said it is investing more than $50 million to build and deliver the Vigorous. The drydock will allow Vigor to service vessels such as cruise ships, tankers and cargo ships. It also will free the company to send another drydock from Portland to Seattle, expanding capacity there.

Frank Foti, Vigor CEO, said the new drydock will allow the company to better serve a range of customers with large vessels at a time when total large-drydock capacity on the West Coast has been shrinking. Two large vessels, Maritime Administration cargo ships, are already booked for repairs when the drydock enters service in November. Vigorous is about the same size as the drydock Foti sold in 2001 in order to repay millions of dollars that the company owed lenders. The sale of the shipyard's largest asset led some to speculate it was the end of shipbuilding in Portland. However, since then the company has grown from the single shipyard to nine locations from Portland to Seward, Alaska. The workforce in Portland shipyard has expanded from fewer than 80 workers in the late 1990s to more than 600 today. Vigor's overall workforce now includes more than 2,000 people.

The drydock was constructed by Shanghai Zhenhua Heavy Industries in Jiangsu Province, China, and is being delivered to Portland aboard the Blue Marlin, a semi-submersible heavy lift ship owned by Dockwise Ltd. When the Blue Marlin arrives at the mouth of the Columbia, the ship will be guided over the Columbia River Bar by the Columbia River Bar Pilots. Once past the bar, the ship will be transferred to the Columbia River Pilots for the trip up river to Portland.

VESSELS

(Photo courtesy of General Dynamics Electric Boat)

Submarine North Dakota

The U.S.'s newest nuclear-powered attack submarine, North Dakota (SSN-784), returned to the General Dynamics Electric Boat shipyard following the successful completion of its first voyage in open seas. North Dakota is the 11th ship of the Virginia Class. North Dakota's alpha sea trials included a range of submarine and propulsion-plant operations, submerging for the first time, and high-speed runs on and below the surface to demonstrate that the ship's propulsion plant is fully mission-capable.

Virginia-class submarines displace 7,800 tons, with a hull length of 377 feet and a diameter of 34 feet. They are capable of speeds in excess of 25 knots and can dive to a depth greater than 800 feet, while carrying Mark 48 advanced capability torpedoes and Tomahawk land-attack missiles.

DeepFlight Dragon

The latest from Graham Hawkes is a Self-Pilot Personal Submarine

Length	15.7 ft. (4.8m)
Height	4.9 ft. (1.5 m)
Width	6.8 ft. (2.1m)
Depth	400 ft. (120m)
Crew	2
Payload	507 lbs
Air Weight	3968 lbs

www.deepflight.com

DeepFlight introduced a new type of personal submarine at the 2014 Monaco Yacht Show: DeepFlight Dragon, an all-electric, compact, lightweight personal submarine to explore down to 400 ft. (120m). At 3,968 pounds (1,800 kg) and under five feet (1.5 m) in height, the Dragon is less than half the weight of competing submarines and readily fits into existing yacht garages or deck areas. Like all DeepFlight personal submarines, the Dragon is positively buoyant, meaning the craft automatically floats to the surface. And the Dragon is the first DeepFlight craft to use vertical thrust, thus enabling a hover capability.

Techniques open up new possibilities

Imaging Measurement

BY WIM LAFEBER

With its staggering ability to show displacements of submillimeter scale to stern waves of several meters high, the Digital Image Correlation technique has been applied on a wide range of projects at MARIN. Examples from research programs in controlled conditions and full-scale trials are highlighted.

In some situations conventional sensors cannot be applied. For example, when the sensors alter the hydro-dynamical or structural properties of the object or, when the sensor capabilities are simply too limited. However, Digital Image Correlation can provide a solution. This is a method where the shape and deformation of a three-dimensional surface can be measured using two cameras. Recently, a flexible composite propeller was tested in the Cavitation Tunnel at MARIN. As strain gauges could not be applied, the Digital Image Correlation technique was used. A random pattern was painted on the propeller blades so the deformation could be captured by the cameras. The measured data from the deforming propeller blades under various conditions was used to improve structural models of composite propellers.

LNG Containment System

Full-scale wave impact tests have been conducted on an instrumented LNG containment system panel. Here, a random pattern was also painted on the surface. The duration of the deformations was shorter than 1 millisecond, which meant that the cameras had to acquire images at 15,000 frames per second! These measurements were combined with data from pressure sensors, strain gauges and high-speed videos of the wave impacts. This combined dataset provided valuable insight and a better understanding of wave impact loading and the corresponding structural response of the containment system. For the validation Computational Fluid Dynamics (CFD) software stern wave measurements were performed on a +100 m vessel. A field of 25 m behind the vessel was covered by two cameras to capture the stern wave at different ship speeds. Here, the natural texture of the stern wave was used for the Digital Image Correlation. The measured shapes of the stern wave were compared to the shapes calculated by MARIN's Parnassos CFD Software. Digital Image Correlation opens up new possibilities for measurement campaigns that previously seemed impossible. MARIN continues to apply this technique within challenging projects.

The Author

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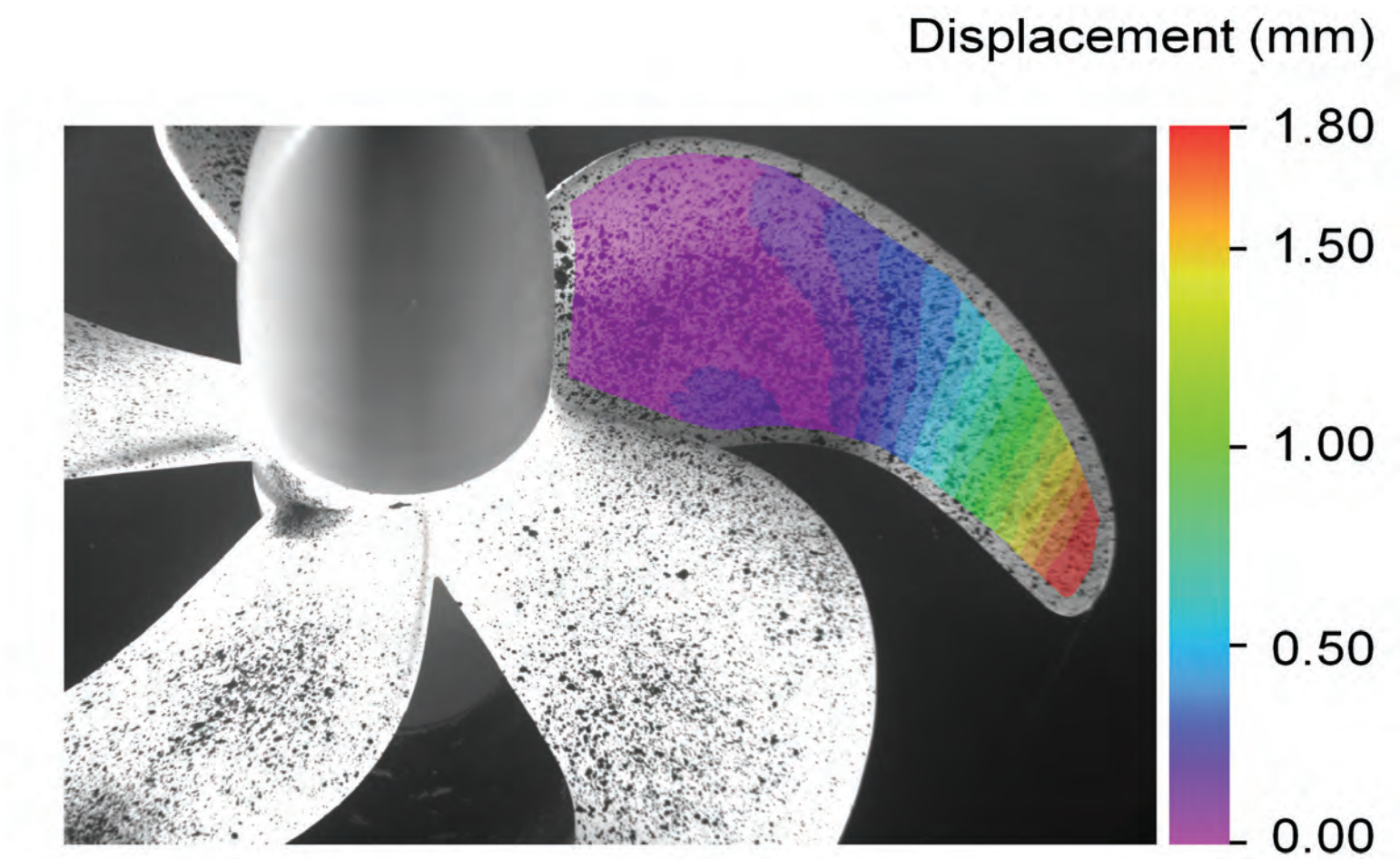
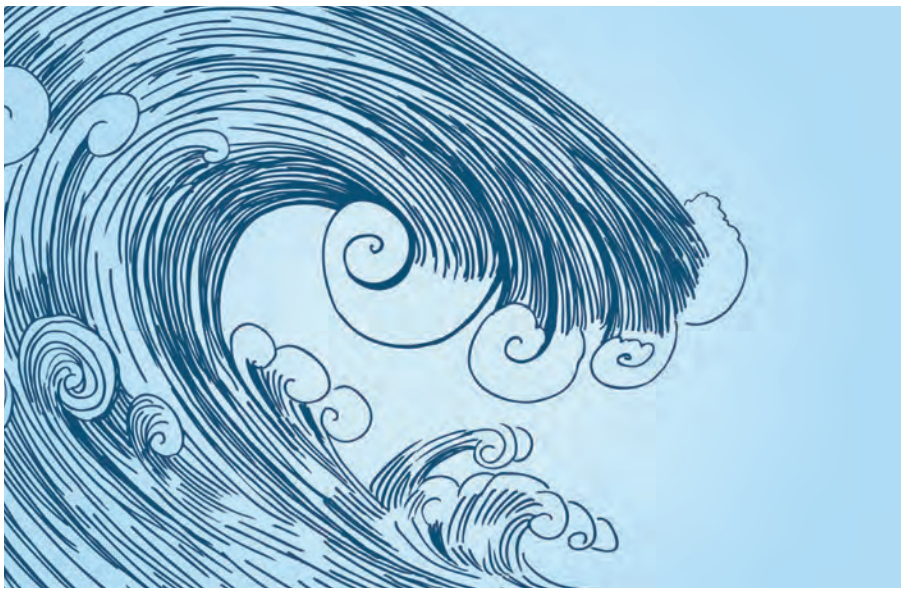


Unpredictable & Dangerous

Rogue Waves

BY DENNIS BRYANT



Ever since man has taken vessels onto the seas, mariners have reported encounters with monstrous waves that seem to arise out of nowhere from an otherwise average sea state. On his third voyage to the New World in 1498, Christopher Columbus recorded in his logbook that a giant wave lifted up his vessels as they transited the waterway between the Paria Peninsula of Venezuela and the island of Trinidad, a waterway he then named Bocas del Dragón (the Mouths of the Dragon). In 1853, the ship Annie Jane carrying 500 emigrants from England to Canada was struck by a monstrous wave off the Outer Hebrides and sank. Only 100 persons survived. In 1943, the ocean liner RMS Queen Mary, converted to a troop carrier, was crossing the North Atlantic at high speed when it was struck by two rogue waves in rapid succession. The ship survived, but it had rolled 52 degrees before slowly recovering. The waves broke windows on the bridge 90 feet above the waterline. On June 14, 1968, the 736-foot tanker World Glory was off the southeast coast of South Africa when it was suddenly struck by two waves of an estimated height of 70 feet each. The first wave put the ship in a hogging position, cracking the main deck. The second wave produced sagging forces that broke the ship into two and sinking it. Ten crew members survived to tell their tale. On March 2, 2001, the cruise ship Caledonian Star was crossing the Southern Ocean after a visit to the Antarctic Peninsula when it was struck by a rogue wave estimated to be in excess of 90 feet high. The wave broke through the bridge windows, toppled and injured the first mate and the helmsman. The ship rolled heavily, but was about to recover and make it to port without further incident.

Meteorologists and oceanographers discounted the reports as exaggerations because they could not duplicate the phenomenon ashore and because the mathematical formula that they utilized to predict wave heights would not yield waves anywhere near the heights reported by mariners. This all changed on January 1, 1995. At the Draupner offshore oil platform in the North Sea, significant wave heights of 36 ft. were being automatically recorded. At about 3:30 pm, a single wave of over 80 ft. was measured. Scientists could no longer ignore the mariners' reports. They determined that they had been using the wrong mathematical formula. For one thing, instead of adding the wave heights, they should have been adding the wave energies. Rogue waves are now defined as waves whose height is more than twice the significant wave height. Significant wave height is the mean of the largest third of the prevailing waves. As the scientists adapted to the new reality, they learned, using non-linear equations, to configure wave-tank experiments to simulate the conditions for generation of rogue waves, but on a smaller scale. They learned that rogue waves can occur when a storm swell encounters an opposing powerful current, a not-uncommon situation in the North Atlantic's Gulf Stream or in the Agulhas Current of the Indian Ocean off South Africa. Large storms can generate powerful wave systems capable of traveling many miles into areas with relatively calmer conditions. If such a powerful wave system comes up against a strong current in a crossing situation, the stage is set for one or more rogue waves to be generated. Scientists, risk managers, and governments are now attempting to predict rogue waves.

At the European Center for Medium-Range Weather Forecasting, scientists use the Benjamin-Feir Index to make twice-daily forecasts for marine areas measuring 20 km on each side. If forecast conditions meet the index's standard, a rogue wave warning is issued. Theoretically it is possible for a ship carrying sophisticated sensors and powerful computers to create a three-dimensional map of the sea state and calculate whether a rogue wave is imminent. Until that becomes possible, ships will have to rely on the available, but imprecise predictions from ashore.

Utilizing a different approach, the European Union (EU) funded a project called Extreme Seas between 2009 and 2013. It brought together meteorologists, oceanographers, researchers, and naval architects for the purpose of designing vessels so as to better withstand the forces generated by rogue waves. The jury is still out on whether there has been meaningful progress in this effort.

Climate change indicates that an increasing amount of energy is manifesting itself in Earth's atmosphere. This may result in additional and stronger storms, increasing the likelihood of rogue waves on the world's oceans.

The cruise ship Louis Majesty departed Barcelona on March 3, 2010 for a routine voyage across the Mediterranean Sea to Genoa. There were about 1,000 passengers and a crew of 600 on board. Three hours out of port, in moderately stormy weather, the ship was suddenly hit by three rogue waves. As the ship rolled and pitched, a wall of water smashed through the windows of the lounge on Deck 5, over fifty feet above the normal waterline. Two passengers were killed and 14 were injured. The tragic incident was filmed (as is almost everything these days) by cell phone cameras. The video is very telling. As passengers are milling about the lounge and a buffet meal is being served, a wave suddenly breaks through the windows, throwing passengers to the deck and sending furniture across the room. The sea state quickly returned to normal and the vessel returned to port. A hindcast later revealed that a powerful wave train from the northeast had converged with another powerful wave train from the southeast at the location in the Mediterranean just as the Louis Majesty was traversing. This type of incident may occur more frequently in the future.

Now that stakeholders are more aware of the problem, efforts can be undertaken to reduce the risk of further rogue wave encounters. Ships can be more ruggedly constructed. Meteorological and oceanographic forecasts can be made more precise and timely. On-board technology can be improved. In the meantime, keep a sharp lookout.

The Author

Dennis L. Bryant is with Maritime Regulatory Consulting, and a regular contributor to Maritime Reporter & Engineering News as well as online at MaritimeProfessional.com.

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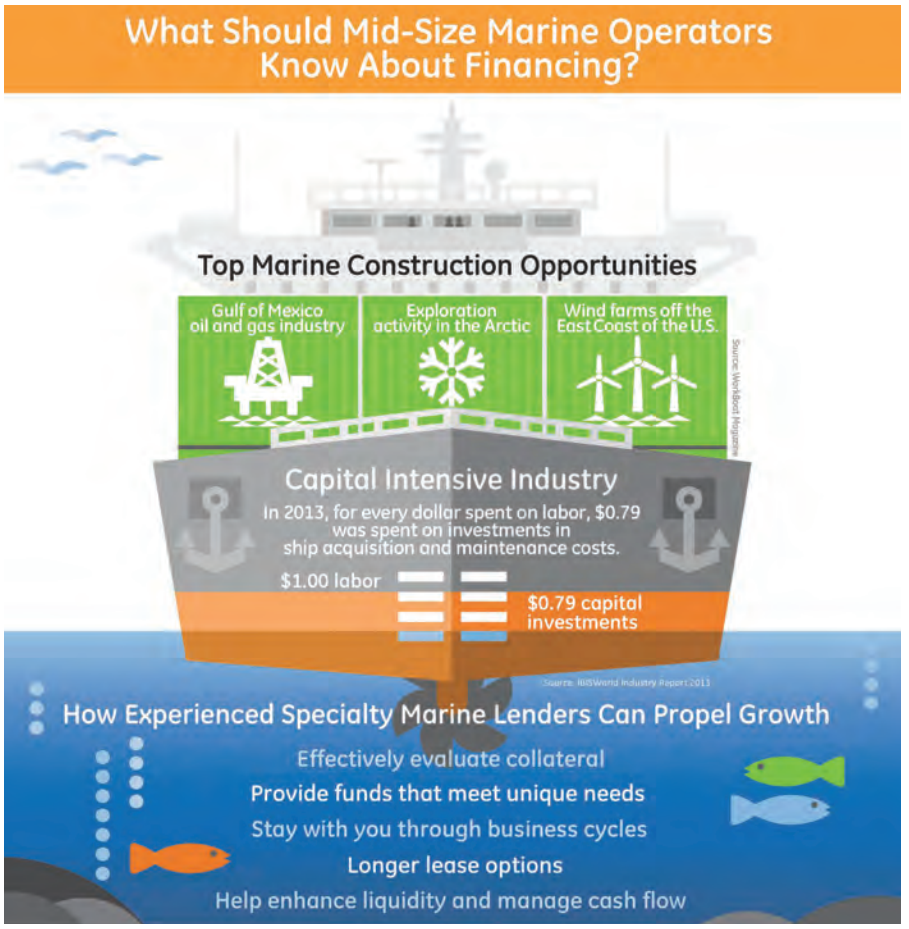
How Specialty Lenders can Propel

Marine Operators

BY ERIC DUSCH

The surge in the shale gas industry in the U.S., as well as stepped up oil exploration in the Gulf of Mexico, is creating enormous demand for marine assets to transport fuels and supplies. To seize this growth opportunity, mid-size marine operating companies with annual revenues from $10 million to $1 billion must address several important issues.

First, what is the most efficient way to finance equipment to keep up with the robust demand? Is ownership of the vessel through a loan structure the best option, or would a lease make better use of working capital? Another issue that operators face is how to evaluate the wave of marine lenders now entering the market and vying for their business. It's more critical than ever to consider a lender's depth of knowledge and experience in the industry to get the best possible financing and long-term financial ally.



The Collateral Equation

Marine collateral can be varied and can be difficult for inexperienced lenders to value. These assets include inland towboats and ocean tugs, inland and ocean barges, marine construction equipment and offshore oilfield services. Adding to the valuation challenge is the absence of an active re-sale market to regularly and transparently value these assets in an open market.

As a result, a specialty lender with deep domain knowledge is going to be more comfortable with the collateral, which often means a higher residual value and thus better pricing for the borrower. A knowledgeable lender may also be willing to finance individual components of the boat, such as a new engine or other technologies, as opposed to only being willing to finance the entire vessel.

Long-Term Commitment

A specialty lender that's been involved in the marine industry is also more experienced with the industry's cycles and more likely to stick with a borrower through the entire business cycle. The industry is now booming thanks to oil and gas, but this tight link to the oil and gas industries is a double-edged sword. A mid-size company borrower needs a lender that's committed to the industry and will not look to exit at the first sign of a downdraft.

Longer Loan Terms

Given all this insight, a specialty lender is likely to offer a wider range of financial products with flexible loan and lease structures and payment terms. That makes the lender better able to match the unique needs and goals of customers whether the company is looking to optimize depreciation, lower monthly payments or monetize assets.

Lending can be ideal for customers with long-life equipment needs, who prefer asset ownership and the associated tax benefits. Typically, borrowers can get 80%–100% advance rates from lenders depending on credit quality.

One facet of the loan structure where a specialty lender can often make a big difference is the term of the loan. For new vessels, many lenders prefer to offer a 3-5 year term loan with a 7-10 year amortization. But specialty lenders are more likely to offer a 7-10 year, full term, full amortization loan for new vessels, allowing the borrower to lock in today's ultra low interest rates for up to 10 years. With a specialty lender, there's no adjustment period and no need to redo the loan 3-5 years down the road.

The Lease Option

Many banks don't offer tax and non-tax operating leases because they are uncomfortable owing the asset given the potential risks of costs and accidents. Although specialty lenders will not lease just any marine asset—for example, they typically don't offer leases on tank barges that carry hazardous material or petroleum products—they are more likely to lease certain marine assets than banks because they are more familiar and comfortable with the assets.

Leasing allows customers to use the equipment without tying up capital by owning it. This helps borrowers to enhance liquidity and manage cash flow. The length of these leases are similar to that of loans, and more specialized marine asset might have a residual closer to 50% after 8-10 years. Most leases include an early buyout option at 3 and 5 years, or a fixed price purchase option at the end of the lease.

Find a Strategic Ally

From a lender's point of view, marine assets are very attractive for three reasons: they tend to hold or even increase in value over time; also, these deals involve large dollar amounts that can be financed over a longer term than most other assets. That makes it easier for lenders to maintain a more stable portfolio of loans. But mid-size marine operators should be cautious of the newcomers attracted to their industry.

Operators need to weigh the relative strength of potential financial allies very carefully. Deep domain expertise and knowledge of the collateral, length of time in the industry and familiarity with the business cycles and the ability to offer a wide breadth of loan and lease products may outweigh another lender's willingness to shave a few basis points off a loan. Ideally, a specialty lender is more than just a lender; it's also a strategic ally to help build the business over the long term.

The Author

Eric Dusch is Chief Commercial Officer—Equipment at GE Capital, Corporate Finance, specializing in providing commercial loans and equipment leases to mid-size companies.

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On Top Line Security Concerns

BY STEVEN JONES, MARITIME DIRECTOR, THE SECURITY ASSOCIATION FOR THE MARITIME INDUSTRY (SAMI)

With progress being made against piracy off Somalia, it seems that other maritime security issues are becoming top line issues for shipowners. The Security Association for the Maritime Industry (SAMI), is a global focal point for maritime security matters, and is well placed to highlight the current maritime security concerns, those which are over the horizon and the initiatives which are being rolled out to counter the threats and mitigate the risks.

While there has been a degree of containment of Indian Ocean piracy, the issue is still a key one for the industry – and while there are other problems elsewhere, it remains that owners and operators should still be sure that they are protecting the seafarers, cargoes and vessels in the High Risk Area.

However, while there should be no resting on laurels or too much self-congratulation – it is important to recognize that a triumvirate of responses has done so much to improve maritime security. Improvements in self-protection through Best Management Practices (BMP), the provision of armed guards and the international naval presence have all combined to improve the dreadful situation. While the three solutions remain in place, then it seems likely that the piracy problem can be contained.

So it is that we can turn attention to other problems and other areas of risk. From the piracy perspective there are not only other hotspots to consider, but unique challenges in each.

Off Nigeria, and across the Gulf of Guinea, there is a still a major security problem. Vessels are being hit by pirates and hit hard. However, this problem is further compounded by the lack of response – while most owners do enact measures akin to BMP, there are serious concerns regarding the use of armed guards and the capabilities of local navies to contain and counter the threat.

This means it is almost impossible to apply the factors which have stemmed Somali piracy off West Africa, and because of this there are heightened maritime security concerns. At the moment Nigerian security efforts are seemingly hampered by an unedifying local spat between the Nigerian navy and the police. One claims pre-eminence in control, while the other has been placing guards on vessels.

Whatever the rights and wrongs of the political infighting, it is the seafarers, owners, charterers who are suffering and there needs to be an urgent solution sought and provided.

While the problems are set to continue off West Africa is has been hugely concerning to note the rise in piracy attacks around the Malacca Straits, Singapore, Indonesia and anchorages in the region. As a result of these attacks SAMI recently urged all owners and masters to exercise caution when vessels transit or operate in the area.

According to reports this current SE Asian piracy spike is based on a very

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specific security problem, as pirates and criminals hijack vessels to steal oil cargoes. We are seeing a rising trend for tankers to be hijacked, and it must be assumed that all oil cargoes in the area are at risk. But despite the specific nature of the current threat the risk does not necessarily start and end with petro cargoes.

While the focus is mainly on product tankers, there are concerns that pirates may pose an associated threat to other vessel types too. SAMI has warned that very often a specific and focused type of piracy can evolve into a more random "smash and grab" form.

Criminal elements with a marine capability clearly may look to alternative targets, seeking to gain whatever they can from any passing shipping. The ongoing threat to oil cargoes and tankers is set to continue, and so urgent measures need to be taken.

Most of the current incidents have taken place within territorial waters, and as such there is hope that local law enforcement and military intervention will ease the current security problems. It is to be hoped that affected countries are able to work together to counter this rising problem. In the meantime, shipping must act to protect itself.

In the meantime it is vital, that action is taken by the shipping industry. There have been accusations of that criminals are being granted access to sensitive information on cargoes and vessel movements. As such owners and masters need to do all possible to control and restrict the flow of such intelligence.

Parallel to this is a need to ensure that practical measures are taken to protect seafarers, cargoes and vessels. From the management ashore, through to the team onboard there needs to be awareness of the local piracy problems, as well as an ability and willingness to take the necessary actions to safeguard and protect their vessels.

According to the advice issued by SAMI, it is now time revisit the Ship Security Plans to ensure that they are relevant and capable of imposing the defensive measures necessary to protect vessels from this form of piracy. While many vessels which trade internationally may have the necessary skills, equipment and knowledge to enact measures akin to those of the Industry Best Management Practices (BMP), there are many in the region only trading in this geographic sector. This could be a problem, but one which needs to be addressed.

For these vessels, it may be more difficult to ramp up the security measures and response – but it is vital that they do so. SAMI urges owners and masters to fully assess their vulnerabilities and the way in which security. Where necessary the association also stresses the importance of external professional expertise, and private maritime security companies are able to provide the insight necessary to protect vessels effectively.

Away from the problems of maritime security, one topline issue has emerged relating to the solutions provided to ensure maritime security. Over the past two years much work has gone into developing a new international standard for private maritime security companies (PMSCs). This is the International Organization for Standardization (ISO) standard, "ISO28007". While it was hoped that the standard would finally facilitate owners to identify only quality PMSCs, there are concerns that the take-up and interest in the standard by shipowners is slow, and there are some who are not seemingly embracing the standard, relying instead on their own vetting processes.

It is of course vitally important that owners do whatever checks they deem necessary, it perhaps a missed opportunity for them to not embrace ISO28007 as a means of initial assessment. SAMI is working hard to ensure that not only are PMSCs who have ISO28007 recognised, but that they can be identified and can win business. In order to this SAMI is shortly to launch its new, re-engineered directory, which will allow shipowners to easily find out which PMSCs have what certification and experience.

It is hoped that by streamlining and improving the online search for PMSCs, then the best companies will win business and they will be rewarded for the investments made in attaining the very highest possible standards.

Of course maritime security is not solely about pirates and stolen cargoes, there are other difficult issues to manage. As part of this assessment of maritime security, challenges, cyber threats are being treated very seriously indeed.

Technology to improve production, cost and reduce delivery schedules –has seemingly opened the door to emerging threats and vulnerabilities as equipment has become accessible to outside entities As crews get smaller and ships get bigger, they increasingly rely on automation and remote monitoring, meaning key components, including navigational systems, can be hacked.

Given the nature of the threat the true extent of shipping's cyber vulnerabilities remains uncertain, but the industry is waking to the implications of cyber-attacks. It is increasingly recognizing that poorly defended systems pose huge risks, as concerns rise that criminals, pirates and terrorists may target shipping.

This is a serious issue, and one which could be likely to be on the agenda for governments, companies and seafarers alike into the future. At the moment the number of known shipping cyber cases is actually low, as attacks often remain invisible to the company, but these numbers are likely to grow in number and impact

It seems the problems are confounded by the facts that shipboard staff are not computer security experts, and there is a seeming blindness and ignorance as to the scale and threat posed by the problems.

Researchers say they have discovered significant holes in the three key technologies sailors use to navigate: Global Positioning Satellites, marine Automatic Identification System (AIS), and Electronic Chart Display and Information System (ECDIS).

It has been stated that cyber security on board merchant vessels and at major ports is 10 to 20 years behind the curve compared with office-based computer systems, This means they are wide open to an ever-increasing range of threats.

It appears there are failings all along the line, and up and down the chain. There is a seemingly lack of leadership, ownership or accountability with this most troubling of maritime security problems. Addressing these cyber threats will take time and investment, but also a change in attitude.

The Author

Steven Jones is Maritime Director at The Security Association for the Maritime Industry (SAMI).

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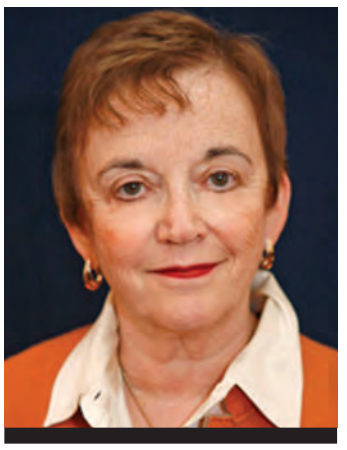

JOAN M. BONDAREFF

The answer to this question is a resounding "no." The U.S. is not prepared to protect its interests in the Arctic over the next decade. The primary legal regime that is being relied upon by all members of the Arctic fraternity, the Law of the Sea Convention, has not been adopted by the U.S. The operational resources needed to pursue our interests have not been funded and there is currently little prospect that they will be funded in the near future. U.S. interests in the Arctic are vast. They include oil and gas, shipping, environmental concerns, climate change, and the rights and interests of Alaskan native communities. The article describes why we are so unprepared.

A Legal Regime for the Arctic

The U.S. is one of eight member nations of the Arctic Council. The others are Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, and Sweden. Next year, the U.S. takes over as Chair of the Council. But the Arctic Council is a voluntary organization with few resources to implement or monitor its own guidelines. It has no formal treaty status and no enforcement authority.

The only international framework that presently applies to claims and resolution of conflicts in the Arctic is the Law of the Sea Convention. As then-U.S. Coast Guard Commandant ADM Robert Papp, Jr., testified before the Senate Committee on Foreign Relations at a June 12, 2012 hearing, "[t]he Coast Guard needs the Convention to ensure America's Arctic future." Admiral Papp also stated that "[o]f the eight Arctic nations, only the U.S. is not a party to the Convention." Further, in testimony before the House Transportation and Infrastructure ("T&I") Committee on July 23, 2014, Ambassador David Balton, Deputy Assistant Secretary of State for Oceans and Environment, echoed this view, stating, "The United States could significantly advance our national security interests in the Arctic by joining the Law of the Sea Convention. Notwithstanding the strong support of past administrations (both Republican and Democratic), the consistent backing of the military, and the support of all relevant industries and environmental groups, the Convention remains a key piece of unfinished international business for the United States. Further delay serves no purpose and deprives the United States of the significant economic and national security benefits we will gain by becoming a Party to the Convention."

Why the Law of the Sea Convention?

It is only with ratification of the Convention that the U.S. will have a formal seat on the Commission on the Limits of the Continental Shelf established under the Convention and be able to protect its claims to a vastly extended continental shelf of up to 600 miles containing potentially extensive oil and gas deposits. The Russian Federation has already filed its claim to an expanded continental shelf as have Norway, Denmark and Canada. The U.S. can only observe and protest publically to other nations' claims with which it may disagree. There is no international forum in which the U.S. can currently bring a legal challenge. With the rapidly deteriorating relations between the U.S. and Russia, it is foolish to think that other members of the Arctic community will stand up to protect U.S. interests with regard to Russian claims in the Arctic when they have their own interests to protect, and when the U.S. has not acted to protect its interests on its own.

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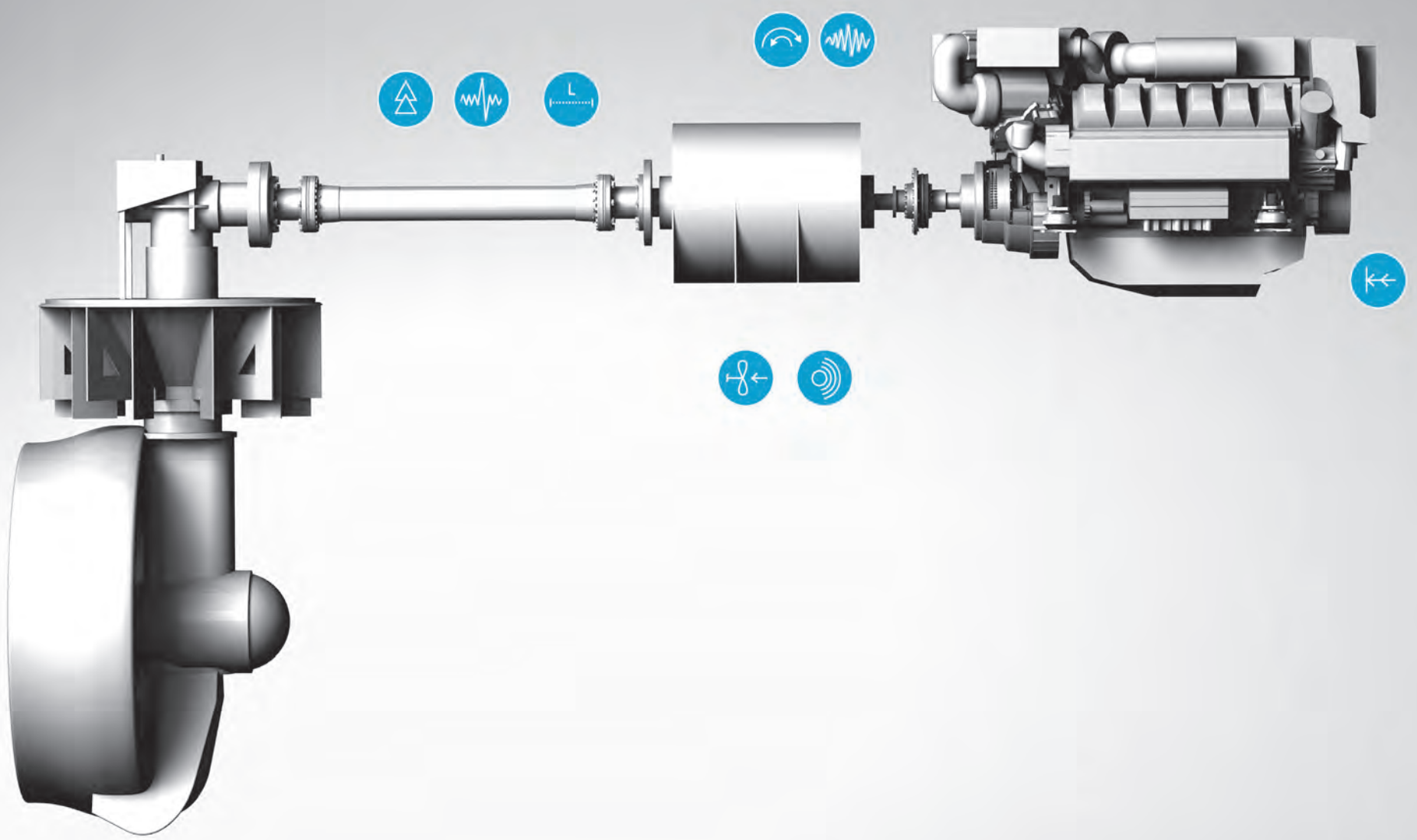

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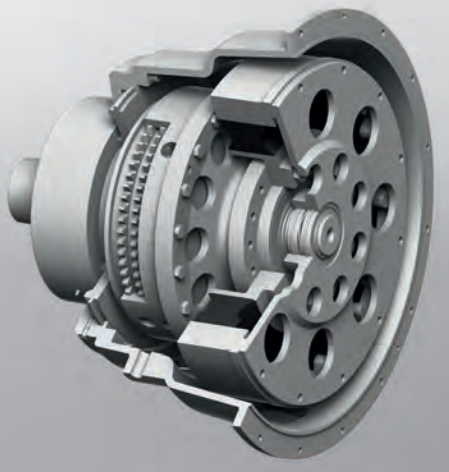

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The Coast Guard's resources are limited by competing missions and declining budgets.

One of the key challenges facing the Congress is whether to fund the Coast Guard to build new icebreakers. Already, the Russian Federation has committed to building a new fleet of nuclear-powered icebreakers. Yet, Congress has withheld funds for a new Coast Guard icebreaker and some have even called for the Coast Guard to lease an icebreaker from the private sector.

The cost to build new polar icebreakers is estimated at $1 billion each, but the long-term cost of not providing this vital platform will be measured in the tens of billions.

Resources for the Arctic

While the State Department has the lead policy role for the Arctic and Secretary of State Kerry will chair the Arctic Council next year, it is the U.S. Coast Guard that has the primary responsibility for patrolling the Arctic and protecting U.S. shipping and maritime interests there. The Coast Guard also has the role of responding to any future oil spills in the Arctic. A number of U.S. companies have expressed interest in drilling in the Arctic, but none have done so to date. The main missions of the Coast Guard in the Arctic are described in its Arctic Strategy of May 2013. http://www.uscg.mil/seniorleadership/DOCS/CG_Arctic_Strategy.pdf.

But, the Coast Guard's resources are limited by competing missions and declining budgets. One of the key challenges facing the Congress is whether to fund the Coast Guard to build new icebreakers. Already, the Russian Federation has committed to building a new fleet of nuclear-powered icebreakers. Yet, Congress has withheld funds for a new Coast Guard icebreaker and some have even called for the Coast Guard to lease an icebreaker from the private sector. The cost to build new polar icebreakers is estimated at $1 billion each, but the long-term cost of not providing this vital platform will be measured in the tens of billions.

The Coast Guard has two heavy polar icebreakers and one medium icebreaker. (The status of these ships is described in detail in a June 5, 2014 report by the Congressional Research Service, entitled "Coast Guard Polar Icebreaker Modernization: Background and Issues for Congress.") The heavy icebreakers are the Polar Star and the Polar Sea – both built by Lockheed Shipbuilding of Seattle, WA in the early 1970s. Both ships are now beyond their expected 30-year life. Polar Star, commissioned in 1976, was placed in caretaker status on July 1, 2006, but Congress provided $57M to repair the ship and she was returned to service in the Antarctic last year in support of NSF missions there. Due to an engine failure, the Polar Sea was placed in inactive status in 2011.

Congress is still debating what to do about the Polar Sea. In the Coast Guard and Maritime Transportation Act of 2012 (P.L. 112-213), Congress directed the Coast Guard to conduct a business case analysis of the options for and costs of reactivating the Polar Sea until September 20, 2022. In this year's Coast Guard bill, the House continues to press the Coast Guard to provide an analysis of the cost effectiveness of acquiring or leasing new icebreaker assets. (H.Rept. 113-384). At the recent House T&I Committee hearing, above, VADM Neffenger stated that the Coast Guard is still studying the issue of the reactivation of the Polar Sea. The Coast Guard has also made clear that there is no room in the existing Coast Guard budget to fund a new icebreaker without cannibalizing other high priority missions.

In the meantime, the House Appropriations Committee deleted $6 million requested by the Coast Guard to continue design work on a new icebreaker because the Coast Guard has carryover funds. At the same time, the Senate Appropriations Subcommittee for the Department of Homeland Security which includes the Coast Guard included the $6 million request and added $8 million to reactivate the Polar Sea. These differences will have to be worked out in any conference at the end of the year. If there is only a Continuing Resolution, no new funds will be provided for this project and the status quo will be maintained.

Another key goal of the Coast Guard and the U.S. in the Arctic is to maintain maritime domain awareness or knowledge of what is happening in the Arctic. This is one of the Coast Guard's key missions in the Arctic as the lead for this activity in the Administration. The Senate's Coast Guard authorization bill directs the establishment of an Interagency Arctic Maritime Domain Awareness Committee (Section 206 of S. 2444). At a recent Senate markup of the defense appropriations bill for FY 2015, $5 million was added to the defense budget for DARPA for Arctic Domain Awareness programs.

The Senate DARPA funding increases raises the valid question, also raised by ADM Papp in talking to reporters following his final State of the Coast Guard address in Washington, DC, on February 27, 2014 – who should pay for the U.S. polar icebreakers? Papp answered this question by saying "[t]he Coast Guard shouldn't bear the full brunt of the cost of the icebreaker because it serves the entire country not just the United States Coast Guard" (as reported by USNI News Editor on February 27, 2014). The capability is needed for defense as well as other purposes and the Coast Guard should not be the only agency whose budget is tapped for this capability.

New Advisors for the Arctic

On July 16, 2014, Secretary of State Kerry named two top officials to advise him on Arctic issues. This may have been partly in response to calls from certain Members of Congress, e.g., Congressman Larsen (D-WA), to have a special envoy to the Arctic. ADM Papp will serve as the first special representative to the Arctic. Fran Ulmer, who presently leads the U.S. Arctic Research Commission, and was a former Alaskan Lieutenant Governor, will be his special adviser on Arctic science and policy(as reported in Greenwire on July 17, 2014: "ARCTIC: Kerry names 2 top-level advisers for region").

Both advisers will bring a wealth of knowledge and experience to these issues. They will also be critical to providing policy advice to Secretary Kerry as he gets ready to chair the Arctic Council next year.

We can only hope that, with their leadership and the leadership of key members of Congress, the U.S. will be better prepared to pursue ratification of the Law of the Sea Convention and to provide the resources needed to manage and protect its interests in the Arctic. The Congressional actions noted above are mere band-aids and fail to begin to address substantively the solutions required to address the national interest of the U.S. The U.S.' strategic and economic interests in the Arctic are too great for the nation to continue to fail to come to grips with both the legal and operational requirements of protecting those interests, and we will have squandered our opportunity to do so if Congress and the Administration do not act soon.

The Authors

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Russian Class &

Arctic Operations

When it comes to Arctic operations, the Russians arguably have more hands-on experience and investment than any other nation. With that in mind, Maritime Reporter spoke recently with Georgiy Bedrik, Head of the RS Business Development Division, for his input on RS and matters of the Arctic, maritime and offshore.

By Greg Trauthwein

LNGC Velikiy Novgorod under construction.

Please give a brief description of the market you serve.

In maritime, RS renders a full scope of classification services for ships including plan approval, survey under construction and in operation, as well as statutory surveys in compliance with international codes and conventions. RS is well represented with the local offices in major shipbuilding regions and survey stations at big ports worldwide. With a variety of ship types in class, RS nowadays is primarily focused on special purpose fleet to support offshore developments, along with ships intended to be operated in harsh environment. With its ice class expertise, RS holds the leading position in classification of icebreakers and ice class ships. Today, there are over 3500 ice strengthened ships in class, including 30 designated icebreakers. The experience gained through decades serves as a firm basis for further research and developments towards fit for purpose improvements of ice class specific requirements, with particular respect to environmental safety provisions. In the offshore realm, RS has accumulated significant experience in plan approval, classification and survey during construction and operation of offshore oil and gas facilities intended for operation in harsh climate. RS is involved in all current Russian offshore projects, including the Arctic sea shelf development. The offshore structures under RS survey vary from fixed ice-resistant offloading terminal in the Arctic to 6th generation mobile offshore drilling units and subsea pipelines. And last but certainly not least, in the area of certification RS carries out survey during manufacture of materials and products in accordance with the requirements of international conventions and agreements, the RS Rules, IMO and maritime administrations' recommendations.

What has been the defining trend or market condition that has most affected your business in the past year, and why?

One of the defining trends of the industry in the past years is a great focus on the gas transportation technologies. The leading yards develop new state-of-the-art gas carrier designs while shipowners place their orders for new LNGCs and LPGCs.

This trend affects RS, expanding its involvement in gas carriers newbuilding projects. Currently, RS is in progress of survey of large capacity LNG carriers under construction for Sakhalin area, thus introducing this state-of-the-art technology into class experience. The prototype ship Velikiy Novgorod has already been commissioned. It is an Atlanticmax gas carrier with membrane cargo tanks of 170 000 cu. m. total capacity. The machinery and equipment are certified to operate at temperatures as low as – 30 °C. The specific feature of the newbuilding is a three-fuel diesel-electric propulsion plant allowing to use the LNG carried as fuel.

The use of gas as fuel will enable reduction of nitrogen and sulfur emissions to the atmosphere, which is an important step towards reduction of the maritime transport share in the environment pollution.

Georgiy Bedrik, Head of the RS Business Development Division

What do you consider to be the biggest challenge to your business in the coming few years (either from legislative, financial or other market conditions).

Today, the technological development enables large ships to pass along the Northern Sea Route, while the Arctic oil and gas development projects are under way. That is why the LNG transportation in the freezing seas is a very promising segment of shipping development. Yamal LNG project on LNG transportation from South Tambey gas condensate field on Yamal Peninsula via Sabetta sea port to Western Europe, the Americas and Asia Pacific region is already launched. The project foresees the construction of up to 16 innovative Arc7 gas carriers.

Therefore, the steady demand for ice strengthened vessels for operation in freezing waters is increasing. The RS potential as the leading classification society regarding the ice class is to be requested for the construction of icebreakers and OSV, Arctic class tankers and gas carriers in the coming years. This will require from RS to maintain or even increase the number of experts with relevant qualification in ice class.

The development of new ice class ship designs will require an elaborate ice classification system and relative flexibility of the normative base. The rules of Russian Maritime Register of Shipping currently make it possible to design and construct the most innovative vessels. A good example of an innovative vessel construction to RS class is an oblique icebreaking salvage ship Baltika. The ship's asymmetrical hull shape and three azimuth propulsors enable the Baltika to make by a single pass when moving sideways a navigable canal up to 50 m wide. By way of comparison, the overall beam of a 'normal' icebreaker is under 30 meters.

How has your organization invested recently to enhance your product/services?

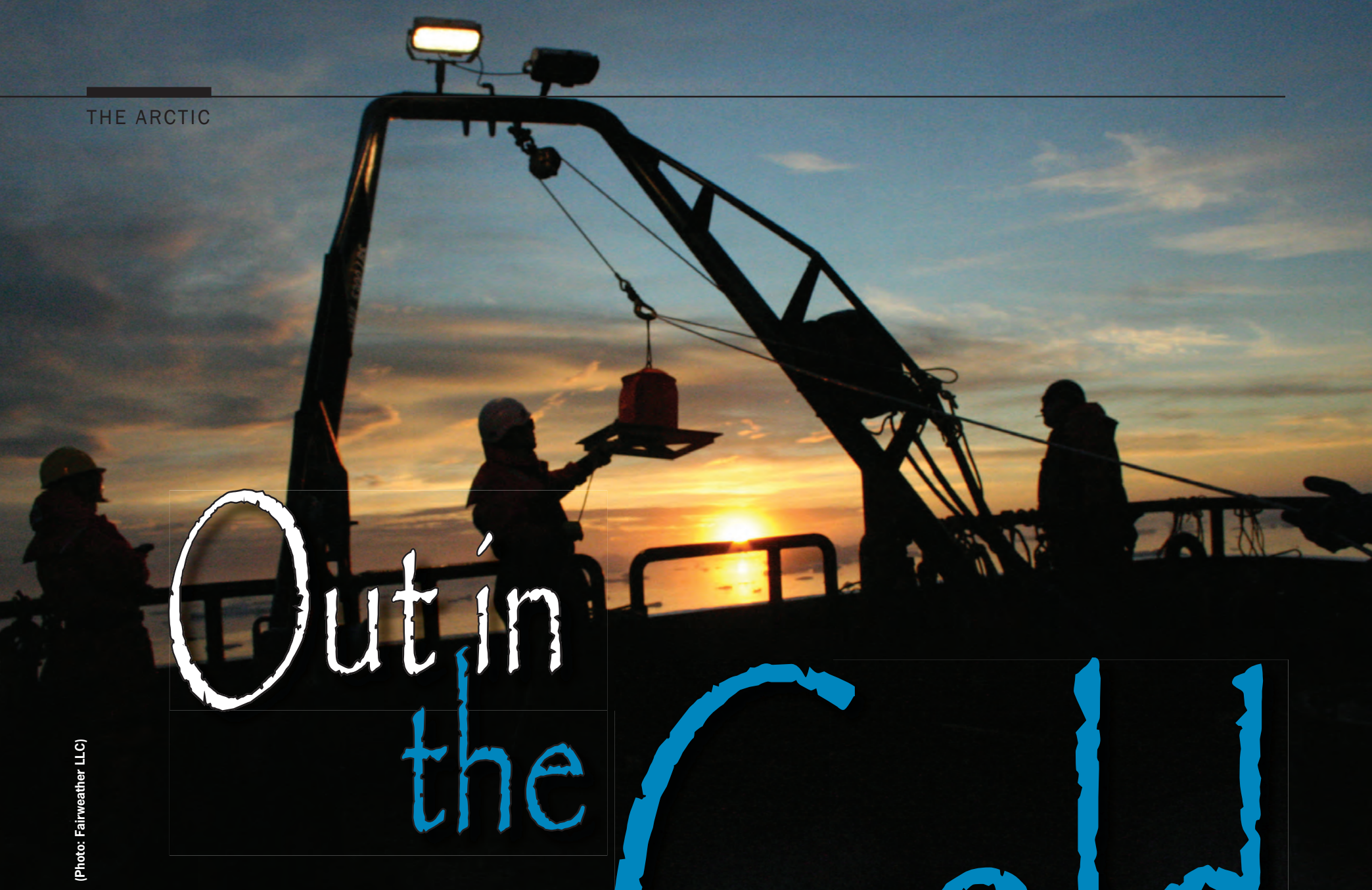
The use of so-called 'double-acting ship' concept leads to the fact that the ice strengthening of the aft of such vessels shall comply with the requirements applicable to the bow of the ship with corresponding ice class. The need to comply with the hull shape requirements complicates the design in case of the adoption of innovative design solutions (e.g. placement of three azimuth thrusters). RS has gained significant experience in the rationale for the estimated ice load in aft part.

The application of bulbous bow on Arctic ships is another challenge. Thus, further improvement of RS Rules' requirements to design ice load value for non-traditional shape of hull is considered as the one of the most promising developments.

During the past five years RS has substantially expanded the competence on Arctic LNG carriers: RS carried out the Approval in Principle for GTT methodology to calculate global iceberg loads and for membrane cargo carriage systems for Arc7 ship operation in the Russian Arctic and along the Northern Sea Route.

The new ice class gas carriers are mainly constructed at South Korean yards, therefore, in this country we opened Design and Newbuilding Support Center to render the full range of RS services for Korean shipbuilding market, including design review, surveys of ships during construction, certification of marine equipment.

We also carried out theoretical and practical training of our surveyors with due regards to the modern international experience. In 2012 to 2013, due to predicted activity growth in design and construction of LNG carriers for procurement of large Russian projects on LNG production (Vladivostok LNG, Yamal LNG, etc.), another two training seminars on LNG transportation by sea were held for surveyors at the RS Training Center. Further on, during 2013 to 2014 the trained engineers proceeded to a yard in South Korea for on-site training on LNG tankers under construction. Currently, their training is successfully completed. RS has by now trained about 70 experts as part of the program for instructing personnel to be engaged in state-of-the-art gas carrier survey and nowadays possesses sufficient number of highly-skilled experts in classification services during construction or operation of state of the art LNG carriers all over the world.



(Photo: Fairweather LLC)

Deployment of acoustic recorder in Beaufort Sea.

Out in the Cold

By Greg Trauthwein

As the polar ice cap thins and recedes, ship owners and oil companies alike eye the Arctic with dollar signs in their eyes. While the premise of a faster shipping route and untold natural resources sounds easy, the Arctic and its perils are anything but simple.

Though shipping cargo through the Arctic is hardly new, the practice historically has been the domain of Russian operators, ships and cargos, and the figurative cover on the Arctic is just now opening for global shipping companies. Commercial activity in the region, primarily shipping as well as energy exploration and production, has increased in step with the rapid thinning and overall reduction of the polar ice cap. To put it simply, there are more days of ice free waters than ever before in recorded history, and ship owners are carefully weighing technical risk versus financial reward of sending ships through an Arctic route versus traditional transit via the Suez Canal or around Africa. While the savings in time and fuel are well within reach, so too are significant risks, including a hefty dose of logistical, technical and human factors, in addition to international law and national political agenda. Physically it is undergoing a rapid, unprecedented change with ramifications not yet known. Commercially, it is seen as a final frontier, a rich source of natural resources and a means to make shipping companies more efficient and profitable.

New Day Dawning

Today's Arctic is at a literal and figurative crossroads. By outward appearance the Arctic is harsh, but in reality it is a fragile environment with a rapidly changing ecosystem. "70% of the volume of sea ice in the Arctic Ocean has disap-

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"My best advice: Listen to the advice of Atomflot and the Northern Sea Route Administration; **and have a Russian speaking ice pilot onboard."**

Felix H. Tschudi
Chairman and fourth generation owner of the Tschudi Group

peared, and more than 50% of the area of the Arctic Ocean is now open water," said Paul Arthur Berkman, Ph.D., Fulbright Distinguished Scholar and Research Professor, Bren School of Environmental Science and Management, Marine Science Institute, University of California, Santa Barbara. He was interviewed fresh from a early 2014 meeting he helped to coordinate at the London HQ of the International Maritime Organization (IMO) entitled Workshop on Safe Ship Operations in the Arctic Ocean.

While the scientific base of knowledge and commercial activity in the Arctic increases exponentially, there remain many unknowns and misconceptions.

"There are two misconceptions," said professor Oran Young, Bren School of Environmental Science and Management, Marine Science Institute, University of California, Santa Barbara (US), who is a renowned Arctic expert and a leader in the fields of international governance and environmental institutions. "One is that the ice is melting, and before you know it the Arctic is going to be ice free and you will be able to run ships anywhere you want without any problems or difficulties. That is not the case, and it will continue to be difficult to operate under Arctic conditions for the foreseeable future. Another misconception is the belief that once the Arctic opens up, there will be a mad scramble

(Photo Courtesy Tschudi Shipping Company AS)

for resources and this in turn will lead to geo political conflict. There is no indication that is the case."

Risk & Reward

Ship owners today are pressed to run cleaner, more efficient ships, and the primary reward in transiting cargo through the Arctic is the saving of time and money. "This (cost savings) is an extremely dynamic issue, but the main point is the time savings which equates to saving in bunker fuels and charter hire," said Felix H. Tschudi, Chairman and fourth generation owner of the Tschudi Group and Chairman of the Center for High North Logistics.

Though the savings in time, fuel and emissions are substantial, there are additional fees to pay, specifically the cost for Atomflot, the Russian icebreaking and escort authority, for icebreaking and safety escort through Russian waters – which is acknowledged as the best and safest route. "At the end of the day, it really comes down to dollars per ton delivered, the relative savings of using the NSR depend on the overall health of the freight market," said Tschudi.

With reward comes risk, and risk mitigation and management considerations are central to any maritime operation, particularly operations surrounding the business of energy production and transportation. First and foremost, operators mulling an Arctic route must consider the ice, as the ice in and of itself is a risk for the hull and the machinery. And while everyone talks about the polar melt and the ice cover vanishing, the area open for shipping is short already. The ice cover has been reduced radically, but this could simply be a cycle, and it could turn again. Outside of the ice, the risk list for Arctic operations is long.

Lori Davey is a lifelong Alaskan and resident of Anchorage, currently the General Manager, Fairweather, LLC. A member of the Edison Chouest Offshore companies, Fairweather, LLC was founded in 1976 by Sherron Perry with a focus on providing aviation weather observation services to remote regions of Alaska. In response to the growth of the emerging oil and gas industry, Fairweather expanded its operations to in-

"Work with local companies who know the area offers the best chance of success. **The Alaska Arctic is fragile and we must do our best to protect it."**

Lori Davey
General Manager, Fairweather, LLC.

-clude a variety of logistics and expediting services to serve both onshore and offshore operations. Today, Fairweather provides a wide range of advanced support services, including drilling and production services, medical services, meteorological and oceanographic forecasting, aviation and airstrip support, environmental research, remote sensing, scientific surveys and expediting and logistics services. In short, Davey has more than a fair share of hands-on experience with all matters Arctic, and she sees these three main challenges to companies new to the region:

1. Remoteness: "Prudhoe Bay is 750 miles away from Anchorage and it is incredibly remote. Prudhoe Bay has the only road system leading into the Alaska Arctic. Everywhere else has to be reached by airplane, boat, or snowmobile."

2. Communications: "Communications are getting better and there is cell service in most villages, but just outside the village it drops to nothing. Internet is also very slow and expensive. Where there is adequate bandwidth it is very expensive – around $1000/ mo per MB."

3. Extreme Temperatures and Weather: The North Slope has some of the harshest weather in the world. Temperatures often dip down to the -50 degrees Fahrenheit. There are phase conditions in the winter where all work has to stop till the snow stops blowing and visibility improves. Special personal protection gear is mandatory to be worn when operating on the North Slope. Often times, it is bulky and hard to work in.

In addition, other major risk factors include:

- the lack of infrastructure, including a lack of: port facilities, emergency oil spill response and remediation, and search and rescue;
- Navigation difficulties, including the dearth of adequately detailed charts of the region and dense fog when warmer air and colder waters meet;
- Availability (or lack thereof) of meteorological data;
- Limited knowledge of oceanographic conditions; and
- last, but certainly not least, the cost of ships themselves. The price for an Arctic-Ready ship can be more than a 50% premium versus similarly sized commercial ships on non-Arctic routes.

A key component of Fairweather's Arctic operations is the Deadhorse Aviation Center (DAC). Strategically located at Prudhoe Bay, DAC provides oil companies and their suppliers with an aviation command center to manage both onshore operations and Outer Continental Shelf (OCS) exploration and production activities on the Arctic Ocean and Beaufort Sea.

Tschudi said he considers the Russian Atomflot as the ultimate tool to manage risk in the region, as the organization not only breaks ice it also provides escort services (towing, hospital and assistance in the case of mechanical failure) and experience navigating the region successfully. "My best advice: Listen to the advice of Atomflot and the Northern Sea Route Administration; and have a Russian speaking ice pilot onboard."

Fairweather's Davey offers some timely advice too. "Work with local companies who know the area offers the best chance of success. The Alaska Arctic is fragile and we must do our best to protect it. It is full of resources in oil and gas, but it also provides the food source for our Native people. Fairweather operates in joint ventures with Olgoonik Corporation in Wainwright and Kaktovik Inupiat Corporation in Kaktovik. This allows us to leverage our business opportunities with the local knowledge to achieve shared success."

The Way Forward

The diverse and dynamic nature of the Arctic makes 'caution' and 'collaboration' keywords when determining the corporate course ahead. "Regarding investment in shipping cargos through the Northern Sea Route, I would carefully consider this step-by-step," said Mikko Niini, former CEO of Aker Arctic. "I would make investments that would give you opportunity to go there, but not necessarily a very large fleet. From the technical side, we have seen that everything goes most safely and efficiently when you go step-by-step."

Tschudi also recommends caution, noting that operational safety and success in the region does not happen overnight, rather through accrued knowledge and experience. He notes too that a key to the long-term success of the route will be the identification and securing of cargoes moving back from east to west. "If you could identify return cargoes that could generate freight income on the return leg to Europe this would make the route almost unbeatable on a round voyage basis saving on fuel, charter hire and delivery time savings," Tschudi said.

Collaboration is crucial, too, as national, corporate and scientific interests collide. Dr. Berkman contends that the challenges to be overcome are much too large for any one entity, and must include public private partnerships. Professor Young, agrees. "My sense (regarding potential for commercial activity in the

"We understand that there are estimates that **global ship traffic will triple in the next 10 years**. If we know that, we can begin to model what it might look like, which then translates into the infrastructure needed to support that increased traffic."

Paul Arthur Berkman, Ph.D.,
Fulbright Distinguished Scholar and Research Professor,
Bren School of Environmental Science and Management,
Marine Science Institute, University of California, Santa Barbara

Chart 1

Cargo from Kirkenes and Murmansk

Destination	Via Suez Canal			Via Northern Sea Route			
	Distance (nm)	Speed (knots)	Days	Distance (nm)	Speed (knots)	Days	Days Saved
Shanghai, China	12050	14.0	37	6500	12.9*	21*	-16
Busan, Korea	12400	14.0	38	6050	12.9	19.5	-18.5
Yokohama, Japan	12730	14.0	39	5750	12.9	18.5	-20.5

*Based on an actual voyage by M/V Nordic Barents from Kirkenes to Lianyungang, China, September 2010. (Source: Tschudi Shipping)

Chart 2

NSR: Europe to Asia

Oil and Gas from Murmansk

State	Through Suez	Through NSR	+/- days
Japan (Kobe)	12291 miles 37.1 days	6010 miles 18.1 days	-19
Korea (Busan)	12266 miles / 37 days	6097 miles / 18.4 days	-18.6
China (Ningbo)	11848 / 35.8 days	6577 miles / 199 days	-15.9

From Rotterdam to Asian Markets

State	Through Suez	Through NSR	+/- days
Japan (Kobe)	10969 miles / 33.1 days	7610 miles / 23 days	-10.1
Korea (Busan)	10754 miles / 32.5 days	7697 miles / 23.2 days	-9.9
China (Ningbo)	10336 miles / 31.2 days	8177 miles / 24.7 days	-6.5

- Source: The Navigation of the Northern Sea Route, Today and in the Future, Aker Arctic, Helsinki, Finland
- First Commercial Transit Voyage of a non-Russian flag vessel via the Northern Sea Route was MV Beluga Fraternity and MV Beluga Foresight in 2009 saving more than 3000 miles and 10 days versus transit through the Suez Canal (Source: The Navigation of the Northern Sea Route, Today and in the Future, Aker Arctic, Helsinki, Finland)

Chart 3

NSR: Total of Transit Voyages in 2010-2013

	2010	2011	2012	2013
Total Volume of Transit Cargo (t)	111,000	820,789	1,261,545	1,355,897
Total Number of Transit Voyages	4 (2 in Ballast)	34 (10 in Ballast)	46 (13 in Ballast)	71

Source: The Navigation of the Northern Sea Route, Today and in the Future, Aker Arctic, Helsinki, Finland

Arctic) is now that we are beyond the visionary stage. We are now moving into the stage of realism where there are an increasing number of practical, focused questions that the CEO has to ask, such as:

- If you ship some cargo west to east, is there a cargo to ship back east to west that makes the voyage profitable?
- Are there new ships and designs being developed that will be more capable of operating under Arctic conditions and what will the cost be?
- What are the issues for the insurance industry?

We are getting down to the nitty gritty stage where you start thinking of the concrete, substantive bottom-line types of considerations."

"We understand that there are estimates that global ship traffic will triple in the next 10 years," Berkman said. "Proportionately, what is the increase in the Arctic? If we know that, we can begin to model what it might look like, which then translates into the infrastructure needed to support that increased traffic."

The book on the Arctic is just now opening, but the plot will thicken soon.

How Much Does an Arctic Ship Cost?

The most significant shipbuilding project to support Arctic route operations is the construction of sixteen 300m long, 170,000 cu. m. Arctic LNG Carriers being built in South Korea by DSME for operation on the Northern Passage, with the first scheduled to come online in 2016 for regular transport between the Yamal LNG project based in the estuary of the Ob River and Asia. The ships are custom designed "Double Acting" vessels powered by three 15MW Azipods for a total power of 45MW. While final costs of the ships have not been publicly released, professional estimates suggest that each ship will cost in the region of $300m, a 50% premium versus the cost of a similarly sized LNG carrier. Increased cost for Arctic Ops is driven by:

- Additional Steel
- Additional Power
- Protection of deck equipment
- Ballast tank heating
- Insulation in housing

Floating Production

What's New in September 2014

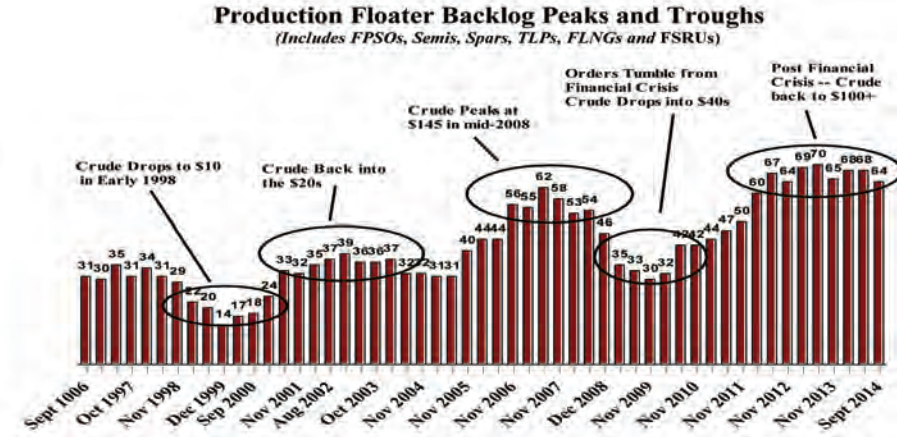
BY JIM MCCAUL, IMA

Today there are 324 oil/gas floating production units are now in service, on order or available for reuse on another field. FPSOs account for 64% of the existing systems, 79% of systems on order. Production semis, barges, spars and TLPs comprise the balance.

The oil/gas production floater inventory has increased by four units since last month. Three FPSOs were ordered in August. We also reinstated a partially completed production semi, Octobuoy, which we earlier deleted from the list of orders when the contract was terminated. This unit was being built for use by ATP in the North Sea. The builder, Cosco Nantong, took ownership of the partially finished semi after ATP defaulted. Cosco is now marketing the unit for completion as a production facility.

The number of idle units has grown to 17 FPSOs, 8% of the total FPSO inventory. This is an increase of one unit over last month. Rubicon Vantage finished producing on the Bualuang field off Thailand. Its lease ended in 3Q 2014 when a new fixed platform + FSO installation took over production. The FPSO will remain on the field until Oct 2014 and could have a redeployment contract lined up. Reuse on the Aje field is a possibility. 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 is the same as last month. In addition, 102 floating storage units are in service, on order or available. **(See Chart 1).**

Graph 1



Recent Orders

August was an active month for production floater orders. Three production systems were ordered, all FPSOs. Two are for use in Brazil, one for use in Indonesia. The total value of the three EPC contracts is around $3 billion.

- **Teekay/Odebrecht** in early-August was the successful bidder to supply a midsize FPSO to Petrobras for use as an extended well test unit on the ultra-deepwater Libra complex off Brazil. The lease is for 8 years firm with two 2 year extension options. If all options are exercised the unit will remain on contract through 2029. The lease rate is reported to be $543,590 per day. Included in the contract are two sets of mooring systems to enable the mooring to be pre-set on the next location where the FPSO will be used for testing. The 20 year old shuttle tanker Navion Norvegia will be used as the conversion hull. Hull/topsides capex is estimated to be ~$0.7 billion. With this order, Teekay now has two FPSO construction contracts in progress.
- **Bumi Armada** in mid-August signed a contract with ENI to supply a VLCC-size FPSO for use as the East Hub on Block 15/06 off Angola. The lease is for 12 years firm with options for 8 yearly extensions. During the firm lease period, the lease payment will average $684,930 per day. In the option period the payment will drop to $308,220 per day. An existing tanker will be used as the conversion hull. This is Bumi Armada's first VLCC-size FPSO. Capex for the project is in the area of $1.0 billion. Bumi Armada now has four FPSO construction projects simultaneously underway.
- **Modec/Schahin** in late-August was the low bidder on the tender to lease a VLCC-size FPSO for the Tartaruga field in the Campos Basin. The lease is for 20 years. Two contractors submitted bids. Modec/Schahin's lease offer was reported to be $780,000 per day. The competing offer from Bumi Amada/UTC was said to be $1,008,000 per day – $228,000 per day higher. Conversion of tanker is to be in Asia, topsides fabrication/integration in Brazil. Hull/topsides capex is estimated to be ~$1.3 billion. Modec now has four FPSOs construction projects at various degrees of completion.

Order Backlog – 64 production floaters are on order as of beginning September, midway in a range of order backlog that has prevailed since early 2012. **(See Graph 1).**

Floater Projects in the Planning Stage

There are 229 floating production projects are in various stages of planning as of beginning September. Of these, 58% involve an FPSO, 13% another type oil/gas production floater, 23% liquefaction or regasification floater and 6% storage/offloading floater.

Among new opportunities since last month, Petrobras is considering leasing an FPSO for use as a pilot production unit on the Libra complex in Santos Basin. It would serve as an interim facility between the EWT FPSO and the long term production FPSOs to be employed on the complex. The unit would have production capability in the range of 100,000 b/d. This would be a near term contract, should Petrobras proceed with the requirement. **(See Chart 2).**

Brazil, Africa and SE Asia continue to be the major locations of floating production projects in the visible planning stage. We are tracking 43 projects in Brazil, 49 in Africa and 39 projects in SEA – 57% of the visible planned floating production projects worldwide. Several large projects in Brazil and (less so) Africa will require multiple production units. Overall, 250 to 270 production floaters of various types will be required for the 229 projects we are tracking. **(See Chart 3).**

Around 13% of the 229 visible planned projects are likely to advance to the EPC contracting stage within the next 18 months. These 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 48 months. The remaining 37% of projects are less advanced in planning, with the EPC contract likely 4 to 10 years out.

Future Business Drivers for Equipment Orders

As indicated above, there is no shortage of floating production projects in the planning stage. But an investment decision is needed to transform these project opportunities into contracts for production facilities. In large projects, the investment decision is a huge commitment entailing billions of dollars in capital expenditure. Even small floater projects entail several hundred million dollars of capex.

There is a growing list of deepwater projects that have been recently deferred at the final investment stage. Gehem/Gendalo is the latest example. Chevron has decided to rebid (for the second time) the $2.5+ billion EPC contract for two production barges. Others include Statoil rethinking the planned $6 billion Bressay heavy oil project in the UK North Sea, Chevron to stop, at least temporarily, the $10 billion Rosebank project offshore the UK Shetlands Is-

lands and BP delaying proceeding with the $10+ billion Mad Dog 2 project in the GOM. Each deferral of a production floater investment decision has unique reasons – but all eventually come down to management not wanting to take the risk of proceeding. So a long list of projects ready to move to development is only part of the story. It provides the inventory of possible projects – but not the tempo of future orders. Ultimately, the pace at which potential projects will be transformed into orders for new production systems will depend on twelve underlying business drivers:

- Future growth in oil/gas demand
- Future need to find new sources of oil/gas
- Perceived risk of conventional supply disruption
- Future oil/gas price expectations
- Competitiveness of deepwater as a source of future supply
- Relative financial return fron deep water investment
- Capex budgets of oil companies
- Availablity of adequate drilling equipment for deepwater E&D
- Constraints in the supply chain
- Cost escalation in deepwater development
- Access to financing of deepwater equipment
- Major environmental incident involving deepwater production

All drivers have an impact on the number and timing of future production floater orders. A new floating production report out shortly examines each of these business drivers and provides a detailed forecast of production floater orders over the next five years (2015-2019). Details for the new IMA floating production report and the accompanying business intelligence database are available at **www.worldenergyreports.com**

IMA provides market analysis and strategic planning advice in the marine and offshore sectors. Over 40 years we have performed more than 350 business consulting assignments for 170+ clients in 40+ countries.

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Chart 1

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

(As of September 1, 2014)

	Total	Active	On Order	Available
Oil/Gas Production				
FPSO	216	161	38	17
Production Barge	10	8	2	0
Production Semi	48	41	2	5
Production Spar	22	20	2	0
TLP	28	24	4	0
Total	324	254	48	22
LNG Production				
FLNG	5	0	5	0
FSRU	24	13	11	0
Storage Systems				
FSO	102	93	8	1

Chart 2

Breakdown of Planned Projects by Type of Production System

(As of September 1, 2014)

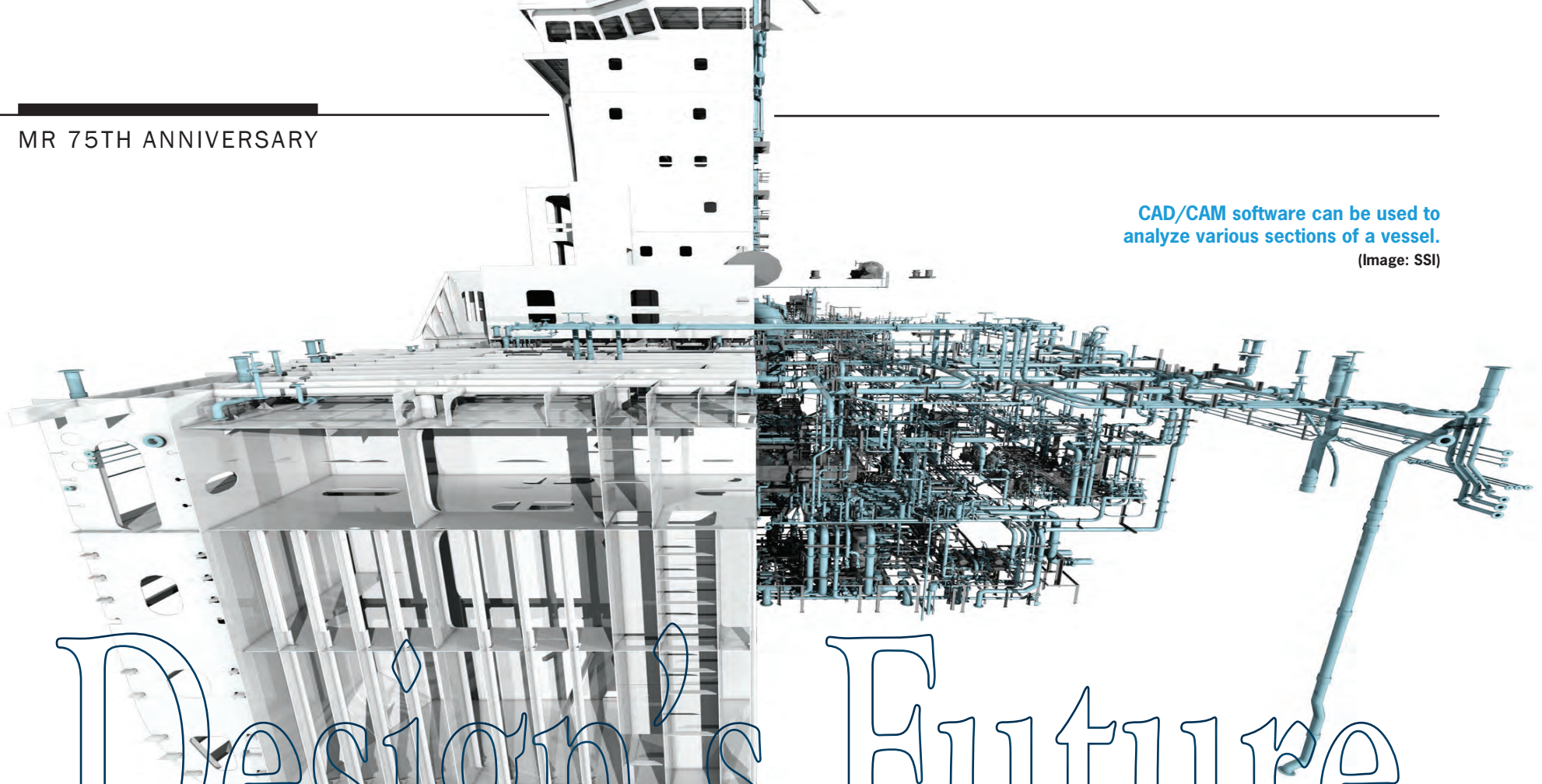
Type System	# of Projects
FPSO	133
Other FPS	29
FLNG	32
FSRU	20
FSO	15
Total	229

Chart 3

Breakdown of Planned Projects by Location of Field

(As of September 1, 2014)

Project Location	# of Projects
Africa	49
Brazil	43
SE Asia	39
GOM	24
No. Europe	23
Aust/NZ	16
Medit	10
SW Asia	10
Other	15
Total	229



CAD/CAM software can be used to analyze various sections of a vessel. (Image: SSI)

Design's Future

3D Modeling, Virtual Reality Wave of Design Future

By Patricia Keefe

Rooted in early computer-aided design (CAD) and manufacturing applications, design and construction software is firmly at the helm of most shipyards today, enabling the production of better designed, more efficient and consistently built ships produced with measurably less waste: less waste of time, materials, man hours and most important, money. The ROI can be substantial, and is traceable throughout the entire process, across all sub sectors such as project management, purchasing, materials, labor and build sequencing.

For example, in terms of production planning, "the same outfitting job being done in the workshop, when done at dry dock or in the final stages can cost up to 15 times more. The customer tells us that the more you can anticipate in the early stages, the more money you save," said Stephane Neuveglise, Product Business Manager at Aveva Group plc.

Rafael de Góngora, General Manager of Sener Marine, agrees "It's a matter of money: The earlier the decisions have the greatest economic impact."

It's estimated that virtually all first- and second-tier shipyards use some form of naval architecture and construction software – ranging from the old man of the design software market, rudimentary AutoCad, to more sophisticated versions of Autocad and even more feature-rich products offered by the small cluster of companies that dominate the market.

Key players include Sener, Aveva, SSI and Dassault Systemes.

In the first piece of this three-part series on ship-building technologies, last month we looked at how the movement of naval architecture from paper to computers has dramatically impacted and changed the process of ship design and construction for the better, where those changes have taken place, and what the payout for shipyards has been [*MREN* August 2014, "Soft Solutions: The Evolution of CAD/CAM].

This month's installation will take a closer look at some of the providers of the technology driving down the need for costly rework orders and in some cases, responsible for eliminating tedious and error-prone tasks of yesteryear, and talk to them about the changes they see cresting above the market.

SENER

To hear Sener Marine GM de Góngora tell it, competitors are many in the market for ship design and construction software – and they fall into one of two distinct camps: Ship design software, and general, typically AutoCAD-based CAD software that can be used for ship design.

"In the first group, we are not so many; maybe half a dozen, if we speak about companies with some importance," says de Góngora, positioning Sener as one of the three main vendors in the ship design CAD software market, and tagging UK-based Aveva as one of its main competitors. In the second group, the number of competitors is greater, and increasing.

FORAN, Sener's venerable offering in CAD ship design, was introduced in 1965 and will celebrate its 50th anniversary next year – an astounding milestone for any piece of software, especially today in an era where application life cycles often run three years or less. It is estimated that FORAN has been involved in the design and construction of over 1,000 vessels worldwide. It is currently used in more than 150 ship design offices and shipyards in 30 countries.

Longevity is actually one of the attributes of de Góngora's "first group." The key players in the ship design application market – Sener (58 years/Spain), Aveva (47 years/UK) and Dassault Systemes (33 years /France) - are all long-time players, with British Columbia-based SSI the youngest, notching 24 years in the business.

Also key to several of these players is a background in naval architecture and marine engineering. Like Aveva, Sener, for example, was founded by a marine engineer, Enrique de Sendagorta, and initially focused solely on marine projects. The company over time expanded into other industries, but its core ship design software was developed by Sener architects seeking to solve their own problems. Eventually, the company realized that it had a product that could be sold to other architects and ship yards, leading to FORAN's debut.

Of course, as de Góngora notes, the FORAN of yesteryear has nothing in common with the system the company is currently marketing, which was most recently updated in July (FORAN V7OR3.0). The technology has changed,

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"If you are in a shipyard that is not highly tech-oriented, you could see savings of 30% to 50%. If you take into account a state-of –the-art shipyard, the improvement is less. We are speaking about 10% in worst cases. But this is something. Ten percent in the price of a ship is many millions of U.S. dollars."

Rafael de Góngora, GM, Sener

Design software can do more than eliminate a task here and there. It can significantly reduce the required number of crew, saving a substantial amount of money over the life of the vessel.

Alain Houard, VP, Marine & Offshore Industry, Dassault Systèmes, maker of Catia design software and 3D and simulation applications.

obviously - think three-dimensional (3D) and virtual reality - but more important, the design process has changed as well

FORAN today is an integrated CAD/CAM/CAE system that can be used in the design, production and manufacture of ships. Subsystems run the gamut from hull structure to machinery, to outfitting, electrical and drafting and mechanical designs. "Expert add-ons" include a PLM link, virtual reality and Control Management. All information is stored in an Oracle database. Among other changes, the most recent version enables the visualization of the ship 3D model already generated in FORAN into a virtual reality environment, two areas Sener and it's competitors see as key to the future.

The Windows-based system comprises several application packages, a number of common modules (build strategy, 2D drafting, 3D walk-through design review, concurrent engineering), links with production equipment, interfaces to management systems and an integrated development environment. There are two major lines of business: the design of ships and marine structures, and the development of FORAN, its design and construction software that now boasts worldwide commercial success.

Key to FORAN's endurance, believes de Góngora, is its ability to provide a single solution from the first stage of the design to the complete assembly and delivery of ship, without requiring the assistance of any third-party software. While the company doesn't provide product lifecycle (PLM) management, it does provide a link to those products. "We are the only one who can provide a single solution," de Góngora claims.

The transformation of the industry, meanwhile, during FORAN's expansive lifespan, has been "dramatic," resulting in measureable benefits, according to de Góngora. "One benefit is time. This is very important in the ship building industry. We have shorter delivery times compared with 25 years ago, because the time required to build, assign and construct is much shorter."

This, despite the added complexity in ships being designed today. Even in the face of more complex ships, CAD design packages help ship builders to continue to win the race for shorter delivery times. More complex operations of the ship require more complex technology. And that complexity in a product, says Aveva's Neuveglise, helps drive the need for more 3D. For example, the more equipment in a given space, the more you need to be able to see in 3D to be able to navigate the area, and the earlier in the process the modeling is done, the better.

"Doing more in the same space of time is actually an advance," says SSI CEO Darrell Larkins, adding that today, it's not so much about being able to do the same thing more efficiently, but rather, about the ability to do more. Put another way, he said, "Software might let you do something a thousand times faster when what you are really trying to accomplish is 1,000 times more complex."

On top of the savings in time, shipyards can achieve a significant reduction in materials waste and cost because design software enables accurate fabrication information and in essence, guarantees no interferences. Scrap from construction of parts is then reduced to minimum.

So what kind of ROI are we talking about? "If you are in a shipyard that is not highly tech-oriented, you could see savings of 30% to 50%. If you take into account a state-of –the-art shipyard, the improvement is less. We are speaking about 10% in worst cases. But this is something. Ten percent in the price of a ship is many millions of U.S. dollars," says Sener's de Góngora.

Another way to tackle waste and push consistency is to enable information about modifications and the data collected in the PLM system to be sent back up the information chain into the computer-aided process planning (CAPP) system from the PLM package, something Sener and Aveva are working on.

"If you are building more ships of one class, the second ship is almost equal. The third and fourth are not the same – some modifications will have been made." Transferring those changes back down the line will enable those modifications to be made to subsequent ships far more easily, notes de Góngora.

Sharing that data more quickly, "I guarantee there will be more consistency between the phases of design than before," said Neuveglise

This is where Aveva touts the benefits of adopting the concept of lean manufacturing from the auto industry. Invented by the founder of Toyota, lean manufacturing is about how to be more efficient in production. It is based on no waste, respect of everyone and their job, and a continual feedback loop at all levels. It's the concept of providing feedback from production back to the design stage that really intrigues Aveva.

"Sometimes when doing a detailed design, you find something that is not easy to do, or which needs to be further fabricated. So production tells the guys in basic design, 'Don't do that anymore for future reference,' " says Neuveglise. It's even more important in shipbuilding because unlike automobile manufacturing, which is designed and built sequentially, in ship building, it's all done at the same time, which makes the process much more complex. "So if something is discovered in the detailed design phase, you need to tell the folks in basic design, and until recently, we weren't able to have this kind of feedback," he adds.

That will change in the next generation of ship design processes as software will need to address two issues, in de Góngora's view:

- Collaborative design on a global level. "The ship building industry is a paradigm of globalization," he says, noting that the design, various parts of the ship, the basic ship, the owners and suppliers typically are spread out around the world. "We need to keep working on a collaborative solution for

all these geographically-dispersed partners."

• Increased use of 3-D software, which traditionally is used more in product design, than in the earlier stages of the design. "This is important because the most important decisions in design are made at the earliest stage where you are defining all the main parts of the ship." All the decisions you make at that stage have consequences," said de Góngora.

SSI

Sener won't get any argument from SSI, which is a big proponent of 3-D software and any form of communication that leads to better design decisions made earlier in the process. In an April blog post, CEO Larkins crowned communications as "the most significant contributing factor to the success of ship yards." By which he means all the steps involved in the effective creation, sharing, dissemination and management consumption of information. "The shipyards who are good at determining not only how and when information will be shared, but also where, why and with who . . . are more effective and more successful," he explained.

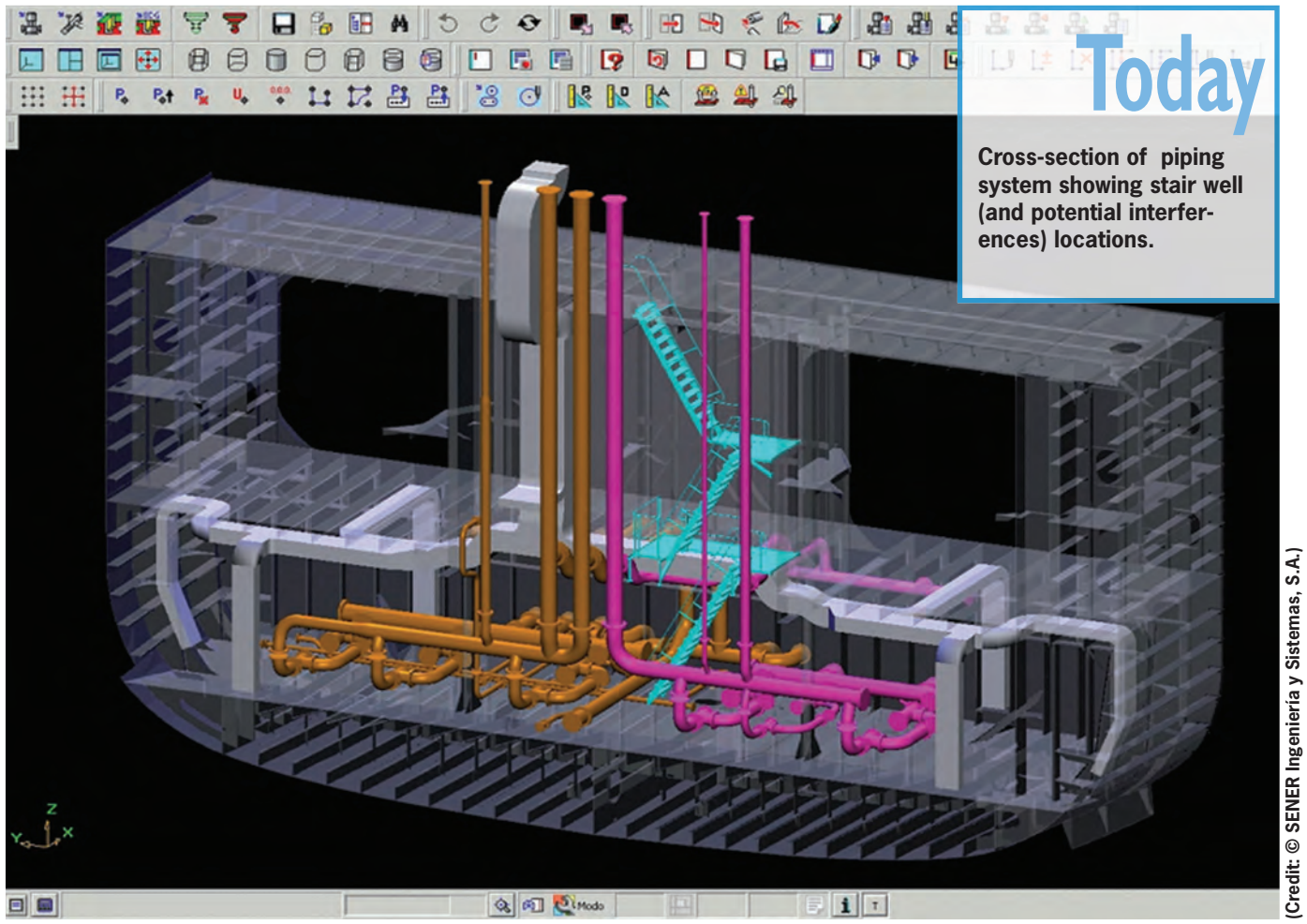
In fact, SSI, formerly known as ShipConstructor Software Inc., is all about three things:

• **Proudly Open Architecture.** Notes CTO Denis Morais in a July post, "I love the idea of keeping ShipConstructor 100% purely open and competing with our competitors solely on benefit to the users. There is not a single piece of information that ShipConstructor hold hostage in a proprietary format." SSI walks the walk on Open Architecture with its membership and participation in programs and study projects at the US National Shipbuilding Research Program (NSRP), The Autodesk Developer Network, Autodesk University, VIATeC, SNAME and RINA.

• **Fostering better communication, collaboration, and information flows,** as early and frequently as possible, with its customers, and between the various

(Credit: SENER archives)

1965 **José Manuel de Sendagorta, son of the founder, and Jaime Torroja, then GM of SENER Marine, presenting to the press at the 1965 launch of the FORAN System (an acronym in Spanish for FORmas ANalíticas, or Analytical Shapes), a CAD/CAE/CAM software package for designing and building ships.**



Today

Cross-section of piping system showing stair well (and potential interferences) locations.

(Credit: © SENER Ingeniería y Sistemas, S.A.)

"Doing more in the same space of time is actually an advance."

Darrell Larkins, CEO, SSI

stages of ship design and production, as noted above in Aveva's embrace of lean manufacturing.

• **And getting customers to understand that it's not just knowing what information to gather and where it's located, but knowing why you are providing it** that is really key. Over engineering, or too much information, can cloud an otherwise clear piece of instruction, and lead to mistakes that will have to be reworked.

The company is trying to move itself into more of a consultative relationship with its old customers and newer off shore clients. According to Larkins, SSI wants to look at the bigger picture a bit more, taking on issues like managing information flow while increasing its focus on providing services.

Spend a little time perusing the company's various blogs written by SSI executives, including Larkins, and the shift to bigger picture thinking is clear. And they want their clients thinking too. In particular, Larkins likes to "lift the curtain" on SSI's popular ShipConstructor package, and explain the business and technical thinking behind and impact of, the changes, approaches and upgrades in the product line, or point to an issue driving those changes, and talk about how to address it.

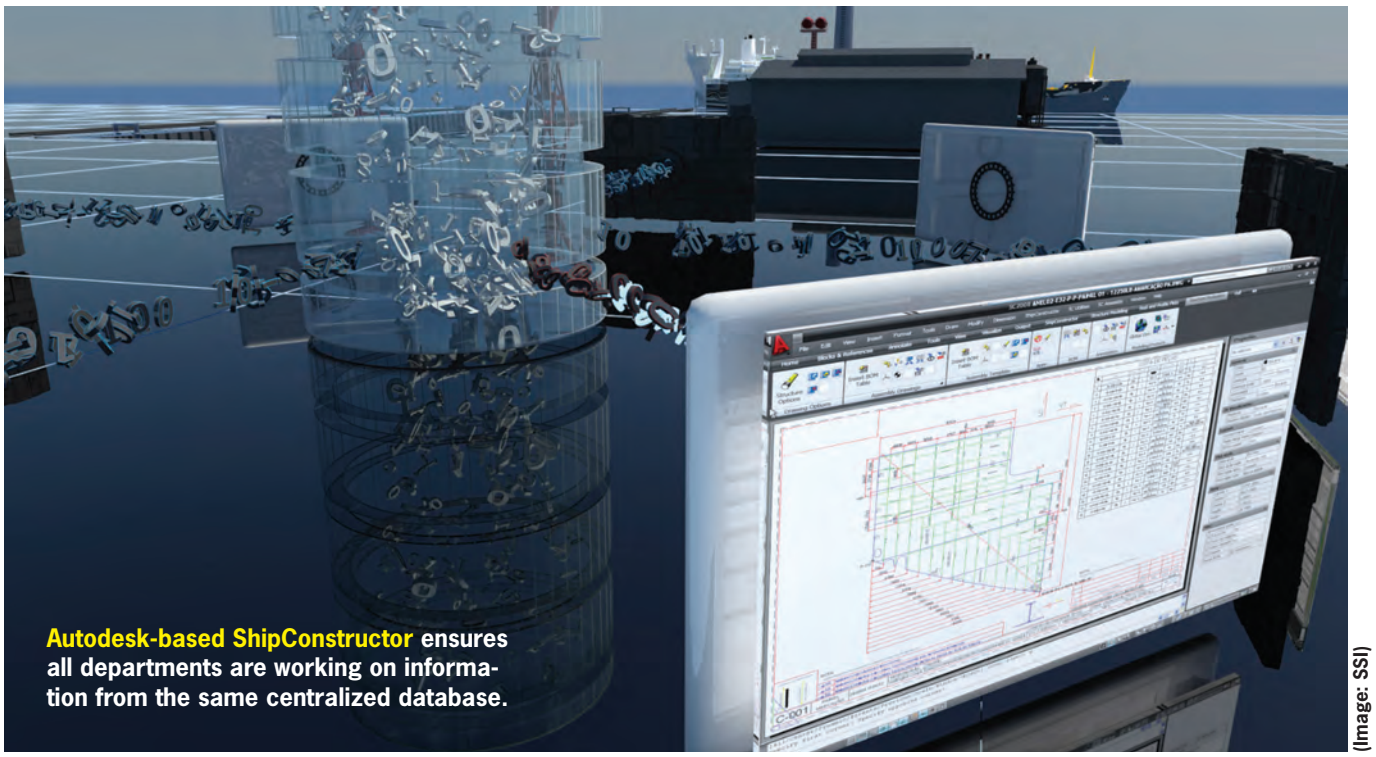
The company provides a lot of avenues through which customers can seek support or provide feedback, and recently added one more: Client Councils, which gather together user representatives from narrow industry sectors and regions, to advise the company on addressing their specific requirements. "Both technology and industry requirements are evolving quickly so our clients continually need to adapt," said SSI CTO Denis Morais.

The initial Client Council consisted of Vripack, Peters Shipyards, Royal Huisman, Vera Navis, Marine Technologies Ltd., BMT Nigel Gee, Mustang Marine, Skipskompetanse, and Pendennis. Some of the groups' requests were featured in the new release: the split plate command, a new fillet cut type for stiffener end cuts, increased pipe and HVAC connection tolerance, and the ability to create MarineDrafting views in other types of drawings. That's the kind of response that engenders loyalty.

Ship Constructor seems to turn up everywhere, often at shipyards and architectural practices that have been with the product since its early days as CAD-Link in the late'80s. Joe Comer, principal of Ship Architects, Inc., claims to have bought the first ShipConstructor license from founder Rolf Oetter in 1988, moving his design process off a mainframe onto a PC. Comer still uses ShipConstructor today. According to the company, the majority of U.S. Naval warships are now built with the SSI solutions. The U.S. Coast Guard also has taken notice, according to Morais, and is asking for ShipConstructor – compatible deliverables on bids for its OPC Program. SSI's flagship product, ShipConstructor serves the shipbuilding and offshore industry, and is an AutoCAD-based 3D Product Modeling and Production Planning CAD/CAM suite running on Microsoft's SQL Server. When announcing his appointment as CEO, Larkins stressed the company's commitment to delivering tools that are user friendly, scalable, easily adopted and implementable with minimal IT requirements. SSI combines support for

"Our belief is get the guys in the shipyard the right info, right materials and the right resources at the right time. To be successful (profitable) in ship building, you have to get it right the first time in production. It's what happens in the production phase that kills the ship yard."

Stephane Neuveglise, Product Business Manager at Aveva Group plc.



Autodesk-based ShipConstructor ensures all departments are working on information from the same centralized database.

(Image: SSI)

the native DWG platform with industry-specific standards, terminology and best practices, and the ability to share engineering data with other business processes and applications such as MRP, ERP or PLM tools. The company claims that ShipConstructor's Marine Information Model provides true Concurrent Engineering for the first time in shipbuilding CAD/CAM, enabling all engineering disciplines to work within a single integrated environment with associativity that extends to the production drawing level. A side benefit of SSI's support for Autodesk and other standards is that ShipConstructor is said to require little training and gives client a much broader labor pool.

AVEVA

Cambridge, England-based Aveva provides a family of integrated engineering design and 3D design, CAD products. The 45-year-old company is also focused on offshore clients, concurrent engineering and global collaboration. It sees its mission as enabling the creation and management of complex digital assets, allowing customers to work globally with less risk, shorter lead times and greater business efficiency throughout the lifecycle of their physical assets.

AVEVA Marine is a set of integrated applications provides engineering design and information management software to the marine and plant industries. This combination provides a level of technology integration, enabling collaboration with plant industry specialists on the most complex vessels or offshore projects, concurrent engineering, and supports highly collaborative "global virtual'' shipyard' projects.

Its naval architecture and hull design capabilities have been developed over more than 30 years in partnership with many of the world's leading shipbuilders. AVEVA Enterprise offers specialist shipyard resource management capabilities enabling an efficient and integrated shipbuilding process, from initial concept to final handover.

Aveva MARS is an enterprise resource management (ERM) package with modules including Material, Planning and Production.

Last month, Aveva launched Aveva Information Standards Manager (ISM), which governs asset information using a standards-based methodology.

This is the 2d in a three-part series on Ship design and construction. Next month, the final piece will examine the fleet management and operations software market, and how those applications can help owners and operators successfully reduce and control costs while protecting profit margins.

Caterpillar for Vessel Driving Power

Caterpillar's complete system solutions strategy

By Peter Pospiech

"Caterpillar Motoren is a German-American success story," were the opening words of Oswald Schöffel, CEO of the Caterpaillar Motoren GmbH, Kiel, Germany, in welcoming guests and select media to the Caterpillar Motoren Kiel facilities earlier this summer for a product presentation of the latest developments in MaK Medium Speed Engines. "The company has grown continually during the recent years and has gained with its innovative products a very good position in the market segments of the shipping industry, stationary power generation as well as in the oil and gas industry. This also applies for and specifically for our sites in Kiel and Rostock, which has, beside others, with construction and delivery of low emission marine engines for the cruise industry earned great respect by shipping owners and passengers."

Collaboratoin Nears Two Decades

In 1997 Caterpillar Inc., headquartered in Peoria, Illinois, acquired the former Krupp MaK Maschinenbau GmbH, Kiel (MaK) and changed the name into Caterpillar Motoren GmbH. Only two years later the company extended the Kiel site and acquired additional parts of the traditional company Dieselmotorenwerk Rostock (DMR). In the year 2000, after just 12 month of work and improvements of the test stand capacities, the manufacturing of the biggest Caterpillar engine series, MaK M43, has been completely transferred from Kiel to Rostock.

Since then medium speed four-stroke engines in the power range of 6,000 to 16,800 kW are manufactured at the site in Rostock-Warnemünde. To guarantee a long term growth strategy for large diesel and gas engines, the plant has been extended by four halls. Today, the Rostock Engine Center ranks among the most modern manufacturing plants in Europe.

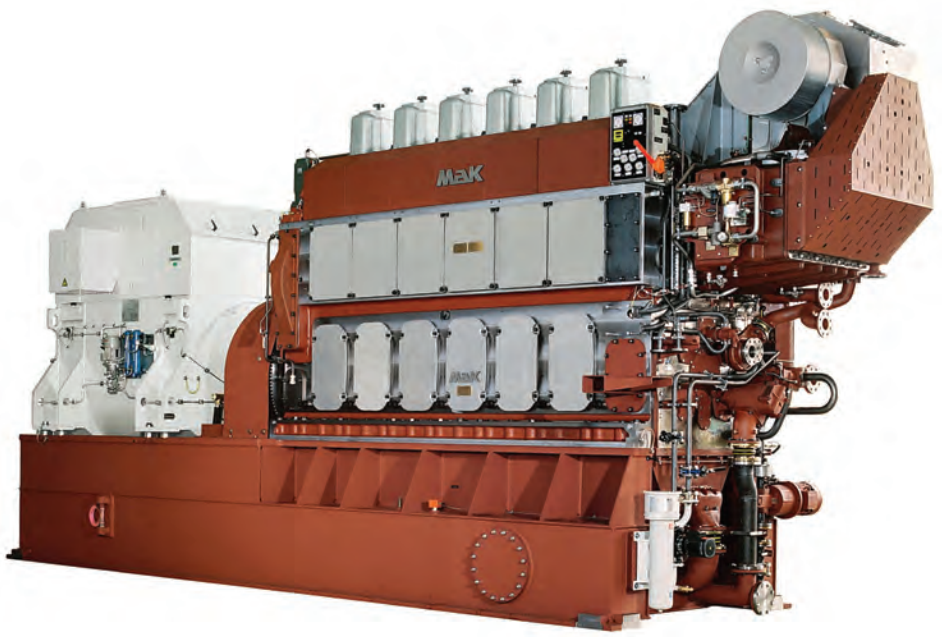
The 22,500 sq. m. plant is responsible for the assembly, testing, painting and delivery of the engine types VM32C, M43C and VM43C as well as the gas engines GCM34, mainly manufactured for the oil market.

"Marine engines out of Kiel and Rostock nowadays are on the high seas all over the world and they reliably perform their function," said Schöffel. "What has started in 1851 with the very first German sea-going steel steamer at the river Warnow, will be continued by Caterpillar Motoren Rostock GmbH."

New Developments

It was Dr. Frank Starke, Global Product Manager, Medium Speed Engines, who opened the product presentation with the words: "For every challenge, there is a suitable solution." Caterpillar Marine, which includes the MaK marine engine range manufactured at Caterpillar Motoren facilities in Germany, China and Brazil, is responding with a number of new developments, including the M32E engine for diesel-electric drive, the M25E engine and three dual fuel op-

Image above: Assembly hall of Caterpillar-MaK in Kiel.



The new M32E extends the M32C power-range to 5 MW and are available as 6, 8 and 9-cylinder inline versions.

tions - the M 46 DF, M 34 DF and M25DF (under construction).

"For each and every challenge you could imagine - whether it' s gas or dual fuel, marine diesel or heavy fuel engine, maximum power or part load optimized - Cat products will provide a suitable solution," Starke said.

"We have developed a range of retrofit and after-treatment solutions that apply the latest developments to engines in service, bringing them up to current standards, meeting modern emission levels and cutting running costs."

For vessel operators, reducing carbon footprint means cutting down on their traditional use of heavy fuel. Starke said: "As engine manufacturers move away from heavy fuel, most of their resources are being put into developing gas and dual fuel alternatives. The benefits of dual fuel are well-known: emissions reduction without after-treatment, fuel costs are all substantially reduced compared with MDO (marine diesel oil), and particulate emissions are down to almost zero, with the bonus of tax breaks for operators in some parts of the world. However, dual fuel options are not necessarily proven for the whole of the marine industry. Smaller vessels have a good reason to convert, but the long-haul operators need to use low-emission fuels only in controlled areas, such as the North Sea and the Baltic, not on the open ocean. There is no single solution that covers the whole world."

The offshore market is where much of the new technology is directed.

"It is one of the more active markets these days in the marine industry," said Starke, "So this technology is also fairly relevant to the offshore tug operators; they are involved in the same field of operation."

It is also a technology that has moved forward considerably in the past five years. Starke explained: "The biggest step we've seen in terms of technical development in recent years in engine controls."

The perception is that a gas engine has a slow response, but that is no longer true, and today's gas engines are comparable to their diesel counterparts. "We have to work with our customers to overcome the old perception, because our dual fuel engines have evolved so they are very competitive," Starke said. "And when you think about smaller engines in a more dynamic operating mode - like tugs for example - even medium-speed engines have their challenges in load response."

Other benefits of the new dual fuel engines are that they will be capable of running on different gas qualities, and CO2 and visible smoke will be substantially reduced, compared with diesel engines.

This is particularly important in tug applications, according to Starke. "Harbor tugs have a problem in that avoiding visible smoke affects how much fuel you can inject and therefore you have a limit in terms of how fast you can speed up the engine. A gas engine doesn't have that problem because it doesn't produce smoke as easily. In addition, MaK dual fuel engines can be customized to the client's operating profile due to modular control systems and flexible mappings."

"Caterpillar Motoren is a German-American success story,"

Oswald Schöffel, CEO of Caterpillar Motoren GmbH Kiel

"For every challenge there is a suitable solution."

Dr. Frank Starke, Global Product Manager, Medium Speed Engines

Production time from start to testing could be reduced from three weeks to five days.

Ongoing Developments on Existing Models

Alongside the development of new solutions such as dual fuel and gas engines, existing products are being continually improved and enhanced. Engine upgrade is one sector where the company is forging ahead with a range of new products. Starke explained: "One of these is the MaK M32E – based on the successful M32C engine design, built for the offshore market."

The first MaK 5MW engine in the 320mm bore segment, the M32E, shares the same footprint as its predecessor. As well as extending the M32C's power range to 5MW, the upgrade runs at 720/750 rpm, and features a more compact (and lighter) engine design. A part-load optimization kit is also available for diesel-electric/CPP and generator set application. "Slow steaming optimization is another new option we are introducing," Starke said. "It allows customers more flexibility in the operating mode while still being as fuel-efficient as we can be in that situation."

The 720/750 rpm concept will reduce generator costs, and there is a low smoke option that makes it particularly useful for harbor tugs and other vessels working in smoke-restricted zones.

Another upgrade is the M25C/E selective catalytic reduction (SCR) system. According to Starke is the M25 SCR for a pure diesel or HFO (heavy fuel oil) engine, and is an after-treatment system to bring the NOx levels down.

"Depending on which application the customer wants to use to operate his vessel, we would provide the technology which fits his specific case."

According to Starke, Caterpillar is watching the gas engine market very carefully and has already put its foot into this door. "You certainly have noticed that we shipped the first Cat 3500 Series marine gas engines from its factory in Lafayette in the U.S., with five of the Cat G3516 marine engines being selected for the world's first LNG-powered barge, in the Port of Hamburg. This engine is a spark-ignited gas engine designed especially to operate in commercial vessel applications. The solution is compliant with the strict Marine Classification Societies requirements, SOLAS, and is cer-

tified by Bureau Veritas. The gas-fuelled barge will be capable of providing up to 7.75MW of electric power. This solution is not only safe and environmentally friendly, but also very economical in regards to the lowest cost of operation."

But in spite of all those benefits, for a variety of reasons, pure natural gas solutions are not always the best option for some customers with the need to have fuel redundancy built into their vessel design. Caterpillar is carefully taking that into account. For those needs the company now offers the pure gas high-speed spark-ignited solutions, as well the high-speed and medium-speed dual fuel solutions to its marine customers.

Starke said that Caterpillar has been introducing natural gas engines to the marine market 'from the top down,' starting with large and medium-sized engines under the MaK brand. While the first M46DF engines have already been shipped, the next smaller bore engine, the MaK 34 DF, which has roughly 3-5MW of electrical power, is undergoing the final tests of a rigorous development programme. The M34DF is a very suitable dual fuel solution, in particular for anchor handlers, where the diesel version, M32C, is already enjoying an outstanding reputation of durability and reliability.

Since 2011 Caterpillar owns also the well-established Mannheim company MWM, founded by Carl Benz in 1871, and became integral part of Caterpillar. Over the past two years, Caterpillar turned the Mannheim location into its global Gas Center of Excellence. Starke said "If the shipping industry during the next years will change rapidly to natural gas fuel, it might be possible that we are going to marinize the MWM gas engines for the use in vessels."

Aside from the latest developments on diesel and gas engines, it cannot be ignored that the economical situation for the Kiel engine production plant is not promising. In the beginning of May 2014 a press report shocked the employees of the plant: Caterpillar intends to transfer the production of their big engines to Rostock and Asia. "With this, the company thus responds to the ongoing weak demand for marine engines and the rising cost pressure," said Schöffel.

The new strategy provides that the engine series M20C and M25C will be produced in Asia instead in Kiel – to be "closer to the biggest market for such engines," said Schöffel. The engines made of Kiel will be installed in vessels on shipyards for owners around the globe.

"The assembly of the larger and more complex engine series will be concentrated at the site in Rostock – this also to maximize the site performance," said Schöffel.

With that manufacturing of the engine series M32 soon to be shifted completely to Rostock. Caterpillar Motoren Rostock GmbH produces already one type of this engine, additionally the engine type M43 and one gas engine are produced there. For the time being around 100 employees are working here. As announced by the company, Kiel shall be further on the worldwide competence center of the U.S.-concern for marine engines and engines for the oil industry. Also administration, design, engine research and remanufacturing of engines will remain in Kiel. In addition, components for the Rostock engines will be produced in Kiel, and also the foundry (Caterpillar Castings Kile GmbH / CCK) will stay in Kiel.

Waterjets
Manufacturing Comes Stateside

Thrustmaster's deal with DOEN brings waterjet manufacturing to the United States.

By Eric Haun

Marine propulsion and thruster manufacturer Thrustmaster of Texas, Inc. announced a deal earlier this year to acquire the technology of DOEN, an Australian designer and manufacturer of waterjet propulsion systems. The deal is significant in that it makes Thrustmaster the only producer of commercial waterjets in the United States, helping the Houston-based company to expand upon an already strong line of commercial marine propulsion offerings. One of only five marine waterjet manufacturers worldwide that builds waterjets up to 4,000 kW, DOEN has been building waterjets in Australia four nearly 50 years. Spurred by a deteriorating market for manufacturing in Australia, the company ventured out in search for international partners to produce and market its products in other regions, ultimately landing a deal with Thrustmaster.

An agreement between DOEN and Thrustmaster was reached after roughly a year of planning between DOEN's Director Mark Peters, DOEN's Director and Chief Engineer Timothy Udvary and Thrustmaster's founder, president and CEO Joe Bekker. "DOEN approached Thrustmaster, and Thrustmaster acquired the exclusive rights for manufacturing the full range of [DOEN's] products," Bekker said, explaining, "Thrustmaster and DOEN work closely together like hand in glove."

Thrustmaster founder, president and CEO Joe Bekker (middle) seals the deal to bring waterjet manufacture to Texas.

The deal, which Bekker said required Thrustmaster to invest "many millions," sees Thrustmaster market and build waterjets under its own name, although the products will be interchangeable in whole and in parts with the DOEN waterjets made in Australia. Following a $40 million investment into its 200,000-square-foot manufacturing plant in 2009, Thrustmaster is again expanding its manufacturing facility, this time to 250,000 square feet, adding more CNC machining capabilities, in-house paint capabilities and warehouse storage to stow an inventory of smaller jet sizes. The company also intends to add 40 employees to its current workforce of 250.

The partnership enables Thrustmaster to hold exclusive rights for sales and support of waterjet products in the Americas and Europe, using waterjets and parts built by Thrustmaster in Houston, Texas, while DOEN will continue to serve markets in Asia, Africa and Australasia with waterjets produced in Australia. Each waterjet is supported by Thrustmaster's global network of sales, spare parts, service and support that includes locations in Houston, Louisiana, Brazil, Europe, Dubai and Singapore.

For Thrustmaster, the deal comes at an opportune time Bekker said. "Thrustmaster has been growing fast over the last 10 years, primarily in the large azimuth thruster segment, like drillship and semi-submersible applications," he said. "The drillship market has cooled off, and we needed a replacement market to keep our factory busy. Waterjets for commercial and military applications fit our business strategy and nicely complement our existing product lines."

The initiative strengthens Thrustmas-

ter's overall product and service offering. Bekker explained that the company's propeller thrusters and Z-drives fill the need for slow speed propulsion applications up to about 15 knots, while the waterjet product line expands the manufacturer's range, primarily filling a fast speed niche for applications of 20-50 knots. Thrustmaster's propeller thrusters range from 26 to 8,000kW and its waterjets range from 100 to 6,400kW.

The Thrustmaster DOEN waterjet lineup includes:

- **100 Series Waterjets** *are available in seven model sizes ranging from 100kW to 900kW to accommodate vessels from 6m up to 20m. Supported by simple mechanical and electronic control system options.*
- **200 Series Waterjets** *are available in four model sizes ranging from 400kW to 2,500kW to accommodate vessels from 15m up to 45m with stainless steel jets supported by a complete range of electronic controls with joystick docking.*
- **300 Series Waterjets** *are available in two model sizes ranging from 1,300kW to 4,000kW to accommodate vessels from 30m up to 60m with stainless steel jets supported by a complete range of electronic controls with joystick docking.*
- **New 400/450 Series Waterjets** *are available in two model sizes up 6,400kW to accommodate large vessels with a complete range of electronic controls with joystick docking.*

Thrustmaster's entire product lineup is designed and manufactured in-house by a complete engineering department for mechanical, hydraulic and electrical design. For 30 years, the company has provided thru-hull azimuthing thrusters, deck-mounted propulsion units for barges, retractable thrusters, transverse tunnel thrusters and the patented Portable Dynamic Positioning System to the offshore and marine.

"Thrustmaster has been the leading supplier of bow thrusters for Fast Supply Vessels (FSVs) for many years already. The market for FSVs is growing fast, with vessels being built in the U.S. Gulf of Mexico region, Brazil, France and other areas," Bekker said, adding, "There is a growing tendency toward powering these vessels with waterjets."

Bekker continued, "Most of these vessels have dynamic positioning (DP) capability. Thrustmaster wants to provide complete propulsion and DP solutions for FSVs by offering waterjets, bow thrusters and control packages from a single source. This reduces risk for the shipyard, facilitates easy integration with the DP system provider and it simplifies and accelerates commissioning, startup and sea trials where one Thrustmaster service engineer can do it all. For the vessel operator, it means that they only have to deal with one supplier for repair parts and services."

Bekker said he also sees promise for U.S. government and military waterjet projects: "Another substantial market for waterjets is the U.S. Government, including the U.S. Navy," he said. "Thrustmaster has always had strong ties with the U.S. Navy. Being able to get competitively priced waterjets produced and supported in the U.S.A. is quite attractive to the Navy."

(LLNL Photo)

The Portunus Concept

The mission of the Lawrence Livermore National Laboratory (LLNL) is to strengthen United States' security through development and application of world-class science and technology. LLNL seeks to enhance the nation's defense; reduce the global threat from terrorism and weapons of mass destruction; and respond with vision, quality, integrity and technical excellence to scientific issues of national importance.

By Hank Glauser

Principal Investigator, Global Security,
Lawrence Livermore National Laboratory

The Portunus concept embodies each of these objectives by thoughtfully and methodically developing technologies and strategies that address desired improvements in our security strategies. What may be unique about this concept however, is that we would accomplish this objective while enabling the U.S. to be the world leader in efficient goods movement.

Our current defense in depth strategy uses a variety of programs such as the Container Security Initiative, C-TPAT, and electronic manifest submittals for screening in advance of arrival. Several reviews by government and non-government agencies have highlighted some weaknesses in these programs. Given the current capabilities of our adversaries, these programs however may be sufficient to provide protection. That may not hold true for the future.

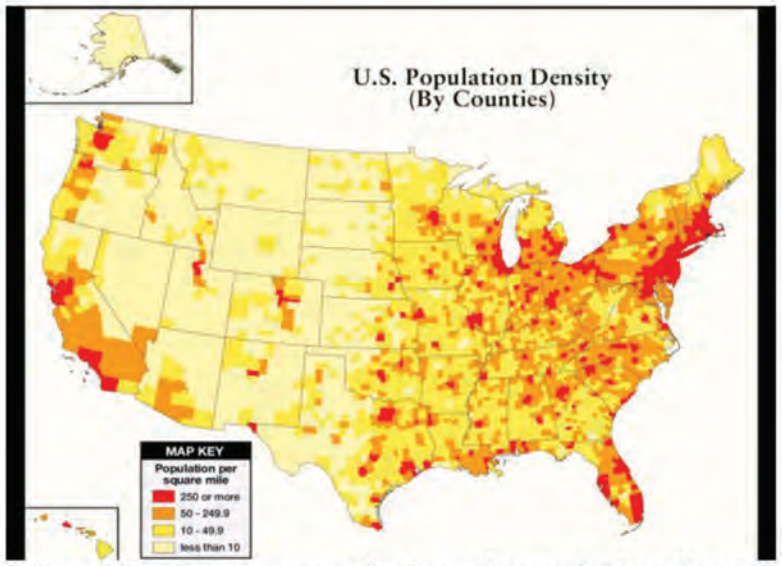
Learning from the Cold War, we understand that our adversaries can use our need for security as a weapon. It costs relatively little for a terrorist to execute an attack on the U.S. The protection against such an event consumes comparatively enormous amounts of resources. Some of those resources are directed overseas and necessitate a reliance on foreign governments for our protection.

If we can turn this dynamic around, so that our security process actually strengthens our economy, then we win this battle in the war against terrorism. Inspection of freight offshore but within the control of the United States is a tough goal. It is difficult for two reasons: (1) It is thought to be an economic poison pill, and (2) It may be technically unfeasible. Clearly, any offshore port strategy must make sense for business if we expect any credibility in its adaptation.

With this at the forefront of LLNL's planning, the Portunus concept is designed to inspect up to 100 percent of transoceanic vessels, containerized, bulk freight and private craft before they get to U.S. ports by establishing a series of state-of-the-art offshore ports.In so doing, we can provide protection and improve port operations by decreasing freight offload times by 30 percent or more, improving intermodal connectivity, and allowing the most efficient movement of goods to consumers across the U.S.

Preliminary work shows this can be accomplished while providing benefits for the environment, domestic employment, infrastructure protection, and government finances.

Portunus is a technology development project that evaluates and optimizes floating and fixed structures for offshore use. These structures are modular in design, start out small



Graphic showing correlation of population density and waterway access.Population density image from U.S. Census Bureau.Commercial Waterways graphic from U.S. Dept. of Transportation.

These offshore ports can couple the most efficient way to move goods internationally (ultra-large containerships), and the most efficient way to move goods domestically (short-sea shipping), **with an efficient port that can offload eight 18,000 TEU ships simultaneously in 36 hours.**

Pictured: Portunus showing interface of triple-pick cranes and automated guided vehicles and automated stacks in the background.
Inset Photo: Triple-pick crane moving 6 TEU.

(LLNL photo: Inset photo courtesy ZPMC)

and can be utilized for other ocean industries while in the development cycle. As the security risk grows, so do the capabilities of the offshore platforms. From a mechanism to offload, inspect and reload freight offshore from a single ship, to a large trans-shipment port servicing many ships.

In its most advanced stage, the Portunus trans-shipment port has distinct sections. **The first section serves international shipping.** This is where freight is offloaded and exports are loaded onto large ocean-going carriers. Containerized freight is then moved by automated guided vehicle to the next section. Bunkering, power, maintenance and repair support is provided along with hospitality services.

The second section is the security and inspections section. A security screening for human trafficking, radiological/nuclear material, chemical/biologicalweapons and contraband, such as explosives and drugs, is performed here. Advanced imaging and detection technologies, currently in development, are paired with high-speed computational capabilities and data warehouses

The Portunus concept is designed to inspect up to 100 percent of transoceanic vessels, containerized, bulk freight and private craft before they get to US ports by establishing a series of state-of-the-art offshore ports.

to compare against electronic manifests and historical records. This data can be used as an operational aid to screeners minimizing false positives and negatives.

Throughout the process of offloading and inspection, a logistics program assigns the container to a location in a stack on the domestic section of the port. Freight in this section is staged for trans-shipment onto smaller ships that optimize transit to a domestic port for the most efficient delivery possible.

This trans-shipment port has advantages beyond security. Given the importance of protecting our coastal population centers from a WMD attack, providing for more secure borders from human trafficking and smuggling, and maintaining the resiliency of our critical infrastructure is important, we also want to see where the economic benefits come from.

These offshore ports can couple the most efficient way to move goods internationally (ultra-large containerships), and the most efficient way to move goods domestically (short-sea shipping), with an efficient port that can offload eight 18,000 TEU ships simultaneously in 36 hours. The process can move the sorting of freight that now occurs after cargo enters domestic ports, to offshore. This allows freight to be "packaged" for delivery to domestic ports nearer to final destinations or to areas with efficient intermodal connectivity through a hub and spoke distribution system.

Faster turn-around time for the larger ships allows more trips per year and more time at sea, increasing profits for ship owners. The faster processing of freight, hub and spoke distribution, and concurrent customs inspection allows for the faster delivery of freight. An economy of scale is achieved when new technologies are developed. Implementation and investment occurs at relatively few offshore ports instead of significant investments duplicated at all major ports in the U.S.

Technology development of offshore platforms provides economic growth and capabilities in vital industries, such as shipbuilding, alternative energy, desalinization, aquaculture, and LNG exports. Offshore platforms also facilitate access to remote areas like the Bering and Beaufort Seas, which opens up possibilities for artic shipping routes and port expansion.

Domestic job creation is achieved by strengthening our merchant marine and shipbuilding industries. Along with this are collateral benefits of support industries and services along with additional tax revenues from domestic activity. Overseas spending is reduced because we can redirect existing spending to domestic needs.

Using a study conducted by the United Kingdom, by inspecting 100% of inbound freight, additional government revenues are estimated of about $2 billion per year with an accurate assessment of imported goods.

Currently, larger ships make one or two stops at major ports, and freight is moved to regional distribution centers by truck or rail, bypassing smaller ports. In the Portunus scenario, smaller ports and ports with good intermodal connectivity provide an advantage for goods movement to their regions and remain vital because smaller craft can move directly from the offshore platform to that domestic port.

In addition to security and economic benefits, environmental benefits are achieved in many areas. As an example, by keeping international ships offshore we can minimize environmental impacts such as invasive species. The need to maintain deep harbors through increased dredging is minimized because the larger ships won't move into most ports. By using a more efficient mechanism of transport, air pollution and fossil fuel use are minimized. This process replaces much of the long haul truck traffic currently congesting freeways with barges and smaller ships able to navigate coastal and inland commercial waterways. This also reduces traffic and freeway maintenance needs.

The natural skepticism that this game-changing technology invokes is understandable. That is why the Lab has worked with ports, economists, universities, merchant marine, shipping companies, engineering firms specializing in offshore structures, terminal operators, and technology companies, among others to provide a strategy that makes sense. The first objective of the concept is to evaluate associated technologies.

Concentrating on computer-aided design and simulation we will evaluate technologies that can be applied for the construction of offshore platforms of various sizes to meet specific mission needs at relatively low cost.

Interim steps in prototype development will help generate private investment into new industries for the U.S. economy. Ultimately, we may be able to produce offshore structures capable of processing and screening commercial maritime and private transoceanic craft.

In addition to a technical feasibility study, a detailed economic analysis will need to be performed not only concentrating on the costs of capitalization and operations, but on regional and business sector impacts. These studies will necessarily integrate with the technology study to provide operating and design parameters.

The last front in this feasibility assessment is the legal and regulatory framework that will be applied. All three fronts will need to be interlinked and coordinated.

The development of these technologies on the scale required will take some time. Too fast an implementation will cause unnecessary and unwanted turbulence in a critically important economic cornerstone of the U.S. economy. Too slow an implementation runs the risk that we may not have a sufficient strategy in place to protect ourselves, without undue economic hardship, when our adversaries have a known capability of delivering a WMD to U.S. soil.

Vice Adm. William Hilarides
Commander, Naval Sea Systems Command

By Edward Lundquist

Vice Adm. William Hilarides, the commander of the Naval Sea Systems Command (NAVSEA), recently spoke to a small group of reporters about his vision for NAVSEA and the challenges and opportunities he faces. A decline in the number of skilled Sailors able to conduct repairs onboard their ships; an aging civilian workforce; balancing capability with affordability and achieving commonality are priority issues for Hilarides and his staff.

To reduce the total lifecycle cost of its ships, the Navy eliminated some sea duty positions for Sailors on ships in the late 1990s. Hilarides says the Navy's reduction of personnel on ships, their associated training, as well as eliminating subsequent shore assignments where they provided technical support may have saved some money, but had a negative effect in the long run.

"We went through a period where downsized the size of the crews. I would say we probably went a little too far. We took them out of the equation to a great measure, and we have to put them back in. So we're putting back into the engineering departments on most of our ships enough people so that the Sailors can learn how to maintain their own ship. That actually makes it more resilient from a war fighting perspective. When you're in battle, and damage occurs, you want to be able to fix it yourself," Hilarides says. "We still have to help our Sailors to be able to work on their own ships."

"What makes chief petty officer a real technical expert is working on the equipment. So we have to re-empower them in that," he says. "This will help with that maintenance burden, and so lower the cost of an individual availability; make the ship more resilient; and, frankly, it'll make happier sailors. They join, generally, to learn technical skills and not letting them work on their own equipment is really, in my personal opinion, denying them what they signed up to be in the Navy for—to learn those hard technical skills. We have to make sure we fulfill our part of that bargain."

Hilarides says the Navy has reestablished intermediate maintenance activities inside the regional maintenance centers, and that will provide a path for that second class petty officer who can start taking his equipment apart. "When he goes back to sea as a first class, he's had more knowledge and expertise."

"An amphibious ship has 10 fire pumps on board, and it makes a mess when the seals on one of them begin to leak. 20 years ago the repair department would come down, lift the casing, figure out what was wrong, replace bearings and seals, align it, put the casing back on, seal it, test it, and put it back in service on the ship," says Hilarides. "Today this job is done by an outside contractor. So if your sailors learn about that pump, then go ashore and work on that pump, then come back as the chief or the first class of the division, they have a chance to be competent to take on that repair and execute it successfully."

"To get a new recruit through A school, onto a ship where he or she is actually working on their equipment, then ashore to that IMA to learn more, and then back to a ship as a chief petty officer, that's 10 or 15 years," says Hilarides. "It's a slow rebuild."

Hilarides says that NAVSEA and the naval shipyards have a senior workforce, with many workers eligible to retire.

"There was a period of almost 10 or 15 years where we really didn't hire, and it has created a "demographic hump" where we have a lot of people 30 and younger, and 55 and older, a pretty good valley in between," he says. "The older workers will retire when they reach that "sweet spot" in their retirement program. So they're leaving at a steady, predictable rate. But when that 55 or 60 year old worker walks out the door, they walk out with 35 years of experience, and somebody with 15 years' experience has to take their place. So we need to capture the best practices for modern knowledge management, and accelerate the learning of this person with only 15 years' experience."

Hilarides sees both a threat and an opportunity. "We're partnering the 35 year olds with 55 year olds to capture that knowledge and share that journeyman experience. The threat, of course, is that somebody walks out the door with the knowledge that only they have and that you can't get any other way. And generally, we find that when they walk out, there's some system that's in its 32nd year, a 688-class high-pressure brine pump, and there's one person that still knows how it was designed and how to fix it. We make sure we keep a good tab on that person so we know where they went in their retirement, knowing we can get them back for brief periods. The opportunity there is why do we still fix it that way? And is there a better idea? That young person coming up without some of those blinders may have a better way to do it."

Modernizing and Maintaining

Combatants usually get a mid-life modernization to bring their combat systems up to date, but not always at the same time as they repair the hull, mechanical and electrical systems. It's a daunting task, Hilarides says. "When we go to modernize at the same time we're doing maintenance—where we take a ship offline for up to a year, and you want it to come out ready to go on several deployments with all the best stuff—you have this very large package that includes tank painting, main engine overhauls, all that sort of really hard stuff, at the same time that you are putting a new network on it, and a new radar on it, as with Aegis modernization. We had treated those as two separate things that happened sort of

Why do we have 247,000 types of valves on ships?
If there's a valve we repair every quarter, that valve should be common across every ship in the fleet so that we get the economies of scale for production and repair.

independent of each other on the same ship, and as a result, that was making it really hard for us to get our avails done well. And so now we're integrating those much better. Doing maintenance and modernization requires good solid planning and contracting. We will continue to have to balance how much modernization we can afford, but the life-cycle maintenance has got to be done."

Hilarides says that as NAVSEA and the Navy strive to institute a culture of judiciousness and affordability, commonality is part of that equation.

"Why do we have 247,000 types of valves on ships? If there's a valve we repair every quarter, that valve should be common across every ship in the fleet so that we get the economies of scale for production and repair. If that valve never gets repaired in the 35 years of a ship's life but once, commonality doesn't matter. We'll pay that one-time cost to go do that repair. We work on air conditioning plants all the time and we have a LOT of different air conditioning plants on all our ships. So they're a perfect target for a commonality initiative," he says. "We can get economies in acquisition, training, repair and operations."

Hilarides has created a new position on his staff, the director of acquisition and commonality. "We've stood up a directorate, and they're on the trail of some really good things, including finding examples where we have one spec for production of a valve that gets interpreted by ten different organizations, both inside my life lines and out, such that the valve manufacturer produces 10 different packages, paperwork packages, to go with the valve he manufactures exactly the same way. There's savings in that. So we're going after that. I think Rear Adm. Tom Kearney and his team are off on the right track."

Balancing Capability & Affordability

Affordability is directly related to requirements, and managing risk, Hilarides says. "In our culture of affordability, we have good, hard requirements discussions with the Pentagon. Over the years, I've looked at requirements and acquisition as a partnership. There are checks and balances in that. Not every requirement is a good requirement. With early requirements, changes are very easy, while late requirements have to be a very high standard," he says. "We have to go make sure we're having the right conversation with our requirements authorities—of which there are many—to make sure we have the right cost and capability balance for what we deliver."

"When we talk through the requirements, we have to look at the cost," Hilarides says. "If you have to be able to make 8 knots with moderate battle damage, there's a couple of ways you can do it. You can take the propulsion train—the diesels, shafts, and the screws— and put them into that full MILSPEC hardened, no-matter-what-you-do-to-'em, they'll still work. Or, you go build an armored box in the front, far away from the rest of the propulsion system, with an 8-knot outboard motor that you can lower down after that damage event, and still meet the 8-knot requirement. We've spent a lot of time on that. It really makes people uncomfortable; they're like, "Whoa! You put the propulsion train on a commercial standard? It's still very survivable, because commercial ship operators don't want their ships to fail if they hit the bottom or get hit hard by a tug. Still fairly good, but you invest in protecting the emergency gear. That's the conversation that's going on: which parts of the ship do you not want to get destroyed by a missile? The magazines; command and control structures; your well deck so that you can continue to get the Marines off or back on in that 8-knot transit out there?"

"It's actually probably the best ship design discussion we've had in a very long time, inside the government," he says.

"When we decided to take LCS 1 and 2 and deliver them as ships of the fleet long before the design was mature, we actually intended them to be engineering development models, to go learn, and get them wet,' so that we design the right class of ships in the long term. Once we owned them, we chose to deploy the first ship early," he says. "There's some risk in that. If it were an airplane, you wouldn't deploy EDM airplanes. We deployed an EDM ship. It did a pretty good job. It met the fleet commander's need for ships out in that part of the world, and did a good job of showing the US flag. But it had some problems, and we seemed to have spent a lot of time apologizing about that. Well, we did exactly what we said we would do. We took the ship, pushed it to the front as fast as possible, and learned a lot."

By comparison, Hilarides points to the Virginia-class submarine. "We took seven years of requirements trades; seven years of design; and seven years of construction to get the first ship out. When it went to sea it was in pretty good shape. But Hawaii and Missouri were much improved compared to the first two, Virginia and Texas."

"With LCS, we chose to accelerate that process. We took just a couple years of design; went to production early – we took a lot of risk there; and deployed early," Hilarides says. "Until you sail it all the way across the Pacific Ocean, you don't really know how it will work. We tried a new maintenance model out in Singapore, and learned a lot, and as a result of that, follow-on ships will be better and better, and the learning curve is much accelerated from what it would have been under a traditional process.

"We take some risk to provide exceptional ships at an affordable price, and we don't always hit the mark," he says. "But that's not to say we shouldn't take any risk in our new developments. So getting that balance right is important."

The New Pipeline

Competition in the maritime communications sector is fierce, and ship owners are the winners as service from land-to-sea is becoming faster and cheaper. MR spoke with KVH's Jim Dodez in Athens at Posidonia for his insights on the present and future of connectivity at sea.

By Greg Trauthwein

More than ever ships at sea demand "land-like" connectivity to the internet. Whether the purpose is maritime business or a content crew, companies such as KVH are growing their business and product portfolios at an equally rapid clip.

"The big driver in the business today is the capability of broadband," said Jim Dodez, SVP Marketing and Strategic Planning, KVH Industries, Inc. "So it's not one thing, it's not entertainment alone, for example. It's really all of the benefits that broadband can bring to a business. The operations manager, the IT manager, the HR manager are looking at the internet and the new services available on land and they are asking 'why can't we do that on the ships?'"

KVH has emerged as a leader in a sector that is defined by rapid fire continuous growth and consolidation (including KVH's recent acquisition of Videotel). It brings a diverse offering to the markets it serves, including leisure, government and commercial.

In truth the 'era of broadband on ships' is still in its infancy, as ship owners en masse are still remiss to invest in the latest communication technology for a number of reasons, starting with cost and including concerns that full-scale entertainment and connectivity for crew could take attention from routine ship operations and safety.

But the direction is clear and broadband at sea is expected to grow rapidly, as technology improves, prices drop and the new generation of merchant seamen

IPMC Home Screen

Jim Dodez,
SVP Marketing and
Strategic Planning,
KVH Industries, Inc.

KVH Middletown
Manufacturing

demand and receive similar internet access and options as they might enjoy on land.

Meet IP-MobileCast

In mid-May 2014 KVH went 'live' with the new IP-MobileCast, a new service designed to make it affordable for mariners to receive a wide range of content. While Dodez would not comment on buy-in to date, he did note that "We're in the process of signing up subscribers, and we have announced 4,000 VSAT terminals in the field already who all can receive this new service."

IP-MobileCast and services like it are designed to bring entertainment options onboard the ship that heretofore could only be found on land. Onboard treatment of the seafarer has come full circle in recent years, driven by legislation such as MLC2006 but perhaps more so by the basic need to attract and retain talented mariners from an increasingly shallow pool. KVH and Dodez believe that services such as IP-MobileCast can help to do that.

"When we look at it we look at it from the customer perspective and we think there is a big human resources requirement: the Crew Morale requirement in the Maritime Labor Convention," said Dodez. "Previously for the crew we had internet café and calling; now we're adding movies and TV, we're adding sports and we're adding news and music to round out the Crew Morale offering. When we're talking to the HR manager, we have the solution for crew morale."

The IP-MobileCast service utilizes multicasting technology to deliver large amounts of content to many ships at once. With the new service content is delivered over the top of the network so there is no charge for the delivery, only for the content itself; and the multicasting transmission does not affect the vessel's mini-VSAT Broadband onboard data speed. Also, the service ensures digital rights management (DRM) of copyrighted material, such as Hollywood movies and television programs; and the content is delivered using forward error correction to minimize burden on the mini-VSAT Broadband network.

Content available via IP-MobileCast is provided by KVH Media Group, a provider of commercially licensed news and entertainment content to the maritime, hotel, and retail industries.

While the connection and the content are the critical component, KVH's new media server which was launched at Posidonia 2014 adds brawn to the system. The new media server, which retails for $4995, has a terabyte drive to start and is upgradable, has the power to store all of the broadcast content, a mass

A strong network ops infrastructure is the backbone to successful shore to ship operations

storage port which effectively enables live streaming television and movies.

While KVH has been busy developing entertainment solutions for the mariner, it has not ignored its core ship owner business customers, and in tandem the capabilities of broadband can deliver efficiencies to everyday ship operations. "The operations manager will be concerned with things like 'how do I get my digital charts on the vessel?'" said Dodez. He sees the evolution of communication service at sea picking up serious steam in this regard, reasoning that as satellite owners focus more capacity on the ocean regions, prices drop and allow companies like KVH to lease the capacity to provide total geographic coverage of the oceans. While the satellite signal is a key component, modern electronics has played a large part too. "Through Innovation and working with modem manufacturers we have been able to bring the hardware down from a stack of equipment that filled a whole computer hardware rack down to one box," said Dodez. "Modern electronics has allowed us to compress that into a simple, easy to install solution."

Slashing Operational Costs by Making

The Switch

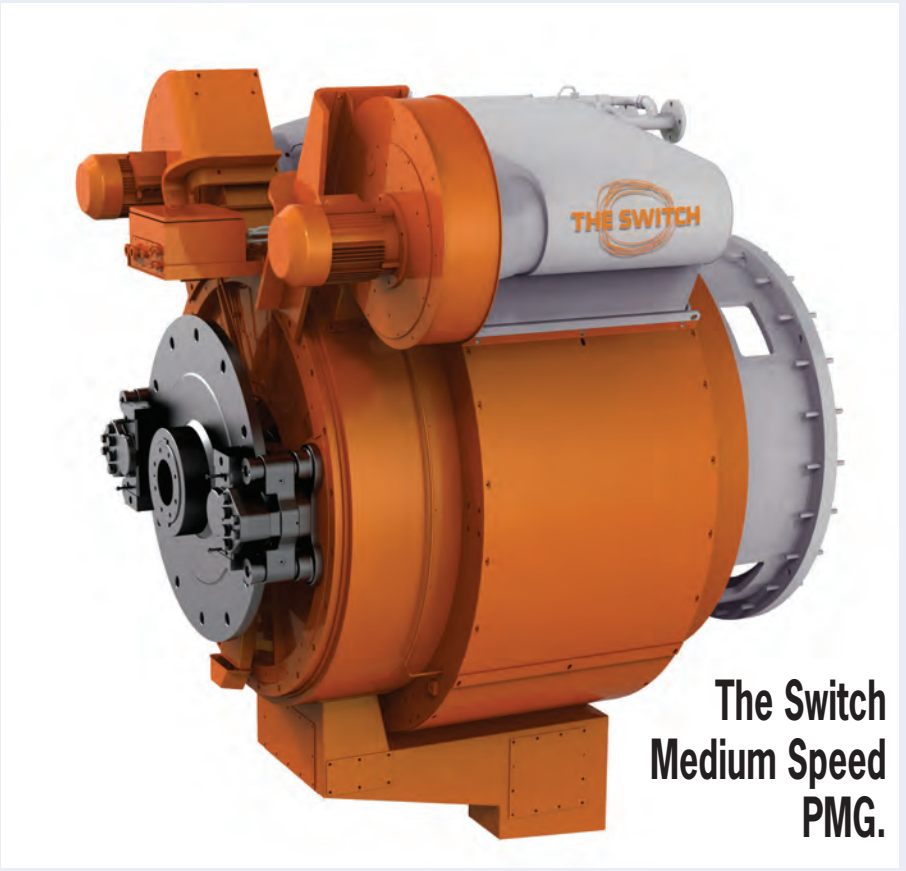
Multipurpose vessels, especially those that operate primarily at part loads, have been facing pressure when it comes to making money in today's business environment. Returning to times of big profit margins will not happen soon without finding a radically different approach. Using permanent magnet technology for electric propulsion systems is a bold and proven way to save ship owners money due to lower fuel costs, less maintenance and fewer failures.

As cost pressures mount and environmental regulations become more stringent, the need for a novel and smarter approach is ever more apparent. This is especially the case for multipurpose service vessels that operate primarily at partial load conditions. Instead of tweaking conventional technology, such as induction motors, to try and invent a better solution, results prove that there's a much better way to save on operational costs.

The Switch, using permanent magnet (PM) motors and generators as key elements in advanced drive trains allows ship owners to take advantage of a more flexible, modular, efficient and lightweight propulsion system.

Although new to marine applications, PM technology has in fact been a game changer for many years in other industries, such as wind power, where it ensures the highest energy efficiency and lowest costs of operation. As a bonus, this technology helps future-proof ships when it comes to even the strictest environmental legislation. For electric propulsion, PM technology based solutions are ideal for seafaring vessels, such as ferries, cruise lines, tugboats, offshore, research vessels, icebreakers and more. The technology enables ships to lower their operational costs by optimizing fuel consumption through superior efficiency, reliability and design flexibility.

- A synchronous PM machine contains Neodymium-Iron-Boron (NdFeB) magnets, which are materials with a very high flux density. This makes them ideal for variable speed motors and generators throughout the entire speed range. The magnet field is created with almost zero rotor losses.
- A PM machine gives high-efficiency performance over the entire operating range, significantly cutting back on fuel consumption. The PM machine is typically 2–4% more efficient at full load and 10% more efficient at part load when compared with induction machines. These efficiencies result from a lack of current losses in the rotor, the absence of an exciter, and reduced winding losses.
- PM propulsion motors and their inverters efficiently turn available energy into thrust, designed to deliver even higher efficiency in a much wider speed and torque range.



The Switch Medium Speed PMG.

Lower Fuel Consumption

In a recent study of two 1250 kW diesel-electric propulsion trains, PM motors achieved an annual fuel savings of >3% with the same Z-drive thruster. PM motors also make it possible to use an L-drive thruster, which results in fuel savings by an extra >1%, along with length and weight savings thanks to the stacking ability.

Adjustable Speed Control

A frequency converter offers the accurate and adjustable speed control needed for dynamic positioning and demanding load cycles in offshore and special vessels. The high energy density of PM technology and resulting lower rotor inertia are beneficial when the ship needs high maneuverability and a DP class propulsion system.

This results in optimum fuel efficiency and lower levels of exhaust.

Highly pulsating power demand also poses a serious threat to the lifetime of a vessel's engine. The ability to deliver to a combination of short full-power bursts and longer low-power demands is extremely wearing.

To handle highly fluctuating load cycles, guarantee longer engine life, cut back on fuel consumption and reach lower exhaust values, adjustable speed control is ideal. This avoids the low or no-load running of generators, which minimizes engine heat stress, reduces fuel consumption and eliminates undesired start/stop engine cycles.

Fewer Failures, Less Maintenance

In direct propulsion systems, no gearbox or accompanying slip rings and brushes are needed, as with other synchronous machines. Therefore, the PM propulsion line machine experiences fewer failures and requires significantly less maintenance.

PM solutions are compact, with lower weight and volume than conventional drive trains. They offer good flexibility and a smaller footprint for all types of configurations, especially when space is a critical factor. Additionally, PM solutions comply with low environmental footprint requirements.

By using a PM generator as part of a genset, significant weight savings can be achieved, and the total length of the genset can be reduced. On the propulsion side, using a PM machine as a propulsion motor combined with an inverter can lead to weight savings and switchboard length reductions.

Frequency Converters

The Switch frequency converters are optimized to work with PM machines for the best overall system efficiency. The electricity produced is of better quality with low flicker, reduced electrical noise emission and THD <1.5%. Additionally, PM drive trains have always demonstrated superior grid connection behavior, even in distributed environments. The frequency converter features a rugged IP54-class cabinet, which is a higher class to withstand the harsh sea environments. It can be easily accessed for installation and maintenance.

The Author

Mika Koli, Business Development Manager at The Switch, is responsible for developing the marine business and applying the company's permanent magnet drive train technology to advanced marine solutions.

New Keel Cooling Option

Volvo Penta is offering factory-built keel-cooled engines for the entire line of marine commercial inboard and sterndrive D4 3.7-liter and D6 5.5-liter engines. The D4/D6 keel-cooled version uses a twin circuit design, with keel coolers for both the high-temperature engine block circuit and low-temperature charge air cooler circuit.

"Keel cooling provides unique advantages for commercial marine vessels," said Jens Bering, manager product management for Volvo Penta North America. "By eliminating the need for the seawater pump, these engines are ideal for vessels operating in water containing high amounts of sand, silt or other debris that can clog up open-circuit cooling systems. The result is reduced maintenance costs and minimized downtime."

Volvo Penta is offering factory-built keel-cooled engines for the line of marine commercial inboard and sterndrive D4 3.7-liter and D6 5.5-liter engines.

"The D4 and D6 engines are proven workhorses for the most demanding commercial marine applications," said Bering. "The keel-cooled versions are fully backed by Volvo Penta's industry-leading warranty and service programs."

www.volvopenta.com

(Photo courtesy of Langh Ship)

Scrubber Receives Class Approval

Langh Ship received final class approval from Germanischer Lloyd for its exhaust gas cleaning system on m/s Laura (pictured), a 1996-built a 6,500 DWT general cargo vessel equipped with a 6 MW main engine. Langh Ship is a shipping company that has developed its own closed loop scrubber. The system uses caustic soda to neutralize the SOx in the exhaust gas and cleans the process water so that it can be led to the sea. The residual is collected in such a dry form that the compact waste can be transported to the nearest waste treatment plant.

The scrubber was recently made available also to other shipping companies through DeltaLangh Ltd., a joint venture company owned by Deltamarin Ltd and Oy Langh Tech Ab, which is part of the Langh companies. Deltamarin provides engineering and consulting services for the shipping, shipbuilding, naval, marine and offshore industries worldwide. "DeltaLangh has already begun installing similar exhaust gas cleaning systems on our other four vessels. The installations are expected to be fully operational on January 1, 2015, when the new regulation comes into force," said Commercial Manager Laura Langh-Lagerlöf, who herself has been actively involved in the development process. DeltaLangh was established in June 2014 when Deltamarin Ltd and Oy Langh Ship Ab came together.

Dredger: 9-Year Wear Life on Cutterhead Shaft Bearings

While the marine industry is rife with rough working conditions, dredging operations arguably pose the toughest challenge to any class of marine equipment. Water lubricated Thordon Composite cutterhead shaft bearings have reportedly performed well for nine years on one of the largest cutter suction dredgers in the world – Dredging, Environmental and Marine Engineering N.V. (DEME)'s D'Artagnan (28,200 kW total installed power).

The vessel had a major dry docking at Drydocks World-Dubai in February 2014 where the shaft was removed, and bearings and shaft inspected. Originally built in 2005, the D'Artagnan self-propelled cutter suction dredger is involved in heavy rock-breaking having a cutting power for operations in rock soils of 6000 kW.

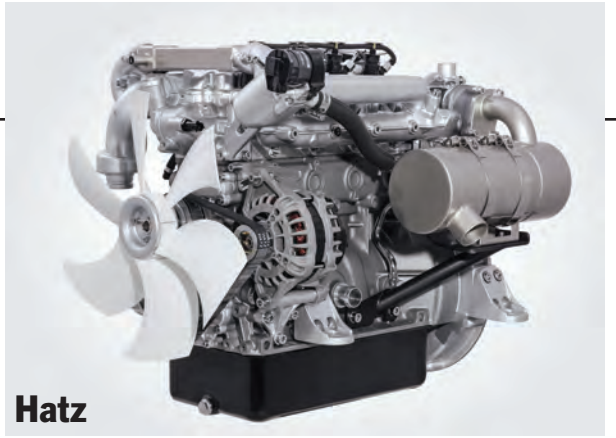
"The bearings performed well and have shown a positive wear life compared to grease lubricated metallic bearings," said Frederik Mertens, Assistant Vessel Manager at DEME. The decision was made to replace the cutterhead shaft bearings. The same Thordon Composite bearings are also installed on the intermediate ladder shaft bearings. Mertens says, "For the intermediate ladder bearings we noticed even less wear on the Thordon bearings than the cutterhead bearings so we did not replace them." Grease-free Thordon SXL wire rope sheaves were also installed during the drydocking.

Thordon's authorized Distributor in the U.A.E., Ocean Power International (OPI), assisted Drydocks World and Dredging International (DEME's subsidiary) in the replacement with additional supervision during, and prior to, installation.

The inspected bearings confirmed that the Thordon Composite grade can withstand the most abrasive conditions typical for a dredger equipped for working in various mediums. "Compared to expensive bio-degradable greases, these water lubricated bearings from Thordon are a real cost saving alternative," said Mertens.

Thordon Composite cutterhead shaft bearings prior to installation on the D'Artagnan owned by DEME

(Photo: EBDG)



EBDG Alaskan Ferry Repower

Elliott Bay Design Group (EBDG) announced the completion of the M/V Columbia (418 ft., 625 pax., 134 vehicles) repower. EBDG provided design services and ongoing owner support services for the ferry's repower, which was performed by Vigor Marine in Portland, Ore. "The Columbia was designed for the Alaska Marine Highway System (AMHS) by EBDG's predecessor firm, so we're intimately familiar with the vessel and its systems," said EBDG Project Manager Matt Williamson. "The main engines were at the end of their useful life and the AMHS opted for replacing them, along with replacing or upgrading drive train components and auxiliary systems where it made economic sense. Replacing the main engines is a significant undertaking in the life a vessel. EBDG's strong familiarity with the Columbia made us the natural choice as the designer for this repowering project."

www.ebdg.com

Hatz New Engine Concept

Hatz Diesel, a manufacturer of industrial diesel engines in the power range from 1.5 to 56 kW, presented the concept study of the new 4H50TIC as a marine version at the SMM exhibition in Hamburg. For 20 years Hatz Marine Center of Excellence in Hamburg has developed and produced power generators, pumps and drive units for work and fishing boats. As a highlight, the concept study of a maritime version of the newly developed 4H50TIC will be presented at the company's stand. The engine has been manufactured in series production since the beginning of 2014 and is designed primarily for use in construction machinery, as well as for stationary and mobile applications. For use as a marine propulsion engine, the engine was converted accordingly. Keel cooling was adopted for the required engine cooling and to reduce heat radiation an insulation was installed for the exhaust silencer. Besides this, the 4H50TIC marine includes the same characteristics as the base engine. The 55 kW water-cooled two-liter four-cylinder turbo engine is equipped with a BOSCH common rail system with 1800 bar rail pressure. Besides a low power to weight ratio, the engine underlines its ecological characteristics by a low specific fuel consumption of just 205 g / kWh at the best point.

www.hatz-diesel.com

Laborde a Steyr Distributor

Laborde Products was chosen as a Steyr Motors distributor, offering sales, service and support throughout Alabama, Arkansas, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Missouri, New Mexico, Oklahoma, Tennessee, Texas and Wisconsin. Laborde will also offer dealer support along the Eastern seaboard of Mexico, from the Texas border to Cancun.

Steyr Motors M1 Monoblock engines are known for the lowest weight in class at less than 1.2 kg/hp and the highest power density, up to 92 hp/ltr. Steyr also offers compact dimensions and low fuel and oil consumption in 2-, 4- and 6-cylinder configurations.

www.labordeproducts.com

Low Loss Hybrid Energy System

Wärtsilä launched its new Low Loss Hybrid (LLH) innovation at ONS 2014. The Wärtsilä LLH uses different power sources in combination with energy storage devices to operate the prime movers closest to their optimum performance. In addition to annual fuel savings of up to 15%, depending on the type and configuration of the engine and mission profile, the LLH ensures a substantial reduction in exhaust gas emissions, the manufacturer said.

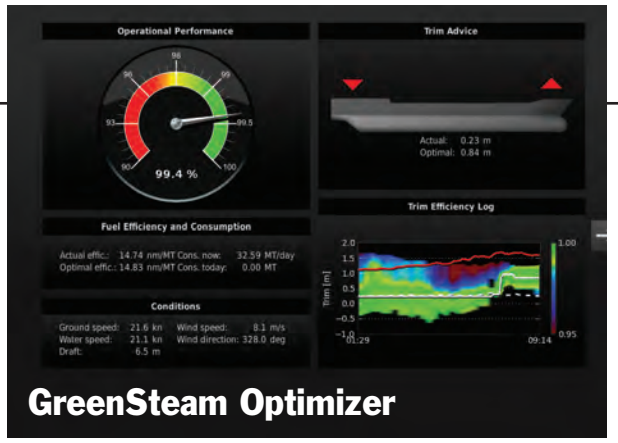
(Photo: Wärtsilä)

Wärtsilä's test facility is equipped to carry out full scale testing of the LLH integrated with Wärtsilä distribution system.

The Wärtsilä LLH was earlier this year installed and tested aboard the Platform Supply Vessel Viking Lady. A comprehensive measurement program that monitored transit mode in heavy weather conditions, critical operations, and standby mode confirmed actual fuel savings of 15%. For this particular vessel, such savings would give an estimated payback time of less than four years. Emission reductions were also substantial, with local emissions in harbor virtually eliminated.

www.wartsila.com

(Photo courtesy of Volvo Penta IPS)



(© Cai Rönnau)

First North American Boat Powered by Volvo Penta IPS

Thomas Paine, a new 50-ft. aluminum patrol boat that joined the Massachusetts Environmental Police fleet in July, is the first commercial vessel in North America to be powered by Volvo Penta IPS propulsion. Built by Metal Craft Marine Inc., the new boat is equipped with twin Volvo Penta D11 510hp marine diesel engines driving IPS650 steerable drive units. The Volvo Penta IPS consists of a steerable underwater drive unit with two forward-facing counter-rotating propellers. The drive units pull the boat rather than pushing it through the water, thereby increasing efficiency.

"We decided to install IPS instead of traditional shafts in the new boat primarily because of its lower fuel consumption and extended cruising range, allowing us to build the boat with a smaller fuel tank, saving space and weight," said Chris Baker, acting director, Massachusetts Environmental Police. "Because the boat idles a lot on station, the automatic DPS was another critical factor in the decision to go with the Volvo Penta IPS."

www.volvopenta.com

GreenSteam Optimizer

GreenSteam Optimizer is an onboard decision support system that is an adaptive, data-driven solution, helping the master to make the right decisions. Achieving maximum fuel efficiency means operating at the most efficient speed using as little fuel as possible. The optimal settings and parameters such as trim, draft are a vital in setting up the vessel, and depend on a range of conditions such as load, waves, wind, water depth and many other factors. By continually optimizing the trim and draft of the vessel based on data collected onboard the vessel, propulsion resistance is minimized, saving fuel. The GreenSteam Optimizer is compact and intuitive, simple to use and fitting the unit to existing vessels is simple and straightforward requiring no major modification of the ship, the developer said. Installation takes less than a day if the cabling has been prepared. The system consists of two small GreenSteam radars installed in the bridge wings, and touch screen console which connects to wind and flow meter sensors, trim and the radars.

www.greensteam.dk

Mermaid Kohler Range Launched

The partnership between U.K. diesel engine marinizer Mermaid Marine and Kohler expands Poole based Mermaid Marine's offering to smaller inboard engines with the company now able to supply engines from 31kW to 376kW.

It has come about through Mermaid Marine's parent company, Power Torque's work with JCB which has partnered with Kohler's Global Power Group to use the Italian manufactured engines in several of its compact machine lines in what the company terms the next stage of its engine strategy. "The decision to partner with Kohler to develop engines for JCB compact machines was driven by the synergy in the technologies used by JCB and Kohler to achieve stringent emissions legislation," said Alan Tolley, JCB's director of engine programs. The Mermaid Kohler mechanical engine is marinized by Mermaid Marine and meets the next stage of emissions targets without the need for a diesel particulate filter. The engines feature cylinder block with bed plate architecture, a 4-valve cylinder head, gear driven valve train and optimized direct injection (DI) fuel system.

The engines use direct injection technology and are naturally aspirated with mechanical governing. The range currently comprises two engines, the KDI 1903M three cylinder, 42hp / 31kW and the KDI 2504M four cylinder 49hp / 36kW with further developments planned in terms of options and power ratings.

www.mermaid-marine.co.uk

VSP for Norderney Ferry

Ferries operated by Norden-Frisia AG have been serving the East Frisian island of Norderney for decades. Navigation in these coastal waters poses special challenges: in some areas the waterway only leaves a few centimeters below the keel and the water contains a significant amount of swirled-up sand. A new sister ship of the double-ended ferry MS Frisia IV equipped with Voith Schneider Propellers (VSP) is to enter service in summer 2015. Norden-Frisia AG had already selected a VSP propulsion system for the Frisia IV which has been serving the route between Norddeich and Norderney since 2002. This propulsion concept proved successful and will now also be used for the new vessel.

The ferry will be built by the Cassens shipyard in Emden. With a length of 74.3 m and a beam of 13.4 m, it will be slightly longer than her sister ship. The newbuild with a draft of 1.75 m and is designed to carry 1,340 passengers and 60 cars, reaching a speed of eight knots in shallow water and 12 knots in deeper water. Four type 16R5 EC/100-1 Voith Schneider Propellers will be used for propulsion and maneuvering. The propulsion concept is diesel-electric, and the VSPs are driven by speed-controlled electromotors. Voith also supplies bow tooth couplings connecting engine and VSP, thus eliminating the need for intermediate gearboxes and additional shafts.

www.voith.com

(Photos courtesy of Olson Marine)

New Power for Alaskan Tug

It has been said that, "There is no reason to design or build an ugly boat." This is clearly a dictum that those who designed and built the Noman O adhered to. Built in 1970 as the Duncan Foss by the Albina Shipyard under hull number 419, at Portland, Oregon, the tug has a fine shear that sweeps down the 75-foot length from a high sea-going bow to a low fantail that carries most of the boat's 24-foot midships beam. The classic rounded west coast style wheel house carries aft to a stepped-down galley and still lower fiddly section leaving ample room on the aft deck for a towing winch loaded with 1,600 feet of 1 3/8 tow wire. A flying bridge atop the wheelhouse serves as a functional vantage for making up to tows.

Since being acquired by Olson Marine Inc. of Ketchikan Alaska, the tug, has provided good service to the firm's five-boat fleet. A black hull and white superstructure with distinctive blue trim shows the excellent level of care that has kept the sound and worthy of a new set of engines to extend her life for several more revenue producing decades.

Owner Rick Olson approached Mike Painter, his local Cummins dealer at South East Diesel & Electric in Ketchikan. The two men worked out a deal to change out the existing older Cat D348s rated at 703 HP each for a pair of modern EPA Tier 3 compliant Cummins QSK19 MCRS engines rated for 750 HP at 1,800 RPM. The electronic controlled engines are built on Cummins' 19-liter (1,150 cu. in.) block that in its mechanical KTA19 version has served generations of Alaskan fishermen and mariners. It that has now won wide spread acceptance in Alaska in the electronic QSK19 version.

A project team headed by Jamie Painter and Brian Pinkstaff, also of SE Diesel, was put together with engineer Kevin Johnson and Capt. Brian Ingerham of the Norman O along with Dave Kuehl, Olson's port engineer. Over a three-month period in early 2014, the team cut, welded, sanded, painted, lifted and aligned to remove the old engines, modify the beds, and then install and align the new engines along with additional refurbishments. When done, the QSK19 engines were delivering 750 HP each at 1800 RPM to ZFW4400 gears turning 70 by 54-inch five-blade stainless props from Sound Propeller. The engines were fitted with C-Command Engine controls with digital display as well as ECM Data and alarm reporting at each control station. To compensate for the lighter engines the team added 8,000 pounds of concrete ballast.

By the end of April the repowered Norman O was ready to go back into service. Sea trials demonstrated a maximum speed of 12 knots with a 38 GPH fuel burn per engine. At peak torque the tug makes 10.9 knots with a fuel burn of only 18 GPH per engine. The 75-foot tug has a 66-foot loaded waterline and a 19,000-gallon fuel capacity.

Speaking to his decision to have the job done in Ketchikan, Olson Marine owner Rick Olson said, "They have a high density local knowledge of the marine repower work. I have a historical relationship with many of the crew, especially the Painters at Southeast Diesel. This network and trust made the project a success and benefitted the local economy."

By Alan Haig-Brown

SigmaGlide 1290

PPG launched SigmaGlide 1290, a 100% silicone binder fouling release system that uses a dynamic surface regeneration technology to eliminate slime problems and increase fuel savings. Through chemical engineering of the 100% pure silicone binder system at a molecular level, PPG has been able to design the optimal configuration for the silicone coating surface. This results in an increased silicone density at the surface to such a degree that slime organisms do not recognize it as a surface substrate and have no chance to settle on it. This significantly extends the effectiveness of the coating. The combination of the 100% silicon binder fouling release system with the ability of the surface to dynamically regenerate makes SigmaGlide 1290 a breakthrough technology.

The product is suitable for all vessel types and also when long stationary periods are to be considered such as FPSOs. It also brings significant benefits for cruise and ferry operators as well as owners of tankers, bulkers, gas carriers, dredgers and containerships.

Hempaguard

Hempel's Hempaguard is designed to offer outstanding resistance to fouling during idle periods – up to 120 days – as well as provide up to 6% in fuel savings. In addition, the coating is touted by the manufacturer for its flexibility, able to cover most combinations of sailing routes and trading patterns, retaining its effectiveness whether slow or fast-steaming anywhere in the world.

"We're offering the most flexible fouling defense system in the market," said Claes Skat-Rørda. "Hempaguard offers significant fuel savings and outstanding fouling resistance in both slow and fast steaming as well as during extended idle periods of up to 120 days. This is particularly interesting for larger container vessels and tankers that, for example, may wish to increase speed on one route to meet schedules and slow steam on the other to achieve extra fuel savings."

Hempaguard is based on Hempel's patented ActiGuard technology, which Hempel scientists spent five years testing and developing. ActiGuard integrates silicone-hydrogel and full diffusion control of biocides in a single coating. Surface retention of the biocide activates the hydrogel, which effectively holds fouling organisms at bay, cutting friction to a minimum while utilizing a minimum amount of biocide.

"What is most remarkable about Hempaguard is that it releases 95 percent less biocide than traditional antifoulings and yet, it still has a significantly better performance," said Claes Skat-Rørda.

Hull of cruise ship after five years with Ecospeed coating with no replacement or repair. This is the state of the hull when the ship came out of the water, without any cleaning or touch-up required in drydock.

Ecospeed Keeps Hulls Clean

Routine in-water cleaning results in a super smooth hull over the life of the vessel and is the best guarantee of the highest fuel savings possible.

This is achieved with the Ecospeed hull coating and routine in-water conditioning and cleaning.

Ecoshield is a special glassflake coating designed to protect rudders and other underwater running gear from cavitation and corrosion damage for the life of the vessel with a single application.

www.hydrex.be

Vessel Specific Hull Coatings

AkzoNobel's Marine Coatings has developed a software system that enables shipowners to assess and predict the risk of hull fouling dependent on a vessel's transit route. Intertrac overlays a vessel's route, speed and location data with comprehensive fouling challenge datasets enabling coating specifications to be tailored specifically to an individual vessel's trading routes, ensuring effective cost management for hull coatings, maximizing vessel's operational efficiencies.

www.akzonobel.com

Extra-Wide Shrink Wrap Protects Oversized Assets

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-ft. 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

FAIRWEATHER LLC

A member of the Edison Chouest Offshore companies, **Fairweather, LLC** was founded in 1976 and is today one of Alaska's leading providers of specialized support services to offshore oil and gas operations in the Arctic. Services include meteorological and oceanographic forecasting, marine science and research, remote sensing and surveying, drilling and production support, logistics, medical and HSE services. Fairweather also operates the Deadhorse Aviation Center at Prudhoe Bay. For more information, go to **www.fairweather.com**.

New LED Light Range

IMTRA announced its latest high-output LED light range, the IMTRA Sigma PowerLED. A straight-forward dimmable LED upgrade for existing marine halogen down light systems, the new Sigma PowerLEDs use existing fixture locations, hole cutouts and two-wire cabling to make full-featured retrofits easy. The Sigma range eliminates the need to rewire existing circuits, while providing the highest level of light quality and protection against interference. The Sigma series is available in small, large and surface-mounted configurations.

www.imtra.com

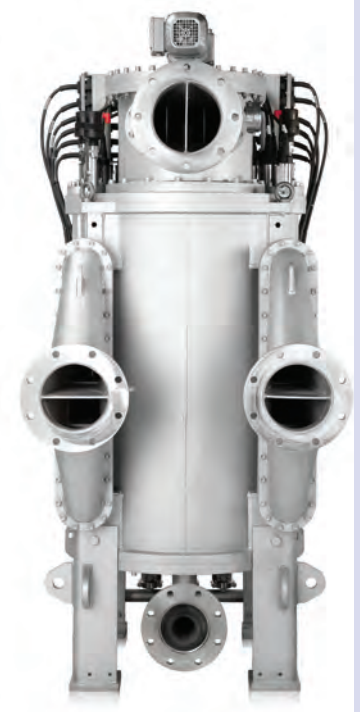
Trojan Marinex BWTS

Trojan Technologies' Trojan Marinex ballast water treatment (BWT) product suite received United States Coast Guard (USCG) Alternate Management System (AMS) acceptance, in accordance with the USCG's final rule for Standards for Living Organisms in Ships' Ballast Water Discharged in U.S. waters, for all water qualities: freshwater, brackish water and marine water.

AMS is a temporary designation given to a ballast water treatment system approved by a foreign administration. Vessels operating in U.S. waters may use an AMS-designated BWT system to manage their ballast water discharges in lieu of ballast water exchange for a period of five years from a ship's compliance date while that BWT treatment system undergoes USCG Type Approval testing. AMS certification neither guarantees nor implies that USCG Type Approval is likely, as the two programs are independent of each other.

The Trojan Marinex BWT product suite is tested and IMO Type Approved to the lowest UV transmittance value in the industry (corresponding to poor water quality) under full flow conditions. Testing was conducted under the supervision of DNV, who is certified as an Independent Lab (IL) by the USCG, in accordance with United States Environmental Protection Agency (USEPA) Environmental Technology Verification (ETV) Ballast Water Protocol.

www.trojanmarinex.com



VDR Tech

Danelec Marine planned to show its DM100 VDR at SMM2014. The company reports it is the first VDR to be type approved and wheelmarked by BSH for compliance with the new IMO standard, which came into force July 1. The DM100 VDR features Danelec Marine's SoftWare Advanced Protection (SWAP) technology, which stores all programming data and configuration files on a hot-swappable memory card.

www.danelec-marine.com

DMC Builds the Smallest Ever Nozzle

Damen Marine Components (DMC), part of Damen Shipyards Group, said it smashed its propeller nozzle world record by 33 percent downwards. This downsizing to an inside diameter of 665 mm— from the previous 1,000 mm 'entry level model' – marks a new milestone for DMC's Optima Nozzle series. Already one-third smaller than the previous one meter (1,000mm) Benjamins, the new 65 centimeter nozzles are, however, dwarfed altogether by the biggest models in the Optima series, with an 8m inside diameter. The two 665mm nozzles weigh 188 kilos each and were built for one 50 ft. (15m) yacht. The two mini Optimas were commissioned at Damen Marine Components by a third-party manufacturer of propulsion systems. DMC's Optima propeller nozzle combines reduced noise and vibration with propelling performance. Its specific inside profile design was patented in 1998.

For dredgers, Stan Tugs or inland waterway vessels, DMC's Optima nozzles usually have an L/D 0.5 ratio (length = 0.5 x diameter). For push boats the L/D is 0.6. The two world's smallest nozzles feature L/D 0.4 in order to still safeguard 'crew comfort' at the river yacht somewhat higher 11 knot speed.

www.damen.com

Photo courtesy of Damen

VE206 Portable Roll Groover

Victaulic introduces the VE206 portable roll-grooving tool, a versatile, durable pipe-grooving solution to make pipe preparation more efficient in the field. The VE206 portable roll groover improves the efficiency of on-site roll-grooving operations. Tool components are lightweight for easy transport and assembly, reducing site-to-site set-up and take-down time. An ergonomically designed tool head featuring two handles enables quick, easy on-off mounting.

The VE206 roll groover can be configured in multiple ways to meet crew and job-site demands. The versatile design enables the tool head to be securely mounted to any tripod stand with a Ridgid 300 bolt pattern or the flatbed of a work truck. The hydraulic hand pump can be mounted on either side of the tool for right- or left-hand operation. The roll groover is compatible with multiple power drive units, including the Victaulic Style VPD752, Ridgid 300 and 700, and Rems Amigo 2.

The VE206 roll grooves 1¼- to 6-inch (32- to 150-millimeter) carbon steel and stainless steel pipe up to schedule 40. Optional roll sets are available to groove light-wall stainless steel and copper.

www.victaulic.com

New Electronics from Moxa

The MPC-2240 is a 24-in. flat marine panel computer for marine e-navigation systems. Powered by an Intel Ivy Bridge CPU, the MPC-2240 panel computers are built to handle the heavy graphic computing demands that marine applications such as ECDIS and radar systems require. The MPC-2240 is intended to help reduce deployment costs and overall time-to-market.Because it is fanless, the MPC-2240's delivers greater reliability over the long term.

www.moxa.com

Calnetix Waste Energy Converter

Calnetix Technologies showcased at SMM 2014 a new system developed with Mitsubishi Heavy Industries Marine Machinery and Engine company (MHI-MME) that captures heat from marine engine jacket water and converts it to electricity for shipboard consumption.

The Hydrocurrent system produces up to 125 kW of power for the ship's electrical load, while still leaving sufficient heat in the jacket water for the fresh water maker. The system pays for itself in a very short time by reducing the load on the ship's bunker-fueled generators, resulting in fuel savings of up to 200 tons per year. It can be retrofitted easily in existing ships with a minimum of downtime.

www.calnetix.com

GEA's CatFineMaster

To combat the problem of cat fines in fuels, GEA Westfalia Separator Group is now offering a new system solution – the CatFineMaster – which was presented for the first time at the SMM 2014. Cat fines can damage the engine and, under extreme circumstances, may also result in the total failure of the main engine. Fuel processing on board is thus of utmost importance; the new CatFineMaster is able to perform this task extremely efficiently and reliably. The system consists of a separator as the core element and a feed pump that can be regulated in the process for ensuring that the flow of heavy fuel oil is adjusted optimally to take account of the respective process requirements.

www.gea.com

Request For Proposal for the

Replacement of the Automation, Drive Systems and other Critical Systems

Aboard the University of Hawaii's R/V Kilo Moana (AGOR 26)

188Ft LOA, 88Ft Beam, 25Ft Draft,

2547 LT Displacement,

A SWATH Design.

Request For Proposal to be released o/a 5 September 2014.

POC for detailed RFP-J. Nikola

808-216-3413, jnikola@soest.hawaii.edu

Proposal Closing Time and Date

1700 30 September 2014 Hawaii Local Time

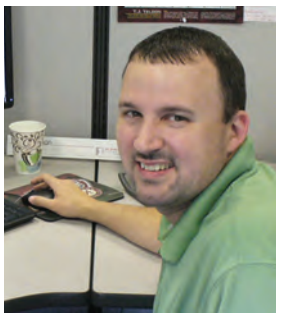
Smith

(Photo: Webb Institute)

McElroy & Mills

(Photo: Euronav)

Euronav NV



Harman

Walker

(Photo: USCG)

Kris & Jesse Kristofferson

Vatnehol

Ladekjaer

Sjoberg

Dohle

Zederkof

Tor Atle Eiken

Michael Stephen Smith joined Huntington Ingalls Industries as corporate vice president, business growth. He will work closely with the HII's senior leadership team in support of corporate development and strategic endeavors and will serve as the company interface with business associations in Washington, D.C.

Erin McElroy of Groton, Mass., and Brian Mills of Sanford, N.C., were chosen as recipients of Crowley Maritime Corp.'s Thomas B. Crowley, Sr. Memorial Scholarship for Webb Institute. McElroy (Class of 2015) is an active member of the school community, and during the winter work term, she interned at Sparkman & Stephens. Mills, (Class of 2016) is a member of the school's soccer, basketball, tennis, volleyball and sailing teams. He has interned as an outside machinist for General Dynamics Electric Boat

Peter G. Livanos was unanimously appointed as Chairman of the Board of **Euronav NV**.

Marine Designer **Paul Harman** has joined the Elliott Bay Design Group (EBDG) staff in New Orleans, and **Rachel Walker** joins EBDG's Seattle office as a Naval Architect.

Tim Dool has been named as Chair of the Board of Directors at the St. Lawrence Seaway Management Corporation (SLSMC). As the former President and CEO of Algoma Central Corporation, he brings an extensive range of marine industry experience to the boardroom table.

Singer, actor and songwriter **Kris Kristofferson** attended his son **Jesse Kristofferson's** U.S. Coast Guard (USCG) boot camp commencement ceremony in Cape May, N.J. In a photo released by the USCG, Kris hands Jesse a certificate during the graduation ceremony of Alpha-190 at U.S. Coast Guard Training Center Cape May, N.J.

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.

Frode Støldal was appointed the new CEO for the Telenor subsidiary. Støldal replaces MCPs founder, Knut Fjellheim, who has served as interim-CEO and now returns to his previous role as COO/CTO.

Carsten Ladekjær was named Chief Executive Officer of KPI Bridge Oil, a global broker and trader in marine bunkers, marine lubricants and risk management products.

Sebastian Sjoberg was appointed Sales & Business Development Manager of BMT SMART Ltd., a subsidiary of BMT Group Ltd. has appointed
As a Sales & Business Development Manager, Sebastian will be responsible for the Asia Pacific and Scandinavian Territories.

Rolls-Royce announced the completion of its acquisition of Rolls-Royce Power Systems (RRPS). **Ulrich Dohle**, CEO of Rolls-Royce Power Systems said, "With our well-known MTU high-speed engines, MTU Onsite Energy distributed energy systems, Bergen medium-speed engines and L'Orange fuel-injection systems, we are proud that we are now a full member of the Rolls-Royce family and look forward to contributing to its success."

A/S Dan-Bunkering Ltd. introduced a new organizational structure effective August 1, 2014. CEO **Henrik Zederkof** said "We must secure our position in the Asian region and look for further opportunities in this for us very important region. In order to achieve this, Managing Director of Dan-Bunkering (Singapore) Pte. Ltd., **Morten Tranberg Mortensen**, has been promoted to Head of Operations Asia, Senior Vice President and will in his new position join Dan-Bunkering's management team," In addition: **Henrik Ladekjær** is appointed Group Credit Manager; and **Mikkel Søholm Vestergaard** is appointed Group Manager Recruitment & Training.

OceanSaver CCO **Tor Atle Eiken** reports that OceanSaver said it has received a rush of ballast water treatment (BWT) system orders for large vessels. The Norwegian firm, a BWT specialist developing solutions since 2003, has won orders for more than 40 systems in the last six months, with some 21 units delivered so far this year.
The latest contracts, worth approximately $30 million, cover a diverse range of large tonnage, from a number of key international markets, with VLCCs, Aframax tankers, product tankers and Cape Size bulk carriers. A pair of Taiwanese-controlled VLCCs, currently under construction in Japan, are the latest assets in the orderbook.

Stevens Institute of Technology was selected as the lead institution for a new Center of Excellence for Maritime Research (CMR). The selection, announced by the U.S. Department of Homeland Security (DHS) Science and Technology (S&T) Directorate will provide Stevens with $2 million per year for five years. The Center will also include the following partner institutions: MIT, University of Miami, Rutgers University, University of Puerto Rico and Elizabeth City State University. Stevens also has new partners with which it will collaborate on research projects, including LSU, Florida Atlantic University, and the University of Connecticut.

The State University of New York (SUNY) Maritime College has been named a Best Northeastern College by The Princeton Review for an eighth successive year. Maritime College is one of 226 colleges and universities from an 11-state region that The Princeton Review recommends to college applicants in its 2015 print and online editions.

Deltamarin Ltd. has established a subsidiary, Deltamarin Floating Construction Ltd., to enlarge the scope of the group's services. The new company will focus on delivering engineering, procurement, construction and installation solutions for the marine and offshore industry on turnkey basis.

Rolls-Royce Marine and **Nauta S.A.** ship repair yard have signed a cooperation agreement in Poland. Rolls-Royce

Stevens Institute

Photo: Stevens Institute of Technology

Nauta S.A. Drydock

Faro

Marine will gain exclusive rights to provide services on all Rolls-Royce equipment coming into the shipyard. In return, the cooperation is expected to bring in an increased flow of customers into the shipyard

The **FARO 3D Documentation Conference**, to be held October 13-15, 2014, was created as a forum for sharing knowledge, best practices and insight into the world of laser scanning and 3D documentation. Over the course of two days at Disney's Swan & Dolphin Resort, Lake Buena Vista, Fla., attendees will hear from respected visionaries on current issues and the future of our industry in the keynote sessions and learn hands-on from expert instructors in our workshop sessions.

ABS was selected by **Nakilat-Keppel Offshore & Marine (N-KOM)** to class its LB310S liftboat, the first ever self-elevating unit built by the shipyard and the first built in Qatar.

Hyde Marine, Inc. launched an agreement with **Goltens Green Technologies** division to help shipowners determine how to best fit the chemical free Hyde GUARDIAN Gold Ballast Water Treatment System (BWTS) onto its existing vessels.

W&O announced the expansion of its European operations into Spain, Portugal and Gibraltar through a strategic partnership with Puerto y Bahía, a marine supply company headquartered in Cadiz, Spain. Together, W&O Europe and Puerto y Bahia will be providing customers a number of products, with a focus on DIN and JIS valves.

Danos recently named **Glenn Gros** General Manager of the company's Fabrication Division. In addition to the day-to-day management and oversight of Danos' nearly 30-year-old fabrication yard at the company's headquarters' in Larose, Gros will also be responsible for establishing the company's new, waterfront fabrication yard.

Leslie Samel, PE, BCEE, has joined the multidisciplinary engineering firm Hatch Mott MacDonald, and will serve as a Senior Project Manager and office leader at HMM's office in Jacksonville, Florida.

Fairbanks Morse Engine, an EnPro Industries company, has named **Rhett Merriman** sales manager for marine power systems. Merriman is a veteran Fairbanks Morse manager, and brings a wealth of knowledge and experience to his new role. Throughout his 36-year career he has been involved with bringing large, complex power system projects from start to completion.

First LNG-powered Icebreaker

Image copyright Aker Arctic

Deltamarin Ltd. won a contract by Arctech Helsinki Shipyard Inc. for the machinery and technical spaces outfitting production design of the first LNG-powered icebreaker. The vessel is to be built for the Finnish Transport Agencey, and aims to reduce emissions and fuel costs by using both diesel and LNG as fuel.
The icebreaker is designed especially for operations in the most challenging icebreaking conditions in the Baltic Sea. The vessel will also be designed to handle oil spill response operations and emergency towing in demanding conditions at open sea in both winter and summer. This ensures year-round safe seaborne transports in the Baltic Sea. It will be delivered by the beginning of 2016.
The vessel will measure 110 x 24m and will have a maximum draught of 8m. It will be able to move continuously through about 1.6m thick level ice and the service speed of the vessel in open water will be 16 knots. The icebreaker will have accommodation for a total of 24 persons, with reserve for additional crew in case of oil spill response operations. The work will be carried out using the **AVEVA Marine Outfitting** software. Deltamarin has earlier delivered similar design packages for several icebreakers built at Arctech.

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

Ward's Marine Electric, 617 SW 3rd Avenue, Fort Lauderdale, FL 77258, USA , tel:(954) 523-2815, fax:(954) 523-1967, monica.avendano@wardsmarine.com

BOAT BUILDING AND DESIGN

Moose Boats, 274 Sears Point Road Port Sonoma Marina, Petaluma, CA , USA , tel:(707) 778-9828, fax:(707) 778-9827, abbie@mooseboats.com contact: Abbie Walther, www.mooseboats.com

Rigidized Metals Corporation, 658 Ohio Street, Buffalo, NY , USA

BOATBUILDING AND DESIGN

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

Tampa Yacht Manufacturing, LLC, 4350 62nd Avenue North, Pinellas Park, FL , USA , tel:813-792-2114, fax:727-954-3436, robert.stevens@tampa-yacht.com contact: Robert Stevens, www.tampa-yacht.com

BOW AND STERN THRUSTERS

Omnithruster, 2201 Pinnacle Parkway Twinsburg,Ohio 44087 , tel:330 963-6310, fax:330 963-6325, widmer@omnithruster.com

COATINGS/ CORROSION CONTROL/ PAINT

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

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

COMMUNICATIONS

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

CORDAGE

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

CORROSION CONTROL

Rustibus, 2901 West Sam Houston Pkwy, North SUITE E-325, Houston, TX 77041, USA , tel:(832) 203- 170, fax:(832) 203-7171, houston@rustibus.com

Ward's Marine Electric, 617 SW 3rd Avenue, Fort Lauderdale, FL 77258, USA , tel:(954) 523-2815, fax:(954) 523-1967, monica.avendano@wardsmarine.com

COUPLINGS

Centa Corporation, 2570 Beverly Drive #128, Aurora, IL 48331, USA , tel:(630) 236-3500, fax:(630) 236-3565, bobl@centacorp.com

CRANE - HOIST - DERRICK - WHIRLEYS

F&M MAFCO, Inc., 9149 Dry Fork Road, Harrison, OH , USA , tel:(800) 333-2151, fax:(513) 367-0363, websales@fmmafco.com contact: Jen Gardner, www.fmmafco.com

DECK MACHINERY- CARGO HANDLING EQUIPMENT

F&M MAFCO, Inc., 9149 Dry Fork Road, Harrison, OH , USA , tel:(800) 333-2151, fax:(513) 367-0363, websales@fmmafco.com

DIVING & SALVAGE

Hydrex Headquarters, Haven 29 – Noorderlaan 9 Antwerp 2030, Belgium , tel:32-3-213-5300 (24/7), fax:32-3-213-5321, hydrex@hydrex.be contact: Dave Bleyenberg, www.hydrex.be

Hydrex US, 604 Druid Rd E; Clearwater, FL, USA , tel:727-443-3900 (24/7), fax:727-443-3990, info@hydrex.us contact: Matthew Brooks, www.hydrex.us

DRILLS

Hougen Inc., 3001 Hougen Drive Swartz Creek, MI 48473

DRIVESHAFTS

Centa Corporation, 2570 Beverly Drive #128, Aurora, IL 48331, USA , tel:(630) 236-3500, fax:(630) 236-3565, bobl@centacorp.com

EDUCATION

Sea School (U.S. Coast Guard Approved Courses), 8440 4th Street North, St. Petersburg, FL 70002, USA , tel:(800) 237-8663, cathybancroft@seaschool.com

ELECTRIC DRIVE SYSTEMS

Avtron, 7555 E Pleasant Valley Rd. Ste100, Independence, OH , USA , tel:216 642-1230, gabrielle.gillota@nidec-avtron.com

ELECTRIC MOTORS AND CONTROLS

Ward's Marine Electric, 617 SW 3rd Avenue, Fort Lauderdale, FL 77258, USA , tel:(954) 523-2815, fax:(954) 523-1967, monica.avendano@wardsmarine.com

ELECTRICAL EQUIPMENT

Ward's Marine Electric, 617 SW 3rd Avenue, Fort Lauderdale, FL 77258, USA , tel:(954) 523-2815, fax:(954) 523-1967, monica.avendano@wardsmarine.com

ELECTRICAL SERVICES

Ward's Marine Electric, 617 SW 3rd Avenue, Fort Lauderdale, FL 77258, USA , tel:(954) 523-2815, fax:(954) 523-1967, monica.avendano@wardsmarine.com

ENVIRONMENTAL SOLUTIONS

Environmental Solution, Inc., P.O. Box 788, Wake Forest, NC 99835, USA , tel:(919) 740-0546, john@totalbiosolution.com contact: John Paparone, www.totalbiosolution.com

FANS

Ward's Marine Electric, 617 SW 3rd Avenue, Fort Lauderdale, FL 77258, USA , tel:(954) 523-2815, fax:(954) 523-1967, monica.avendano@wardsmarine.com

FASTNERS

Nord-Lock / Superbolt, Inc., 1000 Gregg St., Carnegie, PA 92138, USA , tel:(412) 279-1149, fax:(412) 279-1185, Jason.Milburn@nord-lock.com

FILTERS/FILTER SYSTEMS

UT 99 AG Oil Mist Separators, Schaubenstrasse 5 CH-8450 Andelfingen , Switzerland , tel:+41 52 397 11 99, fax:+41 52 397 11 90, info@ut99.ch , www.ut99.ch/en

FUEL ADDITIVES

Nano Fossil Fuels Technology, LLC, 550 South 16th Street, Sparks, NV 60504, USA , tel:775-356-0280, fax:775-356-0283, nanofuels@sbcglobal.net contact: Ernie Gisler, www.combustion-catalyst.com

GALLEY EQUIPMENT

LOIPART AB, P.O.Box 694/Metallgatan 2-4, ALINGSAS , tel:+46 322 668 360, fax:+46 322 637 747, loipart@loipart.se

GROUNDING & EARTHING BRUSHES

Sohre Turbomachinery, Inc., 128 Main Street, Monson, MA , USA , tel:413-267-0590, fax:413-267-0592, tsohre@sohreturbo.com contact: Tom Sohre, www.sohreturbo.com

INSURANCE SERVICES

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

INTERIORS

Rigidized Metals Corporation, 658 Ohio Street, Buffalo, NY , USA

LAUNDRY EQUIPMENT

LOIPART AB, P.O.Box 694/Metallgatan 2-4, ALINGSAS , tel:+46 322 668 360, fax:+46 322 637 747, loipart@loipart.se

LIFESAVING EQUIPMENT

CM HAMMAR AB, CM Hammar AB August Barks Gata 15 421 32 Västra, Frölunda, Sweden , tel:+46 31 70965 50, fax:+46 31 497023, info@cmhammar.com , www.cmhammar.com

HANSEN PROTECTION AS, P.O. Box 218, Tykkemyr 27 1597 Moss, Norway , tel:tel: +47 6900 1300, fax:fax: +47 6900 1301, hpro@hansenprotection.no , www.hansenprotection.no

LIGHTING SYSTEMS/ EQUIPMENT

Ward's Marine Electric, 617 SW 3rd Avenue, Fort Lauderdale, FL 77258, USA , tel:(954) 523-2815, fax:(954) 523-1967, monica.avendano@wardsmarine.com

MARINE TRANSPORTATION

Central Boat Rentals, Inc., P.O. Box 2545, Morgan City, LA , USA , tel:985-384-8200, fax:985-384-8455, earl@centralboat.com or gary@centralboat.com

NAVAL ARCHITECTS, MARINE ENGINEERS

Aveva Solutions Ltd, High Cross, Madingley Rd, Cambridge CB3 0HB, UK , tel:Tel +44 1223 556655 , www.aveva.com

JMS Naval Architects, 34 Water Street, Mystic, CT 22203, USA , tel:(860) 536-0009 EXT 16, fax:(860) 536-9117, RickF@JMSnet.com contact: Rick Fernandes, www.jmsnet.com

OFFSHORE SERVICES

Hydrex US, 604 Druid Rd E; Clearwater, FL, USA , tel:727-443-3900 (24/7), fax:727-443-3990, info@hydrex.us contact: Matthew Brooks, www.hydrex.us

PIPE FITTINGS/CUTTINGS/CONNECTING/ SYSTEMS

Tube-Mac Piping Technologies Ltd., 853 Arvin Avenue, Stoney Creek 32168, Canada , tel:(905) 643-8823 , x119, fax:(905) 643-0643, chris.peitchinis@tube-mac.com

PROPULSION CONTROL SYSTEMS

Centa Corporation, 2570 Beverly Drive #128, Aurora, IL 48331, USA , tel:(630) 236-3500, fax:(630) 236-3565, bobl@centacorp.com

PROPULSION EQUIPMENT

VOLVO PENTA OF THE AMERICAS INC, 1300 Volvo Penta Drive, Chesapeake, VA , tel:+1 757 3824010, lindsy.shrewsberry@volvo.com contact: Customer Relations Support, www.volvopenta.com

PUMPS

Ward's Marine Electric, 617 SW 3rd Avenue, Fort Lauderdale, FL 77258, USA , tel:(954) 523-2815, fax:(954) 523-1967, monica.avendano@wardsmarine.com

RIBS & INFLATABLE BOATS

Wing Inflatables, 1220 5th Street, Arcata, CA , USA , tel:(707) 826-2887, ewing@wing.com , www.wing.com

ROTATING EQUIPMENT

Sohre Turbomachinery, Inc., 128 Main Street, Monson, MA , USA , tel:413-267-0590, fax:413-267-0592, tsohre@sohreturbo.com

RUST AND PAINT REMOVAL

Rustibus, 2901 West Sam Houston Pkwy, North SUITE E-325, Houston, TX 77041, USA , tel:(832) 203- 170, fax:(832) 203-7171, houston@rustibus.com

SALT REMOVING PRODUCTS

Holdtight Solutions, PO Box 27907 Houston, TX 77227-7507 , tel:713 266- 9339, sales@holdtight.com

SEALS

Seco Seals, Inc., 1370 Logan Ave. Unit K, Costa Mesa, CA 63110, USA , tel:(714) 546-3478, secoseals@aol.com

SHIP REPAIR

Advanced Mechanical Enterprises, 217 SW 28th Street, Fort Lauderdale, FL 98052, USA , tel:(866) 377-0770, fax:(954) 527 – 0338, Christine@amesolutions.com

STEEL, PIPE, ALUMINUM & ALLOY SURPLUS - PURCHASING

Texas Iron & Metal, 865 Lockwood Drive, Houston, TX 36652, USA , tel:713-672-7595, fax:713-672-0653, maxr@texasironandmetal.com contact: Max Reichenthal, www.texasironandmetal.com

STEEL, PIPE, ALUMINUM & ALLOYS

Texas Iron & Metal, 865 Lockwood Drive, Houston, TX 36652, USA , tel:713-672-7595, fax:713-672-0653, maxr@texasironandmetal.com contact: Max Reichenthal, www.texasironandmetal.com

STEERING GEARS/ STEERING SYSTEMS

Jastram Engineering, 135 Riverside Drive, North Vancouver, BC,, North Vancouver , Canada , tel:(604) 988-1111, fax:(604) 986-0334, dholme@jastram.com

SURFACE PREP TOOLS

Rustibus, 2901 West Sam Houston Pkwy, North SUITE E-325, Houston, TX 77041, USA , tel:(832) 203- 170, fax:(832) 203-7171, houston@rustibus.com

TRAINING

Freelance Software, 39 Peckham Place Bristol, RI 02809, Bristol, RI , USA , tel:(401) 556-1955, fax:(401) 396-9717, chris@hawsepipe.com contact: Christopher Dady, www.hawsepipe.com

TRANSMISSIONS

Centa Corporation, 2570 Beverly Drive #128, Aurora, IL 48331, USA , tel:(630) 236-3500, fax:(630) 236-3565, bobl@centacorp.com

VACUUM TOILET SYSTEM

Jets Vacuum AS, Myravegen 1 6060 Hareid , tel:47 700 39 100, fax:47 700 39 101, post@jets.no

VIBRATION ANALYSIS

Advanced Mechanical Enterprises, 217 SW 28th Street, Fort Lauderdale, FL 98052, USA , tel:(866) 377-0770, fax:(954) 527 – 0338, Christine@amesolutions.com

WATER JET SYSTEMS

MJP Marine Jet Power AB, 1110A Claycraft Rd, Columbus, OH , USA , tel:(614) 759-9000 , www.marinejetpower.com

WINCH MANUFACTURER

Patterson Company, 870 Riversea Road, Pittsburgh, PA 30004, USA , tel:(412) 322-2012, fax:(412) 322-2785, russ.mayhew@pattersonmfg.com

WIRES & CABLE

Ward's Marine Electric, 617 SW 3rd Avenue, Fort Lauderdale, FL 77258, USA , tel:(954) 523-2815, fax:(954) 523-1967, monica.avendano@wardsmarine.com

MaritimeJobs.com

where employers and job seekers connect

The Maritime Industry's Leading Employment Website. For more information contact: Jean Vertucci at vertucci@marinelink.com

Assistant Marine Energy Engineer
Job Location: USA, Norfolk

Job summary
The Assistant Marine Energy Engineer (AMEE) will aid the Senior Energy Engineers in performing energy audits on all types of vessels, terminals, and facilities as required. The AMEE will also aid in producing the reports of the audits.
Salary is dependent upon experience, license, advanced degrees and certifications, and individual's ability to perform the tasks assigned.
Summary of essential job functions
The AMEE will be required to travel to and from the vessel/terminal/facility to perform the actual auditing. The time period for the audit is typically 1 to 3 weeks. This will also require actual riding of vessels while underway. Travel will comprise 5 to 25% of the work time.
During audits the AMEE is responsible to take technical measurements of various energy consuming equipment onboard the vessel with data loggers, power quality meters, and written logs. The AMEE is responsible to set up the instrumentation, record the data, and download the data to a PC. The AMEE will also be required to take written performance data for various systems, equipment, engines, boilers, etc during the audit.
The AMEE will produce reports using the data collected during the energy audit under the direction of a Senior Engineer. This will consist of analyzing the collected data and producing graphs/charts as required. The job will include considerable time doing research on various equipment and systems. The AMEE will use the information gathered during the research, audit, and analysis and assist the senior engineer in writing the technical report.
Minimum Requirements
•Electrical skills: able to read electrical prints and work on distribution panels and switchgear.
•Computer skills: able to work with Excel, Microsoft Word, and various specialty software programs
•USCG Unlimited Third Assistants License
•Maritime Academy Graduate (Chief Engineer license with senior officer experience will be considered)
•Fluent technical report writing skills
•Able to communicate effectively with other people.

•Advanced degree a plus.
Physical Abilities Required
•Able to work 12 hour days/ 7 days a week, in engine room conditions during at sea phase of energy audit
•Able to carry measurement equipment and gear through out vessels/facilities as required
•Self motivated and ability to perform duties independently
Bobbi Wolff
Alaris Companies
Email: bobbi.wolff@alariscompanies.com

Trawler Deckhand
Job Location: USA, Seattle

Trident Seafoods operates catcher/trawl vessels off the West Coast and the Gulf of Alaska and Bering Sea.
We are currently seeking to interview candidates on the East Coast who: can splice rope and cable; experienced setting, hauling back and mending nets; capable of standing a navigational watch; have a basic understanding of vessel engineering systems; have worked as deck/engineers in an unlicensed capacity; have welding skills. E-mail a current resume and contact information to vesselstaffing@tridentseafoods.com.
Trident Seafoods is an Equal Opportunity Employer: Affirmative Action – Minority, Female, Disability, Veteran
Vessel Staffing
Trident Seafoods
5303 Shilshole Ave NW
Seattle WA 98107 USA
Email: vesselstaffing@tridentseafoods.com

Operations Superintendent
Job Location: USA, Wilmington

Responsible for forecasting and directing terminal handling activities, manpower and equipment allocation, supervision of labor and customer relations. Must be available to work day and evening shifts, and weekends. Terminal operations experience or maritime academy training required.
Elena C. Salvatore
TraPac, LLC
920 W. Harry Bridges Blvd.
Wilmington CA 90744 USA
Phone: 310-513-7416
Fax: 310-513-7439
Email: elena.salvatore@trapac.com
Web: http://www.trapac.com

Marine Hydraulic Mechanic/Technician
Job Location: USA, Dutch Harbor, AK

Hydraulic Mechanics and Technician needed for busy Hydraulic repair and sales shop in Dutch Harbor, Alaska. We repair all manner of fluid power issues aboard fishing vessels. Crane, winches, cylinders pumps and motors etc. Experience in the industry a must. Technician position must be able to diagnose and repair hydraulic systems, 10 years experience needed in marine application. Great Benefits and housing available.
Allana Gustafson
Hydra-Pro Dutch Harbor, Inc.
PO Box 920686
2315 Airport Beach Road
Dutch Harbor AK 99692 USA
Phone: 907-581-3878
Fax: 907-581-3879
Email: HPDH@arctic.net
Web: http://HPDH.net

Marine Electrician
Job Location: USA, Honolulu

This position must be able to handle all electrical and electronic components on on-board marine vessels and/or dry docks and facilities. Must be able to develop and facilitate a maintenance program. Must have working knowledge of electrical systems, high voltage systems, and electronic components. Must have attention to detail and work independently. Must have 5+ yrs of electrician experience, preferably in the marine industry and/or heavy industrial. Must obtain Rapid Gate ID and pass NCIC background check. Valid driver's license. Must be able to provide US citizenship document(s). Must have flexible work schedule.
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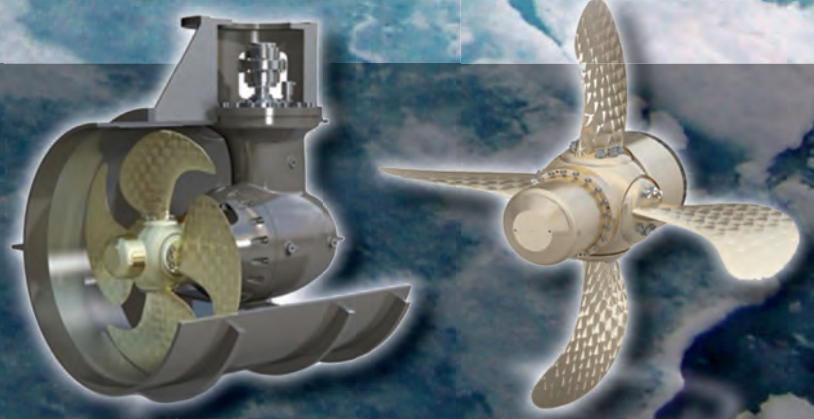

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