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Bulk Shipping

To scrub or not to scrub – and why

LNG BUNKERS

WHO'S FUELING WHOM?

THE EMISSIONS-FREE PORT

SAN PEDRO PORTS: AS 'X' APPROACHES ZERO

MANAGING MARINER WELFARE

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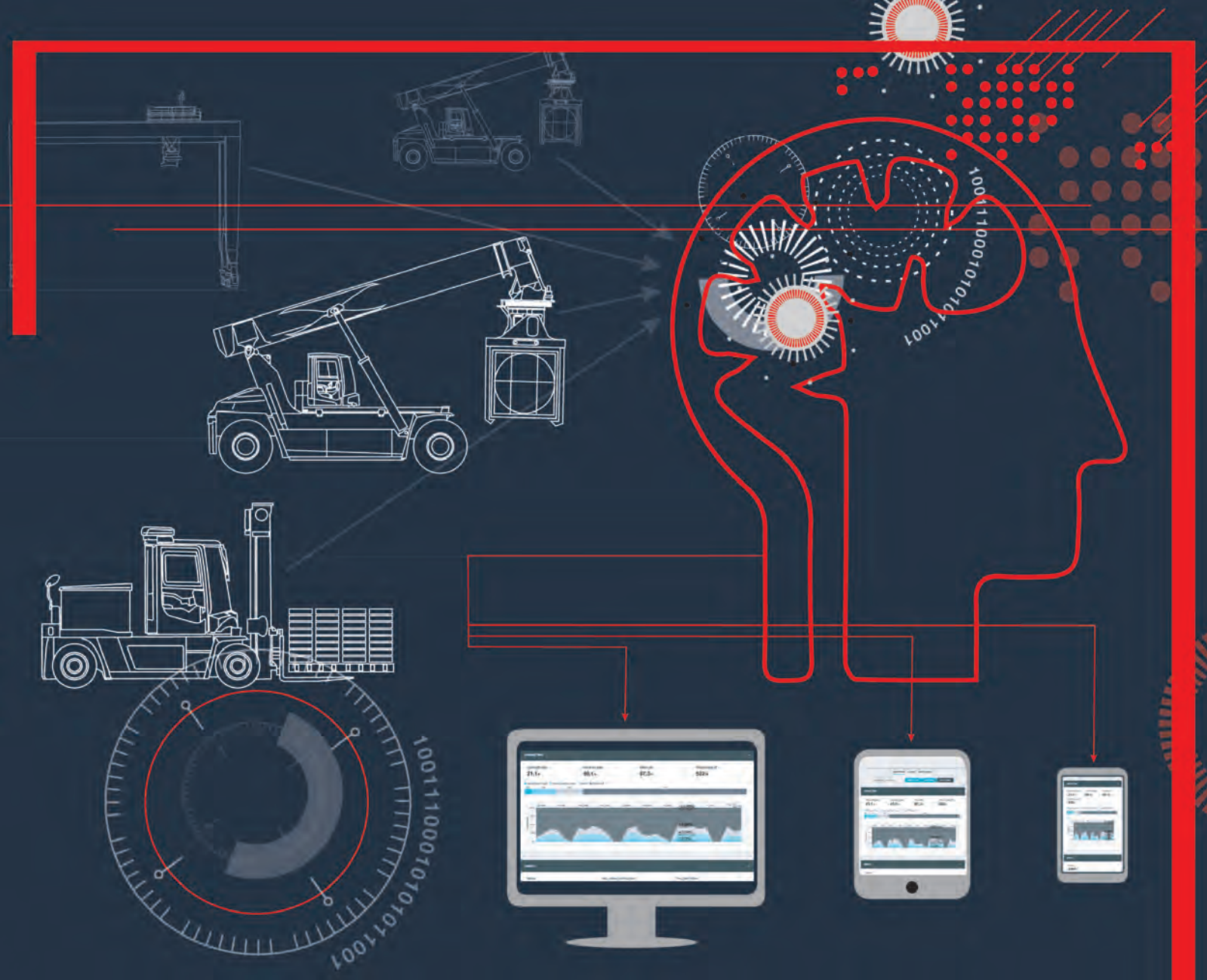

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– Harvey Bauer,
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Tideworks Technology

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ON THE COVER

It has been a wild ride for the Baltic Index and its bulk Shipping Sectors. As the New Year approaches, all bulkers find themselves at the mercy of government policy and regulatory pressures. IMO 2020 and the ongoing trade wars could decide whether the latest run of robust freight rates can continue. Barry Parker's report begins on page 30.

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Editor's Note

Two Kinds of Green

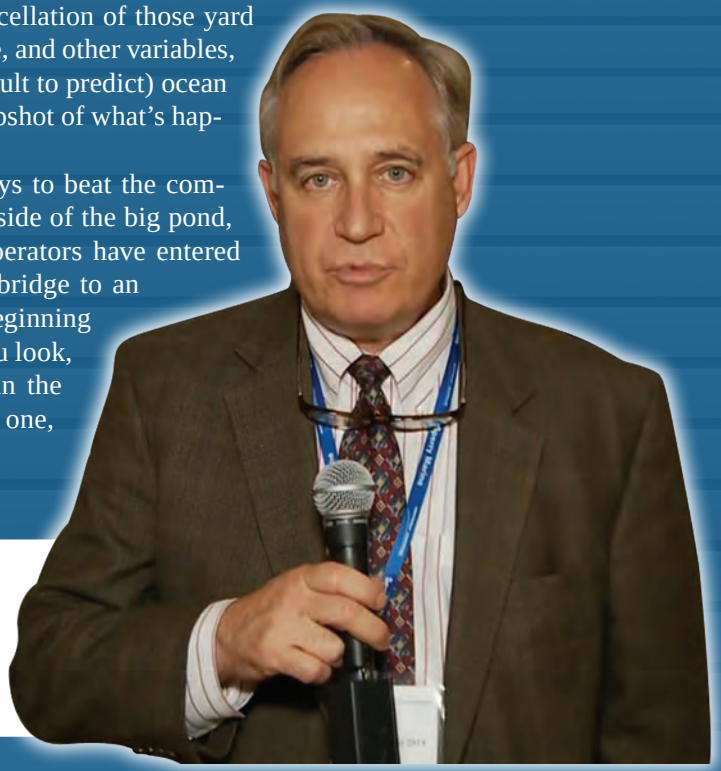
With the 'IMO 2020' mandate looming large in the proverbial center porthole, California's edict for emissions-free port operations by the year 2030, the ballast water treatment rules and, of course, ever-escalating IMO and EPA engine Tier ratings all impacting the global supply chain, it's no wonder that the environment is the number one challenge facing today's maritime industry. Global warming has ratcheted up the heat on shippers, terminals, boatbuilders and everyone else on the waterfront. Without a doubt, if you want to continue to be a stakeholder in this vitally important business, then you'll also need to be an agent for change within your own shop.

The maritime industry takes a lot of heat for what it doesn't do within the global effort to reduce the world's carbon footprint, and, at the same time, not nearly enough credit for what it does right. Nowhere is that more evident than out on the U.S. West Coast, where the nation's two biggest container ports compete – and cooperate – when it comes to commerce and the environment.

The Golden State has ordered all California ports to achieve "emissions free operations" by the year 2030, or in other words, right around the time that China says that their emissions will peak. Notwithstanding the enormous pressure that this gargantuan task exerts on the competitiveness of both ports, the effort also comes at a time when both ports have already picked all the low hanging fruit. Can they get there? Starting on page 40, ***MLPro's*** Tom Ewing sorts it all out for us.

Meanwhile, out at sea, the shipping industry – specifically bulk shipping – is struggling with the same issues. As the IMO 2020 deadline approaches, bulk carrier operators must decide which route that they will take on the way to satisfying the impending environmental rules. This all comes at a time when, for one brief blessed moment, the Baltic Index has heralded robust freight rates for most sectors. Owners who had almost made the leap of faith into the scrubber solution camp now contemplate cancellation of those yard visits so as to ride the higher rates for as long as possible. These, and other variables, weigh heavily on one of the world's most important (and difficult to predict) ocean shipping segments. In this edition, Barry Parker provides a snapshot of what's happening, and why.

Scrubbers and low sulphur fuels; sure, those are viable ways to beat the coming emissions rules. At the same time and at long last on this side of the big pond, the LNG bunkers boom has arrived. Rafts of players and operators have entered the mix, betting that the super chilled fuel will be the final bridge to an emissions-free world. In Florida alone, this massive effort is beginning to reshape American bunker markets. No matter which way you look, on any ocean or coastline, getting green will be Job ONE in the New Year. **Hint:** there are two kinds of green. You won't get one, without the other.



Joseph Keefe, Editor | **keefe@marinelink.com**

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SCRUBBERS: the Best Option for IMO 2020 Compliance

IMO 2020 has been described as the most significant environmental regulation ever implemented for the oil industry, as from 1 January 2020 ships will need to burn fuel with a sulphur content below 0.5%.

Initially, it was thought that about 90% of shipowners would use the new low sulphur fuel oil (LSFO), but as the date gets closer and with many uncertainties surrounding LSFO not least its price, many seem to be opting for marine gasoil in the short term while they assess long term options.

While a shipowner may be deterred from installing a scrubber because of the investment costs, in reality, scrubber installation offers significant financial and environmental benefits above and beyond the other methods of compliance.

Obviously, the actual price of LSFO on 1 January 2020 is not yet known, but commentators have estimated that it will cost between USD $100-300 per tonne more than HSFO. In Rotterdam, the price spread between LSFO and HSFO is forecast to widen to between $200 and $250 per tonne in the fourth quarter of 2019, from about $150 per tonne in the second quarter, according to Matt Wright, a consulting manager at Argus Media, who analyses energy and other commodity markets. And the spread is expected to increase to between $300 and $350 per tonne in the first quarter of next year.

Fitting a scrubber is a significant investment but it seems likely that the savings gained from burning HSFO instead of LSFO will offset the installation cost, with some estimating that for a larger ship it could take just months to 'payback' and offset the costs of installation. HSFO is likely to cheaper than LSFO for quite a few years to come and while the price difference may get smaller, the benefit will remain, and those using HSFO will continue to save money.

Moreover, HFSO is going to be available for quite some time.

Scott Poulter, Executive Director of Pacific Green Technologies explains why a scrubber offers the best option for IMO 2020 fuel emissions compliance.

There are new refineries being built which will only produce the higher quality LSFO, but there are many existing refineries – about 700 globally – which currently show no sign of upgrading their refining facilities (which would require an investment of approximately $3bn). Even if it takes five to ten years for refineries to upgrade, shipowners using scrubbers will still be able to reap the financial benefits.

Furthermore, recent reports including a study published by the Norwegian independent research organization SINTEFF are concluding that scrubbers also offer ship operators and owners the most effective environmental compliance solution.

Chief Scientist Dr. Elizabeth Lindstad, SINTEFF noted in a report published in June that from well-to-wake the continued use of HSFO or HFO with an EGCS offered the most environmentally beneficial means of meeting global Greenhouse gas (GHG) emissions targets. Scrubbers remove up to 94% of the particulate matter found in ships' exhaust fumes, something that cannot be achieved by simply switching to low sulphur fuel.

Some administrations have taken the step to ban discharge from open loop scrubbers in their waters believing that the discharge water will be disproportionately filled with pollutants. But actually, the naturally high sulphur content of the world's oceans means that the additional sulphur from scrubbing washwater represents a tiny fraction of change, with a negligible environmental impact.

The Clean Shipping Alliance 2020 published a report earlier this year examining the washwater from an open loop scrubber and concluded that it consistently met the IMO regulations and numerous other international measurement criteria. Furthermore, the report noted that open loop scrubbers are recommended by the IMO as a 'specifically permitted solution' for ship owners seeking compliance with the IMO 2020 rules.

But even so, every ship is unique and every scrubber installation should be, too.

As one of the largest scrubber manufacturers Pacific Green Technologies (PGT) custom designs every installation depending on the type of scrubber, vessel layout and system configuration, while working to ensure that the scrubber shape and position has minimal impact on the vessel's cargo carrying capacity.

Pacific Green Technologies' patented ENVI-Marine compact, flexible rectangular shape fits within, or next to, existing stacks on any ship, and it contains no moving parts, fans or media, significantly reducing maintenance costs.

The ENVI-Marine is a new generation of scrubbing technology, based on a simple concept. The flue gases are first quenched then cleaned by specialized frothing through pure seawater using a patented TurboHead process before being discharged as harmless salts.

ENVI's unique patented TurboHead provides a highly interactive contact between the seawater and the exhaust gas in a turbulent zone containing a high amount of surface area for gas/ liquid absorption. This high energy liquid/ gas interaction assures both the residence time and complete interaction required to achieve high efficiency removal of sulphur from the exhaust gas and the extreme turbulent interaction transfers particulate matter from the gas to the scrubber fluid.

Marine fuel oil typically has a 0.1% to 0.15% ash content after complete combustion, and incomplete combustion adds carbon and hydrocarbon particulate and oils to that value. A high percentage of these pollutants are captured by the seawater scrubber resulting in a much cleaner exhaust plume.

PGT's ENVI-Marine systems are fully flexible and can be supplied as open loop, open loop hybrid-ready and full hybrid systems capable of both open and closed mode operation for use depending on the sea's alkalinity and the effluent emission regulations wherever the ship is located.

The system discharges neutralized sulphur into sea in its open loop function, or used in its closed loop mode, the system uses caustic soda (NaOH) or magnesium hydroxide (Mg(OH)2) as supplemental reagents, and the solution can be processed and simply stored for disposal ashore.

Last but not least, there have been reports from shipowners that their scrubber retrofitting programs were falling behind schedule.

PGT's message to any ship owner is to select a manufacturer with the operational capacity to fulfill large number orders. Gas scrubber specialists who can work in high volumes with access to raw materials, parts and spares are still able to satisfy orders and equip vessel owners in time for the implementation of the new IMO rules.

PGT has partnered with the state-owned Chinese giant, PowerChina to offer a scrubber solution combining PGT's technical knowhow and PowerChina's massive production capacity. As a result, even though the deadline is approaching, Pacific Green Technologies can still deliver and install scrubber systems on time and on budget.

The Author **Scott Poulter**

is the Executive Director of Pacific Green Technologies. Since 2016, Mr. Poulter has served as Chief Executive of Fresh Air Capital Ltd., a company engaged in the evaluation and financing of environmentally focused startup companies with projects in both Europe and North America. Since 2010, he has also served as the founder and CEO of the Pacific Green Group and more recently the founder and Chairman of Fresh Air Investments Limited which is a substantial shareholder of the company.

TO SCRUB, OR NOT TO SCRUB? THAT IS THE QUESTION...

Llewellyn Bankes-Hughes, Managing Director at Petrospot talks about the controversial adoption of exhaust gas cleaning systems ahead of IMO 2020

"To scrub, or not to scrub" is a question that I get asked quite frequently in this job. It's certainly a contentious issue at the moment with plenty of fierce debate centered on the long-term impact of these specialized exhaust gas cleaning systems.

Whilst the shipping industry might once have hoped that 'sulphur scrubbers' might provide a straightforward solution to IMO 2020 compliance, I rather suspect that might be wishful thinking to think that's a problem solved. To answer honestly, both myself and 'the jury' are still very much out on the long-term viability of scrubbers, from a financial, environmental and, ultimately, political standpoint.

I do not dispute that the deployment of exhaust gas cleaning systems can potentially result in significant savings in operational costs, particularly for very large ships calling at major ports, as users can scrub lower-priced high sulphur fuel oils rather than buy more expensive distillates or very low sulphur fuel oils. But this assumes a readily-available supply of high sulphur fuel and a substantial discount versus low sulphur fuels. Despite numerous industry forecasts and consultants' predictions, neither of these is 100 percent guaranteed, especially in smaller, less flexible ports. This applies to all scrubber systems, whether open loop, closed loop or hybrid.

It is perfectly clear that the technology does work – although if it does break down at any point, the shipowner may be open to regulatory problems as well as mechanical ones, which is something to be aware of when investing in vessels once the IMO 2020 regulation comes into force.

Overall, the biggest concerns are environmental and political. Already, open loop scrubbers are increasingly being labeled as environmentally damaging because they remove sulphur emissions from the air only to discharge them into the sea. A number of ports around the world have either already banned their use in port, or are considering what their stance should be – Gibraltar, Singapore and Fujairah included.

Closed loop and hybrid scrubbers are not yet under that particular microscope, but once attention turns from sulphur emissions to carbon emissions (which scrubber systems do not reduce), they too will be scrutinized. The IMO has encouraged its member states to conduct their own research into the impact of scrubbers on the environment so that individual countries could make their own proposals on the subject of scrubber regulation, which would then need consensus approval by its 174 member states.

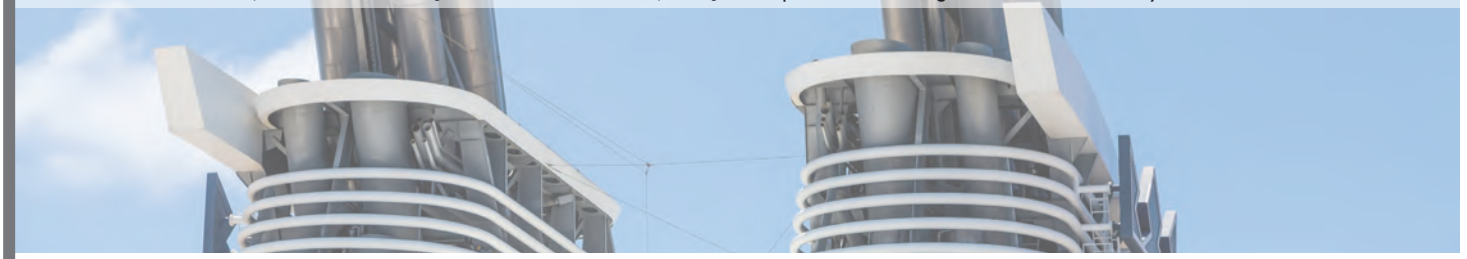
Once the environmental lobby really sinks its teeth into the use of scrubbers – as it is already just starting to do – politicians will not be far behind. Therefore, regardless of their effectiveness, I foresee a time when political imperatives driven by environmental lobbying may put an end to the use of scrubbers.

Additionally, if a larger number of ports ban open loop scrubbers, forcing users to use closed loop or hybrid varieties, all ships using scrubbers will be obliged to retain the scrubber effluent on board until a suitable waste disposal site can be found. This might easily end up being both expensive and not necessarily located at the scheduled ports of call for a vessel that needs to discharge. While waiting to offload scrubber discharge, a ship will also have to carry the extra load, thereby reducing its bunker or cargo carrying capacity, hence costing money.

If I were a bunker buyer, I would be cautious in adopting scrubbing technology based on the current state of affairs, chiefly because once the issue of sulphur has been addressed, environmental and political attention will shift quickly to carbon, for which scrubbers have no answer.

The Author **Llewellyn Bankes-Hughes**

(Managing Director, Petrospot) began his career in the oil industry in 1980 as an oil price reporter (Petroleum Argus), working in London and New York. In 1983, he launched the Petrospot Directory, the first international oil trading contacts directory of its kind. From 1983 to 1985 he was a physical oil broker (Eperon Petroleum and Albion Oil) in New York and London. In 1985, he became markets editor of Petroleum Intelligence Weekly, leaving in 1988 to launch the real-time oil information services OPEC Listener and Oil Market Listener. Over the past 17 years, Llewellyn has worked to raise the profile of the international bunker industry and campaigned for a greater level of education, training and co-operation among industry members, creating some of the industry's most successful training courses, conferences, magazines and books. He has a degree in Spanish and Portuguese from the University of London.

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The View from Tideworks

Harvey Bauer, Director of Marketing and Contracts, at Tideworks Technology, has been with Tideworks for more than 16 years, managing marketing and business development opportunities for the multinational company. Harvey has extensive experience working in the logistics, supply chain and technology industries. Prior to joining Tideworks, Harvey was the general manager at SSA Mexico where he oversaw operational, commercial and administrative functions of specialized container terminals in Manzanillo, the largest container terminal in Mexico. This month, within the pages of ***Maritime Logistics Professional*** magazine, he expands on the evolution of the now ubiquitous Terminal Operating System (TOS), and Tideworks' leadership role in that journey.

Let's talk about the evolution of TOS: give us the 10,000' view of when TOS first began, and Tideworks' place in that development?

The notion of efficiently managing and coordinating the movement of containers at a terminal is not a new one. However, the adoption of more modern TOS solutions to effectively manage terminal operations has become more common in the past 20 years due to the increased efficiency and productivity made possible by newer technologies. Tideworks was launched in 1999 af-

When the TOS tide comes in, all the boats float. It isn't hard to see why.

ter years of experience as the technology division for Carrix, Inc., which operates in more than 250 locations worldwide. With this experience and technical expertise, Tideworks has helped shape the evolution of TOS into what it is today.

In the early 1990s, there was a push to get off mainframe systems and advance to more modern solutions. During this time, there was also incredible software innovation taking place outside of the terminal operating space. As technology stacks continued to modernize, so too did terminal operators' desire for more features and functionality to help effectively manage and automate their operations.

For TOS, automation really began with planning system capabilities to improve vessel and rail load planning, replacing "chits" and other manual methods. In Tideworks case, Spinnaker Planning Management System helped provide comprehensive planning and improve productivity and inventory accuracy. The evolution of TOS continued with the digitalization of equipment dispatch systems (Tideworks Traffic Control), which optimizes the execution of instructions to container handling equipment operators.

More recently the progression of TOS has been around applying new technologies to help operators with data visualization and business intelligence to help them make informed, real-time operational decisions. The industry continues to develop and deploy cutting-edge technology solutions, and we are at the forefront of these advancements. Speed, efficiency and transparency are all requirements of today's operators in order to meet customer demands, maintain profitability and provide ROI to shareholders.

How many terminals/customers does Tideworks have today in the global intermodal supply chain?

Currently, more than 120 marine and intermodal terminal facilities around the world utilize Tideworks' solutions to load vessels and trains, track containers, manage payments and invoicing, and run their operations more efficiently.

Improvements in technology are impacting terminal operators, container owners and other players in the global supply chain. Tell us where Tideworks is involved in that process.

Customer expectations around service levels and increased visibility throughout the supply chain are requiring terminal operators to invest in new technologies just to keep pace. From our perspective, one of the more recent and pivotal changes in TOS technology space is the integrated ability to leverage 'big data' produced by terminal operations. This enables marine and intermodal terminal operators to gain visibility and valuable insight into operational data to make more informed, real-time decisions and thereby increase operational efficiencies and optimize the utilization of assets.

For example, Tideworks Insight, a real-time and historical data platform for terminal operations, has paved the way for operators to drill into TOS data as well as integrate data sets from third-party technology systems gaining visibility into how those systems and their operation are performing.

We have always worked to provide our customers with next generation TOS solutions. In fall 2019, we will launch an update to our current, core marine TOS product, Mainsail, providing customers with the next iteration of innovation.

Marine and intermodal terminal operators are not the only players in the supply chain where Tideworks is involved. Through our joint venture partnership, Advent Intermodal Solutions, we also provide Port Community Systems and a host of other solutions focused on bringing value to trucking companies, BCOs and others in the supply chain.

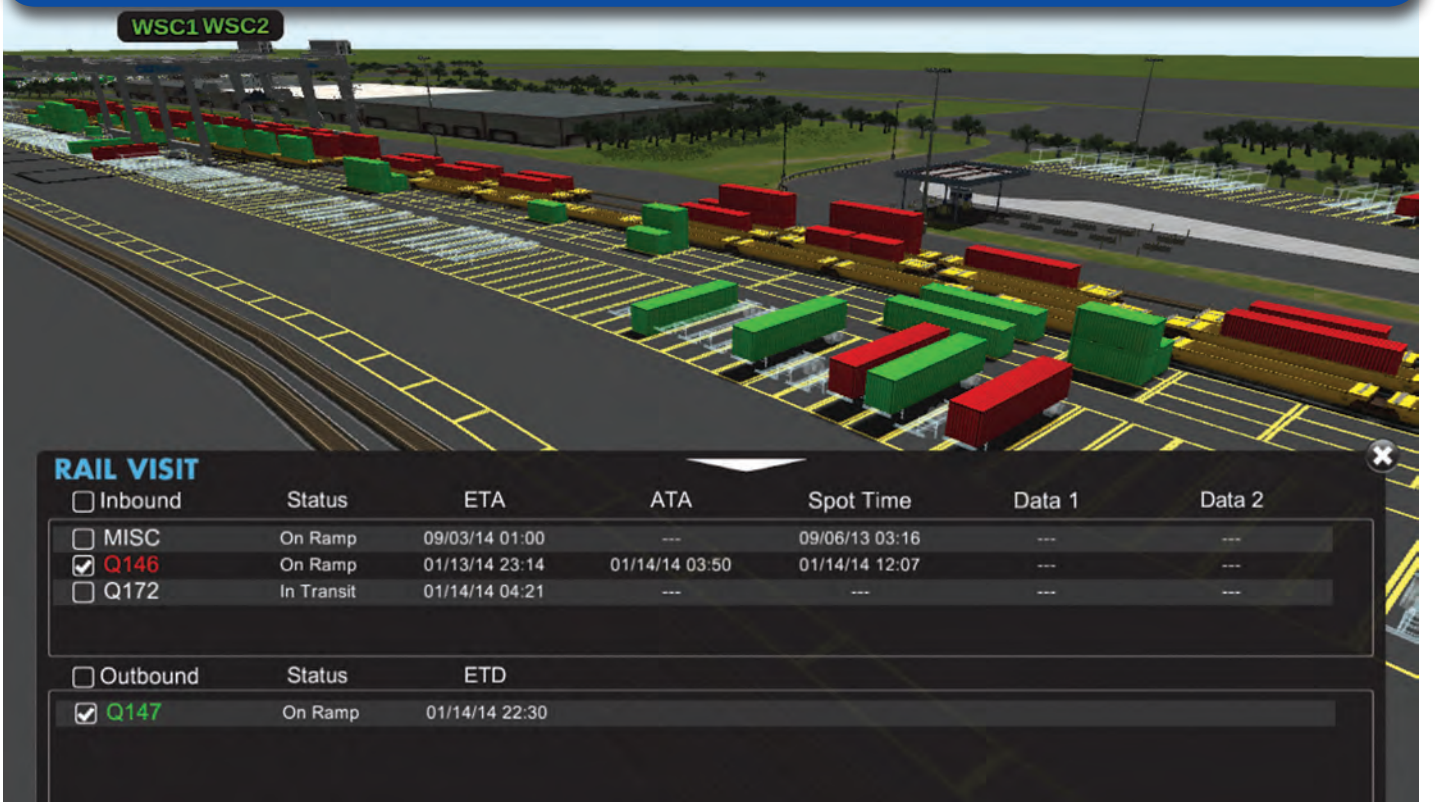
Give us some measurable metrics as to where and how your TOS solution has made a difference for customers.

One case study involves he implementation of Tideworks Insight solution with Manzanillo International Terminal (MIT) in Panama. MIT offers an array of handling services, providing connectivity to 129 ports in 48 countries. After leveraging Tideworks Insight, MIT was able to merge data from its TOS, Automated Stacking Cranes (ASCs) and third-party systems. This gave MIT a holistic view of their operations, which allowed them to identify new opportunities to drive performance and positive margin growth. We can also point to Crowley, who, after deploying Tideworks' TOS solutions under our SaaS model, was able to decrease gate turn times by nearly 40 percent in the case of one terminal.

Talk about best practices for operators to consider when assessing cloud-based TOS solutions and their benefits. Why should a terminal choose a cloud-based solution over a local, internal server setup?

Like other industries, the growth of cloud computing is influencing the terminal operating landscape. With the increased pres-

> *Our solutions, whether deployed in manual or automated environments, help terminal operators manage and access data faster, therefore increasing the control over their operations. With our TOS solutions, operators can easily gain complete visibility and autonomy to manage real-time decision-making of every asset.*
>
> – Harvey Bauer, Director of Marketing and Contracts, at Tideworks Technology



sure to facilitate faster system updates and reduce IT overhead, more technology vendors are developing cloud-based solutions as they offer additional flexibility, scalability and reduce costs when compared to traditional on-premise solutions. Additionally, a cloud-based solution is normally associated with a "subscription" commercial model, which is significant break from the conventional licensing and ongoing maintenance and support paradigm. A subscription provides the terminal operator with a well-known TCO and enables the operator to spread out their technology costs over time under an OPEX rather than CAPEX model.

Tideworks says cloud-based TOS can increase efficiency of container movement, flexibility in processes and planning and the ability to scale operations for future growth. Tell us how.

First, without getting too technical, we need to talk about the architecture of the software that enables its deployment in the cloud and to reap the benefits therein. Traditional TOS architecture, incorporating decades of customer requests for more and richer functionality, has led to very complex and monolithic systems. As a leader in this space, Tideworks is breaking down these monoliths into more manageable "microservices," which in turn enables much

faster responsiveness to customer requests; greater software quality, not only because we test smaller units but because test automation is built into the process; and ultimately quicker delivery to market.

It is this approach that allows us to deploy several of our offerings to the cloud currently and will propel us forward toward a fully cloud-enabled TOS. The benefits of leveraging the cloud are well-known, and these are the benefits that operators can expect: multi-tenancy capabilities, vertical and horizontal scalability based on demand, etc.

Terminal Automation is not a 'one-size-fits-all' solution. What aspects of Tideworks' TOS make it an appropriate choice for operators contemplating automation?

We have worked with a number of terminal operators to assess how automation fits within their current operations. Because automation is not a one-size-fits-all solution, it is important for terminal operators to take a tailored approach when evaluating automation solutions. We help customers understand what solution(s) will best accommodate their terminal's size, location and general needs before selecting a solution. Sometimes full-scale automation is not the answer. Because we are independent, we also try to give customers the freedom of choice, rather than prescribing only certain automation technologies and providers that work with our TOS.

Our solutions, whether deployed in manual or automated environments, help terminal operators manage and access data faster, therefore increasing the control over their operations. With our TOS solutions, operators can easily gain complete visibility and autonomy to manage real-time decision-making of every asset. Often, when people think about automation, they fear having less control of their operations. With our solutions, we help ensure operators have better, more comprehensive control of their operations from a holistic standpoint while also improving efficiency.

Our newest TOS rollout, Mainsail 10 that we are launching this fall, is built on a Rich Internet Application (RIA) development platform that is scalable and flexible in its ability to support today's increasingly integrated terminal technology ecosystem. This enables operators to deploy automation and improve integrations between other solutions, thus allowing them to access the data they need when they need it, increase terminal efficiency and ultimately handle additional throughput without investing in more equipment or resources. It also enables operators to easily provide customers and partners with visibility to streamline communication.

The march towards terminal automation is as much driven by safety as it is for operational efficiencies. For TOS providers, that's meant navigating the interface between the existing TOS, and the automation that typically follows. Tell us about how that happens; both in a new terminal, and an existing one that is contemplating upgrades.

You're correct. One of the most important outcomes of automation in the terminal environment is providing safer working conditions. Over the past several years, we've seen digitalization and automation in the operating environment providing the platform to implement and integrate with various systems to enhance terminal and worker safety.

Examples include collision avoidance systems, seat belt monitoring technology, remote crane operations, and safety halos which create operational buffers around people, to name a few. Additionally, gate automation developments at many facilities have helped get terminal staff out of dangerous gate lanes and improved driver safety with the use of mobile phone apps to keep drivers in their cabs. Whether a new terminal or an existing terminal transitioning to a new platform, these are extremely positive safety enhancements and automation is providing the launching pad for this continuous improvement in the terminal environment.

One thing that TOS systems seem to strive for is providing a unified access platform to previously 'siloed data' streams. Would you agree?

Yes, it is beneficial for terminal operators to manage and track their data in a unified way. Operating various siloed technologies and systems that manage aspects of operations separately can create discrepancies in data, limit an operator's and customer's ability to access real-time, accurate and consistent information and can negatively impact operational efficiency.

Terminal operators need seamless integration and communication capabilities with third-party systems such as auto data capture technologies, position detection systems, gate solutions, and even human resource and accounting systems to provide full visibility and a more streamlined operation. This is precisely why Tideworks has developed and taken to market its unified data platform, Tideworks Insight. With Tideworks Insight, terminal operators not only get access to historical and real-time TOS data, they can also incorporate other, third-party data sets to secure a 360-degree view of their operations and their business.

The old saying goes something like, "If you've seen one port, you've seen one port." Terminals come in all shapes and sizes, too. Hence, Terminal Operating Systems must adjust for that reality. Would you agree?

Yes, we would agree. Terminal operators have unique needs and therefore cannot rely on one-size-fits-all solutions. It's imperative that terminal operators take an intentional, personalized approach when selecting a TOS technology to address their specific needs.

On the other hand, the onus is also on TOS providers to stay ahead of trends and their customers' changing requirements to offer effective solutions that continue meeting their needs. At Tideworks, we understand this and have made it a priority to provide the next generation TOS, fully recognizing that it isn't a stopping point, rather a continuous improvement and evolution of our solutions to include the latest technologies available. We offer a suite of products and partner with our customers to make sure they are operating with the best solutions to succeed in a dynamic, highly competitive environment.

HOW WELL DO YOU KNOW YOUR SHIPS?

Collaboratively use existing technologies and data to find valuable information about a ship's actual condition. Eventually, this leads to positive changes in vessel performance and optimization. Is that too much to ask?

By Tapio Hulkkonen and Teemu Manderbacka

What's the basis for the difference between the prices paid for VLCCs at the moment? Is it the variance in size or equipment? Or, perhaps the geopolitical tensions and changing expectations of tonne-mile demand? Maybe it is the reputation of each vessel's shipyard? How about refinery capacity growth in the Middle East and Asia? And, then there's the enforcement of tighter regulations with stricter safety and environmental standards? And, what about that clean energy "transition?"

Each of these factors certainly influences the final price. But to anyone with reasonable knowledge of the sale and purchase market, we've so far overlooked perhaps the most important obvious factor of them all: the ship's current state.

THE VALUE OF DUE DILIGENCE

The stresses, strains, forces and tensions – otherwise known as cyclic loading – on a ship are responsible for the structural causes of material degradation, and ultimately fatigue. While at sea these factors cause progressive deterioration of a vessel, affect its service lifespan, and the level of service and maintenance it will require.

It's possible to get a partial understanding of a ship's working life through its logbooks. Similarly, its classification records will tell you of any mechanical or structural defects which have been remedied, and there are a variety of other specialist sources from which you can infer aspects of a vessel's condition.

However, even with all these sources, you can't get a complete understanding of its seaworthiness. None of shipping's mandatory records will detail the weather it has endured, the loads it has carried, its engines' revolution profiles, or the daily stresses of its superstructure – and these are all factors that affect the condition of a vessel, the safety of its crew and cargo, and the value at which it is bought, sold, or insured.

If we take the example of Jones Act shippers, we can see how important it is that you accurately understand the remaining working life of a vessel you're buying – especially where accurate assessments of lifespan can be worth hundreds of millions of dollars.

In 2017, the United State's federal government's Congressional Research Service estimated that American-built coastal and feeder ships – for example, those most commonly used in cabotage trades – can cost between USD $190-250m. Whereas the same type of ships built elsewhere in the world can be had for as little as approximately USD $30m. At the top end, this implies a difference of $220m to a Jones Act operator's P&L. The net effect is that any ship purchased for intra-USA commerce which has a shorter working life than expected could end up costing its owner ruinous amounts to replace it.

Jones Act container ships have spent, on average, three decades in service. The international average is 11.5. For bulkers, the numbers are even further apart: 38 years old in the USA, and nine internationally.

It's worth emphasizing that these vessels all undergo periodical surveys by their flag state administration or classification society and are therefore legally safe to sail. But with so many miles under their belts, how much longer can they be expected to earn enough to make a profit as well as supporting maintenance and ongoing compliance requirements?

A SURVEY A DAY KEEPS OFF-HIRE AWAY

Recent technology developments that provide a ship's minute-by-minute position via AIS and make it easy to identify the local weather enable you to build an accurate timeline of a ship's operations and the environmental conditions in which it operated. Combine this data and connect it with structural analysis software and you are provided with a valuable estimate of a ship's current and future service needs.

NAPA Fleet Intelligence acquires hourly AIS data and global weather data, and we collate them for each vessel's specific operational history. This includes position, speed, wind conditions, sea currents, and wave and swell height, direction and period.

As part of this process, NAPA can combine this with advanced structural analysis – as well as the experience it has gained as the provider of the ship design software used for more than 90% of ocean-going newbuilds – to create a digital twin of the vessel that reliably estimates remaining fatigue life, and safety profile. It would be possible to use this information to derive a financial assessment of a ship.

The scientific research which provides the foundation of these structural and wave estimates is not new. They are the outcome of numerous empirical investigations over the past decade, which have proven their underlying effectiveness. However, it has not been possible until recently to combine them in one simple, easy-to-use package.

In comparison to other non-destructive fatigue detection methods, this provides an optimized experience and can substantially

"Jones Act container ships have spent, on average, three decades in service. The international average is 11.5. For bulkers, the numbers are even further apart: 38 years old in the USA, and nine internationally. It's worth emphasizing that these vessels all undergo periodical surveys by their flag state administration or classification society and are therefore legally safe to sail. But with so many miles under their belts, how much longer can they be expected to earn enough to make a profit as well as supporting maintenance and ongoing compliance requirements?"

reduce inspection costs compared to conventional testing.

STAYING OUT OF DRY DOCK

Navin Thakur, director at Drewry Maritime Research, noted last year that ship financiers are now rarely willing to estimate that a ship will have an average economic life of 25-30 years.

In an era in which almost every sector has overcapacity concerns and freight rates which are frequently unable to cover OPEX and debt repayments, it won't take much off-hire to leave a shipowner or operator underwater.

With the arrival of this development from NAPA, it is now possible to collaboratively use existing technologies and data to find valuable information about a ship's actual condition which was previously difficult to obtain, and lead to major positive changes to the current state of vessel performance and optimization.

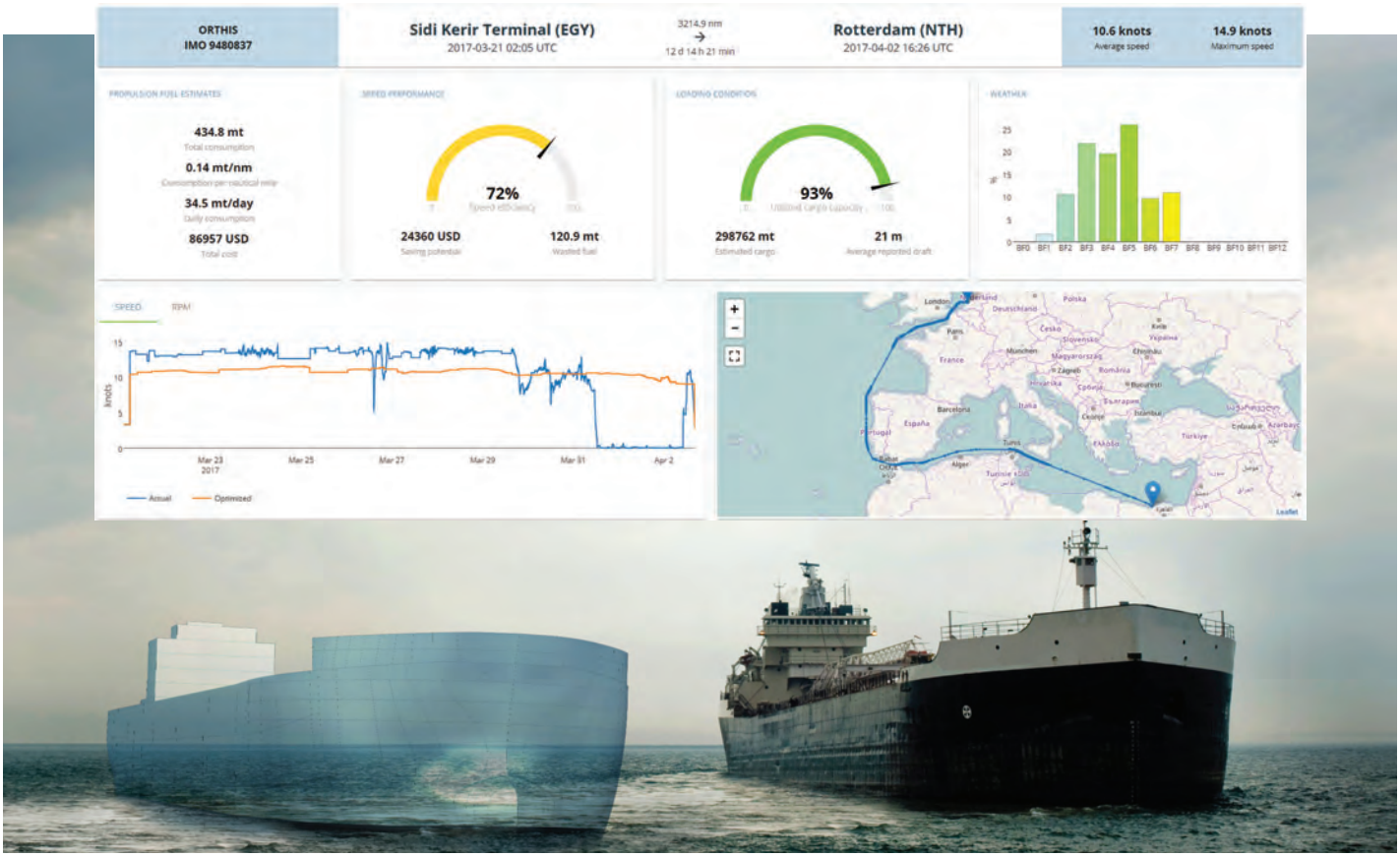
Think about it: no surprises, no off-hire. Just the provision of consistent, reliable service. Isn't that what you want to know about your ship?

The Authors **Tapio Hulkkonen**

is the Director of Product Management at NAPA Design Solutions. He is responsible for the development of structural design solutions and business at NAPA. His previous experience includes 23 years working at shipyards in Finland and now 14 years at NAPA.

Teemu Manderbacka

is a Senior R&D Engineer at NAPA Shipping Solutions. He has a background in experimental hydrodynamics and computational modeling, and holds a Doctor of Science in Naval Architecture. Teemu's interest is to advance Energy Efficiency and Safety by combining naval architecture principles with statistical methods and big data processing.



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THE CYBERSECURITY CHALLENGES FACING THE MARITIME INDUSTRY

Never in history have we had more access to better goods, produced at lower costs, reaching larger swathes of population, bringing about economic growth and raising well-being. This progress has been possible with the integration of economies of scale, as well as revolutionary concepts such as "just-in-time" production.

Intermodal transportation, an idea that's been around since the second half of last century, has been an important factor, reducing freight costs that enable a more efficient distribution of raw materials necessary for production, and delivery of finished goods to global markets. If we look around our home, or in the workplace, our clothes, shoes, household appliances, computers, furniture, car parts, tools, etc. have all spent some time in a container either at sea, in a railroad or loaded in a truck.

According to the International Chamber of Shipping (ICS) about 90% of international trade is carried out by sea. Seaborne trade has contributed to improved standards of living worldwide, and disruption of the supply chain provided by ships can have a negative impact, from economic loss and increased costs to proliferation of disease and famine in countries that rely on imports. The prevalence of seaborne trade, combined with the increasing dependency of maritime systems on newly available technology, means that cybersecurity plays an increasingly important role in the maritime industry. This importance resonates with insurance, legal, and risk management professionals, as well as ship owners and operators.

Cyber-risk is defined as any risk of financial loss, disruption or damage to the reputation of an organization arising from failure of its information, and in the case of ships, of its operational technology systems. Despite this being a hot topic across other indus-

AdobeStock_CREDIT Andrey Popov

Think cybersecurity doesn't apply to the maritime industry? Think again.

tries, cybersecurity in the maritime industry has not been taken seriously enough, and it has been within the scope of regulators and industry stakeholders for several years.

On June 16, 2017, the International Maritime Organization (IMO) adopted Resolution MSC.428 (98). This instrument encourages governments to ensure that ships trading under their flags address cyber risks in their Safety Management Systems (ISM Code), no later than the first annual verification of the company's Document of Compliance after January 1, 2021. It should be recalled that ISM Code already prescribed a formal requirement (mandatory since 2010) for companies to assess the risks to ships, personnel and the environment arising from their shipboard operations, with cybersecurity now considered one of these risks.

In 2002, long before the risk assessment tool was made mandatory for the safety management systems of ship owners and operators, IMO had amended the SOLAS convention to incorporate the International Ship and Port Facility Security (ISPS) code, compulsory from July 2004. The ISPS Code requires that a ship security assessment (SSA) be performed and include identification and evaluation of key shipboard operations and the associated potential threats. Furthermore, Part B.8.3.5 of the Code recommends that the SSA should address radio and telecommunication systems, including computer systems and networks.

Yet, in 2017, one of the world's largest shipping companies (A.P. Møller-Maersk) reported a huge loss due to business interruption caused by the NotPetya virus attack.

A number of international shipping organizations and companies have developed the Guidelines on Cyber Security Onboard Ships, which can be voluntarily implemented by the shipping companies and operators. These guidelines help to cope with the increasingly integrated systems and processes that rely on automation, as well as information and operational technologies (ECDIS, AIS, GPS, email, electronic shipping documents, to name a few), that are more interconnected as a network and to the internet.

The guidelines propose a Risk Management Approach consisting of six steps, namely:

- *Threat identification*
- *Identification of Vulnerabilities*
- *Risk exposure assessment*
- *Developing protection and detection measures*
- *Establishing contingency plans*
- *Response and recovery from cyber security incidents*

Some of the cybersecurity challenges facing the maritime industry have to do with one or more of these steps. As an example, threat identification should include activists, disgruntled employees, or cyber criminals, deliberately seeking to cause damage to a company's reputation, or disrupting its operations, by publishing (or threatening to publish) sensitive information to obtain the attention of media; or launching a Denial of Service (DoS) type of attack flooding its networks with bogus data.

Also, an important relationship is between the ship owner or ship manager and the ship agent. The agent is the party interacting continuously with the ship's crew, ship owners and operators, terminals, port services, vendors, authorities, independent inspectors, etc. Agents exchange sensitive information between these parties to coordinate their efforts. For this reason, the ship agent may become a target of cyber criminals who exploit their weaknesses and ultimately use them as an external access point, in order to breach the company's or ship's systems.

Last but not least, it is necessary to bear in mind that cyber risk is different from any other safety or security risk, in that detection and evidence of a cyber-attack may go unnoticed for months, or even years. Therefore, little information is available for a prompt response to a cyber incident, or to evaluating areas of opportunity for continual improvement of cybersecurity until damage is done.

In conclusion, cybersecurity in the maritime industry is a complex and changing topic, requiring expert advice, specialized measures and dedicated resources to effectively mitigate the negative consequences of an ever more interconnected world. Despite all the challenges posed by cyber risk, ship owners and operators can now take action and, assisted by cybersecurity and risk professionals, prevent the disruption of the supply chain and the benefits it brings to society.

The Author **David Cisneros**

joined MatthewsDaniel in 2015 with extensive marine and offshore experience. His seagoing career started in 1989 as a naval mechanical engineer on different types of offshore support vessels, then moving onshore as port engineer and head of maintenance for Mexican and Chilean companies. He was also senior marine surveyor, ISM/ISPS auditor and MLC inspector for a major classification society, leading numerous projects and performing safety inspections and security audits on behalf of Flag Administrations. David is an accredited CMID inspector, bi-lingual Spanish and English and a member of the Society of Naval Architects and Marine Engineers and the National Fire Protection Association.

THE ETHANE ERA EMERGES

By Aditya Aggarwal

The prospect of abundant and cheap ethane from U.S. shale drilling is behind a surge in the number of projects investigating marine transport options for the gas. The flurry of activity comes from energy companies, ship owners and shipyards, all of which seek to benefit from a rush of ethane trade into key manufacturing centers in Asia, Europe and South America.

The strong demand for ethane has created an entirely new shipping market since 2016, when the first regular exports were sent by sea. Prior to that, the gas was predominantly carried by pipeline from the US to Canada, and from Norway to Sweden and the UK, with only very small batches being shipped by sea.

With new markets being well out of the reach of pipelines, a need has arisen for a dedicated fleet of large ships capable of carrying ethane. Until four years ago, the largest vessels capable of carrying ethane offered cargo capacities of 22,100m³. With recent deliveries, this size has more quadrupled, and present projects look set to double unit capacities once again.

The Logistics of Ethane

From limited export markets, companies are now shipping ethane to chemical plants in Europe, India, Brazil, and China, where it is the feedstock to make ethylene and used for a wide array of plastics and chemicals – everything from plastic bottles to clothing and medicine. And, if the price differential between ethane and Naphtha (the alternative) remains at present levels, demand is expected to continue to quickly rise.

In all, there are as many as 40 prospective Very Large Ethane Carriers (VLEC) and Ultra-Large Ethane Carriers (ULEC) in the pipeline, waiting for the projects that are underpinning their construction to be approved. Most seek to transport U.S. ethane exports to new processing plants – known as 'crackers' – in China, waiting only for a successful resolution of bilateral US-China trade agreements and the subsequent approvals of import licenses. But, that's anything but certain. What is certain is that demand is increasingly robust, and there are many reasons for it to continue to be that way, regardless of whether trade agreements can be finalized.

In many respects, India's Reliance Industries proved the commercial viability of VLECs with a groundbreaking order of six 87,000m3 units in 2014, which it subsequently used to move cargoes between the U.S. Gulf and its petrochemical facilities in Gujarat, India. The ships loaded their first cargo from a U.S. Gulf of Mexico port in 2016.

The Reliance ships were designed and built with the GTT Mark III cargo containment system, which allows a ship to maintain a relatively shallow draft while expanding cargo capacity within the vessel's set dimensions. The majority of VLECs ordered and delivered to date have opted for the same containment system.

A Reliance Industries VLEC design

Strong demand propels robust exports – here and across the big pond. A new fleet of gas carriers is being built to meet the logistics challenge.

Credit: ABS

Capacity Coming

Earlier this year, China's Zhejiang Satellite Petrochemical entered the shipowner ranks with an order for six 98,000 m³ VLECs from shipyards in Korea, again setting new unit capacity records for ethane carriers. Yards in Asia currently are in competition for a pair of similarly sized ships for the UK-headquartered chemical company INEOS, which intends to use the ships to transport ethane to its new cracker near Antwerp, Belgium.

Another major project involves the American Ethane Company (AEC), who, with technical support from ABS, is committed to ordering a 'next generation' fleet of 150,000m³ ULECs to deliver up to 7.2 million tons of ethane every year from the U.S. Gulf coast to several new processing plants in China.

AEC's prospective fleet of 17 ships is likely to be built in China. The project includes shipping partner China Merchants Group, Hudong-Zhonghua Shipbuilding and Jiangnan Shipyard Group, among others. Its partners are hoping to have the first vessels contracted in the near future.

"The joint effort between China Merchants Group, AEC and ABS means these vessels will have incorporated modern technologies such as the latest cargo containment system, ethane propulsion, and an efficient hull design, bringing logistics efficiency and cost savings to long-term ethane shipping between the USA and Asia," AEC CEO, John Houghtaling, said in a release announcing the deal at Gastech in Houston last month. "Approval in principle of this design by ABS is the first step to further innovations in the industry."

Capacity, Flexibility – and Propulsion, as well

The AEC ships will be propelled by a single MAN gas-injected, ME-GIE two-stroke engine capable of burning ethane as its primary fuel. AEC expects the vessel to consume about 2.5% of the ships' cargo on a roundtrip between the U.S. Gulf Coast and the east coast of China. To that end, ABS – the IACS classification society of choice for more than 85% of the current VLEC market – has been actively supporting the pioneering work of designers and shipyards looking to tap into the promising ethane carrier sector.

Last month, the class society announced the Approval in Principle (AIP) for a new VLEC design from China's Jiangnan Shipyard Group. The 99,000m3 "Bluebonnet" design ethane carrier includes the shipyard's "BrilliancE" independent prismatic type B cargo tanks. These tanks may offer an option to a fledgling market sector that so far has been dominated by innovative GTT's Mark III cargo containment system.

Like many of the VLEC and ULEC blueprints currently on industry drawing boards, the Jiangnan ship is designed to be more environmentally friendly than its predecessors (built as little as five years ago) in that they can burn ethane as fuel.

While the first VLEC entered into service in 2016, ethane shipping is still viewed as an immature niche market; as such, vessel owners and financiers demand more flexible designs that will support the carriage of alternative cargoes. For VLECs built with cargo capacities of up to about 100,000m³, cargo flexibility is relatively easy to provide by equipping them to carry LPG. Significantly larger vessels, however, will prove too big to trade to conventional LPG terminals.

For this reason, enabling the vessels to carry LNG cargo provides greater opportunities. Designing a vessel that can carry both ethane and LNG is possible, but it is likely to significantly increase the cost of the vessel. Designing a vessel to be "LNG Cargo Ready," however, would limit the initial investment while maintaining a viable option to select LNG as a future cargo.

To support the greater interoperability of VLECs and ULECs, last month ABS became the first classification society to offer an "LNG Cargo Ready" notation for ethane carriers. The notation assesses the level of LNG 'readiness' for an ethane carrier and its ability to be easily converted to trade LNG cargoes. The notation highlights the equipment and systems that are designed to operate with LNG.

It will offer prospective VLEC/ULEC owners a cost-effective way to include only the LNG-capable equipment and systems that are necessary, precluding the need to spend many millions of dollars during the newbuild stage to hedge future market risks.

Just Over the Horizon

Driven by U.S. shale oil and gas, global exports of ethane have risen from zero to eight million metric tons annually in the past six years. With a number of U.S. projects expected to come on line in the next couple of years, the industry can expect export capacity to continue to see substantial growth.

From the ABS perspective, there will be a host of opportunities to provide classification services and independent technical support as a substantially expanded ethane trade accelerates the construction and maturity of supporting marine transport infrastructure. This is just the beginning.

The Author **Aditya Aggarwal**

is ABS's Director for Global Gas Development.

LIFELONG LEARNING IN AN

By Ted Bailey

The global labor market is changing at a rapid pace. One of the major drivers behind it is technology which is shifting the balance between the work performed by humans and jobs undertaken by machine learning, automated workflows and Artificial Intelligence (AI). While it is predicted that automation and AI will generate prosperity if managed properly, estimates show that as many as 375 million people worldwide will need to shift their occupational focus and upgrade their skills during this transition.

With 40% of employers globally finding it difficult to recruit people with the skills they need, an active and ongoing support offered to the workforce to learn and develop new skills is more critical than ever before. But it is equally important that individuals take a proactive approach to their own lifelong learning in order to really take advantage of the new opportunities in the digital workplace.

A professional lifelong learning plan includes a structured approach to personal development throughout one's career. It covers the whole spectrum of formal and informal learning to enhance career progression, employability and competitiveness in the job market. What has really changed is that, in the past, it may have been assumed that an employee would gain training and development through their employer but now the onus to push forward with training requirements lies on the employee.

AGE OF DISRUPTION

Maritime 4.0, a changing workforce and the rise of new skills

The maritime industry is no exception to the trends above. The sector is entering what has been dubbed Maritime 4.0, including the emergence of autonomous ships, "connected" ports and harbors, and the growth of alternative fuels and green ship technology. These are developments which have not been around for long and making sure personnel are kept on top of these rapid advancements is a major challenge.

According to the Department for Transport's Maritime 2050 strategy document, the skills profile of the maritime sector will change significantly over the next 30 years. The importance of STEM (Science, Technology, Engineering and Mathematics) subjects will increase as jobs become more skilled and data driven in response to new technology. Roles will be multidisciplinary, potentially requiring the ability to create, operate and maintain autonomous and technological systems.

To add to this complexity, we are witnessing profound changes to the structure of the maritime workforce, particularly from a demographic point of view. Crews have become fully internationalized with an explosion in the number of seafarers hailing from Ukraine, Russia and China. Alongside that,

"The sector is entering what has been dubbed Maritime 4.0, including the emergence of autonomous ships, "connected" ports and harbors, and the growth of alternative fuels and green ship technology. These are developments which have not been around for long and making sure personnel are kept on top of these rapid advancements is a major challenge."

a change in generations coupled with poor succession planning has resulted in a lack of senior people, particularly ship superintendents.

The end result of these tectonic movements is a lack of personnel and insufficient skills which are not keeping pace with the transformation of the industry.

Closing the skills and training gaps

At the recent London International Shipping Week conference, Baroness Scotland, the Secretary-General of the Commonwealth of Nations, emphasized that the most effective form of investment is in human capital, as that differentiates the best-performing organizations across the globe. However, global research conducted by Lloyd's Maritime Academy (LMA) has revealed that over 41% of professionals from the maritime industry still receive no funding from within their business for training. This statistic highlights the need for

companies to demonstrate more commitment to training, to invest time in building professional development and map out a variety of career paths to attract new people and close the existing skills gap.

At the same time, the importance of proactive lifelong learning in maritime has never been more important and, according to LMA data, the share of self-paying learners has been growing markedly. Better internet connectivity at sea and new, agile e-learning delivery models are facilitating lifelong learning of seafarers. This trend is set to continue with the application of technologies such as virtual reality that is changing the way "older" on the job deck training programs are delivered. Regularly reviewed and easily adaptable training packages to match new skills requirements are further driving the uptake of online training programs.

E-learning that supports a maritime professional's lifelong learning

Online learning is not just important for fostering lifelong learning of current maritime professionals. It is becoming ubiquitous if the industry is to meet the expectations of new generations entering the workforce. Growing up as digital natives, their standards have been shaped by online experiences created by tech giants. A training environment experienced by their parents 20 years ago may not seem like an attractive employment proposition anymore.

There are some key principles to look out for when establishing whether an online training program is relevant to someone's career progress and provides a high-quality learning experience:

- *Learning is delivered via a user-friendly platform that is easy to navigate and follows the latest evidence and best practice in instructional design.*
- *Course content is regularly updated and reflects the latest values, industry trends, findings, legislative changes…*
- *Quality control in terms of external quality assurance and accreditation is provided by industry bodies and/or established educational institutions.*
- *Availability of stimulating course materials in a range of different formats that encourage engagement, such as a combination of short videos, written content and audio content.*
- *Emphasis on the quality of interaction not just with the tutor but also among learners from around the world. High value training incorporates both high quality of information and also the core fundamentals of good teaching which ensures the information is properly absorbed and used in practice. This is where many online courses, for example MOOCs (Massive Open Online Courses) struggle, with attendance normally dropping off the cliff after the first session.*
- *Most importantly, the program needs to be part of someone's lifelong learning journey and be useful to their career progress.*

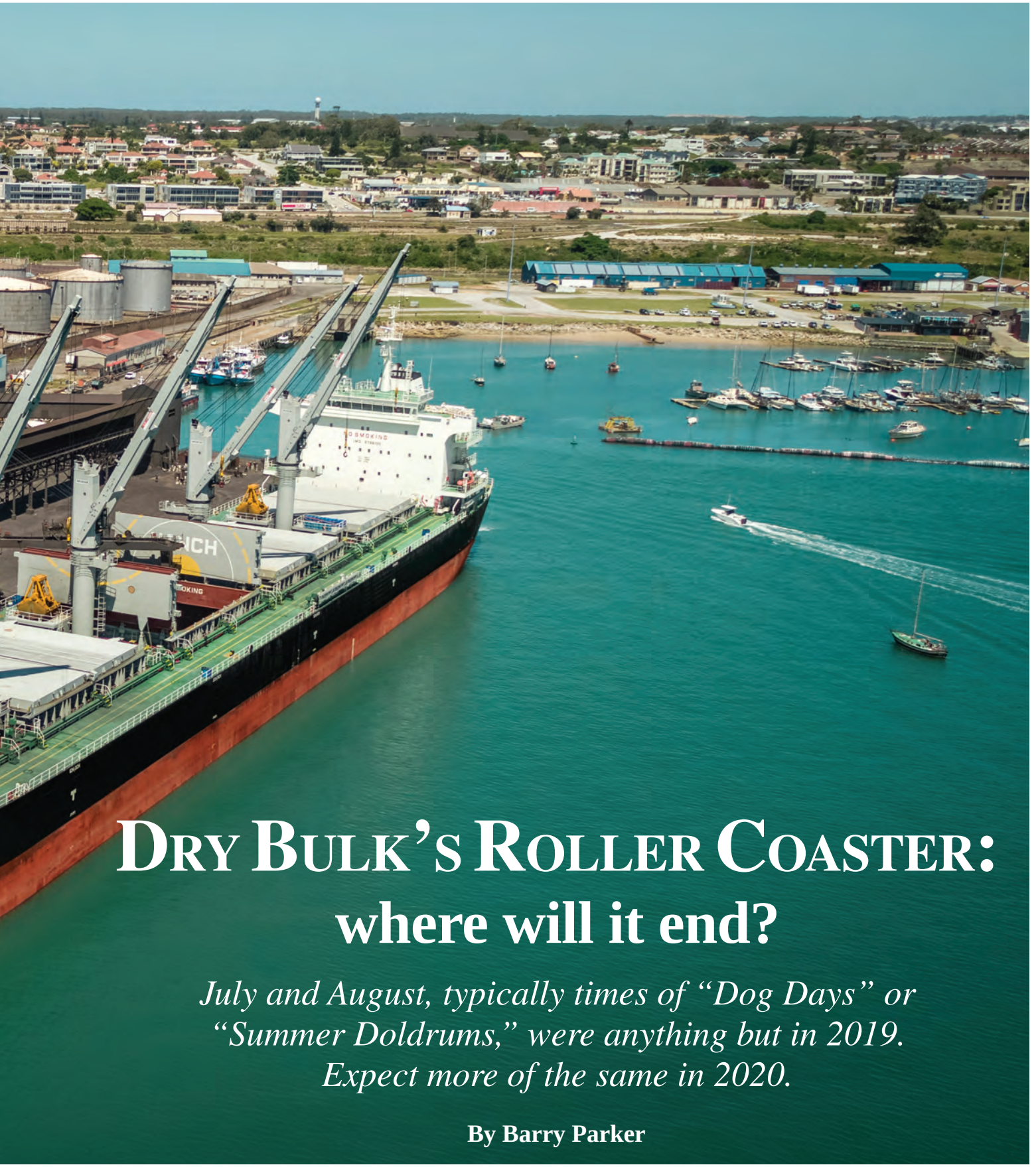
At Lloyd's Maritime Academy we always challenge learners to really understand their needs, motivations and longer-term goals to be able to facilitate their lifelong learning at any stage, from introductory certifications to a full MBA. Several courses are accredited and awarded by reputable educational institutions or professional associations, such as Middlesex University London, North Kent College and Chartered Management Institute, with several courses contributing towards Royal Institution of Naval Architects (RINA) and IMarEst CPD requirements.

By following the path of lifelong learning and taking responsibility for upgrading our skills we can all play a big role in the next exciting chapter of the maritime industry's transformation.

The Author **Ted Bailey,**

Head of Digital Learning, Lloyd's Maritime Academy. Within his current role as Head of Digital Learning at Informa plc, Ted leads a team responsible for creating and delivering high-value professional development learning online – either in collaboration with academic partners or independently through Lloyd's Maritime Academy.

Credit: Eagle Bulk Carriers



Dry Bulk's Roller Coaster: where will it end?

July and August, typically times of "Dog Days" or "Summer Doldrums," were anything but in 2019. Expect more of the same in 2020.

By Barry Parker

Credit: Capital Link

The moderator of a drybulk panel at Capital Link's early September forum, Fearnley Securities' Espen Landmark Fjermestad, said it very well: "Drybulk has been a bit of a roller coaster this year." The Baltic Dry Index (BDI) which, just like it sounds is a measure of spot hires for multiple categories of drybulk vessels, hit levels not seen since a 2010-2011 mini-run-up.

The index, composed in turn of sub-indices for Capesize, Panamax and Supramax bulk carriers in key time charter trades, reached a level of just over "2500" in early September, based on hires averaging- across geographies, around $35,000/day , $18,000/day, and $15,000/day, respectively, for the three size classes. In comparison, at times of the market's 'super-cycle boom' of 2007 into early 2008, the index had reached a high of nearly 12,000, with daily hires (adjusted for round trips) at staggering levels of $160,000, $80,000 and $60,000.

Some stakeholders are not convinced of the staying power of the late summer 2019 run-up. In their September Drybulk Freight Forecaster, the analysts at London-based Maritime Strategies International (MSI) wrote: "Vessel earnings will fall from current highs in all cases by November. Weakening steel demand and factory closures during Chinese New Year celebrations will undermine rates in February, with Capesizes the hardest hit."

Analay's Numbers

Although vessel hires in the August/ September 2019 flurry were only a fraction of the super-cycle highs, they still exceeded fully costed daily breakevens for most vessels. As recently as early February, 2019, the spot measure hovered around "600" (working back to charter hires well below daily costs) as the drybulk markets saw the impacts of a "Black Swan" event(s) of a collapsed dam in Brazil lead to severe cutbacks in shipments by the miner Vale. Pessimism about Chinese growth prospects also hit the drybulk markets, as did worries about the impact of the U.S.-China trade war, leading to pullbacks by charterers. The iron ore trades are the lifeblood of the Capesize sector, where hires had dipped to below $5,000/day.

For now, the demand side has been holding its own. Greg Lewis, Equities Analyst at BTIG, an international investment bank, writes, "Let's be clear: tariffs and trade wars are not positive for the BDI, but other than a minor blip in the global grain trade (~10% of the global dry bulk trade) the US and China dry bulk trade (both ways) is de minimis to the global dry bulk trade." Analysts credit the impetus for the markets upward thrust to resumption of shipments from Vale's all-important Brucutu mine (near to the site of the dam collapse) in late Spring. At the Capital Link session, Hamish Norton, President of Star Bulk Carriers explained, that "Supply of iron ore cargo, a big demand driver from Brazil, had come back almost completely to where it had originally been expected." In describing the demand side, driven by iron ore, he added, "The trade war has not reduced Chinese steel production in any way that we can see."

But psychology plays an outside role in moving the drybulk

Credit: Barry Parker

markets as they search for inflection points. The Capesizes are heavily dependent on iron ore shipped on long hauls where seaborne fuel costs are a significant component of cost structures. That sentiment, in turn, filtered down to the Panamax and Supramax market. Another Capital Link panelist, Martyn Wade, the top man at Nasdaq listed Grindrod Shipping, referred to the 'feel good factor,' saying "… if Capes are going up, sentiment turns positive." He went on to explain that with a general shortage of vessels in the Atlantic, charterers are now being forced to take ships from further away.

The sentiment, in this case, is driven by cargo flows. Iron ore volumes have now recovered. Equity analyst Amit Mehrotra at Deutsche Bank, echoing the views of Star Bulk's Mr. Norton, explained to clients in a mid September briefing, "China has also returned to the iron ore import market to support its record-high steel production, providing a further boost to rates over the summer months. Chinese iron ore imports were up 6% year-on-year in August to 94.5M tons, a 19-month high, while the country's steel production continues to make new highs." The smaller bulkers, which include the Supramax, Handy-max and Handysize sectors, also are seeing a good tailwind. Mr. Lewis, from BTIG, wrote: "Most encouraging from an economic perspective is that the minor bulk trades (~40% of the global dry bulk trade) continues to chug along at 4-5% growth driven by strong demand for bauxite, various ores, and fertilizers."

At the London drybulk discussion, the focus was heavily on the supply side of shipping; specifically how much capacity will be available to serve cargo demand, which is growing, albeit at an unexciting pace. Supply side issues are being driven, like many markets segments, by 'IMO 2020' considerations. Simply put, owners can pay increased costs for low sulfur fuels, or they can burn fuel with a higher sulfur content (purchased at a lower price) and then capture particulates with a scrubber.

Scrubbing the Forecast

While analysts had previously been focusing mainly on reductions on vessel supply, after January 1, due to slow steaming (brought about by cost saving efforts in the wake of increased prices for low sulfur fuel), a different dynamic, with more immediacy, has emerged. For example, the consultancy Drewry, offered, "… in the run up to the impending IMO regulations, the effective supply of vessels has contracted. To avoid using expensive fuel and save on bunker costs, many shipowners are retrofitting their vessels with scrubber before the regulation comes into force. This process takes about a month, during which time the vessels will be removed from the operating fleet." On the Capital Link panel, Star Bulk's Hamish Norton commented, "More ships have been trying to get scrubbers installed than there are shipyards able to install scrubbers … you've got ships parked two, three and four abreast at the pier… so these ships are waiting for much longer than was initially expected And, it's actually taken a substantial fraction of the fleet out of service. It's been very positive for the

supply/ demand balance."

In talking about these delays, Drewry's estimation of a one-month install time may actually be too conservative, possibly underestimating the reduced capacity facing the fleet. Mr. Norton's fellow panelist Magnus Halvorsen, is Chief Executive Officer of the Oslo-listed 2020 Bulkers, the owner of eight "Newcastlemax" bulk carriers each with a carrying capacity of approximately 210,000 DWT and with six still under construction at Q4 2019. All are to be scrubber fitted. He described a time span of 60 days for a Capesize bulk carrier in a Chinese yard.

For its part, Drewry added, "We expect the momentum in retrofitting scrubbers to only increase as the IMO deadline approaches with almost 10% of the additional Capesize/VLOC fleet scheduled for retrofitting in the remaining months of 2019, taking the spot rates even higher." Mr. Halvorsen pointed on the current spread of low would slow down by 5.5% ... which is 3% over 200 at sea days."

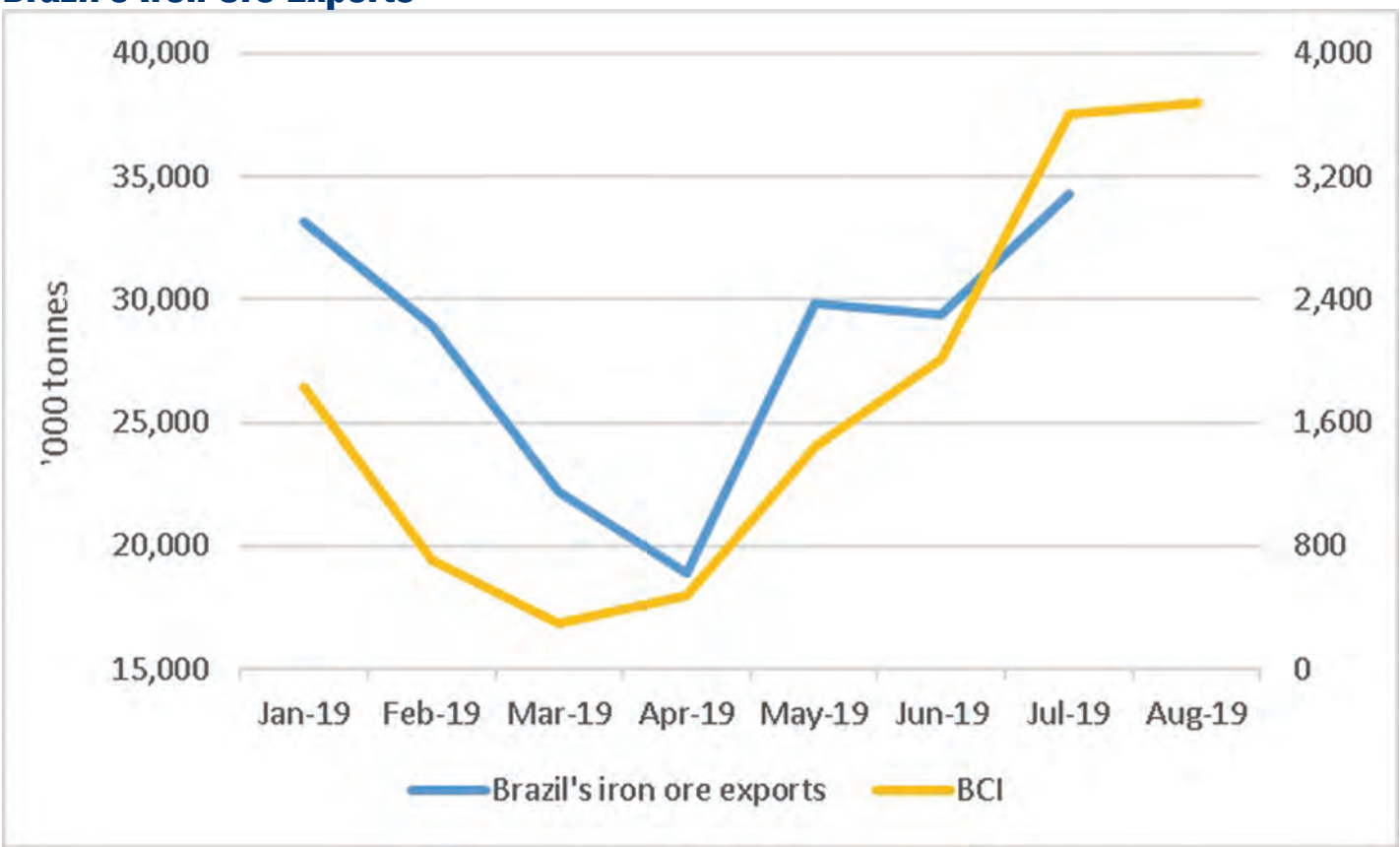
"… in the run up to the impending IMO regulations, the effective supply of vessels has contracted. To avoid using expensive fuel and save on bunker costs, many shipowners are retrofitting their vessels with scrubber before the regulation comes into force. This process takes about a month, during which time the vessels will be removed from the operating fleet."

– Drewry

Separately, Fearnley's Fjermestad opined that part of the recent to estimates of 60 Capesize (and larger) seeing scrubber installations in 1H 2019, and estimating 140 due for work in 2H 2019. "It's very back-end loaded," he said. Amit Mehrotra, at Deutsche Bank, wrote in a briefing, "…about 15% of the global operating Capesize fleet will undergo a scrubber retrofit."

Slow steaming issues, once pushed backward in the list of concerns, may move towards the front of the queue shortly. Gary Vogel, is the CEO of Nasdaq-listed Eagle Bulk, a specialist in the Supramax and Ultramax sectors. His firm is also in the midst of a $122 million acquisition program as it modernizes its fleet). Putting some actual numbers behind the concepts, e told the Capital Link listeners, "Based

Brazil's Iron Ore Exports



Credit: Drewry

Capesize strength was due to owners already slowing down their vessel on long ballast voyages back from China. Grindrod's Mr. Wade chimed in, "If you see the fuel prices going up, I think that you'll see ships slowing down quite dramatically." He explained that a slowdown of 1 knot, fleet wide, would take approximately 8% of supply out of the picture, noting the extremely positive impact if such a supply reduction comes on top of the estimated 3% already out of action.

Different Ships; Different Long Splices

Differing viewpoints are what makes a market. For example, and in a late September report on the derivatives market for Capesize freight, brokers Freight Investor Services told clients were that the "Calendar 2020" forward freight agreement (FFA) instrument – reflecting investors' collective views of Capesize hires throughout 2020 – was priced a little above $16,000/day. Broker Fearnleys noted in their early October weekly report that the Baltic Dry Index had dipped to just over 1800, with one year physical time charters of Capesizes worth $19,750/day and Panamaxes garnering $14,000/day. Importantly, the forward financial and physical markers were both below the early October spot indices from the Baltic Exchange, which stood at $23,675/day for Capes. The Panamax showed a flat forward curve, with the spot Baltic Exchange marker at $13,868/day, virtually identical to the one year time charter.

Eventually, and depending on how many owners actually opt for the scrubber route – and that has been a controversial discussion as of late – market rates will no doubt react to the lack of availability (or overcapacity) of tonnage, as a result. Hence, the markets and associated freight rates find themselves once more at the mercy of governmental policies (trade wars) and regulatory (IMO 2020) pressures. And, it's entirely possible that one variable could cancel out the other. Or, not.

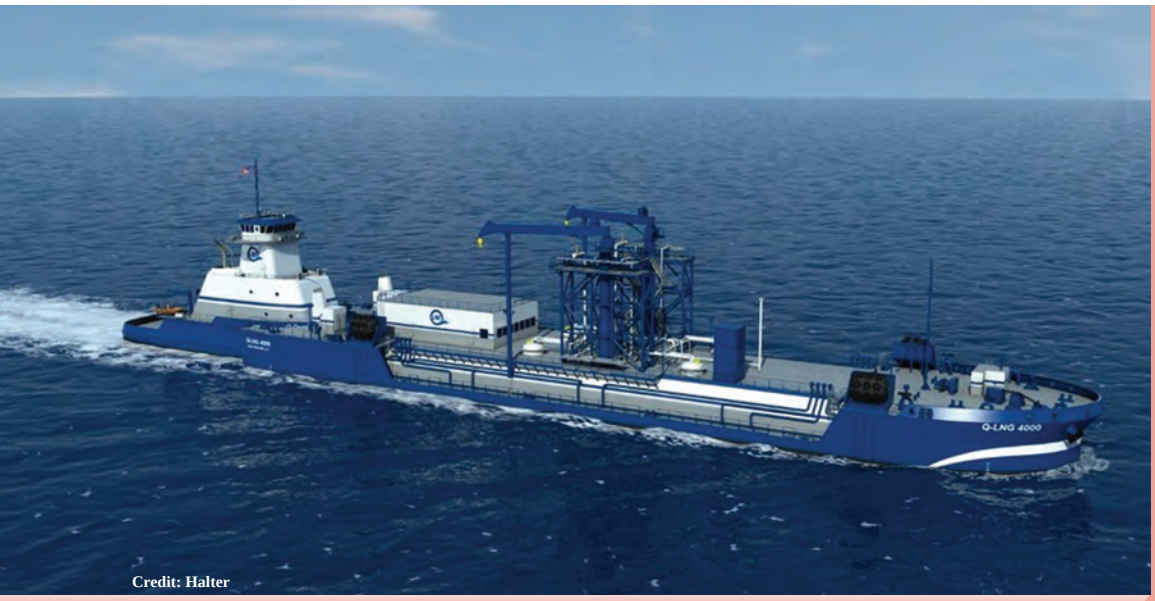
Throw in the unexpected Black Swan event and even the best of projections can be dashed in a New York minute. There are as many opinions as there are variables in this market, something that's always made this a segment not for the faint of heart. One thing is for sure: it will remain that way in the coming months.

The Author

Barry Parker

Parker of bdp1 Consulting Ltd provides strategic and tactical support, including analytics and communications, to businesses across the maritime spectrum. The company can be found online at www.conconnect.com

Credit: Imabari



Credit: Halter

Credit: Eagle

Who's Fueling Whom?

A snapshot of Florida's nascent LNG bunkering business.

By Rick Eyerdam

With the Port of Jacksonville the first and most visible LNG bunkering port in the United States, it seems that barges will be the preferred choice for bunkering most LNG cargo and cruise ships calling Florida ports for several years. This is probably because the captain and crew of an LNG powered vessel must load passengers and/or cargo safely along with tons of liquefied natural gas at -257 degrees and extreme high pressure, if both are to be loaded in one place at one time. And Crowley Maritime is actually doing this for the first time at any port.

It has little to do with the port, once the land lease is signed. Support of the port and its client lines are imperative. But, the real "go/no-go" decisions are made by investors and state and federal regulators. Indeed, "Early engagement with first responders, regulators (i.e. the United States Coast Guard and the Jacksonville Port Authority, JAXPORT) was vital as the concept of LNG bunkering while also simultaneously conducting cargo operations was novel. It was through rigorous operational risk analysis that mitigation strategies, safe guards, personnel training, and operational doctrine was established to ensure a safe and secure operation was achieved," according to a SEA/LNG case study of JAXPORT's bunkering plans.

Whatever the case, it is clear that the LNG bunkering industry is heating up, with multiple stakeholders and more than a few innovative transfer methods evolving.

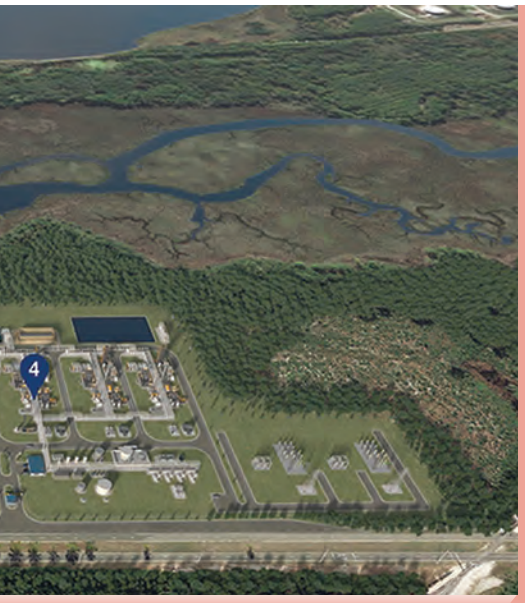
Who Fuels Who?

According to Steve Cadden, the chief operating officer of SEA/LNG, an industry group that promotes the use of LNG as marine fuel, there are 168 LNG-fueled ships in operation today and another 177 on order. In addition, there are 141 "LNG-ready" ships — dual-use vessels that could be converted to run on LNG. (These numbers do not include ships that actually transport LNG, which commonly use "boil-off" cargo as fuel.)

The number of barges that bunker LNG ships has grown from just one in Jacksonville in 2017, TOTE's Clean Jacksonville, to nine at the end of last year. More than 30 are expected to be in operation within two or three years, according to Cadden's report.

Numerous cruise companies are operating or building LNG-fueled ships including Carnival (its Aida, Costa and Carnival Cruise brands), Disney, Royal Caribbean, MSC Cruises, TUI, Hurtigruten, Norwegian Yacht Voyages and Ponant Cruise Lines.

And there are the two innovative ConRo operators in the JAXPORT to Puerto Rico trades: TOTE and Crowley, each with two



Credit: Shell

ships powered primarily by LNG. It's amazing the number of companies that are lining up to till this fertile ground.

Take Eagle LNG, for example

Eagle LNG Partners is a wholly owned subsidiary of Ferus Natural Gas Fuels LP. This is a management company privately held by The Energy & Minerals Group, which is the management company for a series of specialized private equity funds. EMG focuses on investing across various facets of the global natural resource industry including the upstream and midstream segments of the energy complex. EMG has approximately $16 billion of regulatory assets under management and approximately $11 billion in commitments have been allocated across the energy sector since inception, its corporate documents state.

In the United States, Ferus NGF LP is an equal partner in Eagle LNG Partners, a consortium dedicated to building out LNG infrastructure across the country, and is partnered with GE Ventures in The Last Mile Fueling Solution, a fully-integrated natural gas fueling system for oil and gas and other high horsepower operations, often using gas that would have otherwise been flared. Eagle LNG Partners is based in Houston, Texas.

For its part, Eagle LNG Partners is involved in several different ventures at Jaxport. It's Maxville Plant has loaded LNG into ISO containers that have long been trucked to the port and shipped by Crowley to Puerto Rico for the pharmaceutical industry, and recently to supply the Coca Cola plant.

Eagle LNG's Marine Fuel Depot – Talleyrand, located on the Port of Jacksonville on the Talleyrand Marine Terminal now routinely bunkers LNG onto Crowley's LNG powered ConRo ships, El Coquí and Taino, for U.S. mainland to Puerto Rico container and vehicle trade and shipping. Eagle LNG's Talleyrand LNG Bunker Station at JaxPort began delivering weekly bunker Jan. 9, 2019 when the facility fueled Crowley's newest ConRo ship, Taino. This newly designed terminal is a first-of-its kind, shore-to-ship, LNG bunkering facility.

Eagle LNG's Talleyrand LNG Bunker Station is built with 500,000 LNG-gallons of storage capacity and with a design capacity flow rate of 2,700 gallons per minute, sufficient to fuel each of Crowley's vessels in less than eight hours. The Talleyrand LNG Bunker Station is routinely filled via truck from Eagle LNG's Maxville LNG Facility located in West Jacksonville. The Maxville LNG Facility has another 1 million LNG-gallons of storage capacity; assuring security of supply for Crowley's weekly bunkering events.

Sean Lalani, President of Eagle LNG said, "The Talleyrand marine bunkering terminal in JAXPORT is capable of providing LNG fuel for the maritime industry while its small two-acre design can be easily replicated in other coastal ports." He added, "We are proud of our partnerships with Crowley, the Jacksonville community and JAXPORT without whom this cutting-edge bunkering technology could not have come to fruition."

Eagle LNG transfers LNG to power Crowley's ConRo ships through a Mobile Transfer Unit with ongoing simultaneous operations, including gantry crane operation and container movement forward, and RO/RO aft of accommodation. This unique permanent infrastructure ensures transfer of the highest quality, coldest liquid fuel, increasing ships' range and time between 'fillups,' according to company statements.

Eagle LNG is also focused on completing its larger LNG export plant, also to be constructed in Jacksonville, on the St. Johns River north of JAXPORT. The new plant will have capacity to produce 1.5 million LNG gallons-per-day with a 12 million-gallon storage tank, a marine jetty and road tanker-loading bay. It will supply LNG for power generation to the Caribbean Islands plus domestic fuel and power markets, according to company statements

"Eagle LNG is investing millions of dollars creating small-scale

"According to Steve Cadden, the chief operating officer of SEA/LNG, an industry group that promotes the use of LNG as marine fuel, there are 168 LNG-fueled ships in operation today and another 177 on order. In addition, there are 141 'LNG-ready' ships — dual-use vessels that could be converted to run on LNG."

LNG infrastructure to supply LNG as a cleaner-burning, more economical fuel alternative for marine bunkering and for export to the Caribbean," said Lalani. "It represents the start of Eagle LNG's plans to build LNG infrastructure across the nation."

Or Take JAX LNG

NorthStar Midstream owns and operates a crude gathering, logistics and sand transloading facility in East Fairview, along the western edge of the Bakken play in far northern North Dakota. NorthStar Midstream owns fifty percent of the JAX LNG terminal in Jacksonville, constructed through a partnership involving NorthStar and Pivotal LNG.

Pivotal LNG is part of Southern Company Gas, a major power provider. Southern Company subsidiaries operate hydroelectric, gas, coal, and nuclear generation sources to generate approximately 200 terawatt-hours of electricity. In 2009, coal represented 57 percent of the company's output, followed by nuclear (23%) and natural gas (16%).

Oaktree has formed the new company, Polaris New Energy, to order an LNG barge that will be built at the Fincantieri Bay Shipbuilding yard in Sturgeon Bay, WI. The barge is scheduled for delivery at the end of 2021. The purpose of the barge is to open the door to natural gas marine bunkering in Florida and then beyond as the demand grows. And according to company statements, Pivotal "is expanding into the marine bunkering business, targeting operators of cruise and cargo ships that are planning to use natural gas as bunker fuel."

In October 2015, TOTE Maritime and its partner JAX LNG received their first LOA from the USCG establishing an industry first landside LNG bunkering facility in the Port of Jacksonville. Since then, the Marlin Class vessels have safely received more than 18,000,000 gallons of LNG through the truck-to-ship bunkering process.

"TOTE Maritime is committed to safety above all else. Thanks to the commitment of our partner, JAX LNG, we have developed strong standards for landside LNG bunkering that will continue to be the hallmark of our barge-to-ship bunkering operations," noted Peter Keller, Executive Vice President of TOTE.

To conduct the barge-to-ship operations, TOTE ordered the barge Clean Jacksonville from Conrad Orange Shipyard in Texas, with gas trials undertaken in Port Fourchon, LA. The vessel, with a 2,200 cubic meter LNG capacity, is sufficient to bunker two Marlin Class container ships; the Isla Bella and Perla del Caribe, operating on LNG fuel between Jacksonville and San Juan, Puerto Rico. It was the first of its kind among barges.

Pivotal is after a much broader constituency. "Pivotal is committed to transforming the nation's energy landscape by leading the way in how we supply liquefied natural gas to our customers," said Tim Hermann, president of Pivotal LNG. "One way we are doing this is through the development of the JAX LNG facility. With our partners NorthStar, we've implemented innovative solutions to make clean, safe, reliable and affordable LNG available to marine and inland customers that can be served from the port of Jacksonville."

Tim Casey, senior vice president of LNG at NorthStar, said the company plans to load fuel on the planned Polaris Energy barge at the JAX LNG terminal. He said Polaris plans to use the large, ocean-going barge to fuel ships in Port Canaveral and the Miami/Port Everglades area. He said Jacksonville is a good place for an LNG terminal because there are pipelines in the vicinity delivering the quantities of gas needed for a liquefaction facility.

The Polaris LNG Barge will have capacity of 5,400 cubic meters (cbm) of LNG stored in four 1,350-meter tanks. The barge will be 340 feet in overall length, have a beam of 66 feet and a draft of 32 feet, 10 inches. The cost of the barge was not revealed. Utilizing a suitable tugboat, the barge will operate as an articulated tug and barge unit. NorthStar's agreement with Fincantieri gives it the ability to potentially construct two sister barges.

Casey said Polaris also plans to fuel cargo ships and would like to build additional barges that would fuel ships in other coastal ranges or inland waterways in the U.S.

LNG Momentum Building

Carnival Cruise Lines includes its Aida, Costa and Carnival Cruise brands each of which has plans or is already operating primarily on LNG. AIDAnova was the first cruise ship to be LNG powered and the first to bunker LNG on a cruise.

The world's first LNG-powered cruise ship, AIDAnova owned by AIDA Cruises has made its maiden call at the new cruise terminal in Santa Cruz de Tenerife where it completed the first LNG bunkering operation. The Shell LNG tanker Cardissa supplied the ship with liquefied natural gas. With four dual-fuel engines and three gas tanks on board, it is the first cruise ship in the world that can be powered at port and at sea with liquefied natural gas.

Earlier this year, Crowley Maritime's new Con/Ro El Coquí delivered its first cargo from Florida to Puerto Rico. El Coquí, a sub-Panamax container ship and ro-ro built by VT Halter, is among the first of her kind to be powered by LNG.

VT Halter Marine is constructing (and has launched) a 4,000 cbm LNG articulated tug and barge unit with Quality Liquefied Natural Gas Transport, LLC (Q-LNG) that is due for delivery in the first quarter of 2020. Last year it reportedly executed a letter of intent to build a second 8,000-cbm LNG barge. The barges will be chartered to Shell. Shell is supplying LNG to Carnival, according to a company statement.

Credit: Eagle; Maxville LNG

In 2017 it signed an agreement to build an offshore Liquefied Natural Gas Articulated Tug and Barge (LNG ATB) unit with Quality Liquefied Natural Gas Transport, LLC (Q-LNG). VT Halter Marine has contracted with Q-LNG for engineering services to complete the detailed functional design for the development and construction of one LNG Bunkering ATB. The ATB Tug will have 5,100 horsepower, GE 6L250 MDC EPA Tier 4 main engines, with Z-drives, and dimensions of 128' x 42' x 21'.

Q-LNG is owned 70 percent by Shane Guidry and 30 percent by Harvey Gulf International Marine, New Orleans, Louisiana. Q-LNG will own and operate assets providing marine transportation of liquefied natural gas (LNG), commencing with a long-term contract with Shell Trading (U.S) Company (Shell) to deliver LNG as a fuel source to various ports in Florida and the Caribbean.

The future: a submerged jettyless system?

On September 19 of this year, Magma Global signed a contract with Shell Global Solutions to develop and qualify a flexible, single polymer composite (SPC) pipe for cryogenic applications involving temperatures down to -196oC. The cryogenic flexible pipe will suit a number of applications including Shell's flagship low-cost jettyless LNG offloading system.

Arjan Maijenburg, Engineering Manager at LNG Regas, explained, "Development of jettyless concepts for low cost LNG transfer will open up new markets for LNG import. This composite pipe development is a key step in enabling these solutions. We look forward to working with Magma, a world-class thermoplastic composite pipe supplier to develop this product. An overall cost reduction of 30% can be achieved by moving away from a jetty/trestle-based solution with breakwater to a jettyless system without breakwater and using sub sea cryogenic composite pipelines."

The SPC pipe is comprised of Long, unidirectional fibers are combined in a matrix of the same polymer to produce a tape, which delivers high strength while maintaining all the benefits of the polymer. The tape is then fused together in layers using lasers within Magma's precision manufacturing process, resulting in a continuous long length of spoilable pipe with excellent cryogenic properties.

Martin Jones, CEO, and Magma Global, said: "LNG is being embraced by energy operators but facilitating the growth has its challenges. This exciting development uses a very low-cost polymer composite to produce a pipe with exceptional cryogenic performance, which makes it highly attractive in the LNG market and in many other applications where simplification and cost reduction are the focus. We are delighted to be working with Shell to enable LNG to meet fast-growing global demand."

For many years, and when it comes to maritime and offshore developments, European markets have led the way in many ways. That includes any discussion of offshore wind and, yes, LNG bunkering infrastructure and propulsion solutions. That continues today. At the same time, and like the long-promised offshore wind boom on this side of the big pond, LNG has officially arrived in North America, especially where it intersects the marine bunkering markets. And, it is here to stay.

The Author

Rick Eyerdam
is a Miami-based, national award-winning journalist and editor. He is a former editor of Florida Shipper Magazine and has served as an adjunct professor of communications at Florida International University. Eyerdam graduated from Florida State University with a double major in English Literature and Government. His articles have appeared in myriad maritime publications.

SAN PEDRO PORTS – *Clearing the Air*

As the nation's largest and busiest port complex pushes towards a (mandated) zero-emissions future, most of the low hanging fruit has already been picked. The work, nevertheless, goes on.

By Tom Ewing

When it comes to maritime related environmental issues, no two ports in the world have been more active, persistent – and successful – than the San Pedro Ports: Los Angeles and Long Beach.

Consider some recent – and encouraging – statistics. First, from the POLB:

- ***A 90% decrease in diesel particulate matter (DPM) from ocean-going vessels; from 605 tons in 2005 to 63 tons in 2018.***
- ***A 97% decrease in DPM from heavy-duty vehicles, from 205 tons to 7.***
- ***For cargo handling equipment, DPM dropped 93%, from 47 tons in 2005 to 3 in 2018.***

Critically, among eight air pollutants monitored by Long Beach, double digit reductions occurred in almost every category. For example, look at SOx (sulfur oxide) emissions from locomotives alone: down 99%!

Table ES.1: 2005-2018 Air Emissions Comparison by Source Category

	PM_{10} tons	$PM_{2.5}$ tons	DPM tons	NO_x tons	SO_x tons	CO tons	HC tons	CO_2e MT
2005								
Ocean-going vessels	720	577	605	6,726	6,952	537	236	394,186
Harbor craft	45	41	45	1,107	5	294	70	44,746
Cargo handling equipment	47	44	47	1,289	11	398	65	103,710
Locomotives	43	40	43	1,273	76	179	66	60,579
Heavy-duty vehicles	205	196	205	5,273	37	1,523	318	391,610
Total	**1,060**	**898**	**945**	**15,667**	**7,081**	**2,931**	**755**	**994,832**
2018								
Ocean-going vessels	85	80	63	4,169	213	341	151	297,800
Harbor craft	23	21	23	682	1	483	73	55,364
Cargo handling equipment	4	4	3	327	1	632	34	121,766
Locomotives	23	22	23	619	1	149	36	52,382
Heavy-duty vehicles	7	7	7	1,151	3	156	27	308,378
Total	**143**	**134**	**120**	**6,948**	**219**	**1,760**	**321**	**835,689**
Change between 2005 and 2018 (percent)								
Ocean-going vessels	-88%	-86%	-90%	-38%	-97%	-37%	-36%	-24%
Harbor craft	-48%	-48%	-48%	-38%	-86%	64%	5%	24%
Cargo handling equipment	-91%	-91%	-93%	-75%	-88%	59%	-47%	17%
Locomotives	-46%	-45%	-46%	-51%	-99%	-17%	-46%	-14%
Heavy-duty vehicles	-96%	-96%	-97%	-78%	-92%	-90%	-92%	-21%
Total	**-87%**	**-85%**	**-87%**	**-56%**	**-97%**	**-40%**	**-57%**	**-16%**

Not all the work is done. Note three remaining troublesome areas:

- ***Carbon monoxide from harbor craft increased from 294 tons to 483 and similarly increased from 398 to 632 tons from cargo handling equipment; 64% and 59% increases, respectively.***
- ***Similarly, for harbor craft, hydrocarbons (precursors for smog/ozone) increased by 5%, from 70 to 73 tons.***

Data from the Port of Los Angeles closely track with Long Beach. Summary numbers from Port of Los Angeles data revealed that the port has a similar challenge from harbor craft and cargo handlers. That said, new battery powered units and hybrid equipment, not yet in service as this report was filed, will likely start to reverse these emissions. Additionally, and importantly, CO increases are sometimes allowed as a tradeoff. In their report on 2018 emissions LA officials explain:

"The CO emissions increase for several categories is due to the fleet turnover to newer engines which have higher CO emission standards. When lowering standards for other pollutants such as PM and NOx, the corresponding CO standard is often relaxed to allow flexibility for engine manufactures to meet the other standards."

It is important to note that diesel particulate matter emissions and greenhouse gas equivalents (CO2e) did increase slightly from 2017 to 2018, but those levels are still down from 2005. The increases are more likely an anomaly, not a fixed reversal. For many pollutants, current reductions already exceed goals set for 2023.

Critically, it's important to keep in mind that LA and Long Beach aren't exactly a couple of sleepy ports where decreased traffic has impacted air quality data. Together, the side-by-side ports handle about 1/3 of the total TEUs imported into the US. Business for the San Pedro ports keeps increasing, not decreasing.

Planning (and cooperation) Matters

Successes at LA and LB are planned-out, deliberate and hard won. There's no haphazardness in these year-over-year environmental improvements.

The San Pedro Ports Clean Air Action Plan (CAAP) is the core document driving these emission reductions – importantly, for both Ports, which work together on environmental and energy issues. Port officials coin the relationship as "Coopatition." The LA/LB Ports compete for maritime business but cooperate on environmental issues since; after all, they are right next to each other.

The 2017 Clean Air Action Plan Update set a goal for the Port of Long Beach to transition terminal equipment to zero emissions by 2030 and on-road trucks by 2035. The Port received nearly $80 million in total grant funding from the California Energy Commission (CEC) and the California Air Resources Board (CARB) to proceed with six zero emission and advanced energy demonstration projects. Here's a closer look at this upcoming work:

- ***Zero-Emissions Terminal Equipment Transition:*** *CEC awarded $9.7 million to help fund demonstration and deployments for zero-emissions cargo-handling equipment. The project includes electric rubber-tire gantry cranes, yard tractors, and hybrid/electric drayage trucks.*
- ***Sustainable Terminals Accelerating Regional Transformation Project (START):*** *CARB awarded a $50 million grant for a transformative demonstration of a near-zero and zero-emissions supply chain. This includes the ports of Oakland and Stockton and more than 100 pieces of zero-emission terminal equipment. At Long Beach 34 pieces of zero emission cargo handling equipment will be tested as well as an electric-drive tugboat, five electric trucks at an off-dock container yard, and two heavy-duty truck charging outlets.*
- ***Port Advanced Vehicle Electrification (PAVE):*** *PAVE will design, install and deploy electrical*

"We're like a giant test bed. We're very concerned about impacts on customers, but we need to continue to clear the air. We've met goals in the past and costs started high. But they've dropped and we see that (decline) continuing as we keep working at it."

– Matt Arms, Acting Environmental Planning Director, POLB

charging infrastructure, including electrical conduit, wires, switchboards, transformers and switchgears, to support battery-electric yard tractors and forklifts at Total Terminals International's facility at Pier T. CEC is paying $8 million of the $16.8 million project.

- ***Microgrid — Resilience for Critical Facilities:*** *A microgrid project will allow the Port to learn about the design, installation and operation of microgrid systems. This work could protect marine terminals against larger, external grid failures.*
- ***C-PORT Zero-Emissions Demonstration:*** *The Port, in partnership with SSA Marine at Pier J and Long Beach Container Terminal at Pier E, will demonstrate five zero-emissions cargo handling vehicles, including three never-before-tested battery electric top handlers and a head-to-head comparison of a hydrogen fuel truck and a battery-electric yard truck.*
- ***Port Community Electric Vehicle Blueprint:*** *The Blueprint will identify the path toward zero emissions and an economical, demonstrated approach to EV planning that other California seaports can replicate.*

Local Action, Global Implications

Among those leading the local LA/LB energy and environment work are Heather Tomley, Acting Managing Director of Planning and Environmental Affairs at Long Beach, Matt Arms, Acting Environmental Planning Director, also at Long Beach and Chris Cannon, Director of Environmental Management, Port of Los Angeles.

Each reiterated and emphasized the cooperative spirit that marks their R&D work. Tomley noted that a big part of this work is "building the larger market" for zero-emission equipment, to "ultimately create greater demand that will bring overall costs down."

Cannon added, "We're trying to work in a coordinated way with the demo projects so that we can have the benefit of the experiences and knowledge." He says that the "San Pedro ports are like a giant test bed for new technologies."

The upcoming demo projects will start over the next few months as test equipment arrives and related port infrastructure is upgraded. Tomley said this "isn't just one project with everything on the same timeline." Rather, individual demos are slated for implementation from 2019 to 2022. Indeed, a major project got underway in October when LA announced receipt of two pre-commercial battery-electric top handlers for testing at the Everport Container Terminal.

"We are making good on our pledge to do the hard work of advancing commercially feasible solutions to meet our goal of transitioning all cargo-handling equipment to zero emissions by 2030," said Port of Los Angeles Executive Director Gene Seroka. "We're excited to power up these battery-electric top handlers and test them under the real-world conditions of a working container terminal."

Testing will be in-depth and Port officials stressed that this will stem from established criteria, specifically, "An emerging platform is deemed commercially available when (1) it is being manufactured in large quantities and within similar timeframes as the baseline equipment (usually powered by diesel ICE technology), and (2) it has (or approaches) baseline-equivalent customer support systems for vehicle warranty, maintenance, and parts."

The equipment has to meet business and operational needs, not just test protocols. The top handlers are designed and built in the U.S. by Taylor Machine Works, Inc., based in Mississippi. This equipment loads, unloads and stacks containers weighing up to 75,000 pounds onto trucks and trains.

The top handlers run on a one-megawatt battery designed to operate for up to 18 hours between charges. Each has a data logger for tracking hours of operation, charging frequency, the functionality of the charging connections and systems, energy usage and other performance indicators. Data collection will include comments from drivers and mechanics regarding maneuverability, noise level and safety. Testing will last a year, starting this December.

Paying the Price: as 'X' approaches zero

New equipment, new energy, new infrastructure – "new" comes at a cost. The Ports' environmental officials are fully aware of the expense associated with not just reducing air pollution from energy, but, really, ending it. LA's Cannon said the estimated price tag within the 2017 CAAP is $14 billion. He noted that some private sector companies think the total will be closer to $30 billion. The Ports, of course, produce just a fraction of southern CA's total pollution load. The Ports could do everything right and the region may still exceed federal air quality regulations and the State's hoped-for CO2 reductions.

Nevertheless, officials are confident that they are on the right path and have business' support. "We're like a giant test bed," Matt Arms noted. "We're very concerned about impacts on cus-

tomers, but we need to continue to clear the air. We've met goals in the past and costs started high. But they've dropped and we see that (decline) continuing as we keep working at it."

On the business side, the Ports' hundreds of commercial tenants are keeping a close eye on these alternative energy initiatives, for which there is general support. After all, businesses are partnering with the agency-led demo projects, either with in-kind investments, e.g., on-site accessibility, or with cash, paying for equipment and infrastructure or providing funds to match public grant money.

Weston LeBar is Chief Executive Officer of the Harbor Trucking Association, an advocacy group for Port businesses. LeBar said that HTA members want to be a partner in port electrification, not an obstacle. LeBar said that businesses learned a hard lesson from early Ports' efforts to implement a clean trucks program. There were mandates for vehicles that either weren't ready for commercial use or were not appropriate for harbor/freight work.

LeBar noted that it's not infrequent on a hot day in LA for public service announcements to ask people to not lower their air conditioner settings because of power supply problems. Furthermore, LeBar asks, "how do you electrify 12 marine terminals at the Ports of LA and Long Beach? If you have a 100 acre port site that's all electric and you have a blip in your power, it resets the whole terminal."

His suggestions include moving forward first with the most promising equipment, matched with infrastructure upgrades. Understand where and why there are bottlenecks – from construction and permitting timetables to equipment actually being commercially available. LeBar said businesses want new technologies to work. When the landscape is ready, changes and new investments will follow.

One company using a more "disruptive" approach to untying the Ports' logistics and transport is a new IT company called NEXT Trucking. With NEXT, think of Uber or DoorDash for freight. NEXT uses an app to connect shippers, fleet dispatchers and truck drivers. The company owns 85 trucks.

Gary Kendle is NEXT's Head of Operations. Air quality is important to NEXT. "We believe, first and foremost, that finding and implementing zero-emissions solutions is the right thing to do," Kendle said. "We recognize what trucking is doing to the air we breathe. The technology still has a way to go before we can reach our goal, but we want to do everything in our power to be at the forefront of this movement as all the pieces come together."

The Author

Tom Ewing
is a freelance writer specializing in energy, environmental and related regulatory issues.

Managing Mariner Medical Care

It's complicated, and it is expensive. But, it doesn't have to be.

By Joseph Keefe

The competent authority shall require that, prior to beginning work on a ship, seafarers hold a valid medical certificate attesting that they are medically fit to perform the duties they are to carry out at sea. ***[Source:*** *MLC 2006/ Standard A1.2 – Medical certificate.]* That sounds simple enough. In practice, it is much harder to carry out with any degree of certainty.

Seafarers are an essential workforce to the global economy with as many as 1.5 million working day and night, securing the safe and efficient transportation of more than 90% of the goods that move across the globe. The remote character of that working environment defines them as a 'hard-to-reach' population group. And, the vulnerability of these seafarers makes their health and wellbeing a concern and a priority in a public health point of view. Nevertheless, their collective wellbeing is an underserved aspect of the global supply chain and one which, if left unchecked, could place us all in peril.

According to Natalya Butakova, Business Development Director at AP Companies, a global medical assistance company that caters to the maritime sector, today's seafarers actually have a 1 in 11 chance of being injured on their tour of duty – much higher than any other occupation. Exacerbating this phenomenon is any one – or a combination – of the following risk factors for mariners:

- *Exposure to physical and psychological strain*
- *Spending periods of time in countries with low quality healthcare*
- *Exposure to epidemic diseases*
- *Changes in diet*
- *Dangers posed by ship and port environments*
- *Contact with individuals of questionable health*
- *Exposure to sudden climate change*
- *Exposure to devices with electromagnetic, vibration and sound radiation*
- *Delays in medical assistance*

At the same time, the Maritime Labour Convention also states that seafarers must receive equal quality of care as the population on shore enjoys. But, that's not always the case. In case of sickness on board, seafarers might find themselves in need of medical evacuation and/or repatriation.

Direct and Indirect costs are entirely covered by the employer, which could be as much as ten times the amount of direct costs. Indeed, and in 2013, it was estimated that the annual costs of evacuation and medical treatment for the shipping industry amounted to a total of 760 million euro. Much of that cost, primarily a function of poor or indifferent planning on the part of ship operators, is avoidable. Engaging a case manager is one way to mitigate most of that risk.

Natalya Butakova, Business Development Director for AP Companies, weighed in on the matter, saying, "MLC 2006 is a global document, it covers a number of different subjects, but it is not that detailed in terms of healthcare coverage, and that leaves a lot of space for very different options of healthcare cover, depending on the size of the shipping companies and the goodwill/opportunities of the ship owners. To our mind, the healthcare standards for crew, should be more standardized." And, that's at the heart of the AP companies' mission.

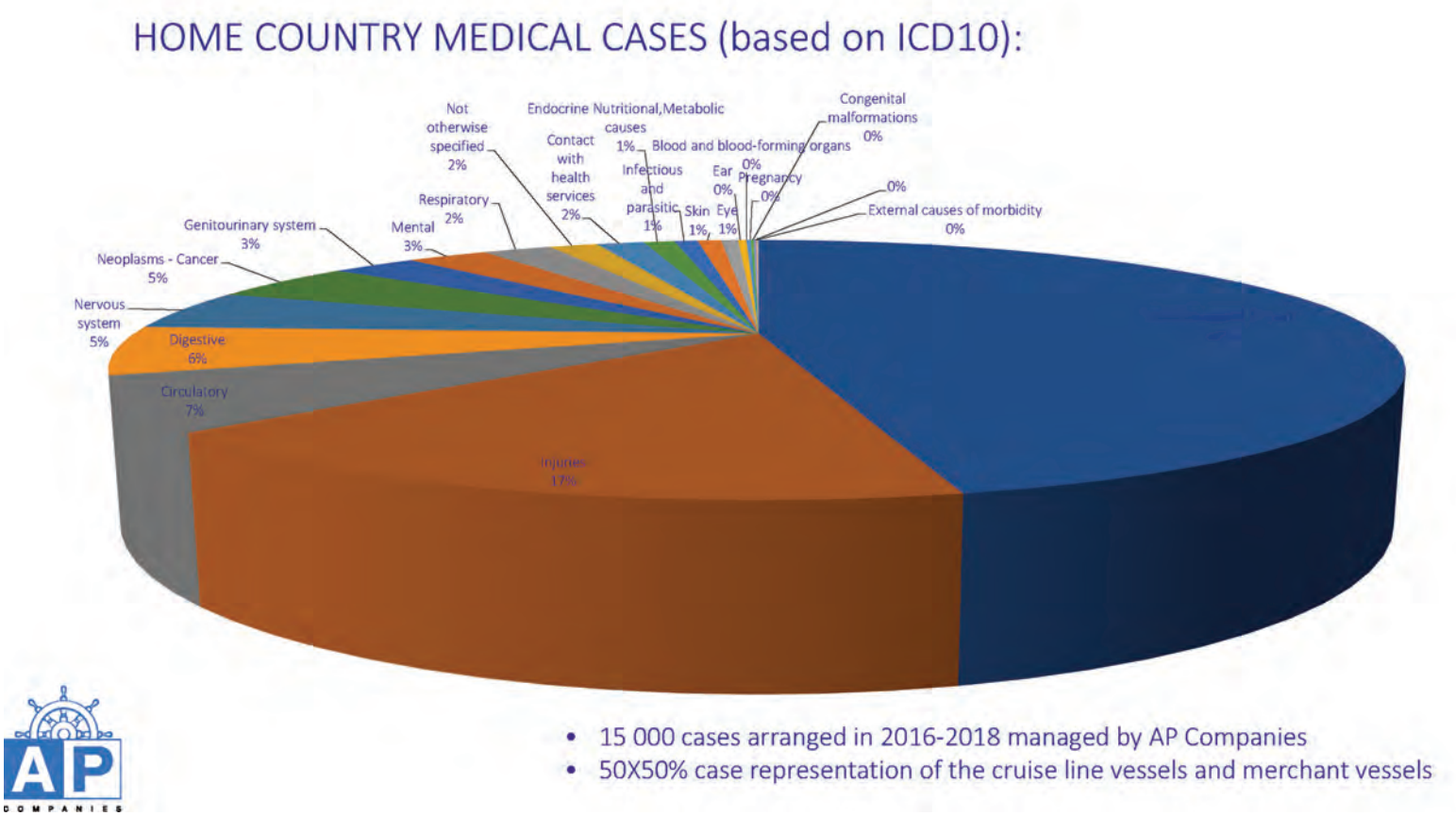
A Standardized Solution

AP Companies is an international, ISO 9001 and ISO 27001 standards compliant company, specializing in providing emergency and planned medical services for crew members, travelers, and expats around the world. Their direct medical provider network includes over 37,500 medical providers spread between 180 countries. Importantly, AP companies provides medical assistance to Crew members all over the world in the Ports of call and Home countries, arranges pre-employment (PEME) and re-employment (REME) medical evaluations, as well as perform medical evacuations to different parts of the world.

In a perfect world, well prior to the embarking any mariner, a trusted medical consultancy is already at work, mitigating seafarer issue, and client risk. That's because, unfortunately, very often the importance of PEME (pre-employment medical examination) tests are underestimated. Left to the responsibility of the seafarer, and/or treated as a formal requirement, eventually leads to costly claims on board that can manifest as a direct threat to the crewmember's life.

The last thing a seafarer wants is to be classified as unfit for duty. But, some individuals are not – and should not be embarked, for their safety and that of others, and yes – the bottom line of the vessel operator. That's because on board medical emergencies, in particular those conditions not declared during the PEME, can result in huge costs that involve the deviation or delay of the vessel.

Today, says AP's Butakova, a large percentage of shipowners delegate the responsibility of conducting PEME to the Crew



Member and this can brings significant challenges. For example, she says, "Not all the seafarers hold sufficient funds for a reliable facility. And not all the seafarers are keen to get truthful and objective medical examination, as they might be declared not fit for duty and would be refused a job based on this fact. The objective of the seafarer, at the end of the day, is not the evaluation itself; in most of the cases he/she is not interested in finding out the actual state of his health, the main objective is a 'Fit for Duty' certificate."

The Pre-employment medical examination at first glance might seem an insignificant formality, but at its heart, it is the foundation of the seafarer's wellbeing and safety, a guarantee for his family and a vital cost containment tool for the ship owner.

For its part, AP Companies has been facilitating high quality medical check ups for seafarers in different parts of the world since 2012. There are several key aspects to this service, including the careful selection of the PEME/REME facility itself. To ensure the continuity of sampling and testing, an objective evaluation of test results is necessary. All 'Fit for Duty' certificates are evaluated by an AP staff doctor. That starts with transparency and the clear management of expectations, for all parties involved. This includes the manning agency (who often wants the mariner employed at all costs), the shipowner and the seafarer himself. Often, there is a time crunch in the event of a 'pierhead jump,' but under AP companies' protocol, shortcuts are not allowed under any circumstances.

AP Companies' global network of medical providers (hospitals, multispecialty clinics, specialists, GPs, dentists, ambulance and air ambulance companies) is assembled and maintained via strict credentialing procedures, ensuring the highest possible quality of care – no matter where that care is provided.

On Board, but Not Forgotten

Emergency and planned medical care in foreign ports of call, where unfamiliar surroundings and unknown caregivers present risk, and sometimes inflated costs, is obviously important. The benefits of managing home country medical care, on the other hand, are less transparent. The challenges of home country medical treatment for shipowners are many.

For starters, crewmembers for just one shipowner can hail from as many as 80 different nationalities. The standards of care can differ from country to country, but seafarers nevertheless must get medical help that corresponds to international standards. Once ashore, however, and without a standardized care regimen, there's no guarantee that adequate care can be found and/or that the medical opinion given to reinstate a previously injured/ sick seafarer is trustworthy.

Beyond the obvious risk of boarding (or reboarding) an unfit mariner, medical care that does not satisfy the mariner (for whatever reason) may instigate legal action. The number of le-

"Not all the seafarers hold sufficient funds for a reliable facility. And not all the seafarers are keen to get truthful and objective medical examination, as they might be declared not fit for duty and would be refused a job based on this fact. The objective of the seafarer, at the end of the day, is not the evaluation itself; in most of the cases he/she is not interested in finding out the actual state of his health, the main objective is a 'Fit for Duty' certificate."

– Natalya Butakova,
Business Development Director at AP Companies

Care Arranged by Trusted Contract Provider	Arranging Care 'in house' or via Local Agent
Extensive medical provider network in Port of call	Expensive treatment
Original invoice from provider attached to every claim	No control over utilization
Accumulating volume of cases / access to discounts	Medical care not the specialty of agent
Access to the price lists in hospitals for locals	Lack of transparency / No itemized bill
Compliance w/personal data protection requirements	No effective cost/quality/fraud control
Effective cost control/Effective fraud control	Additional staff for case management
Medical care quality control	Confidentiality issues

gal cases arising from this increases every year. It is complicated, it changes from nation to nation as to what constitutes adequate care, and it is a nightmare for manning agencies and shipowners to keep track of. Beyond this, local medical facilities will overprice seafarer treatment simply because there is a lack of control of those charges in the first place.

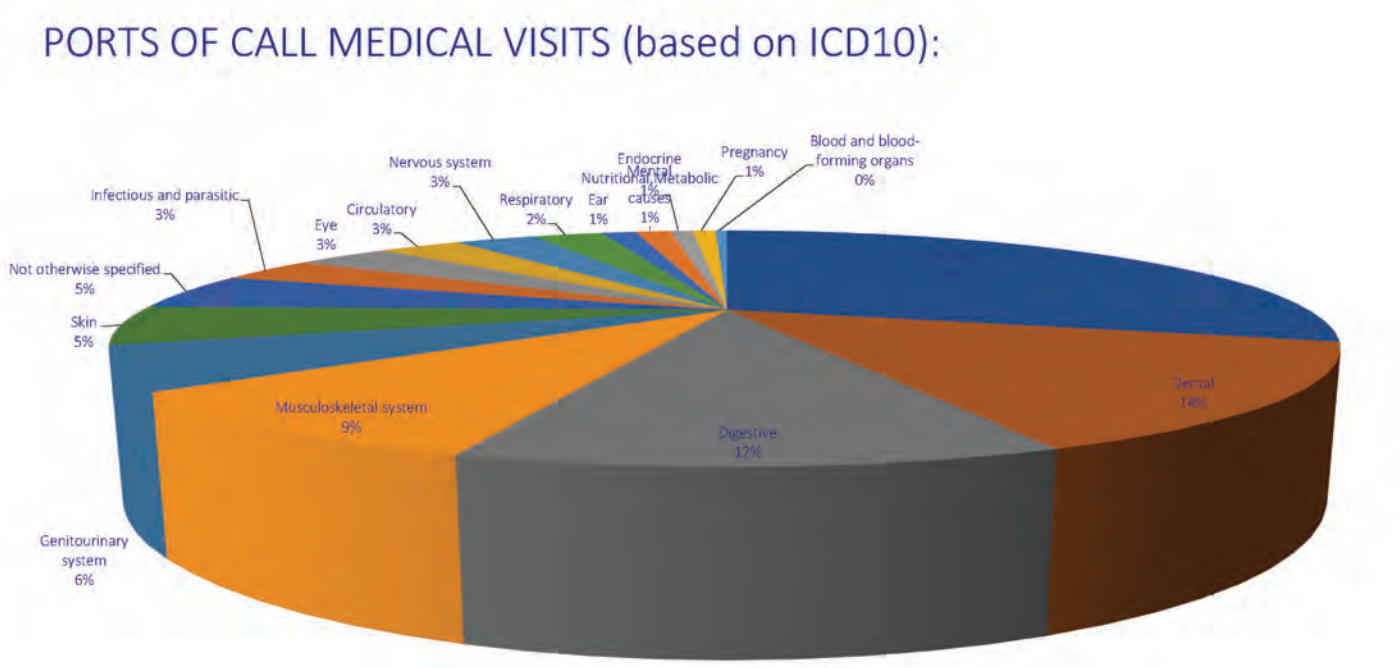
By having an effective and professional health and safety management system to mitigate the risks of occupational illnesses and accidents onboard, companies will be able to reduce loss time incidents, reduce medical costs and workers' compensation costs, improve employee morale and productivity and comply with national and international regulations.

Moreover, the General Data Protection Regulation (GDPR) is a legal framework that sets guidelines for the collection and processing of personal information from individuals who live in the European Union (EU). GDPR compliance and data security is just one more layer – and a frequently neglected aspect – of the multinational healthcare dilemma facing the flag of convenience operator.

The answer can involve the organization of an internal and extensive medical department; one that would contract with hospitals, negotiate prices, make appointments, get the documentation and keep an eye on the quality of medical care. In reality, no one in this freight market can afford those costs; certainly not on an international, multi-national scale. Alternatively, shipowners can roll the dice and hope for the best when it comes to homegrown medical certificates and healthcare – a practice that is fraught with risk. The prudent shipowner or manning agency, however, can outsource these functions to a trusted third party partner.

Turn Key, Compassionate Solutions

According to AP Companies data, during the time frame of 2016 through 2018, the firm arranged some 15,000 visits for clients. The top three reasons for these medical events were injuries, dental health issues and digestive problems. Twenty



years of cost comparisons between 'managed' visits and the typical costs associated with an unexpected port of call event shows – according to AP companies data – that clients save approximately 24-31% in costs related to 'Ports of Call' visits and another ~45% in home country cases.

MLC-compliant, efficient and compassionate care begins, says Natalya Butakova, "with a good and thorough pre-employment medical examination. A tailored package that ensures the quality of that initial examination is important."

Butakova continued, "Once the member is on board and working, the risk of health problems related to injuries and traumas is very high, and in this case prompt and efficient medical help in the ports (in case of minor issues) and in the home countries (in case of long term treatment) is key for the ship owner. AP Companies is the right partner to assist in both cases and to make sure the level of care and cost of medical services is the best combination for the ship owner."

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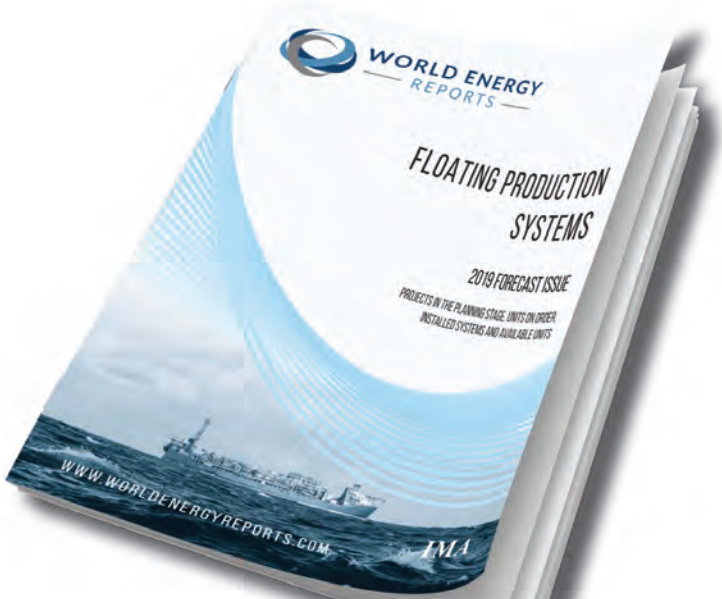

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