MARITIME IMPACT

ISSUE 01–15

THE MAGAZINE FOR CUSTOMERS AND BUSINESS PARTNERS

PERFORMANCE

PUSHING LIMITS

OPTIMIZING OPERATION
Raising competitiveness through retrofitting and lower OPEX

TECHNICAL EXPERTS
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Tor E. Svensen
CEO of DNV GL – Maritime

Dear Reader,

Most segments of the global shipping industry started off 2015 with subdued expectations. Amid tough competition, constant pressure to enhance efficiency and more stringent regulations, the only good news seems to be the unexpected drop in fuel prices – and nobody knows how long that will last. Nevertheless there is an amazing amount of positive energy pulsating through the industry as it endeavours to cope with challenges old and new.

Performance is our main theme in this issue. There are many ways to unlock hidden performance-enhancement potential, from scrutinizing operating expenditure and retrofitting existing vessels to the Route Specific Container Stowage class notation and new experiences with innovative ship design. Our fascinating story about how our 1,300 surveyors around the world can contribute to better performance is a true eye-opener.

New exhaust emissions limits in ECA zones are upon us with stricter requirements and a more complex fuel picture than ever before. The available options are explained in detail in our compliance section. DNV GL's software product FCO helps crews ensure a smooth fuel changeover procedure when entering ECA zones. In our portrait of the multitalented Finnish shipowner and inventor Hans Langh you will learn how an eco-friendly scrubber system can be installed without losing cargo space.

North America is our regional focus this time. Read about the amazing resurgence of North American shipbuilding and how DNV GL helps shipowners mitigate the risk of violating the US Vessel General Permit. The cruise industry has sailed through the financial crisis and come out unscathed. Cruise ships are getting ever more luxurious and elaborate, attracting holidaymakers from all parts of the world. The history of this segment is retold from the American perspective by Micky Arison, Chairman of Carnival Corporation.

At DNV GL we always take the broader view, supporting our customers in creating a competitive advantage by planning wisely and sustainably and ensuring the performance, efficiency and compliance of every single vessel or rig. I hope you will enjoy reading this inspiring issue as much as I did.

Tor E. Svensen

A LEGEND REVIVED

Last October the ice-breaking bulk carrier *Nunavik* of Arctic shipping firm Fednav was one of the first unescorted commercial ships to carry cargo of Arctic origin through the legendary Northwest Passage.

Nunavik's 6,700-mile trip from Quebec's Deception Bay to northern China was completed ahead of schedule and without any difficulties. On the first commercially viable voyage through the notorious Northwest Passage, the ship carried nickel concentrate for the Chinese mining company Jilin Jien Nickel Industry Co. Ltd.

Favourable weather conditions, efficient route planning and support from a shore-based team of ice navigation specialists were keys to this success, says Thomas H. Paterson, Fednav's Senior Vice President, Shipowning, Arctic and Projects. "In early October, there is no ice to contend with. The vessel's engine was operating at about 24 per cent of capacity only."

The Northwest Passage route saved substantial amounts of fuel and reduced greenhouse gas emissions by more than 1,300 tonnes compared to the 12,500-mile route through the Panama Canal. "The journey made economic sense," says Paterson.

Classed with DNV GL's Polar Class 4, *Nunavik* is the most powerful conventional ice-breaking bulk carrier in the world. **JKL**

Photo: Fednav/Tim Keane

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IN BRIEF

Advanced analytics applied to data from multiple sources can deliver enormous economic benefits to all participants in the maritime value chain.

New AIS Business Intelligence Service

AIS and other maritime data can have a profound impact on the way ship operators and owners monitor ship safety, sustainability and performance.

DNV GL's new AIS Business Intelligence Service delivers valuable information. Maritime experts from the advisory division at DNV GL interlink various types of data, such as ship positions, OPEX models, geographical port information, ship schedules, etc. to create a holistic view of vessel performance. Using advanced models and analytic schemes, they analyze information about voyage management, port and bunker operations as well as benchmarking data from other market players. DNV GL can tailor the analysis to each customer's needs, providing advice on reducing operational costs, optimizing voyage management and finding the best retrofitting solutions for a given operational profile.

Ship operators and owners, port operators and authorities, insurance companies as well as commodity traders and maritime service providers can all benefit from AIS Business Intelligence data, be it for identifying the causes of vessel delays or advising on a switch to ports with shorter anchorage times or for finding the right dry dock.

Technical helpdesk in Houston

DNV GL has opened the American hub of its technical helpdesk, providing customers with direct access to 400 technical experts globally. The network now includes teams in all main time zones.

"Our classification customers need timely, authoritative answers to technical questions," says Jan Solum, head of the new Technical Helpdesk Team in Houston. "Our new competence centre delivers answers quickly. We call this service DATE – Direct Access to Technical Experts."

The helpdesk ensures that customers have access to DNV GL's expertise at all times. Technical queries are routed to 400 technical experts globally, all authorized to provide formal answers on behalf of DNV GL.

When offices in Europe close, Houston takes over until Singapore is online to respond to them. The DATE service is free of charge to DNV GL's customers, as part of the company's comprehensive customer service.

Jan Solum heads the new DNV GL Technical Helpdesk Team in Houston, Texas.

Strong presence in central China

A new DNV GL office has opened in Nanjing to support business growth in the area and coordinate operations in central China. Headed by Area Manager Chen Keng, DNV GL Central China covers most of the Jiangsu Province and follows the Yangtze River upstream to Chongqing and Sichuan.

"Central China is home to dozens of shipyards and manufacturing companies and thus a key area for DNV GL in China. Our new office demonstrates our commitment," said Torgeir Sterri, Vice President and Regional Manager for Greater China at DNV GL.

"Broad expertise in all ship types and offshore units and a strong focus on research, technology and innovation enable DNV GL to support the transformation and development of central China's maritime industry effectively. Together with our customers, we will contribute to a safer, smarter and greener future for China," Sterri added.

Festive opening of the new DNV GL office in Nanjing.

The expanded office accommodates all staff from both former DNV and GL Group. "Our customers now have easier access to our services. This puts us in a much better position to support them, strengthen existing cooperations and generate more business in the area," said Area Manager Chen Keng.

Greening Norwegian coastal shipping

DNV GL has taken the initiative to launch a Green Coastal Shipping programme in Norway, a joint effort by the industry and authorities to ensure that in the future this country will have one of the world's most environmentally friendly and efficient coastal shipping sectors.

LNG and battery power are predicted to play a major role in ship propulsion around the globe in the future. As a leader in this field, Norway is in an excellent position to promote environmentally sound business and implement these new technologies on a broader basis.

The Green Coastal Shipping programme has been developed to help implement the government's new maritime strategy and will be a joint effort by several industries, ministries and state departments. It will make an important contribution to the achievement of both national and global climate goals, not least by helping reduce air pollution. At the same time, it will be a driver for innovation and green jobs. In time, it is also expected to provide major export opportunities for the maritime, energy and supply industries.

"We want to make Norway a world leader in, and a showcase for, green coastal shipping and attract international attention," said DNV GL's Narve Mjøs, Director for the Green Coastal Shipping programme.

Norwegian State Secretary of Climate and Environment Lars Andreas Lunde (holding the declaration), Norwegian Minister of Trade, Industry and Fisheries Monica Mæland (right), and DNV GL's Deputy Group CEO Remi Eriksen (left) signed a declaration of cooperation with key players in the Norwegian coastal shipping industry.

Photos: DNV GL, Elena Garm

IN BRIEF

DNV GL and N-KOM to promote LNG as ship fuel

A memorandum of understanding (MOU) was signed by DNV GL and Qatar's premier shipyard Nakilat-Keppel Offshore & Marine (N-KOM) to promote the use of liquefied natural gas (LNG) as a fuel for the maritime and offshore industries.

N-KOM CEO Chandru Rajwani and Dr Henrik O. Madsen, DNV GL Group President and CEO, signed the memorandum in a ceremony during the 150th anniversary celebrations of DNV GL in Dubai at the end of 2014.

The MOU will further strengthen the position of N-KOM, a joint-venture between Qatar Gas Transport Company (Nakilat) and Keppel Offshore & Marine, in the areas of LNG-fuelled vessel conversions and construction of related floating assets. N-KOM will benefit from the competence and long-standing experience of DNV GL in LNG, working with shipyards, shipowners and other stakeholders globally to develop synergies to promote LNG as a ship fuel.

"Qatar is the single largest producer and exporter of liquefied natural gas in the world and has become a leading cluster for gas-related activities. We look forward to establishing a valuable partnership with N-KOM to make the shipping industry greener," said Henrik O. Madsen.

Signing ceremony: N-KOM's CEO Chandru Rajwani and Dr Henrik O. Madsen, DNV GL Group President and Chief Executive Officer, signed the memorandum.

Chandru Rajwani said: "By sharing our knowledge on the latest technology as well as environmental protection, safety and quality with DNV GL, we will be able to offer our customers an even wider range of solutions and facilities for LNG."

Lithium-ion batteries help *Viking Lady* balance enormous load variations when manoeuvring.

Innovation boosts safety and efficiency

***Viking Lady*, an offshore supply vessel operating in the North Sea, is a veritable test laboratory. At the "Greener Shipping Summit – Ships of the Future" conference in Athens, Dr Nikolaos Kakalis, Head of DNV GL Strategic Research & Innovation in Greece, showed how the vessel could lead the way to a significant improvement in the safety and efficiency of high-risk operations.**

Speaking to the Greek shipping community, Nikolaos Kakalis presented the battery hybrid propulsion system and its benefits for *Viking Lady*. The system resulted from the FellowSHIP III research and development project of DNV GL, Eidesvik Offshore and Wärtsilä, co-funded by the Research Council of Norway.

Viking Lady's diesel-electric propulsion system consists of four dual-fuel engines driving five thrusters for propulsion and manoeuvring/dynamic positioning (DP). In the project, a 450 kWh lithium-ion battery was added to enable the vessel to use hybrid-electric propulsion. The battery acts as an energy buffer balancing the intense load variations that can occur during manoeuvring, especially in DP and standby operations.

Emerging economies and young people are most optimistic about their ability to seize sustainable opportunities.

Business leaders show strong confidence in sustainable growth opportunities

Business leaders all over the world feel strongly about their ability to turn sustainability challenges, such as water scarcity or the dependence on fossil fuels, into new business opportunities, particularly in the manufacturing and finance sectors of emerging economies. This is one of the key findings of the *Global Opportunity Report* published recently by DNV GL, the UN Global Compact and Monday Morning Global Institute. The new report is based on a survey and consultations with more than 6,000 public and private sector leaders in over 21 countries.

"Businesses across the planet are not shying away from global risks such as climate change, and increasingly recognize the positive benefits of seizing the related opportunities. The report confirms that [...] private sectors are now a critical driver of sustainable development with emerging economies in the front seat," said Dr Georg Kell, Executive Director of the UN Global Compact.

Innovative ideas and solutions

In addition to the 6,000 leaders surveyed, 200 experts from eight countries contributed to the Global Opportunity Report, which identifies and ranks 15 sustainability opportunities according to public and private sector interest and potential impact on societies and business. With the new report, the partners aim to demonstrate how global sustainability challenges and risks can be seen as opportunities. As an open innovation platform, the work enables stakeholders worldwide to explore and seize sustainability opportunities and solutions across risk domains and regions. The report identifies more than 120 readily available solutions.

Opportunities in water innovation

Business leaders see untapped and profitable opportunities especially in solutions addressing water scarcity and promoting green consumer choices. "I believe one of the clearest signals in the survey is the confidence we see in our ability to address water scarcity. It is a grave problem that affects hundreds of millions of people globally and the competition for water is seen as a major obstacle to health, growth and prosperity. This finding also makes me optimistic that we'll meet a global development goal to ensure availability and sustainable management of water and sanitation for all," said Dr Henrik O. Madsen, DNV GL Group President and CEO.

Private sector more optimistic than public sector

"The report findings are encouraging and concerning at the same time," said Erik Rasmussen, founder of Monday Morning Global Institute. "The strong interest in sustainable business opportunities in the private sector is very positive. Yet, the governmental sector seems to be more reluctant. Business and governments must share visions and initiatives."

To download the report, please visit globalopportunitynetwork.org or scan the QR code.

Photos: DNV GL, FellowSHIP, Laurence Tissot

THE CORE TEAM AT WORK

They are the guardians of the DNV GL classification services and work in more than 100 countries around the world. The global surveyor network is an integral part of a classification society's service offering. *MARITIME IMPACT* accompanied three DNV GL surveyors to inspections on different vessel types to find out what issues they look for, how their work varies on different ship types and which of DNV GL's services can do the most to help owners and operators increase the safety and performance of their fleets.

Photo: DNV GL

On board the *Berge Stahl* surveyor Arjen van der Meer focuses on structural issues such as cracks and deformations.

Checking the hatch coamings and upper part of the cargo hold is essential.

Almost every square centimetre of Rotterdam's iron ore terminal is covered in a coat of red sludge as a massive crane unloads *Berge Stahl* one 40-tonne scoop at a time. It takes four days to empty the 342-metre very large ore carrier (VLOC) that ships 355,000 tonnes of iron ore from Brazil to Rotterdam eight to ten times per year. *Berge Stahl* is so large that her passage has to be timed to coincide with high tides. In 28 years of service, the phenomenal vessel has carried around 95 million tonnes of iron ore to Europe and is justifiably one of the pioneers in the industry.

Important values

Up on deck the captain and several crew members are following around two men in orange boiler suits. One of them, Arjen van der Meer, has started hitting the hatch covers with a hammer. He and his colleague Kim den Boer will spend the next two days doing an annual inspection on the vessel to check whether it still fulfils the class requirements, after passing its main class intermediate survey in April 2014.

Van der Meer, one of 1,300 surveyors in DNV GL's global network, inspects containerships, offshore vessels, very large ore carriers and other bulk carriers. Before joining the Rotterdam DNV GL station eight years ago, van der Meer worked on several ship types as a technical engineer. "What attracted me to my job at DNV GL was the fact that the company represents values that are important to me personally, too, and that my colleagues have a very positive, no-nonsense attitude to surveying ships."

On board the *Berge Stahl*, which was the largest VLOC until the launch of the Valemax class in 2011, van der Meer especially looks for structural issues, such as cracks and deformations. "Deck structures belong to a bulk carrier's most critical areas, because the cargo places great stress on them. In deck it is the hull girder bending moments and their way into and out of the hatch side coamings that are essential," he explains, kneeling down on the deck to continue his survey. Besides the structural checks, all safety and firefighting equipment must be inspected as part of the statutory survey. DNV GL is authorized

Trainee surveyor Kim den Boer inspects the engine room.

Captain Rohit Sharma has served on the *Berge Stahl* in all ranks from 3rd Officer to Master.

Knowing where to look to assess a ship's condition is Arjen van der Meer's (left) job.

by nearly all flag states in the world to perform surveys and issues certificates on their behalf. The next stop is the ship's engine room – a steel jungle full of ladders, pumps, valves and pipes.

Hard to swallow: loading 18,000 tonnes per hour

Some of the equipment has been down here since the vessel was delivered in December 1986, but its operating environment has become a lot more challenging since. The loading rates for VLOCs have grown considerably as mines want to ship more and more iron ore abroad and the conveyor belts at the port terminals are capable of loading vessels at a rate of up to 18,000 tonnes per hour. "This places much greater stress on the ship's ballast water system, which has to be very well managed and large enough to deliver the high flow rates and avoid any build-up of overpressure in the tanks at the same time," van der Meer adds. As the leading classification society for VLOCs, DNV GL has been working to mitigate the risks of such operations. DNV GL-classed newbuilds now include an Easy Loading notation (EL-2) that ensures the ship's structure and ballast water system are fit to handle loading rates of 18,000 tonnes per hour.

Berge Stahl can be loaded at a maximum rate of 16,000 tonnes per hour and copes with the challenge by applying meticulously planned, highly efficient loading procedures. "We drain excess water that is naturally contained in the iron ore through special drain filters inside the bilges of the cargo holds into separate tanks. This very efficient technology is only used by a few vessels. The special filters allow drainage even while in port," explains Captain Rohit Sharma, the Master of the *Berge Stahl*.

The professional and experienced captain from Mumbai has served on the *Berge Stahl* in all ranks from 3rd Officer to Master and has been in command for over ten years now, working closely with DNV GL's classification experts throughout. *Berge Stahl* was built to DNV standards. "We appreciate our good cooperation with the professional surveyors from DNV GL, who always respond quickly and ensure strict standards are upheld," says Captain Rohit Sharma. When Arjen van der Meer enters the engine room, he checks the condition of the main engine and other auxiliary machinery for any leakages or abnormal operation, ensuring compliance with the applicable regulations, safety standards and operating procedures. "The *Berge Stahl* is very well maintained and in excellent condition, despite her age. It is a pleasure to work on this vessel."

What brings most jack-ups to their knees?

280 kilometres north of Rotterdam another DNV GL surveyor is sitting in a man overboard boat >

The very large ore carrier *Berge Stahl* has been in service for nearly 30 years.

Photos: DNV GL

Detailed surveys are crucial to ensure the safety of jack-up rigs, says surveyor Ronald van Rooten.

> inspecting the shell plating of a jack-up's hull three metres above him. Ronald van Rooten is examining a barge-type, non-self-propelled rig called *Paragon C20052*. This self-elevating drilling unit was towed to Eemshaven for its intermediate survey.

"I'm checking the bottom plating the way you normally inspect a ship when she is on the blocks in a dry dock," the surveyor explains. According to van Rooten, about half of all jack-up drilling rigs currently in operation are more than 30 years old, even though they were originally designed for approximately 20 years of service life. "So maintenance, or the lack thereof, is a real issue that calls for very detailed surveys," van Rooten adds.

Complex team effort

DNV GL's routine for jack-up surveys is very comprehensive and van Rooten spends hours looking for wear and tear caused by the jack-up's harsh operational environment in the North Sea. The highest corrosion rate is in the wind/water area of the legs, called the splash zone. These areas are normally not accessible when the unit is in operation, and re-applying a coat of hard epoxy paint whilst the unit is operating offshore is impossible.

"Proper maintenance of the units is difficult due to the drilling operations. But at the end of the day, it is lack of maintenance that could shorten a rig's lifespan," van Rooten explains. " The 55-year-old joined DNV GL three years ago, after working as a marine engineer on various types of vessel and surveying for other classification societies. At DNV GL he specializes in inspecting Offshore Class vessels and units.

Jack-up surveys are a complex team effort. Rope access specialists carry out non-destructive tests on the legs, while a group of divers inspect and carry out eddy current testing on the weld connections of the spudcans underwater. The divers have cameras mounted to their helmets allowing van Rooten to see underwater.

"The connections between the legs and the spudcans are critical. The *Paragon C20052* mainly operates on the hard sand bottoms of the North Sea

where its spudcans rarely penetrate the seabed and failure of the leg-to-spudcan connection would be disastrous," he adds.

Unplanned repairs on a jack-up during operation confront owners with huge costs, downtime and the risk of losing the contract for a particular project. In typical cases of failing leg braces or corrosion reducing the plate thickness beyond the class standards, DNV GL offers customers a detailed, site-specific analysis for the unit or a finite element analysis for the area in question. This allows DNV GL to determine the exact allowable diminution value of the steel plates in question and see whether the structure may have in-built added contingency in its design, which may make it possible to continue operating beyond the theoretical corrosion allowance. DNV GL can grant short-term approvals and set reduced operational criteria based on the analysis results.

Time is… a lot of money in Shanghai

Ronald van Rooten will examine the jack-up rig for seven days before giving his final approval. Chinese DNV GL surveyor Yin Bo does not have such a generous time frame when he goes on board the 9,000 TEU container vessel *MSC Azov* for her annual survey in Shanghai. This port handles more than 50,000 vessels annually and has one of the busiest and biggest container terminals worldwide. "Container vessels run on very tight schedules and only stay in port for short periods of time. Consequently, we are required to complete the surveys as quickly as possible – otherwise our customers could face huge losses," Yin Bo explains. In order to complete the surveys within the limited timeframe that is available, DNV GL often sends two surveyors to carry out periodical surveys on board containerships. DNV GL is by far the leading classification society in container vessels and has a market share of more than 50 per cent in the segment of large containerships above 12,000 TEU.

The *MSC Azov* is only one year old and during an annual survey such as this one Yin Bo checks the overall condition of the ship – focussing on safety and lifesaving equipment, fire prevention and detection devises and installations as well as propulsion and power generation systems, amongst other things.

As container vessels are sometimes loaded and unloaded quickly and roughly, he also looks for damage to the hatch covers – undetected faults can be catastrophic at sea. But according to Yin Bo, container vessels are usually maintained in a systematic way, as owners want to minimize the risk of breakdowns, which may lead to delays and would disrupt the schedules. "DNV GL-approved lashing computers and route specific container stowage (see pages 18-19) solutions are very popular with our customers," he explains. Not only do they enhance safety, but they also boost vessel utilization by better accounting for a ship's individual characteristics and trade patterns, including weather conditions en route.

Yin Bo, Arjen van der Meer and Ronald van Rooten see the consequences of today's challenging market conditions for customers every time they set foot on a ship. "In times like these, with so many challenges and changes affecting requirements, we need to be very proactive, assist clients in finding manageable, cost-effective solutions to maintaining the quality of their fleet, and explain what new regulations mean for their daily business," says van der Meer. He and his colleagues in Rotterdam and all over the world do much more than inspect, test and approve – they are translators, emergency responders, relationship managers and the backbone of their classification society. **AJO/CZ**

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Time is of the essence for surveyors in the busy port of Shanghai.

Happy faces at the end of a successful survey.

Photos: DNV GL, Paragon Offshore

AIMING HIGH

The Route Specific Container Stowage (RSCS) class notation is a success story. It boosts vessel utilization rates with flexible container stowage options.

Gigantic but flexible: *CSCL Globe* is one of the world's largest containerships. Not only that: the vessel and her future sister ships boast the optional RSCS class notation, which was developed by DNV GL and introduced into the market in May 2013. It further increases the efficiency of container transport by allowing more flexibility in stowing containers on board on specific routes without compromising safety.

"Another new class notation, LC (Lashing Computer), is available for unrestricted worldwide use, and mandatory for all newly contracted containerships," says Daniel Abt, Senior Engineer and expert advisor for the LC and RSCS notations at DNV GL.

To calculate safe deck loads, maximum weights, lashing requirements and other stowage param-

Photo: Hasenpusch

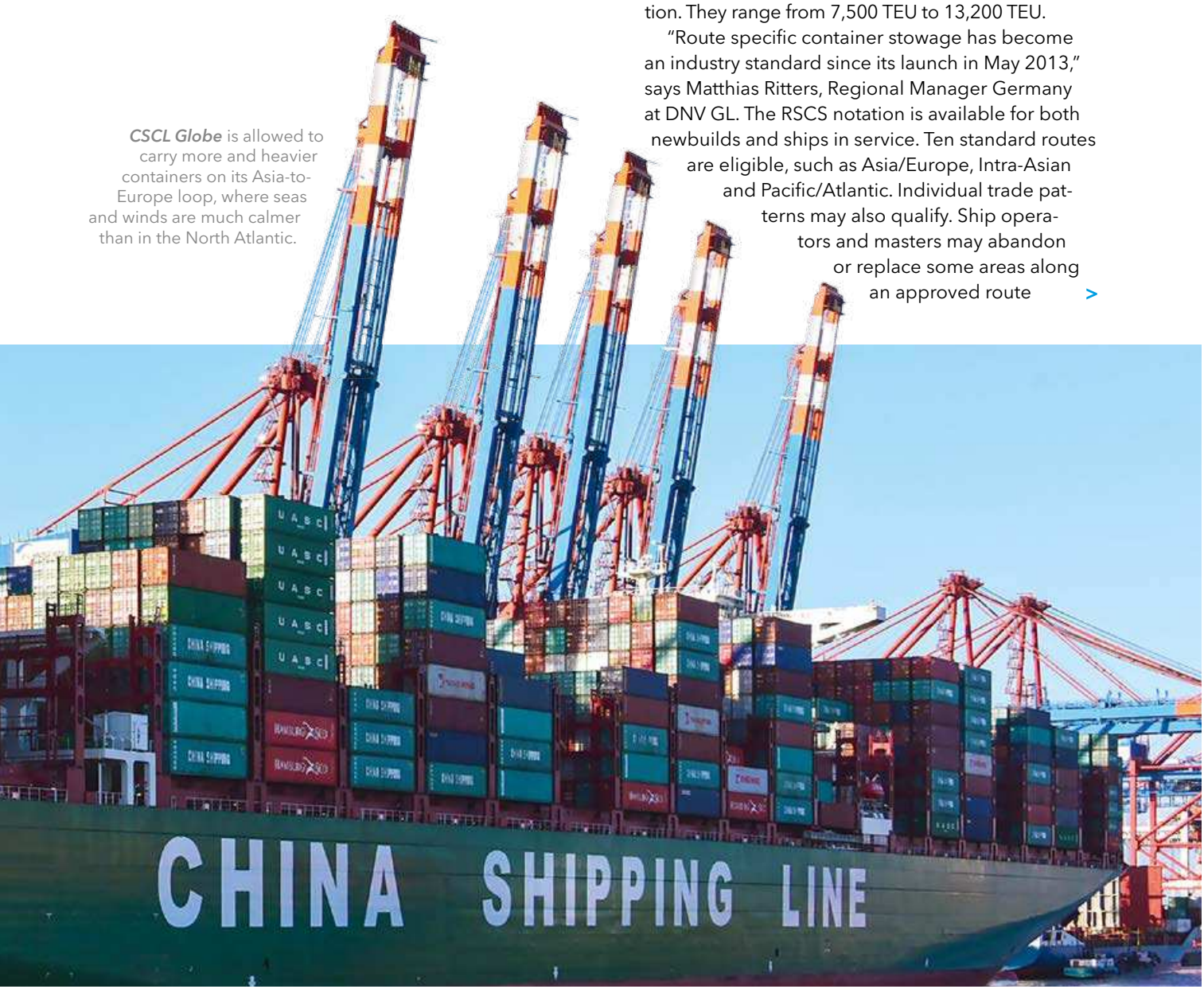
eters, classification societies have traditionally relied on wave load factors developed for the stormy and hurricane-prone North Atlantic, Abt continues. As a result, the stowage potential of cargo vessels cannot be fully utilized in less stormy sea areas.

A solution for calmer seas

Based on studies of wave conditions in various ocean regions, DNV GL developed RSCS to account for calmer conditions on specific routes. Now shipping lines can place heavier boxes on the upper tiers of deck stacks, more containers on the outside stacks, and in certain cases add an extra tier of empty containers on those routes. This brings more flexibility to vessels like *CSCL Globe*, which operates on the Asia-to-Europe trade loop.

DNV GL has already completed RSCS approvals for more than 400 vessels owned by companies such as CSCL, E.R. Schiffahrt, Reederei Claus-Peter Offen and MSC, and about 200 more ships will follow. Georg Eljardt, Head of Rickmers Maritime Technology, one of the first adopters of the new notation, says: "We are proud to be among the world's first shipping companies to offer this competitive advantage, which translates to greater flexibility and efficiency for our clients." Hapag-Lloyd, the world's number four container shipping line, recently signed a contract with DNV GL for classifying 28 vessels with the special RSCS notation. They range from 7,500 TEU to 13,200 TEU.

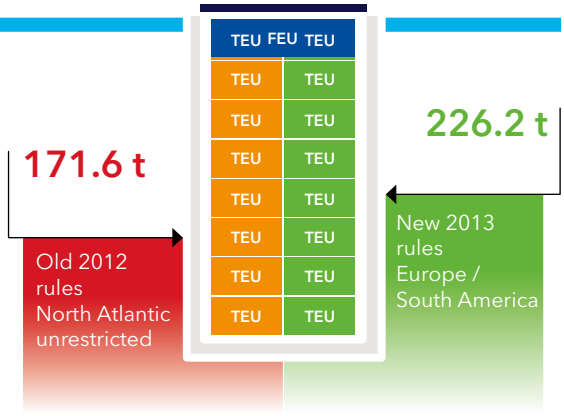
"Route specific container stowage has become an industry standard since its launch in May 2013," says Matthias Ritters, Regional Manager Germany at DNV GL. The RSCS notation is available for both newbuilds and ships in service. Ten standard routes are eligible, such as Asia/Europe, Intra-Asian and Pacific/Atlantic. Individual trade patterns may also qualify. Ship operators and masters may abandon or replace some areas along an approved route >



CSCL Globe is allowed to carry more and heavier containers on its Asia-to-Europe loop, where seas and winds are much calmer than in the North Atlantic.

THREE EASY STEPS TO RSCS

- Review three quotations in line with specifications: from the supplier of container lashing equipment, for approved container securing arrangement (CSA) plans; from the software vendor, for a certified lashing computer (both of these items are required for RSCS); and from the responsible DNV GL account manager for RSCS class notation.
- Follow up with the on-board preparations and installation of the CSA and lashing computer.
- Receive the RSCS class notation for the vessel(s).



Increased stack loads in cargo holds for the Europe-to-South America trade with the RSCS class notation.

> as long as they spend less than ten per cent of the entire duration of the voyage in a new area. Deviations in excess of ten per cent are permissible provided that the significant wave height in the new area is ten per cent lower than on the original route.

Applause from all sides

Ship operators opting for this class notation will quickly realize the benefits of being able to stow heavier containers in higher positions on deck. This is because the centre of gravity of shielded stacks can be raised by up to 21 per cent. For example, a 13,100 TEU vessel in the Europe/Asia service may place up to 750 additional containers weighing in at 14 tons each on the fourth deck tier, compared to the five-tonne limit permitted by applying previous rules. Moreover, with the RSCS notation ships can achieve a significant increase of the weight per 20-foot stack in hold from 180 to 225 tonnes. Furthermore, the nominal capacity can be increased by up to 500 containers by including the outer rows and adding a tier where the line of sight is not affected.

THE BENEFITS – AN OVERVIEW

- Greater flexibility to stow heavier containers in higher positions
- Significant increase of 20-foot container stack weight in hold
- Larger nominal capacity at the outer stacks and in an additional tier on top
- More efficient planning, e.g. better consideration of short-notice requests
- More efficient loading, e.g. fewer movements of the gantry crane, improved load/stowage planning assurance via verified lashing software
- Boost in profits by carrying more laden containers per voyage
- Easy and convenient implementation procedure for both ships in operation and newbuilds

"LC and RSCS have slightly lowered the safety margin related to the load assumptions," says Abt. "But this has been compensated by requiring an approved lashing computer system." He is sure this will raise awareness of the limitations of lashing systems, which he sees as a clear advancement.

Industry experts are highly pleased with the new class notation as well. DNV GL was among the winners of the 2014 Lloyd's List Asia Awards: "DNV GL walked off with both the Innovation and Classification Society Awards. The field for innovation is highly competitive in these awards, but DNV GL' s entry, detailing its Route Specific Container Stowage notation, a system that is already helping boxship operators boost efficiency by giving them enhanced flexibility in loading and stowage, impressed the judges."

Presumably, the greater portion of the world's container fleet will eventually obtain this notation. At the moment it is especially popular for larger ships. "The benefits for vessels above 3,500 TEU are much greater," says Ansgar Gorrissen, DNV GL's Outfitting Team Leader. In the case of feeder vessels, for example, smaller deckhouses set certain limits. On the other hand, there have been no negative reports to date whatsoever, and the range of eligible routes is growing steadily. "Every shipowner can tell us its ports of call," says Gorrissen. "We will work with the stowage plan experts to assemble the specific route." The most efficient one, naturally. **HSG**

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MARITIME

PUT THE FUTURE OF YOUR FLEET IN SAFE HANDS

As your classification partner, our extensive maritime expertise, technical knowledge and regulatory foresight will help to ensure that your fleet meets the demands of the future. Our aim is safety, compliance and optimal operational performance throughout the lifetime of your vessels, benefitting your business and the maritime industry as a whole. With DNV GL your fleet is in safe hands. Can you afford anything else?

Learn more at dnvgl.com/maritime

HOW TO OPTIMIZE YOUR OPEX

Charter rates continue to disappoint in many segments. Ship managers are encouraged to scrutinize their operating expenses (OPEX) without compromising operational and asset performance.

Pressures on ship managers are increasing. Charter rates dropped sharply when the crisis began and have been at low levels for quite some time. Many new charter contracts closed during the past two to three years barely cover the operating expenses. Maintenance of a significant number of vessels has been reduced or delayed, but this is hardly a sustainable strategy to weather a longer crisis. More serious efforts must be taken. The challenge lies in the need to keep up a vessel's operating (and safety) performance and condition while driving down the costs.

Performance expectations need to be clarified

It is an economic commonplace that maximizing performance and minimizing costs are irreconcilable opposites. Hence, expectations need to be clarified between the owner and the manager of a vessel. Performance or service levels need to be defined and costs minimized within these boundaries. Interestingly, ship management contracts typically fail to do that. The Baltic and International Maritime Council's (BIMCO) industry standard SHIPMAN 2009 covers administrative and legal issues in the main body and crewing as well as budgeting in its annexes, but the subject of vessel performance is never touched. That amounts to a clear disadvantage for ship managers who want to play the quality card.

As a general rule, performance levels should be made part of ship management contracts. Operational performance is of paramount importance for the charterer and impacts the vessel's position on the charter market. Asset-related performance is important for the owner and the financing bank, which typically uses the vessel as collateral.

Photo: Lukasz Zakrzewski – iStockphoto.com

KEY INITIATIVES TO TACKLE OPEX

Procurement
From transactional to strategic approach
- Streamline transactional jobs
- Advance tactical procurement
- Become strategic

5–15% POTENTIAL SAVINGS*

Maintenance
Less can be more
- Question PMS jobs
- Operationalize maintenance strategy
- Apply risk-based approach
- Establish KPIs on implementation and effect

5–15% POTENTIAL SAVINGS*

Docking
Proper planning prevents surprises
- Set up dedicated team
- Prepare properly, considering learning from sisters
- Combine with retrofitting
- Expect the unexpected

15–20% POTENTIAL SAVINGS*

Crewing
Good people pay off
- Define crewing strategy and manning levels
- Advance in sourcing of officers and ratings
- Stay ahead in contracts and incentives
- Develop staff

±0% POTENTIAL SAVINGS*

Administration
Right set-up and lean processes
- Challenge business processes and historically grown workarounds
- Develop integrated IT strategy
- Adapt organization to lean processes

10–20% POTENTIAL SAVINGS*

*Project experience as per cent of addressable spend; saving potentials are partially overlapping

Operational KPIs relate to off-hire, port state control, incident/accident statistics and occasionally, additional, more peripheral industry standards such as Oil Companies International Marine Forum's (OCIMF) Tanker Management Self Assessment (TMSA) level (and vetting performance) or selected InterManager key performance indicators (KPIs). Asset-related KPIs likewise account for port state control performance, TMSA and occasionally, conditions of class imposed during regular inspections and specialized condition surveys. Pre-defined performance levels can be included in ship management contracts in a variety of ways. Performance-related fees can establish the desired level of commitment.

All cost positions should be challenged

Even ship managers who want to play the quality card need to address every single cost position to minimize costs within the defined performance level. For a ship manager, OPEX monitoring and benchmarking are the first steps towards achieving cost savings. Internal benchmarking (over time, across sister vessels, across comparable vessel >

> classes etc.) requires consistent cost categorization and solid analytics. Some shipping companies have the necessary IT infrastructure to support analytics. Those who do not suffer the consequences of insufficient itemization, poor data quality and system breaks. External benchmarking is even more challenging. Comparisons need to be made like for like (same performance level, similar vessel age, etc.) using the same basic categorization. Shipping companies often struggle even with reports from commonly used providers. Some new benchmarking initiatives with participating companies voluntarily opening their books to an independent third party are beginning to fill this gap.

Following internal and external benchmarking of all cost items, a number of initiatives can be taken to enable OPEX reductions.

Procurement – from transactional to strategic

In many shipping companies procurement is still largely transaction-based: employees handle material requisitions, logistics, contracts management and purchase-to-pay processes. The tactical level of procurement alone, including category management for main spend items, tendering, negotiations, performance management, etc., receives too little attention. Few shipping companies make effective use of buying consortia and e-procurement platforms. Specifications often remain unquestioned. Strategic procurement systems adapted to the given fleet size, with defined roles and responsibilities backed by appropriate staff training, are the exception rather than the rule. Fleet management units of larger operators as well as a few ship management companies have been the first to take this step from transactional purchasing to strategic procurement. Savings of 5 to 15 per cent are realistic, depending on the spend categories addressed.

Photo: Lukasz Zakrzewski – iStockphoto.com

SHIP MANAGEMENT CONTRACTS LINK TO PERFORMANCE-BASED FEES

Linking performance to ship management contracts

- Many "owning managers" have a reputation for high-quality technical management, not for OPEX excellence
- Standard ship management contracts don't specify performance expectations, just crewing and budget
- Opportunity for quality suppliers to leverage competence with performance-based fees

Operational performance

- Paramount importance for charterer
- Impacts vessel's and owner's position on charter market

KPIs related to

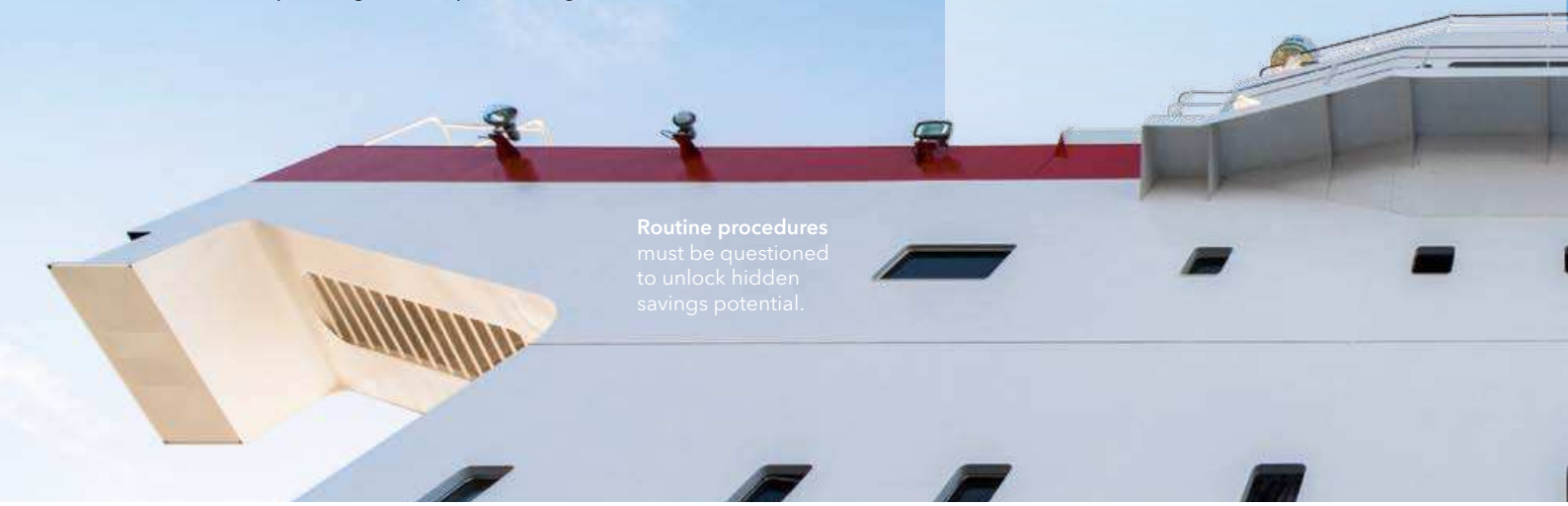
- Availability/off-hire
- Port state control performance
- Incident/accident statistics
- Industry standards as
  - TMSA level
  - Vetting performance
  - Selected InterManager KPIs

Asset-related performance

- Important for owner (vessel value)
- Important for financing bank (collateral)

KPIs related to

- Port state control performance
- Conditions of class at regular surveys
- Dedicated condition surveys
- Industry standards as
  - TMSA level
  - Vetting performance
  - Selected InterManager KPIs



Routine procedures must be questioned to unlock hidden savings potential.

Maintenance – less can be more

Maintenance costs are on a steady rise. With the adoption of ISM, TMSA, OVID/SIRE, etc., the number of maintenance jobs continues to increase. Once established, these jobs are typically not questioned even though they may differ from those of sister vessels. This not only wastes money directly but could also cause consequential damage. Experience shows that a certain amount of repair work is caused by well-intended but poorly executed maintenance.

Proper maintenance starts with a maintenance strategy with cascading processes and procedures, firm organizational footing and appropriately skilled staff. A risk-based maintenance approach accounting for risk categories, criticality levels and potential consequences should be adopted wherever permissible to define a maintenance plan with associated spare parts management. The implementation and effectiveness of this system should be tracked using meaningful KPIs. 5 to 15 per cent of sustainable savings on maintenance and related repair costs are achievable.

Docking – proper planning prevents surprises

Docking is closely linked to maintenance. Time and cost overruns of 20 to 30 per cent and more seem to be the norm for many shipping companies while others manage to stay within their time and budget limits. The reason: they have dedicated docking teams instead of regular superintendents accompany their vessels. They plan and prepare jobs ahead of time and follow up during docking. They learn from sister vessels. They issue docking requests for proposals (RFPs) for a series of sister ships. These are just a few good practices helping prevent surprises and cost overruns. But it is also necessary to prepare for the unexpected. Ad hoc decisions at the yard's call for additional work can be costly if no proper process is in place. Finally, planned dry-docking is a perfect time to do energy efficiency retrofits.

Crewing – hiring good people pays off

While crew costs account for 30 to 40 per cent of total OPEX, crews must not be seen as a mere cost factor. The crew largely determines vessel performance, affects OPEX items worth about twice their wages, and bunker costs worth ten times their wages. Crewing strategy and manning levels, sourcing of officers as well as ratings, contracts, incentives for retention, training and promotion standards all should be above market average to build crews willing to go the extra mile. Some OPEX savings may be achieved in administrative processes, job and travel planning.

Administration – the right set-up and lean processes

Shipping companies vary significantly in the set-up and complexity of their business and support processes. Processes have often grown over time, with workarounds for system breaks, silos and lacking interfaces. An integrated, company-wide, forward-looking IT strategy and integrated fleet teams support lean, cost-efficient processes.

In general, ship managers should strive to enhance operational excellence and defend their own as well as their vessel's competitiveness. While adhering to defined operational and asset-related performance levels, they should flip every stone looking for savings potential across their core processes. **JHH**

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FINANCING RETROFITS

To improve the energy efficiency of their fleet an increasing number of shipowners are investing in hull optimization and retrofitting. Dr Carsten Wiebers, Global Head of Maritime Industries at KfW IPEX-Bank, explains the available financial tools.

How relevant is energy efficiency for you as a maritime financier?

Carsten Wiebers: We are observing a two-tier shipping market development: ECO-vessels with lower fuel consumption are more competitive than vessels which are not state of the art in terms of energy efficiency and regulatory compliance. ECO-vessels have enhanced marketability, higher revenue potential and thus a more favourable risk profile for financiers as well as for shipowners. This trend is largely driven by intensified competition due to the persistently low charter rates and tightening environmental regulations.

How do you as a financier assess the energy efficiency of vessels?

Wiebers: We took the above-mentioned trend into account as early as 2011, asking DNV GL to develop a "CO_2 evaluation tool" for the purpose of analyzing the energy efficiency of our maritime loan portfolio, which comprises over 800 vessels, and to benchmark individual ships against the portfolio average as well as world fleet averages. Based on over 50 characteristic traffic patterns, the CO_2 tool not only allows us to

DR CARSTEN WIEBERS

- Global Head of Maritime Industries at KfW IPEX-Bank in Frankfurt. He joined KfW in 1992 and the shipping department in 1998. He completed his doctoral thesis in Agricultural Economics at the University of California at Berkeley and holds a Master's degree from the Technical University of Berlin.

benchmark vessels but also calculates actual energy and bunker cost savings compared to the portfolio and/or world fleet average. Assessing ship design and energy efficiency based on the results of the CO_2 tool is today an integral element of financial project due diligence, which is why we favour shipowners who order energy-efficient vessels.

In early 2014, we asked DNV GL for an extension to the CO_2 evaluation tool, which now also compares costs and savings of specific retrofitting measures such as bow, propeller and trim optimization for a specific vessel. This helps us and our customers work jointly on the improvement of fleets and allows us to proactively initiate discussions with shipowners regarding retrofitting.

Do you see a growing demand among shipowners for retrofits increasing energy efficiency and reducing fuel consumption?

Wiebers: We have been seeing a growing interest and are in the advanced negotiation stages with a number of major shipowners about financing for retrofitting measures, especially propellers, bow optimization, scrubber installation and LNG-fuelled propulsion systems. Many shipowners had delayed their investment decisions until the end of last year because of rumours that the tightening of emission regulations would be postponed.

Since 1 January 2015, vessels operating in Emission Control Areas (North Sea, Baltic Sea, North American coastline and US Caribbean) are now required to burn bunker with a maximum sulphur content of 0.1 per cent. Operators who fail to comply could face penalties and detention by neighbouring states. The regulation is now in effect, and shipowners can choose between burning low-sulphur fuel oil – at a significantly higher cost compared to heavy fuel – and installing emission reduction technologies such as scrubbers, or making the switch to burning LNG. The price spread between low-sulphur fuel, LNG and heavy fuel is actually regarded by some shipowners as an opportunity to build competitive advantage through retrofitting, rather than a threat.

Generally speaking, how difficult is it to receive loans for this purpose in the seventh year of the shipping crisis? What are your prerequisites for financing?

Wiebers: All in all, the conditions for shipowners and financiers have improved in recent years. The world economy is recovering slowly. Many banks have cleaned up their balance sheets and are lending again. Today, well-positioned shipowners have sufficient access to financing. However, banks today differentiate more between risk categories than before 2009 while applying tougher loan requirements such as higher equity contributions by owners, corporate guarantees/structures etc.

Apart from classic vessel financing, we are observing a trend towards alternative financing sources such as equipment-based financing for retrofits and newbuildings. This approach allows shipowners to access financing from countries where they source major equipment. KfW IPEX-Bank can provide long-term ship financing of up to 80 per cent of the purchase price for a tenor of up to twelve years. The minimum financing volume should be around 30 million US dollars, which can be easily reached >

Photo: KfW IPEX-Bank/Alexander Kempf/Thomas Klewar

KFW IPEX-BANK

The Maritime Industries department of KfW IPEX-Bank provides financings for all maritime assets in cruise, offshore and shipping sectors. With its loan portfolio of 18.3 billion US dollars KfW IPEX-Bank is one of the leading financing institutions in the maritime sector worldwide.

> when ordering a specialized vessel or if shipowners consider retrofitting an entire fleet. Our financing contribution is not limited to German equipment, but it is based on European content. However, German maritime suppliers in particular are in a leading position internationally, in an industry which is strongly driven by innovation. Some leading suppliers have teamed up in the German Maritime Export Initiative (GeMaX) to provide shipowners with a more focused means of sourcing maritime equipment, which we support by financing their vessels.

What are typical retrofitting measures you have financed?
Wiebers: Our responsibilities mainly comprise financing of scrubbers and propeller replacements. Some initial commitments have been made in this segment. As a consequence of the new, stricter emission limits in ECAs, we did not see an increased demand for financing until a few months ago. We are in the advanced negotiation stages with a number of major shipowners about financing fleet-wide retrofits (in particular propellers, bows and trim optimization) as well as LNG-fuelled vessels. For the latter in particular, we expect a growing demand from liner companies whose vessels operate on predetermined routes where LNG bunkering facilities can be secured. We expect to team up with an engineering office offering LNG propulsion packages to cargo shipowners which could be financed by KfW IPEX-Bank.

Will we see more liner shipping companies getting involved in joint retrofitting projects with tramp owners in the future?
Wiebers: The longer a charter tenor, the more willing the charterer will be to participate in ship upgrading costs. Since tenors are usually longer for larger vessels, charterers are likely to reward higher energy efficiency and lower bunker costs. As for trading routes within ECAs (especially in the North and Baltic Seas), we expect emission-compliant vessels to be rewarded since bunker cost savings are significant. The current low bunker prices may delay some of these measures, but in the long run efficiency is relevant at lower fuel costs, as well, and competition will drive the market in this direction.

In which shipping segments and markets are you doing most of your business at the moment?
Wiebers: We are an active lender to all major maritime markets and segments. In 2014, we provided 3 billion euros in loan commitments to customers in Germany, Europe, the Americas, Asia/Pacific and West Africa. We finance specialized and standard vessels being built both inside Europe and outside.

> "We expect emission-compliant vessels to be rewarded since bunker cost savings are significant."
>
> **Dr Carsten Wiebers**,
> Global Head of Maritime Industries, KfW IPEX-Bank

KfW IPEX-Bank is providing Danish shipping company DFDS with 50 million euros in financing for the installation of scrubbers on 20 ferries.

While the situation in cargo shipping remains tense due to low freight rates, we did provide financing to well-established liner operators and shipowners for retrofits and newbuilds in 2014. In view of the large order book, we do not expect a rapid recovery of freight rates so we are quite selective in our financing of cargo vessels. But since the competitive environment also drives technology, as outlined above, there is an opportunity for shipowners to strengthen their market position by increasing fuel efficiency and lowering their transport costs.

In specialized shipping, primarily cruise ships and LNG vessels, the markets are quite healthy. Despite the dramatic drop of the oil price, our long-term outlook for the offshore oil and gas industry, to which we provided significant loans last year (e.g. pipe laying vessels, FPSOs, etc.), is also positive. ■ **NIS**

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Photos: DFDS Seaways, DNV GL, Reederei NSB

RETROFITTING: WHERE THE SAVINGS ARE

Despite the current low oil prices, retrofitting existing vessels remains a valuable option. Measures such as a bulbous bow, rudder and propeller redesign or raising deckhouses have shown to produce solid savings.

The eight retrofits shipowner E.R. Schiffahrt undertook recently, supported by class partner DNV GL, were a full success: the measures included new bulbous bows, energy efficient propellers, engine modifications and cargo boosting.

DNV GL evaluated the vessels' energy efficiency based on CFD calculation results, test reports and technical documentation to determine fuel and power savings for a given operational profile. This data was cross-checked with information gathered over a representative period before and after the retrofit.

DNV GL acknowledged the shipowner's initiative by presenting E.R. Schiffahrt with the newly created Modification Excellence Award. "E.R. Schiffahrt has made a sustained and firm commitment to increasing the efficiency of its operations. Our analysis shows these ships use 15 per cent less energy, resulting in annual savings of approximately 3.8 million US dollars," said Jörg Lampe, Senior Project Engineer at DNV GL. The classification society's advisory services have a long track record with E.R. Schiffahrt, having jointly planned and executed retrofits of more than 25 vessels over the past few years.

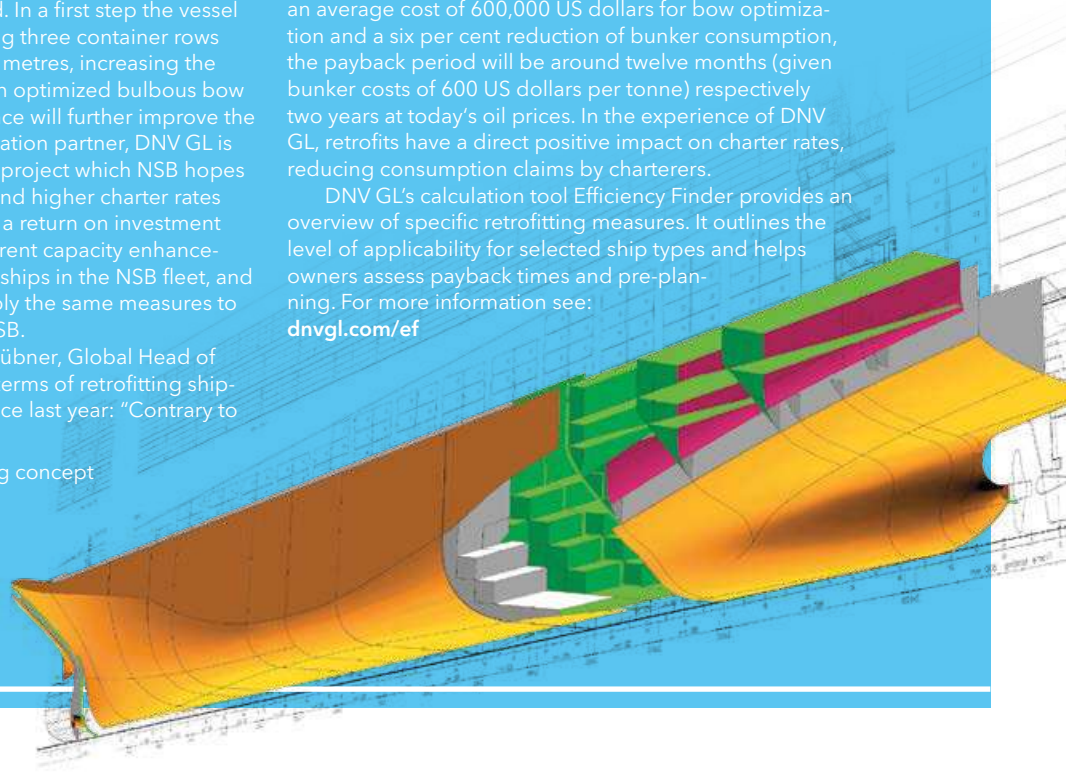
Reederei NSB has implemented similarly ambitious retrofitting measures within its fleet, including the spectacular widening of a container vessel. The 4,860 TEU ship is currently being upgraded to 6,200 TEU in a five-month conversion project at a Chinese shipyard. In a first step the vessel is cut in half lengthways. By adding three container rows the beam will grow from 32 to 39 metres, increasing the cargo capacity by 1,340 boxes. An optimized bulbous bow designed to reduce wave resistance will further improve the ship's efficiency. As NSB's classification partner, DNV GL is overseeing this unique high-tech project which NSB hopes will result in better employment and higher charter rates for the vessel. The owner expects a return on investment within three to four years. The current capacity enhancement contract includes two sister ships in the NSB fleet, and negotiations are underway to apply the same measures to several additional vessels, says NSB.

According to Dr Jan-Henrik Hübner, Global Head of Shipping Advisory at DNV GL, in terms of retrofitting shipowners have come a long way since last year: "Contrary to last year, nobody you ask about retrofitting today will seem taken aback. Many shipowners have decided in favour of retrofitting in the meantime. Assuming an average period of about nine months between the decision to retrofit and the implementation, there are quite a few retrofitting projects in progress at the moment."

Every ship type has optimization potential. The Efficiency Finder offers perspectives on boosting performance.

Bulbous bow retrofits are among the most common measures. DNV GL has supported bulbous bow optimizations on 150 containerships of the global fleet of 4,500 vessels so far, Jan-Henrik Hübner estimates, so there is still plenty of potential. The investment pays off: assuming an average cost of 600,000 US dollars for bow optimization and a six per cent reduction of bunker consumption, the payback period will be around twelve months (given bunker costs of 600 US dollars per tonne) respectively two years at today's oil prices. In the experience of DNV GL, retrofits have a direct positive impact on charter rates, reducing consumption claims by charterers.

DNV GL's calculation tool Efficiency Finder provides an overview of specific retrofitting measures. It outlines the level of applicability for selected ship types and helps owners assess payback times and pre-planning. For more information see: **dnvgl.com/ef**



The rendering shows the widening concept for panamax containerships.

- New and/or reconstructed sections
- Unchanged inner sections
- Unchanged outer sections

The first of an order for 23 10,000 TEU containerships, *Hanjin Buddha* is based on a DNV GL design concept.

EFFICIENCY SURPRISES

Amid the financial crisis, Seaspan had ordered an entire fleet of large, next-generation container vessels. The first one is in operation – and surprising its owners.

To most observers in the industry, it seemed to be rather a risky decision when in 2011 – at a time of very depressed rates in the container market – the independent containership manager and owner Seaspan placed an order for 23 10,000 TEU container vessels featuring a next-generation design that, if successfully executed, would result in dramatic cost savings. The project was to be a concerted effort combining research and development resources and manpower from several industry leaders, including Seaspan, Yangzijiang Shipyard, MARIC and former DNV.

It is always challenging to roll out a new design, but adding to the challenge was the sheer volume of the newbuilding project: To this day, the 23-ship Seaspan order has been the largest in Chinese history. An order of that magnitude required two separate teams working at two different shipyards.

In March 2014, Yangzijiang Shipyard launched the *Hanjin Buddha* – the first of Seaspan's 23-vessel order. The owner refers to this ship as a "SAVER" vessel – short for "Seaspan Action on Vessel Energy Reduction" – because, as the name suggests, it features significantly reduced fuel consumption.

"Reputations were at stake for all of us," says Seaspan chief operating officer (COO) Peter Curtis. "But my compliments to the yard – and to DNV GL for managing the many challenges of a project like this. We obviously had to have a broad and deep approach to risk management, and DNV GL was at the centre of this."

Increased efficiency – reduced emissions

The new 10,000 TEU SAVER container vessels offer major improvements in terms of energy efficiency, cargo capacity, operational efficiency, and emission reduction. Compared to current 10,000 TEU container vessels, the SAVER vessels carry more cargo while consuming less fuel. The new hull design enables these ships to minimize ballast water while in operation. Furthermore, the ships emit 20 per cent less pollutants to air per TEU. The SAVER design was inspired by the DNV Quantum concept developed in 2010.

Curtis says there has been much discussion about the realism of the cost-saving estimates. Seaspan pursued ambitious goals and applied strict validation methods as the project progressed. "We asked for increased loadability and decreased fuel consumption per deadweight ton," he explains. "The validation showed us results that were far in excess of what we had asked the designer and yard >

In March 2014, 100 industry VIPs attended *Hanjin Buddha's* grand naming ceremony in Shanghai. Gerry Wang, CEO of Seaspan, and Ren Yuanlin, Chairman of Yangzijiang, both praised DNV GL's vigorous support of the project.

Photos: Seaspan

"I remember when former DNV developed the Quantum concept. We were very keen on it. Of course, it had its funky and futuristic aspects, but it also had gold nuggets. The biggest gold nugget was this: design your ship around its actual operational profile. Not around maximum speed and deadweight."

Peter Curtis, COO Seaspan

The "Quantum" design developed by DNV GL puts energy and cost efficiency first.

> to achieve. The combined result – in terms of number of loaded TEU per metric tonnes of fuel over a certain time – amounted double digits, which was twice what we had asked for."

Curtis notes that the final results exceeded his expectations to the point that, initially, he was somewhat sceptical. "At first we couldn't believe it. We thought it was too optimistic," he says. "But through careful review with separate sources we concluded the results were correct."

Myth buster

As it turns out, Curtis' critical approach to validating all data, assumptions and ideas also busted some widely held beliefs in the industry. One of these myths was that ballast is inherently bad for fuel consumption. "We have tested and validated data on this now through draught trim optimization, and can now bust that myth," says Curtis. "For example, we optimized ballast for the speed and loaded draught for the first voyage, which in fact called for increased draught through adding ballast, and saved several tonnes of fuel per day. So, ballast is not always bad."

Curtis and his team also examined the disproportionate effect of small changes in speed. "We have looked at typical scenarios of 'dash-and-loiter' with relatively small differences between fast and slow," he says. "What you spend when you hurry is never offset by the gain when you slow down. This means several tonnes of fuel a day wasted or translated into some thousands of dollars a day, which is close to five to 15 per cent of the charter rate, to no gain. You just increase the cost to the customer – and that is not a competitive advantage. Now we are measuring time, speed, distances and fuel consumption of our entire fleet, so that we can see the big picture, and make the necessary adjustments together with our ship crews."

A tough act to follow

If the new SAVER vessels offer reduced costs, lower emissions, and greater fuel efficiency, the obvious question is: why isn't everyone copying the Seaspan model, as recently suggested by *Lloyd's List*?

The reason, Curtis says, is that there simply is not enough capital for everyone to have these big ships. "We believe this is where many liner majors will move

in time – but for now, the cost and access to capital does eat into the efficiency gains," he says. "So there will be ships of all types around. Our panamax vessels are still needed, despite all the doom and gloom about that size of vessel. They serve a certain purpose, too."

For now, though, Curtis says that Seaspan has decided to remain at the forefront of industry technology and innovation. In addition to his 23-vessel SAVER order, the company has also ordered 15 additional SAVER ships above 10,000 TEU. For Seaspan, this makes good economic sense – particularly when it comes to how the company finances newbuilds.

"We have never done speculative tonnage; it's always against a back-to-back, long-term time charter," says Curtis. "Those are the fundamentals of our model. Additionally, our charters have been blue chips who have performed consistently well, even during times of financial crisis."

Curtis says that, in general, Seaspan prefers to keep things simple. The company takes a conservative approach when it comes to innovation. "We transfer what we like and trust from prior designs onto new designs and change what we don't like – including equipment and methods of operation," he says. "If you look at our newbuilding programme, you will see we have a huge capital expenditure over what is basically only three series of ships. We'd rather spend some time getting the recipe right, and then build a series of ships." ▮ **JKL**

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ABOUT SEASPAN

Seaspan is a leading independent owner, operator and manager of containerships, providing high-quality, modern vessels with best-in-class operations and innovative ship design.

It employs more than 3,000 people at offices in Hong Kong, Canada, India, China and Korea, as well as on board their large fleet of vessels.

Photos: DNV GL, Seaspan

GIANTS OF

The expertise of DNV GL is in great demand, whatever the ship type – from container vessels to offshore processing ships and megayachts. A selection of the biggest of their class.

MSC Oscar (2015)

Type: Containership | **LOA:** 395.4 m | **Beam:** 59 m | **Tonnage:** 192,237 GT | **Class:** DNV GL

Dockwise Vanguard (2012)

Type: Heavy-load carrier | **LOA:** 275 m | **Beam:** 78.75 m | **Tonnage:** 191,784 GT | **Class:** DNV

Prelude (under construction)

Type: Offshore processing ship | **LOA:** 488 m | **Beam:** 74 m | **Tonnage:** ~300,000 GT

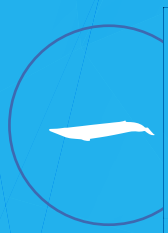
DNV GL highly involved in the project

Allure of the Seas (2010)

Type: Cruise ship | **LOA:** 360 m | **Beam:** 60.50 m | **Tonnage:** 225,282 GT | **Class:** DNV

THE SEA

Blue whales are the largest beings to ever exist on earth. But they are dwarfed by the biggest ships: the container vessel *MSC Oscar*, for example, is twelve times as long and with a lightweight of 59,100 tons about 300 times as heavy as the biggest blue whale. And even the comparatively small 180-metre megayacht *Azzam* is six times as long.



Blue whale

Length: up to 33 m
Weight: ~200 t

Ore Brasil (2011)

Type: Ore carrier | **LOA:** 362 m | **Beam:** 65 m | **Tonnage:** 198,980 GT | **Class:** DNV

Type: Yacht | **Tonnage:** 18,000 GT

LOA: 180 m | **Class:** GL

Beam: 20.80 m

Azzam (2013)

SUCCESS BUILT ON MEDITERRANEAN VALUES

MSC Oscar during her seatrials.

MSC OSCAR FACTS

- Length overall: 395.4 m
- Length between perpendiculars: 379.4 m
- Width: 59 m
- Draught: 16 m
- Depth (moulded): 30.3 m
- Container capacity: 19,224 TEU (initially specified at 18,000 TEU)
- Service speed: 22.8 kn
- Main engine: MAN B&W 11S90ME-C10.2
- Classification: DNV GL
- Class notation: +100 A5 IW BWM(D2) DG LC RSD(gFE) NAV CONTAINERSHIP + MC AUT CM-PS EP-D

The launch of *MSC Oscar*, the world's biggest containership to date, has brought the success story of MSC Mediterranean Shipping Company to the fore. *MARITIME IMPACT* looks at a unique company history and the values transported to the next generation of a global maritime business.

The humble beginnings of MSC founder Gianluigi Aponte as a selfmade man are legendary. In 1970 the former captain borrowed several thousand dollars to buy his first cargo ship, a 1,750 GT second-hand vessel, and established a shipping line between the Mediterranean and East Africa. Over the years MSC added further vessels, and by the late seventies, the line was serving northern Europe, Africa and the Indian Ocean. MSC continued to grow and eventually became the renowned maritime empire it is today. Its strategy was using ships which could be operated at moderate costs.

In January 2015 MSC reached a historic milestone when it launched the DNV GL-classed, 19,224 TEU containership *MSC Oscar*, the new record holder in box capacity. MSC has 18 more 19,000 TEU vessels on order, which could make the Swiss operator the largest container shipping line in the world.

Diego Aponte, President and CEO of MSC Mediterranean Shipping Company, welcomes *MSC Oscar* at the naming ceremony.

Traditions and innovation

"For over 40 years the MSC family has been growing – and so has our fleet," says Diego Aponte, the founder's son. He joined MSC in 1997 and has been heading the Geneva-based company as President and CEO since October 2014. Today the Mediterranean Shipping Company employs 24,000 people around the world and operates more than 470 vessels sailing 200 different routes and calling at 315 ports. "I am immensely proud of our global team for their dedication, passion and commitment shown towards our customers whose unwavering loyalty has played a key role in our progress over the last four decades," says founder Gianluigi Aponte. "MSC is and always will be for the real world."

His son Diego Aponte looks back: "During the early years, MSC's cargo operations captured our family's values and respect for the sea. The culture of hospitality, drawn from the family's Mediterranean origins, encouraged the company to venture into new business areas and inspired the founding of the cruise business in 1989 as a second pillar." He adds that MSC honours tradition yet maintains a strong focus on the future. "We have been leaders in cultivating an innovative approach to cargo shipping, cooperating with our industry partners. We have always worked hard. We continue to work hard, and are committed to working smarter to better serve our customers," says Diego Aponte, describing the company's philosophy.

New-generation vessels

MSC continues to invest in its state-of-the-art fleet. Named after Diego Aponte's son Oscar, who might succeed his father as third-generation CEO one day, the 395.4-metre *MSC Oscar* is only marginally shorter than the previous holder of the capacity record, *CSCL Globe* (19,100 TEU) – but *MSC Oscar* can take in as many as 19,224 TEU. Thanks to the Route Specific Container Stowage (RSCS) class notation developed by DNV GL, the ship can utilize its cargo capacity most efficiently depending on the route, without compromising on safety (see p. 18). >

Photos: MSC

A stack of brand-new MSC containers waiting to be taken aboard.

Handling oversized or "out-of-gauge" cargo on board an MSC-owned containership.

> She was delivered to her owners on 8 January 2015 – earlier than scheduled – by the Korean shipyard Daewoo Shipbuilding and Marine Engineering (DSME). "The design phase took six and a half months, and it took another eleven and a half months, or 45,000 man-days, to build this vessel," says Giuseppe Gargiulo, project manager for newbuildings at MSC. The vessel, which cost around 140 million US dollars, is one in a series of three ships ordered in 2013. All are to be operated by MSC based on a long-term charter agreement.

But this gigantic newbuilding project is not just about sheer size. Many forward-looking features have been integrated into *MSC Oscar*. For example, the engine has been optimized to enable automated fuel consumption control based on speed and weather conditions. The propulsion system has a broad optimal speed range for added operational flexibility. "Yes, it is a classic diesel engine, but it is electronically controlled, and as a super-long stroke engine, it features very low specific fuel oil consumption. In addition we have an 'exhaust gas bypass' to maximize vessel performance at lower engine loads," says technical expert Gargiulo. What is more, the ship is equipped with the latest autopilot system, which enhances safety and reliability while supporting energy-efficient navigation. The adaptive control technology automatically optimizes steering, avoiding unnecessary rudder movements. "We have a full-spade rudder equipped by a rudder bulb to improve propulsion efficiency," Gargiulo explains.

Partners of long standing

"We are very pleased to mark this historic event with MSC and are proud to have been part of MSC's evolution into a world leader in container shipping," says Jan-Olaf Probst, Director Business Development at DNV GL. Diego Aponte adds: "Our partnership with DNV GL continues to be an important part of our journey. It dates back more than 15 years, and almost all vessels built by MSC are DNV GL-classed." The cooperation began with the *MSC Diego* in 1999, the largest newbuilding for MSC at that time. It was a milestone in company history, which is why the vessel was christened in honour of Gianluigi Aponte's son. Built by Hanjin Heavy Industries in South Korea, the 259.6-metre, 4,056 TEU vessel is still in service.

In 2005, another joint newbuilding project with DNV GL, the 9,000 TEU *MSC Pamela*, set a new world record for the number of containers carried on

"Our partnership with DNV GL continues to be an important part of our journey. It dates back more than 15 years, and almost all vessels built for MSC are DNV GL-classed."

Diego Aponte, President and CEO,
MSC Mediterranean Shipping Company

board. *MSC Pamela* also marked the company's entry into the large-boxship market.

Opting for DNV GL was thus a very conscious decision: "At MSC we strive to be the best in class and we only work with the best industry partners," says Diego Aponte. And the success story continues: "In April of this year, *MSC Oscar* will be joined by her sister ship *MSC Oliver*, built to the same demanding class regulations. This will be yet another milestone in our relationship with DNV GL," he emphasizes.

New alliance

"Commissioning the world's largest-capacity containership is the next step in modernizing our fleet to meet the demands of today's shipping customers," Diego Aponte points out. To further strengthen the world's second-largest container shipping line, MSC has formed the 2M Alliance with number one player Maersk Line. This partnership was launched earlier this year when the network picked up its first containers at the port of Dalian in north-eastern China. On 25 January, *MSC Oscar* joined the Albatross stream from Dalian as part of 2M's vessel sharing agreement.

Diego Aponte is confident that the cooperation will pay off and raise the bar in terms of reliability and customer service. "The two leading shipping lines offer complementary services on East-West routes," says the MSC President and CEO optimistically: "In the course of 2015 we will begin to see the benefits of industry-wide consolidation into four consortia, which will bring more stability to the market." The MSC story continues, and the prospects are excellent. ▮ **SG/NIS**

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In 1999, the 4,056 TEU *MSC Diego* was the company's largest-ever newbuilding.

The 9,000 TEU *MSC Pamela*, delivered in 2005, marked MSC's entry into the large-boxship market.

Photo: Royal Caribbean Cruises

In November 2014 *Quantum of the Seas* departed for her maiden voyage. Her home port is New York City.

QUANTUM LEAP

With *Quantum of the Seas*, Royal Caribbean Cruises wanted to create a cruise ship unlike anything the world had seen before. To truly set new standards for excellence in the cruise industry, the company turned to some good old friends.

Meyer Werft is capable of building two cruise ships simultaneously.

The Azipod propulsion system cuts fuel consumption and emissions to air.

The 16 lifeboats are attached to the railings of Deck 5.

At 168,666 GT, 348 metres long and 41 metres abeam, Royal Caribbean's latest cruise ship, *Quantum of the Seas*, is a true giant, with a total capacity of 4,905 passengers and space for an additional 1,500 crew members. But *Quantum's* size is only part of what makes her a game changer in the cruise industry. Take for example the North Star, a jewel-shaped capsule mounted to a crane near the ship's bow, designed to take up to 13 passengers up more than 300 feet above sea level.

The wow factor

Still not impressed? *Quantum* also has a FlowRider, which allows passengers to surf on board, a skydiving simulator, robotic bartenders, a climbing wall, dedicated, satellite-enabled high-speed Internet service, the Music Hall with seats for 559 guests and SeaPlex, a large, flexible space that can be used as a roller rink, basketball court, circus school, bumper car arena or dance hall. Another space, known as Two70°, features a three-storey-high room affording 270-degree panoramic ocean views, a café and an ice bar. Automatic window shades adjust to sunlight, and a 13-projector system can project live views from outside the ship (or any other imagery) onto screens. At night, the space evolves into a highly dynamic entertainment venue that features six robotically controlled 100-inch LCD television screens, providing digital backdrops to complement live performances. The technology and engineering behind many of these features represents "firsts" for the cruise industry. But according to Mika Heiskanen, Royal Caribbean's Director (Quantum Class), every aspect of the design and construction of *Quantum* revolves around the passenger. "We are proud of the many innovations found on *Quantum*, but our primary goal is to create a safe, memorable and truly unique passenger experience," he says. "Sometimes, we have to push boundaries of what is possible at sea to get what we want, but if the response to this vessel is any indication, it has been worth it."

Heiskanen notes that while many features of the Quantum Class vessels may seem revolutionary, elements of the ship's design and construction can be traced back to earlier Royal Caribbean ship classes. "For example, Royal Caribbean's first cruise ship *Song of Norway*, built in 1970, featured a circular, glass-enclosed lounge called the Viking Crown, a concept that has been gradually transformed and upgraded over the years," he explains. "Echoes of this concept can be found on all Royal Caribbean vessels, including *Quantum's* Two70° space. Our design process is more evolution than revolution."

Cruising the green way

While many of *Quantum's* features are passenger-driven, Royal Caribbean also focused on reducing the vessel's environmental impact. Indeed, *Quantum* offers a number of energy-efficient solutions including optimized hydrodynamics, a heat recovery system, energy-saving LED lighting, an air lubrication system reducing hull friction in water, and a state-of-the-art exhaust gas treatment plant (a hybrid scrubber). "By investing in these new technologies, we predict we will not only reduce carbon emissions but also achieve significant energy savings

> "DNV GL has proven to be a good partner through all phases of the build, especially for this project which included so many innovations."
>
> **Peter Hackmann**,
> Head of Communications, Meyer Werft

The world's most advanced cruise ship was built by Meyer Werft in Papenburg, Germany. *Quantum of the Seas* took less than two years to complete. In October, 2014, the stately lady was delivered to Royal Caribbean Cruises.

QUANTUM OF THE SEAS

- Registry: Nassau, Bahamas
- Built at Meyer Werft, Papenburg, Germany
- *Quantum of the Seas'* maiden voyage: 2 November 2014
- Her sister ship *Anthem of the Seas* will be delivered in spring 2015
- *Quantum of the Seas'* godmother: Kristin Chenoweth
- 168,666 GT
- 1,141 feet (348 metres) long
- 136 feet (41 metres) wide
- 28 feet (8.5 metres) draught
- 22 knots cruising speed
- 16 guest decks
- 18 total decks
- 16 guest elevators
- 4 bow thrusters with 4,694 hp each
- 4,180 guests (double occupancy)
- 4,905 guests total
- 1,500 crew members

compared to our Freedom Class cruise ships," says Royal Caribbean Project Manager Mika Heiskanen. "This not only makes good business sense, but with passengers increasingly sensitive to environmental issues, we strengthen our reputation as a responsible company."

Partnering for success

Heiskanen says that while Royal Caribbean has always had strong, in-house technical expertise, the company relies on a network of partners and suppliers to achieve their vision. "Class and the yard play an important role, and we have come to view our relationship with DNV GL and the Meyer Werft shipyard as more of a partnership than a traditional owner-supplier relationship," he says. "We tend to work with companies that understand our business, think like we do and have the competence to think outside the box."

Jörg Langkabel, Business Director at DNV GL in Hamburg, says that Royal Caribbean, Meyer Werft and DNV GL have enjoyed a relationship that dates back decades. "Our organization has deep roots with Royal Caribbean, and our relationship with Meyer Werft began in the mid-1990s," he says. "We got involved in the *Quantum* project at an early stage, providing advisory and verification services."

DNV GL's Project Approval Manager, Siw Solstad, made sure that the more than 3,800 drawings, some of which included special designs, were reviewed and discussed thoroughly with the yard and owner during several intensive workshops prior to approval. Indeed, Langkabel notes that *Quantum of the Seas* is such an innovative vessel that existing SOLAS rules on passenger safety at sea did not cover all of her features. "Part of our role was to develop rules to ensure passenger safety for some of *Quantum's* unique spaces and attractions," he says. "For >

Photos: Royal Caribbean Cruises, Meyer Werft

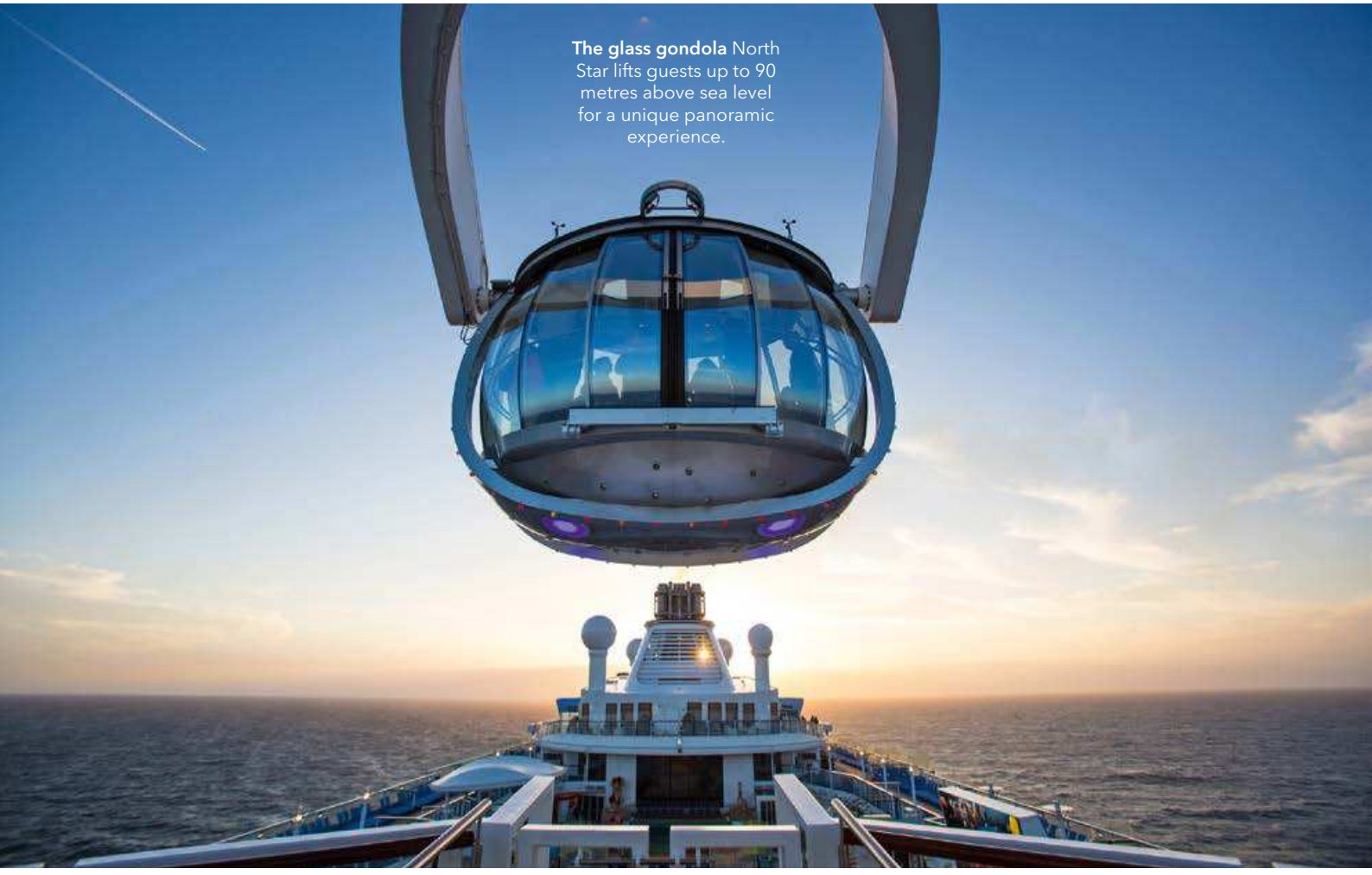
> example, the North Star capsule and the skydiving simulator were built for operation on land, not for use on a moving vessel. And Two70° is such a large and complex room it required some new thinking with regard to fire safety."

For Langkabel, good cooperation between DNV GL's site team and yard personnel is critical. "Meyer Werft's production philosophy requires precise coordination of various suppliers, so we have to be efficient," he says. "By understanding what is important to the yard and the owner, and working closely with them to support their businesses, we have been able to help them achieve their ambitions."

Flow-line production

Peter Hackmann, Meyer Werft's Head of Communications, explains that the yard has invested about 500 million euros to modernize production over the last decade. "We have built a laser welding centre, an automated pipe centre, computer-aided logistics and a material-flow control system. We upgraded our dry docks, invested in a wide range of automated equipment and redesigned our processes to sped up production," he says. "We have also put roofs on all of our facilities so that the production process is not impacted by weather. We are building two huge cruise ships in one year – quite an achievement, given the complexity of these vessels."

Hackmann says the yard's production philosophy can be compared to the way cars are manufactured. Yet, he notes, a cruise ship is far more complex. "Suppliers play a key role in keeping things moving on schedule," he underlines. "We expect them to be reliable, flexible and responsive, especially when issues arise. DNV GL has proven to be a good partner through all phases of the build, particularly for this



The glass gondola North Star lifts guests up to 90 metres above sea level for a unique panoramic experience.

Star chef Jamie Oliver (with wife Juliette) in his first restaurant at sea.

Huge windows enable breathtaking views of the sea from the indoor pools.

SeaPlex is a convertible, multipurpose sports and family fun arena.

project, which included so many innovations," Peter Hackmann emphasizes.

Trust and open communication

In fact, representatives from the yard, DNV GL and Royal Caribbean scheduled regular meetings every two weeks during the build, and even more often whenever they reached critical milestones. DNV GL's veteran Site Team Manager Andreas Hosak notes that unlike building commercial tonnage, the construction of cruise ships requires a lot of specialized expertise and good communication. "In terms of complexity, cruise ships are challenging, and even more so for such an advanced vessel like *Quantum*," he says. "Meeting the expectations of both the yard and the owner can be difficult, but we have been working with both for so long, there is a lot of trust."

Hosak says that this close relationship between class, the yard and the owner helped manage some challenging technical issues. "The sheer size of the hybrid scrubber created some headaches; we also spent a lot of time working out fire safety with the Two70° space," he says. "In total, about 400 kilometres of piping and 2,200 kilometres of electric cables have been installed aboard *Quantum*. Also, because the air lubrication system to reduce hull friction was new, it took some time to get right." In addition to his close cooperation with the yard, Royal Caribbean and suppliers, Hosak got a lot of support from his colleagues at DNV GL from all over the world, including China, South Korea, Greece, Latvia and Germany as well as the Regional Approval Centre at DNV GL's headquarters in Høvik, Norway. "We leaned on the expertise of our Noise & Vibration team, headed by Eileen Mandt-Brun, and our scrubber expert Markus Osterkamp during critical phases of the project," he says. "It was a real team effort."

For Hosak, now working on *Quantum's* sister ship, *Anthem of the Seas* (due for delivery in the spring of 2015), the project has been a genuine success. "When you consider how many people were involved at different stages of the build, and look the end result, it is hard not to be proud of being part of the project," he says. "It may be known as *Quantum of the Seas* to passengers, but for me, a better name might be *Collaboration of the Seas*!" **AW**

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"We are proud of the many innovations found on *Quantum*, but our primary goal is to create a safe, memorable and truly unique passenger experience. Sometimes we have to push boundaries of what is possible at sea, but if the response to this vessel is any indication, it has been worth it."

Mika Heiskanen,
Royal Caribbean's Director (Quantum Class)

Photos: Royal Caribbean Cruises

The story of success started in 1972, when Carnival's first cruise vessel *Mardi Gras* (l.) commenced operations. The current fleet comprises of ships such as *Queen Mary 2*, *Costa Diadema* and *Regal Princess* (f. l. t. r.).

BUILDING THE BIGGEST-EVER CRUISE LINE FROM SCRATCH

The start four decades ago was rocky, but today Carnival Corporation is the world's leading cruise company. Chairman Micky Arison tells the story.

Carnival Place is at 3655 North West 87th Avenue in Miami, Florida, and houses the global headquarters of the mighty Carnival Corporation. The visitors are welcomed into the office of Micky Arison, the Chairman of the Board of Carnival Corporation. From his office, which is full of ship models, the port of Miami is visible at a distance just north of the Miami skyline. Airplanes on the final approach to the busy airport whizz by on either side of the office – actually some 40.5 million passengers fly in and out of "The Magic City" on an annual basis, quite a few heading for a cruise.

Today, Carnival is the world's leading cruise provider, with 100 ships, some 95,000 employees and an annual turnover of 15.9 billion US dollars. Carnival commenced operations in 1972 and its first ship was the *Mardi Gras*, which ran aground on a sandbar on her maiden voyage. Not a good start for a new cruise line, but fortunately no one was injured and the ship was eventually refloated to continue the journey.

"Our position was that of being the underdog in the cruise market when we started our operations back in the early 1970s. This has stayed with our



Holland America Line · P&O CRUISES · SEABOURN · PRINCESS CRUISES

The multibrand strategy enables Carnival Corporation to cater to the preferences of a wide range of customer groups.

company and has been a great inspiration to expand. Our competitors were few at that time, but included Norwegian Caribbean Line (NCL) and Royal Caribbean Cruise Line (RCCL). They had more modern ships with better amenities," reflects Micky Arison.

"Eventually, we had a fleet of three rather old and worn ships all sailing with a very spirited atmosphere on board which was what our guests wanted: to have fun.

Setting new trends

"It was the breakup between my father Ted Arison and Knut Ulstein Kloster that led to the establishment of Carnival. We had the sales organization and employees in Miami but needed ships, so this is why we started the cruise line. Our partner then became AITS, which was a tour operator that used the word 'Carnival' in the name of its tours, such as 'Rio Carnival'. This is why we named our new company Carnival Cruise Lines. At the time, we did not set out with a huge visionary idea of becoming the world's leading cruise line."

Micky Arison, Chairman of the Board of Carnival Corporation.

Some of Arison's earliest days in the cruise industry were spent as a shipboard employee. "I worked on board the *Skyward* in the freewheeling late 1960s and 1970s – you know, this was the flower-power generation – Sgt. Pepper's Lonely Hearts Club Band... A good time to grow up, but these were probably the craziest years of my life, before Ted more or less hauled me off the ships to pursue a shore-based job and an education. In hindsight, probably a wise decision," says a frank Micky Arison with a laugh. "Following the start with the *Mardi Gras*, we were able to buy two additional ships, the *Empress of Britain*, purchased in 1975 and converted into the *Carnivale*, followed by the *S.A. Vaal*, converted into the *Festivale*, which at the time in 1978 was the largest cruise vessel in the Caribbean. We saw the potential, so eventually we started to design and build our own ships and the *Tropicale* was delivered in 1982. That was a 38,000-tonne ship – small by today's standards but trendsetting at the time. This, in my view, was a marked turning point for the entire industry and >

Photos: Carnival Corporation, Cunard

> turned into a multi-billion dollar building spree," Micky Arison remembers.

Serving different customer profiles

"Back in the 1970s, RCCL also started off with Norwegian shipowners on the finance and ownership sides – Wilhelmsen and Skaugen – and its first ship was the *Song of Norway*. And Kloster went to France and bought the *France* and converted this into the *Norway*. The latter became by far the largest cruise ship in the Caribbean for two decades. For Carnival's part, we've not looked back since then and have continued to grow by acquiring other cruise operators, too. Our customers have different preferences so this is why we have so many brands with different profiles in our group. We introduced a multibrand strategy and our first acquisition was Holland America Line," he explains.

"During the course of expanding the company, there were deals that succeeded and others that didn't. Efforts to purchase Norwegian Cruise Line and Royal Caribbean, for example, did not come to fruition whereas other deals such as the acquisition of Cunard and P&O Princess were huge milestones for us," says Arison.

Would it be possible for the industry to expand again the way it has over the past 20 years? "The growth rate for Carnival Corporation has been nothing less than incredible during that period. Source market growth is still strong, especially in international markets such as Australia, the UK and many other European countries. Also, there are some new cruise operator entrants trying to come in, such as Virgin. It takes quite a lot to establish a new cruise line and gain the necessary experience. For example, it took Disney a few years to establish and streamline its operations, however they eventually became quite successful. So it will be interesting to watch as new players enter the field."

Taking a look forward, Arison says, "The future holds even larger ships which provide economies of scale as does having a multibrand company such as ours with a 100-ship fleet. In terms of developing new markets, we are increasing our capacity in the East, especially China where there is also a lot of

A BIG MARKET PLAYER

Carnival Corporation & plc is a global cruise company and one of the largest vacation companies in the world. Its portfolio of cruise brands includes Carnival Cruise Lines, Holland America Line, Princess Cruises and Seabourn in North America, P&O Cruises and Cunard in the United Kingdom, AIDA Cruises in Germany, Costa Cruises in Southern Europe and P&O Cruises in Australia. The Carnival companies attract some ten million guests annually and the company's stock is listed on both the New York and London stock exchanges.

Headquartered in Miami and in London, Carnival Corporation operates a fleet of 100 ships, with another seven ships due for delivery between now and March 2016. With approximately 200,000 guests and 77,000 shipboard employees, there are more than 277,000 people sailing aboard the Carnival fleet at any given time.

Creating fun for millions of passengers requires advanced, technically sophisticated cruise ships with a multitude of exciting features as well as appropriate port facilities. Serious competition from Asia might soon challenge the industry.

> "The future holds even larger ships which provide economies of scale as does having a multi-brand company such as ours with a 100-ship fleet."
>
> **Micky Arison**,
> Chairman of the Board of Carnival Corporation

government support for developing the industry. In the future, there will be better distribution and ports and this market may eventually become as big as or even bigger than Europe. There are many ports along the Chinese coastline."

Focus on the customer's needs

With respect to the future, Arison cautions on the need for thoughtful itinerary planning and port development: "Larger ships carry more guests and many ports in both the Caribbean and Europe are already operating to capacity. The market for more ships is there, but the need for expansion of port facilities and the development of additional destinations is an important factor," says Arison.

"When the cruise industry started, the shipboard experience in terms of dining, activities and entertainment was much more basic. Those days are gone. Now we have to offer all kinds of entertainment, food and destinations based on people's desires, tastes and wants. Dining concepts, for example, now range hugely, from Italian and steakhouses to sushi, Asian fusion and celebrity chef partnerships. And from a technology standpoint we need to ensure great connections for Internet service and smartphones while the ships are sailing, too, not just when in port. Today's cruise passengers are the social media and smartphone generation – more or less across all age groups," says Arison, who himself is quite active in social media, including Twitter.

In addition to running the world's largest cruise company, Arison is also the owner of the Miami Heat, a professional basketball club. "The interest in and support for this club was initiated by my father and eventually I became the owner," says Arison. Given his role with the Heat, Arison is a highly recognizable figure in South Florida. "If the Heat is doing well, then that's great, but if we're not performing so well I get to hear that loud and clear, too. Sports fans are extremely passionate and vocal."

With a passion for cruises and a life at the centre of the cruise industry there is no doubt that Arison will continue to grow the business and create fun for his millions of passengers. **MAR**

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Photos: AIDA Cruises, Carnival Corporation, Cunard, Seabourn

EMISSION LIMITS: TIME TO ACT

The challenges for the shipping industry are not getting any easier. New emission limits, while not coming unexpectedly, require substantial investments in technology; and time is running out. A look at the available options.

The shipping industry has been going through turbulent times. For a sector accustomed to planning decades ahead, the sequence of unexpected major events, from the financial crisis to depressed freight and charter rates, and from dropping fossil fuel prices to new international tensions, has certainly added plenty of headache to investment decisions. Many shipowners delayed investing in new anti-pollution technology hoping for a clearer field of vision, while others took action early to gain competitive advantage. With new sulphur limits now in force for European Emission Control Areas (ECAs), and the North American and US Caribbean Sea ECAs also regulating NO_X and PM, those who chose to wait must act now. Further regulations will take effect soon, and additional regional and national regimes are emerging around the globe (refer to info box). Investing now will save shipowners money and protect their reputation. However, the substantial capital requirement, a lack of mature technology and uncertainty regarding compliance documentation add to the complexity of this decision.

The IMO's new ECA regulations, in effect for Northern Europe and North America since 1 January 2015, were announced as far back as 2008. As the year advances, the majority of shipowners will without doubt take the required steps since full compliance has to be substantiated now. Shipowners and

The international shipping community is committed to cleaner air and a greener public image.

operators hammering out their ECA strategies have to find answers to a number of difficult questions, and DNV GL is ready to help them devise the right compliance and technology strategy.

More than 40 per cent of the ships trading in the Baltic Sea are general cargo vessels which typically do not cross larger oceans; they either sail within the Baltic Sea only, or within Northern European waters. Oil and chemical tankers, bulk carriers, and passenger ferries are other major ship types operating in the Baltic Sea. The age of these ships is fairly evenly distributed from new to about 40 years old, which means that old vessels are being replaced at a steady pace. In other words, it takes about ten years to replace 25 per cent of the fleet.

The shipowners' point of view

The most obvious choice to ensure compliance with ECA regulations is switching to low-sulphur distillate fuel. The investment requirement is moderate, but detailed guidelines for the fuel changeover should be prepared, and the crews must be trained properly to understand the technical implications of the switchover procedure. The following special considerations should be made to avoid engine failure:

- **Temperature:** As the operating temperatures of the two fuels differ by about 100 degrees, special care must be taken.

Cruising the Kiel Canal: Lower noxious emissions will benefit both the environment and human health.

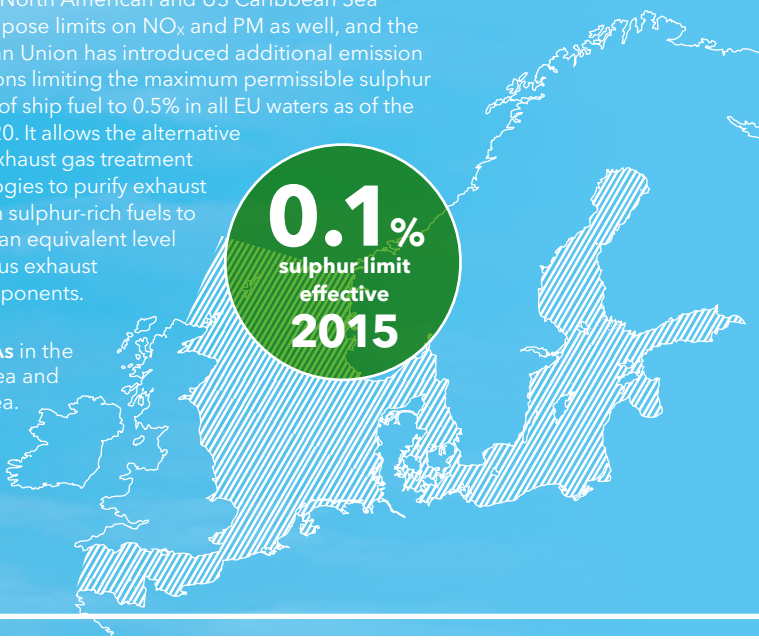
- **Viscosity/lubricity:** Heavy fuel oil (HFO) and marine gas oil (MGO) have very different viscosities, which may cause fuel pump failure.
- **Fuel incompatibilities:** HFO and MGO are mixed in various ratios during the changeover procedure, which may clog filters and cause engine shutdown.
- **Cylinder lubrication – acidity:** Decreasing the sulphur content affects fuel acidity so another type of cylinder oil must be used.
- **Contamination:** Tanks formerly used for HFO need to be cleaned thoroughly before switching to MGO. The solution is often dedicated fuel tanks and separate tanks for different lubrication oils. >

REGULATIONS AND TECHNOLOGIES: HOW THE SHIPPING INDUSTRY IS CLEANING UP ITS ACT

Sulphur oxides (SO_X), nitrous oxides (NO_X), particulate matter (PM) and carbon dioxide (CO_2) are emission components originating from combustion of marine fuels. They can severely damage ecosystems and human health. IMO MARPOL Annex VI defines a combination of general maximum global emission levels and more stringent emission limits applicable to designated Emission Control Areas (ECAs). Typical abatement alternatives include exhaust gas cleaning systems known as scrubbers for ships continuing to burn HFO; using LNG as a ship fuel; or switching to low-sulphur fuel when operating in an ECA. There are also new solutions emerging which either focus on avoiding sulphur from entering the engine or on removing SO_X from the exhaust gas.

In 2020 or 2025, pending an IMO decision in 2018, a global 0.5% sulphur cap will enter into force. A study group led by the USA has now been established to assess the availability of low-sulphur fuels before the 2018 IMO meeting.

The North American and US Caribbean Sea ECAs impose limits on NO_X and PM as well, and the European Union has introduced additional emission regulations limiting the maximum permissible sulphur content of ship fuel to 0.5% in all EU waters as of the year 2020. It allows the alternative use of exhaust gas treatment technologies to purify exhaust gas from sulphur-rich fuels to achieve an equivalent level of noxious exhaust gas components.

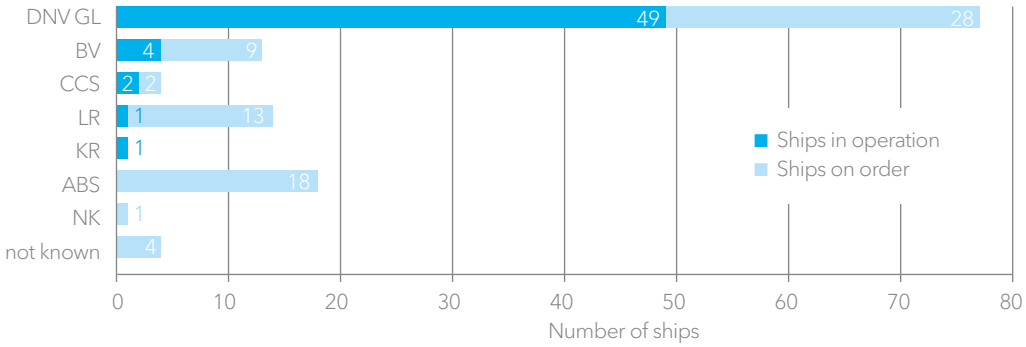


The ECAs in the North Sea and Baltic Sea.

Photos: Chez - Dreamstime, Ralf Gosch - Fotolia

LNG-FUELLED FLEET BY CLASS*

The current picture shows DNV GL-classed ships leading the industry by a wide margin.



*Excluding LNG carriers and inland waterway vessels/including conversion projects

As of January 2015

An alternative solution is to use a scrubber while continuing to burn HFO. A scrubber washes the SO_X out of the exhaust gas by spraying either seawater on it or a freshwater solution with chemicals added. Seawater scrubbers are simpler to install since the water is not recirculated but used once in a so-called open-loop system before being treated, neutralized and discharged to the sea. To achieve the right efficiency levels, seawater scrubbers rely on high-capacity pumps, which consume significant amounts of energy.

Scrubber installation

A more sophisticated installation is a closed loop scrubber, which dissolves chemicals in freshwater and recirculates this solution after each use, partially replacing it. The spent part of the solution is purified and released to sea. These scrubbers consume less electrical power but rely on chemicals. All scrubbers produce a hazardous sludge which must be properly disposed of in ports. One scrubber can treat exhaust fumes from several engines; some can switch between closed and open-loop operation, depending on the shipmaster's preference. In general, scrubbers increase fuel consumption by one or two per cent, thereby raising the overall fuel costs and CO_2 emissions. Many ships have been retrofitted with scrubbers to ensure ECA compliance. For example, the US-based cruise ship fleet has adopted scrubbers as its preferred means of complying with ECA regulations. Globally more than 160 ships have installed or ordered scrubbers.

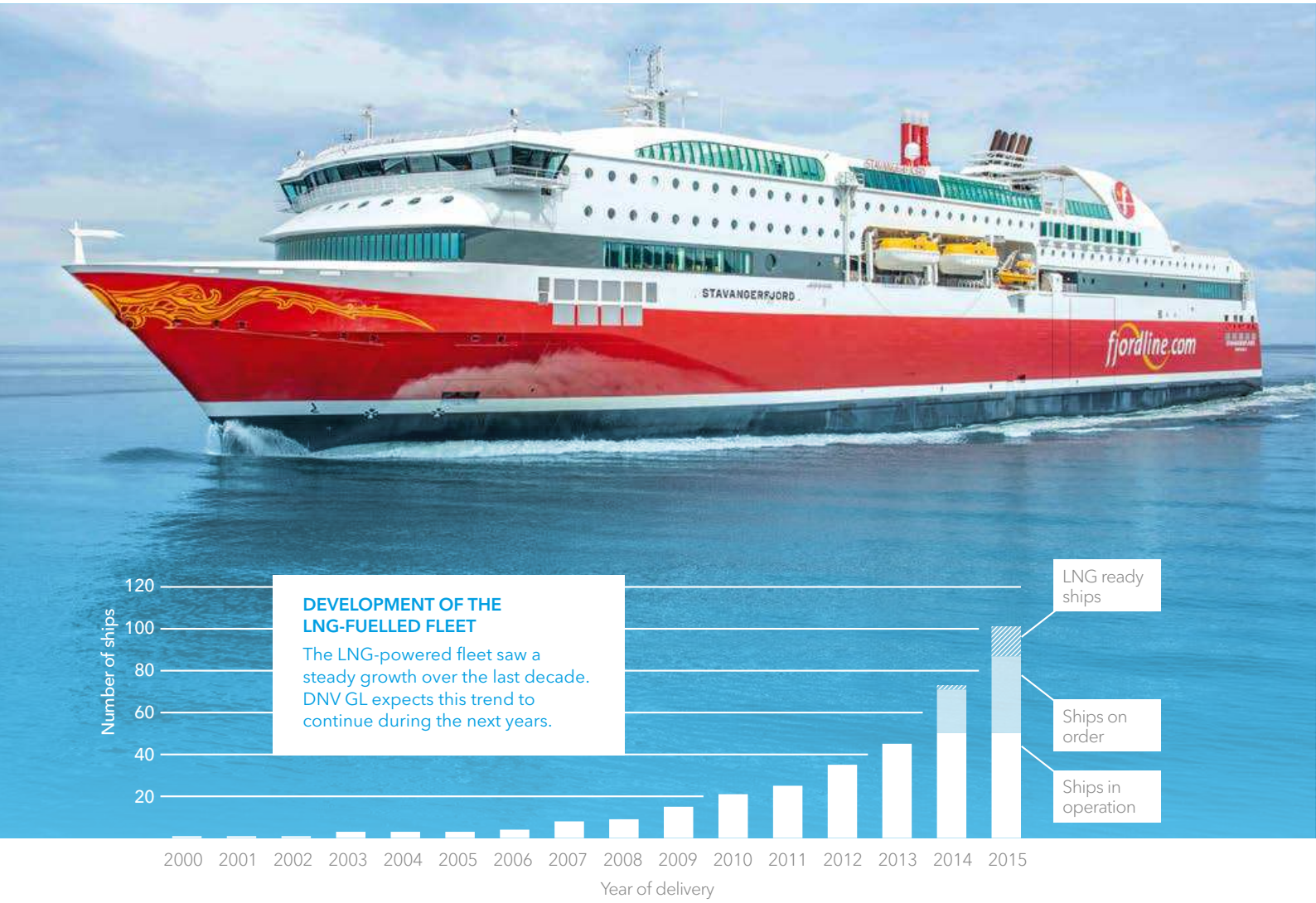
Closed or open-loop scrubbers are a popular technology to achieve compliance with the new limits.

The cleanest option

The third alternative is to fuel the ship with LNG. Natural gas is the cleanest fossil fuel available, and when fuelling a ship with LNG no additional abatement measures are required to meet the ECA SO_X requirements. The additional cost of the on-board LNG equipment can be recovered in three to six years, depending on the LNG fuel price and the extent of ECA exposure. An LNG-fuelled ship requires purpose-built or modified engines and special fuel tanks, a vaporizer, and double-insulated piping. Accommodating the LNG fuel tanks can be challenging and will reduce cargo space, but with new prismatic tanks entering the market the negative effects can be minimized.

DNV GL estimates see the fleet of LNG-fuelled ships increasing over the coming decade, forming a diversified fleet of smaller coastal vessels and large ocean-going ships.

More than 50 LNG-equipped vessels are currently in service (refer to graphic), and more than 75 LNG-fuelled newbuilds have been ordered. New technical solutions are under development, and work on the new International Code of Safety for Ships Using Gases or Other Low Flashpoint Fuels (IMO IGF Code) is practically finalized. The code will create a common platform for LNG-fuelled ships. Vessels currently in service or under construction are covered by the IMO interim guidelines for LNG as a ship fuel (MSC-285(86)) and related class rules, which together form the basis for flag administrations to issue the required SOLAS certificates.



Photos: Wärtsilä, Fjord Line

LNG fuel practically eliminates SO_x and PM emissions and reduces NO_x emissions by 40 to 90 per cent depending on engine type. Release of unburnt natural gas has been an issue ("methane slip") but new engines have more or less solved this problem, giving LNG-fuelled engines a clear greenhouse gas (GHG) advantage over conventionally fuelled engines.

What is hampering the widespread adoption of LNG is the limited network of LNG bunkering stations, but many potential suppliers are seriously considering entering this market. Along with new initiatives to develop long-range LNG-fuelled ships, this may be the game changer needed to boost LNG-fuelled shipping globally. The ISO is developing an LNG bunkering guideline to support the development of local LNG infrastructure. Moreover, DNV GL released a Recommended Practice (RP) for LNG bunkering in 2014 to fill the regulatory gap between legislation/standards and local LNG bunkering procedures. In addition, DNV GL's LNG Ready service assesses the additional components needed to use LNG fuel, the associated costs as well as ship safety, stability and strength issues. DNV GL also offers evaluation of LNG bunkering facilities for ports and terminals in both the planning and execution stages. Key elements include safety, service strategy, stakeholders, capacities and feasibility.

The ports' point of view

Many ports and terminals are defining strategies for implementing LNG bunkering services, and there are clear indications of the development spreading beyond Norway and Sweden. What is needed now are bunkering facilities accessible to any LNG-fuelled ship, and more LNG bunkering locations, especially around the ECAs. Predictable LNG fuel end-user prices will also help boost a development bringing the LNG >

> industry close to the maritime industry in new ways. Having served both industries for decades, DNV GL is in an excellent position to help find smart solutions to advance LNG as a ship fuel.

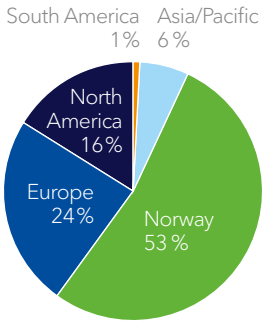
For ports, DNV GL has published a five-step methodology for LNG fuel logistics assessments:

1. Define future LNG bunker demand for a given port over typically 10 to 20 years, broken down by the port's main ship categories.
2. Define alternative elements in various relevant LNG supply chains.
3. Estimate cost-efficiency of alternative LNG main supply concepts.
4. Perform a detailed analysis of an LNG main supply and distribution concept, covering incoming and port logistics, bunkering operations, port investments and utilization.
5. Create and recommend a solution, accounting for annual volumes and fluctuations.

Beyond this, ports should develop their safety regimes for LNG bunkering, bunkering practice, a scheme for licencing LNG providers, and port traffic safety assessments with present LNG-fuelled traffic.

LNG PROJECTS BY REGIONS

Global development – all confirmed projects (in operation & on order).



DNV GL has been working on these topics on a global scale for over ten years and performed financial analyses for LNG providers. The conclusion is that LNG bunkering can be a safe, lucrative business for providers, especially around ECAs which, by coincidence, have relatively low LNG feedstock prices.

DNV GL encourages major ports around the ECA regions to assess their options regarding LNG fuel. A number of recent initiatives and new construction projects seem to indicate that the development of an LNG infrastructure is picking up speed. While LNG fuel offers great opportunities to shipping, many owners prefer scrubbers or low-sulphur fuels. New and even more cost-effective solutions will emerge and there are some financial support programmes available. DNV GL looks forward to seeing more clean ships plying the seas these coming years! **HM**

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Download the new report for extensive information on LNG as ship fuel at dnvgl.com/lngreport

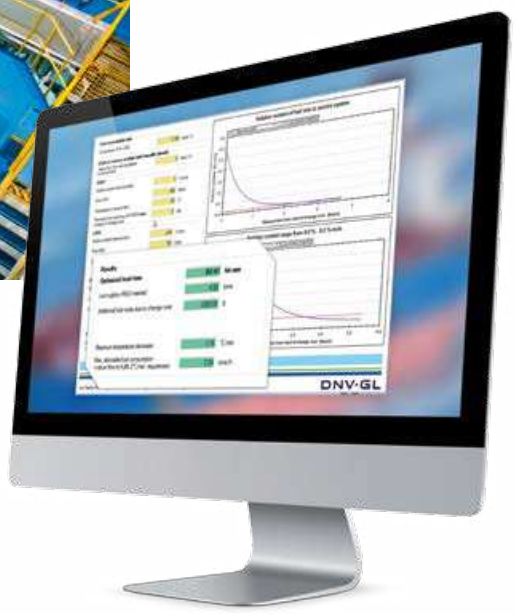
NEW REPORT: LNG AS SHIP FUEL

LNG as fuel is now a proven and available solution. While conventional oil-based fuels will remain the main fuel option for most existing vessels in the near future, the commercial opportunities of LNG are interesting for many newbuild and conversion projects. But taking the leap to LNG can only be made on the basis of the best possible information and a thorough analysis of your needs, both today and in the future.

DNV GL's new report has been developed to assist you in working with all the relevant factors that come into play, based on our experience with this young technology in newbuilding, conversion projects and advisory services related to the design, construction and operation of LNG-fuelled vessels. The new report provides extensive information on the most important topics in the sector, including:

- LNG today and tomorrow
- Alternative fuels for shipping
- LNG – The right option?
- LNG as fuel on a newbuild MR tanker
- Retrofitting cruise ships to LNG by elongation
- LNG fuel tank concept for large vessels
- Innovating for safer and sustainable shipping
- Gas as ship fuel
- 2014 – Status for LNG as ship fuel
- Making sense of LNG containment system innovations
- Engines for gas-fuelled ships
- LNG in the US

DNV GL believes that the groundwork has been laid for LNG to thrive in the shipping and transport sectors – and invites their customers and business partners to come and take the next steps together with DNV GL.



FCO Calculator's Windows-based user interface delivers clear, precise information to ensure a smooth switchover.

CHANGEOVER MADE EASY

DNV GL software helps crews master the tricky fuel changeover process and avoid costly errors.

The shipping industry is making great strides towards a more eco-friendly future. New standards and technologies must be adopted in rapid succession. With the new sulphur limit for Emission Control Areas (ECAs) in force, ships operating on heavy fuel oils must switch over to ultra-low sulphur fuel oil before entering these areas. Marine gas oil (MGO) is currently the most viable option.

However, fuel changeover is a much more complex operation than one might expect. It is a gradual process that must be carefully prepared, timed, controlled and monitored to avoid costly equipment damage or fines for non-compliance. DNV GL has issued guidelines to help the industry plan and implement the fuel changeover process with confidence. In addition, DNV GL offers a new software application which guides crews through the changeover process: the Fuel Change-Over (FCO) Calculator.

On-board guide for a smooth transition

The tool runs under Microsoft Windows and is configured for each individual ship. It helps mitigate the risks associated with switching to marine gas oil by supplying operators with the best parameters for the procedure. DNV GL provides configuration assistance to the customer to establish the ideal fuel changeover parameters.

The software takes into account variables, such as the ship's fuel system layout, any constraints on temperature and the variable sulphur content of fuels, as mixing occurs in the service system and can significantly reduce the risk of human error during preparation of the changeover procedure. The software uses a complex numerical simulation that is more accurate than previous linear models. It calculates the optimal lead time for changeover, the resulting costs and the maximum hourly consumption based on various constraints. The application allows the crew to make solid, data-driven decisions, ensures cost-efficient, reliable fuel changeovers and helps demonstrate compliance with the new sulphur directive vis-à-vis the authorities. By mitigating risks, it gives owners and operators peace of mind. **AJO**

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DNV GL FCO CALCULATOR TAKES INTO ACCOUNT:

- Ship-specific fuel system layout
- Constraints on temperature
- Continuously variable sulphur content of fuels
- Continuously variable temperature of fuels
- Continuously variable fuel oil consumption
- Return flow from service system to service tank
- Price of respective fuels

SMOOTH PASSAGE IN US WATERS

For ships sailing in US waters, regulations are tightening. DNV GL has devised a verification system to ease compliance and give shipowners and operators peace of mind while saving time and energy.

"It's not enough simply to achieve compliance," says Sarah Lasselle, project manager for the verification work. "You have to be confident that the ship will continue to operate under compliance during the entire journey." For that reason the new US Vessel General Permit (VGP) verification system also focuses on reducing the risk of potentially costly new violations.

The VGP verification service consists of a review of company-wide VGP procedures, if they exist, which are usually based on VGP or environmental best practice documentation. On-board visits confirm that the vessel's documentation is consistent with the on-board documentation required and that the vessel is operating in compliance with its environmental procedures and VGP requirements.

Systematic approach simplifies, clarifies

According to Per Holmvang, Program Director for Environmental Protection Technologies at DNV GL – Maritime, the VGP verification service provides users with a second set of unbiased expert eyes on their documentation procedures. "DNV GL's VGP verification service can be tailored exactly to the customer's needs, from a desktop review or workshop outlining VGP changes, to a full on-board and shore review and plan for corrective action, even help and advice on developing a VGP plan from scratch," he says.

The most recent updates to the VGP include requirements for the preparation of a detailed annual report. The VGP verification service provides a comprehensive review of both VGP procedures and documentation. DNV GL's new solution includes performing a gap analysis of vessel operations, reporting, and discharge technology to provide answers to the following questions:

> "The VGP verification service can be tailored exactly to the customer's needs, from a desktop review or workshop outlining VGP changes to a full on-board and shore review."
>
> **Per Holmvang,** Program Director for Environmental Protection Technologies in DNV GL – Maritime

The port of Los Angeles is the busiest container port in the US and number nine worldwide.

- Does the vessel documentation and reporting on board satisfy VGP requirements?
- Are vessel operations in accordance with the VGP?
- Does the vessel have the necessary VGP-sanctioned pollution prevention technology?
- If there are risks of non-compliance, how will they be corrected?

Once the review and any necessary corrective actions have been undertaken, DNV GL provides a verification statement indicating that the vessel's operations and record-keeping are consistent with VGP requirements. This verification statement also contains a list of the VGP requirements and outlines how the vessel fulfils the requirements.

Wilh. Wilhelmsen leads on with a good example

Known for their high technical, safety and environmental standards, Wilh. Wilhelmsen was a natural partner for a pilot test of the new DNV GL compliance system. After a full examination of Wilh. Wilhelmsen's company-wide VGP recommended practices, DNV GL experts went on board the RoRo vessel *Tarago* to conduct a careful review of the record-keeping. The ballast water management plan, deck log book, engine room and oil record log books, and the VGP log book were all checked to ensure that all necessary records were present for VGP-related procedures.

The verification confirmed Wilh. Wilhelmsen's high standards and thorough preparation. Key project takeaways from the investigation, part of the VGP check-list, highlighted the importance of:

- Consistency of scheduled and weekly inspections
- Up-to-date manufacturer documentation, especially for Environmentally Acceptable Lubricants (EALs)
- Record-keeping in vessel log books according to the company's own recommended best practice

Filip Svensson, Vice President Marine Operations at Wilh. Wilhelmsen ASA, had this to say about the VGP experience: "Our ambition is to be an environmental forerunner. With several port calls in the US, it was valuable for us to team up with DNV GL to do a pilot on new technical and reporting requirements set forth in the updated VGP. As vessel owners, we want to ensure our operations and standards are in line with regulatory requirements. Through the cooperation with DNV GL, we confirmed that our efforts towards high standards pay off, but we also acknowledge that there is always room for improvement. By being in the forefront, we take steps towards our long-term ambition of shaping the maritime industry."

Sarah Lasselle concludes: "It was a valuable learning experience to see how Wilhelmsen tackles the environmental problems of operating a ship like the *Tarago*, and to exchange ideas on how best to stay in compliance with the VGP."

Customers who need to take action now have the chance to develop a plan in a fast and efficient manner or correct any deficiencies in an existing plan. DNV GL's verification statement also provides an easy way for a vessel operators to demonstrate they have taken all aspects of the VGP into consideration, in the event of controls by US authorities. **KG**

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RoRo vessel *Tarago* passed the VGP check by DNV GL experts.

Photos: Port of Los Angeles, Wallenius Wilhelmsen

Photo: Magne A. Røe/DNV GL

HANS LANGH: FARMER, SHIPOWNER AND INVENTOR

Calling Pikis a town would be an exaggeration. It is more of a gathering of farms near a train stop close to Turku (Åbo), Finland. Hans Langh's farmhouse in Pikis serves as headquarters of Langh Ship and several other Langh companies.

An old anchor propped up next to the driveway is the only indication that the two-storey wooden building might have something to do with ships. Built in 1845, the yellow farmhouse serves as the headquarters of the shipping company Langh Ship. In 2015, founder Hans Langh resigned as Managing Director to become Chairman of the Board, handing over the operational responsibilities to his daughter Laura.

But operating ships is not all Hans Langh has done in his lifetime. In fact, he is an inventor with no fewer than 100 patents and patent applications to his name. His inventions focus on solutions for handling and transporting cargo – and for cutting ship emissions: DeltaLangh, his joint venture with Deltamarin, the developer and manufacturer of an innovative scrubber solution.

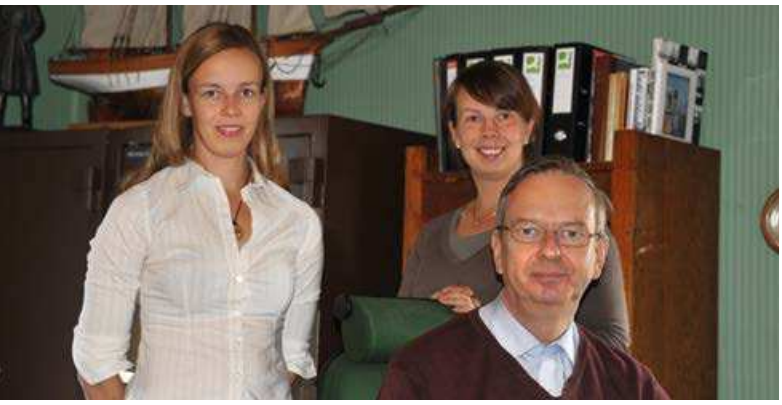
All five ships in the Langh fleet are classed by DNV GL, and Hans has been a long-standing customer and frequent visitor to the offices of the former GL Group in Hamburg, now the headquarters of DNV GL – Maritime. "Hans always brought his two young daughters along when he came to visit his ships. They used to wear bright red boiler suits with their names on the front and the Hans Langh logo on the back," remembers DNV GL Turku Station Manager Hannu Jokela. Shipping is in the genes of the Langh family, he adds: Laura Langh-Lagerlöf is now the Managing Director of Langh Ship, while Linda Langh is the Managing Director of Industrial and Ship Cleaning Services Hans Langh, the company that handles ship and industrial waste under the mottos "Hans Langh washed here" and "Dirty job well done". That the business is a family affair is clearly visible in Langh's offices where he keeps toys for his grandchildren to play with when they visit.

Effective scrubbers

Hans Langh brings out a small glass jar containing a dark grey residue: the effluent of a scrubber. "The scrubber residue is taken ashore and processed as special waste," he says. "The scrubbers we have developed from scratch at DeltaLangh are also environmentally friendly in the sense that they are closed-loop systems. Besides, they do not take up valuable cargo space on board." He proudly points to a picture of containership *Laura* with the scrubber installed vertically in the space underneath the bridge. "We also considered other solutions to cut exhaust gases, such as using LNG as a fuel, but all in all we find the scrubber solution to be the most cost-effective. The ships now comply with all IMO and EU regulations, and these scrubber systems will only produce small >

Entrepreneur and inventor with a 50-year career and an impressive array of achievements: Hans Langh.

The office building of Langh Ship dates back to 1845.



Running the family business together with their father Hans Langh are Laura Langh-Lagerlöf (l.) and Linda Langh.

Cleaning ships and industrial plants has been one of the Langh businesses for decades.

> quantities of sludge; in the case of *Laura,* as little as one cubic metre per month. In developing the scrubbers, we were able to benefit from the excellent skills of our Senior Technical Advisor Reino Verosaari who managed this project," adds Langh.

Excellent support

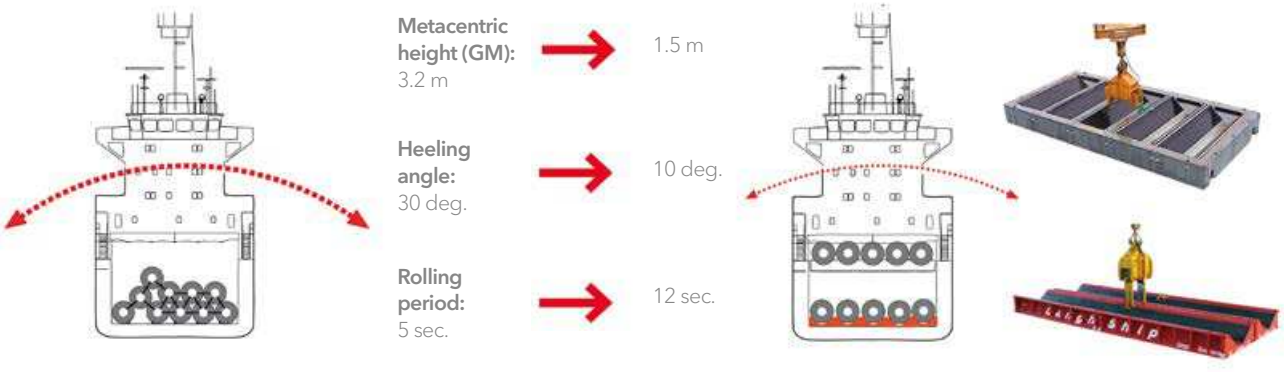
"Our fleet consists of five multipurpose vessels custom-developed for transporting steel, containers and bulk. We have developed several innovative transport solutions and methods which save our customers time and money. It has always been my goal to stay at the forefront of technology and I have always had excellent support from GL in Hamburg, and now DNV GL. I have been to Hamburg many times to discuss my technical solutions and, as I said, I have always been very well received and given very good support. The same goes for our local DNV GL office here in Turku as well." All Langh ships are registered in Finland, all are built to GL class, and they all typically trade in the Baltic Sea and North Sea all the way to Rotterdam.

"Our shipping tradition dates back to my mother's grandfather. He started the shipping business in 1900 and had his ship, a galeas, built here in Finland. Unfortunately he had to discontinue operations in 1950. I was the one to continue the family tradition. I began as part-owner of a ship. Later, in 1983, we began operating our first self-owned vessel. During all these years I was also running my ship cleaning business."

Award-winning cargo solutions

The Langh fleet frequently transports steel coils. Manufactured to customer specifications in Finland and Sweden, steel coils are very valuable cargo that requires utmost care on the part of the shipping company to prevent damage or loss. This is where one of Hans Langh's patented inventions comes into play. "The idea," recalls Langh, "was to develop a cradle-type fixture wherein to place the steel coils before lifting them onto the ship." His invention earned him the prestigious Seatrade Award in 2003. "Since introducing this concept, we have not

Superior in steel transport. Steel transportation in ships involves stability. Heavy cargo low down in a ship's hold makes the vessel overly stable and in rough seas this causes extreme rolling, which could potentially cause the steel coils to move around and sustain damage. Hans Langh had the idea to build pontoons with cradles to keep the coils securely in place. Subsequently Langh developed suitable transport solutions.



had a single incident or cargo damage involving steel coils." Langh has also developed specialized containers for transporting steel coils by rail or road, and several other containerized solutions for various transport needs. In addition to the Seatrade Award, Langh received a Finnish innovation award in 1998, the InnoSuomi award and the Tuottava Idea for productivity-enhancing inventions in 2002, the Sea Sunday Maritime Safety Award in 2005 and finally, the Finnish LOGY logistics award in 2015.

Industrial and ship cleaning

At the Meyer Turku yard, construction work on *Mein Schiff 4* is nearing completion. The huge cruise ship is still in the dry dock, dwarfing visitors as they walk underneath her enormous hull. In a few days the dock will be flooded and the ship will float on her own for the first time. A bright red truck from Industrial and Ship Cleaning Services Hans Langh is parked next to the ship for some finishing work.

"Ship cleaning has been one of our key competencies since early 1973," explains Hans Langh. "We perform cleaning services for the shipping, construction and manufacturing industries worldwide. We clean and disinfect tanks and clean engine rooms, shafts, casings and funnels as well as cargo holds. We remove asbestos and contain the damage if something has gone wrong on board. We clean ship hulls, bottoms and decks, we strip paint and clean up after sandblasting." One cannot help but be impressed by this man's quiet single-mindedness in putting his ideas to work and building a lasting legacy. ▮ **MAR**

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A tween deck six metres wide extends across the cargo hold, capable of carrying up to 4,000 tonnes. This solution greatly improves the vessel's seakeeping.

"It has always been my goal to stay at the forefront of technology and I have always had excellent support from GL in Hamburg, and now DNV GL."

Hans Langh

Containership *Linda* in dry dock at Turku Repair Yard in August 2014. This 14-day docking period was an excellent opportunity to install the scrubber, seen here right after it was lifted into place underneath the bridge wing.

Photos: Langh Ship, Magne A. Røe/DNV GL

IT'S BIG. IT'S POWERFUL. IT'S BUILT FOR HIGH PERFORMANCE

Photo: Chantier Davie Canada

Chantier Davie Canada changes the game with the completion of the *Cecon Pride*. The Canadian shipyard proved its expertise by delivering one of the most complex commercial vessels ever built in North America.

After a tough start for the project and a restart of the yard, Chantier Davie Canada Inc. (or "Davie", as the company is known) rolled out a true game changer with the completion of the offshore construction vessel *Cecon Pride*. Named for its owner, Norwegian oilfield services company Cecon, *Cecon Pride* is the largest and most complex ship built in North America in the last 25 years. It's big. It's powerful. It's built for high performance.

And according to Davie CEO Alan Bowen, the completion of *Cecon Pride* signifies more than just a successful delivery of a high-spec vessel. "*Cecon Pride* represents a shot in the arm for North American shipbuilding," says Bowen. "We are back on the map. Building such a complex vessel signals that we're the best in the business. This ship proves we can do it all here in North America, with our high-quality vessel construction capabilities and low-cost base."

A team effort

When it comes to building big ships, Chantier Davie Canada Inc. isn't exactly lacking in experience. In fact, 25 years ago, when a North American shipbuilding record was set for the largest vessel, Davie was the yard. But since then, the company – and the North American shipbuilding industry – has experienced ups and downs.

In fact, construction of *Cecon Pride* had actually got under way five years ago but had since been abandoned after Davie underwent changes in ownership and management. Bowen is quick to admit that it was a challenging scenario. He credits DNV GL for providing support along the way. >

Cecon Pride is the first in a series of three offshore construction vessels ordered by Cecon from Canadian Davie shipyard. She has meanwhile been renamed *Micoperi Pride*.

"Owners and operators from North America can be confident that these vessels are built right here with their tough operating environments in mind. And if these vessels are good enough for our customers here, they will also be good enough for export to customers worldwide."

Alan Bowen, CEO,
Chantier Davie Canada Inc.

> "It wasn't easy restarting this cold, five-year-old project. We knew what was at stake," he says. "The help and guidance from DNV GL all the way from the contract phase until the very day the ship was delivered was crucial. It was a partnership where DNV GL worked hard with us every day to make sure this project turned out successfully. When issues were identified, they were swiftly dealt with and we all moved on. There was no feeling of hierarchy or 'us' and 'them.' It was truly a team effort."

And the team effort produced results which are nothing short of amazing: built by a team of more than 1,000 skilled shipbuilders, the 130-metre *Cecon Pride* is designed to perform a wide variety of functions for the oil and gas, renewable energy, and naval markets.

Building worldwide confidence

Following *Cecon Pride's* launch in October 2013, the hull was outfitted and further works were added to the construction programme to ensure the vessel could be deployed immediately from the shipyard to Europe in August 2014, where she has already performed offshore construction activities on behalf of her charterer who renamed her *Micoperi Pride*. Meanwhile work has begun on the two sister ships which will be delivered to the same owner.

Cecon Pride is the first of three ships in the new VS 4220 design series which features diesel-electric power generation systems feeding six electric thrusters. The vessel is also equipped with dynamic positioning (DP 3) to help steady her position while performing high-sea operations such as subsea construction, pipe laying, diving well intervention, and support of remotely operated underwater vehicles.

Bowen adds that his company has received great feedback from customers, not just from North America and the North Sea but from Asia as well, who have signalled interest in Davie's offshore construction vessels and multipurpose vessels. This feedback, Bowen adds, is proof that ships built in North America provide the same quality and durability as those constructed in other parts of the world. **JKL**

Highly satisfied with the results: Davie CEO Alan Bowen emphasizes the constructive cooperation with DNV GL.

CHANTIER DAVIE CANADA INC.

"Davie" is Canada's largest shipbuilder and one of the leading yards in North America. With more than 1,000 skilled shipbuilders employed today, Davie builds value-added vessels integrating complex technologies such as those required for heavy ice navigation, environmentally friendly LNG propulsion, and complex dynamic positioning. Davie has built over 700 vessels and is also a leading heavy industrial fabricator for the power, defense, transportation, and natural resources industries.

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MICOPERI PRIDE (EX-CECON PRIDE)

Principal dimensions
Length overall: 130 m
Width: 28 m
Gross tonnage: 15,000 t
Transit speed: 16 knots
Cargo capacity: 10,000 dwt
Deck area: 2,000 m²
Subsea crane: 250 t
Accommodation: 100 persons

Power and propulsion
Aft: 3 x 3.0 MW Azimuth
Fwd: 2 x 1.5 MW Tunnel thruster
Fwd: 1 x 1.5 MW Retractable azimuth
Total power installed: 19.0 MW
Dynamic positioning: DP3

Helideck
13 t, 22.2 m diameter helideck, designed for Sikorsky S61N

Classification
DNV, 1A1, DYNPOS AUTRO, E0, CLEAN, COMF-V(3) C(3), HELDK-SH, SF, ICE C, CRANE, NAUT OSV(A)

Register notations
DK(+)

Photos: Chantier Davie Canada

TOGETHER FOR SAFETY

Major players of the offshore oil and gas industry recently started a Joint Industry Project (JIP) with DNV GL to study and discuss safety culture in offshore shipping.

Offshore shipping is an important segment of the petroleum industry: it is responsible for moving oil rigs, installing and maintaining sea floor equipment, and keeping oil rigs supplied with personnel and material. Operating conditions are often challenging for both the ships and their crews. Safety very much depends on the proper condition of the equipment, proper procedures and the skill and team spirit of the crew.

The Joint Industry Project "Together for Safety" was initiated to study new approaches to accident prevention in offshore shipping. Its participants include DOF Management, Bourbon Offshore, Solstad Offshore, Eidesvik, Havila Shipping, Boa Offshore, ConocoPhillips, Shell, "K" Line Offshore and DNV GL.

Photo: Stanislav Komogorov – Fotolia.com

Demanding tasks require an effective safety culture.

Understanding chains of events

Major accidents are often the result of several factors coinciding in a complex chain of events. Reconstructing these chains of events is a crucial means by which to understand the contributing factors, external influences and the way they interact. The ultimate goal is to take a proactive approach to safety by designing equipment, procedures and standards that can avoid severe events.

The most important contributor to safe and effective operation is the way humans interact with each other and with technology. Unlike technology, humans are capable of assessing unique conditions and environmental factors in a new and challenging situation. They can evaluate, prioritize, take decisions based on personal judgement, and deliver quality results despite the complexity of the given task.

On the other hand, human behaviour is less predictable than that of machines. People can be distracted or forgetful, they can be in a state of shock or fear, they can miscommunicate with each other or misjudge a situation, or they can fail to recognize a hazard. In the past, many accidents have been attributed to "human error". Yet, people seldom err on purpose, and by actively taking into account the interaction between organizational, technical and external influences, one can reduce the likelihood for human error.

The "Together for Safety" JIP hence started from the perspective that people are not infallible, and that the industry's development efforts must focus on supporting people performing the safety critical tasks.

In interviews with captains and mates, in workshops and project meetings, the project members charted the factors influencing human performance during complex operations as well as the origins of these factors. In a methodical approach they identified issues that are common to most shipping companies. In addition, presentations by representatives from the aviation industry, the cruise industry, a leadership development consultancy, the Norwegian Accident Investigation Board (Statens Havarikommisjon), the Norwegian Maritime Authority (Sjøfartsdirektoratet) and Ålesund University College contributed new insights into major accidents, investigation methods and current research.

In complex offshore operations the risk of accidents caused by "human error" increases.

Photo: (c) Sedi78 | Dreamstime.com

The way forward

The project participants quickly realized that there should be no reservations among shipowners and other industry stakeholders against an open exchange of information regarding safety challenges and solutions. Based on the lessons learned during the project, the way forward is to focus on understanding human error as a symptom of an organizational problem.

By affecting the factors influencing human behaviour, the likelihood of human error can be minimized. In particular, the ability to understanding the complex chain of events that may lead to a major accident is essential for mitigating risk.

But there are external factors as well. For example, oversensitive alarm systems on board can make it difficult for the crew to distinguish between important and less important alarms. Better rules and equipment are needed to support decision-making on the bridge. As a result of the JIP's work, the challenges related to alarm system design were presented at Kystverket's e-navigation conference in Oslo in June 2014, and DNV GL and the Oslo School of Architecture and Design (AHO) are jointly discussing solutions with industry partners.

While the immediate effect of this project on the frequency of accidents may be difficult to assess, it became clear that current technology and procedures must be optimized to enhance people's ability to adjust, prioritize and make decisions while providing tolerance for human error and helping people learn from mistakes. **OG/TR**

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EVENTS & EXHIBITIONS

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conferences and exhibitions.

Nor-Shipping, the leading maritime event week, opens its doors from 2 to 5 June in Oslo, Norway.

16. – 19.03.15
Cruise Shipping Miami
Miami, USA

23. – 25.03.15
CMA Shipping
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24. – 26.03.15
Intermodal Asia
Shanghai, CN

07. – 09.04.15
Intermodal South America
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21. – 23.04.15
Sea Asia
Singapore, SG

04. – 07.05.15
OTC
Houston, USA

19. – 21.05.15
IMDEX Asia, International Maritime Defence Exhibition & Conference
Singapore, SG

19. – 22.05.15
INTERTANKO Annual Event
Athens, GR

02. – 04.06.15
Maritime Industry
Gorinchem, NL

02. – 05.06.15
Nor-Shipping
Oslo, NO

11. – 13.08.15
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Rio de Janeiro, BR

07. – 09.09.15
BALTEXPO International Maritime Exhibition
Gdansk, PL

08. – 11.09.15
SPE Offshore Europe
Aberdeen, GB

20. – 22.09.15
Intermodal Expo 2015
Fort Lauderdale, USA

22. – 25.09.15
NEVA 2015
St Petersburg, RUS

23. – 25.09.15
INMEX-SMM India
Mumbai, IN

23. – 26.09.15
Monaco Yacht Show
Monaco, MC

03. – 07.10.15
Interferry Conference
Copenhagen, DK

05. – 07.10.15
Seatrade Offshore Marine & Workboats
Abu Dhabi, UAE

06. – 08.10.15
PACIFIC 2015: International Maritime Exposition
Sydney, AUS

20. – 23.10.15
Kormarine 2015
Busan, KR

27. – 30.10.15
Gastech
Singapore, SG

03. – 06.11.15
EUROPORT – exhibition for maritime technology
Rotterdam, NL

03. – 07.11.15
World Marine Conference, SNAME
Providence, USA

04. – 07.11.15
Marine Indonesia
Jakarta, ID

06.11.15
Eisbeinessen
Hamburg, DE

17. – 19.11.15
Intermodal Europe
Hamburg, DE

01. – 03.12.15
International WorkBoat Show 2015
New Orleans, USA

01. – 04.12.15
Marintec China 2015
Shanghai, CN

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IMPRINT

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