ISSUE 01 • 2011
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GL

Dear Readers,

Erik van der Noordaa

THE EFFECTS of the global financial and economic crisis are still noticeable in the shipping sector. However, the industry is now viewing the future with more optimism – even if the floods in Australia and the catastrophe in Japan caused setbacks in certain market segments.

EFFICIENCY AND ECOLOGY remain the definitive parameters in the world of shipping. Small wonder that these issues are top of the agenda at Nor-Shipping, the leading trade meeting venue near Oslo. One of the main prerequisites for reliable and cost-effective operation is the integrity of ship and machinery. Innovative solutions for maintenance management, as offered to customers by Germanischer Lloyd, generate real added value for shipowners and crews. For instance, GL HullManager can be used to monitor and assess the hull condition and to provide documentation over the entire lifecycle. GL MachineryManager helps to achieve continuous supervision of the engine condition and minimise the scope of maintenance work. In this field, GL is cooperating closely with manufacturers and suppliers, such as the Swedish bearing specialist SKF. The bottom line: reduced downtime and lower maintenance costs.

THE HOT TOPIC is still fuel consumption. Stricter environmental regulations and rising oil prices have increased the need for action once again. Here too, GL is a technology leader acting in the interests of its customers worldwide: after the operational parameters such as speed, displacement and water depth have been entered, GL ECO-Assistant calculates the optimum dynamic trim of a ship. And, on the basis of wave and weather forecasts, GL SeaScout shows the ship's officers the best route to their destination. The result is an immediate reduction in fuel consumption – without any modifications to the ship. Just how much adapting the hull can yield is demonstrated by the GL subsidiary FutureShip – the benefits of optimising the ship design from a hydrodynamic viewpoint are indeed impressive.

THESE ARE JUST A FEW EXAMPLES of how GL as a classification society and integrated consultancy can give its customers valuable tools for boosting the efficiency and competitiveness of their fleets. In this issue of *nonstop*, you will find many more helpful articles about these topics.

The eye of the financial storm seems to have passed, but the challenges remain: only companies that are well positioned and keep a straight course will continue to pass safely through these difficult waters. We at Germanischer Lloyd will always be there to guide and assist you!

Erik van der Noordaa
Chairman of the Executive Board
Germanischer Lloyd SE

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know-how

technology

Photo: Peter Andryszak

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safety

extra

standards

Cover Photo: Peter Andryszak


www.beluga-hochtief-offshore.com

Photo: BELUGA HOCHTIEF

Four-Legged Force

"Innovation" – the name says it all. This newbuilding, ordered by Beluga Hochtief Offshore from the Crist shipyard in Gdańsk, makes it possible to transport and install components for offshore wind turbines in a particularly efficient way. Thanks to its four jack-up legs with a lift capacity totalling 8,000 tonnes, the ship can operate at water depths of 50 metres and wave heights of up to two metres. GL is supporting this innovative project with its offshore expertise.

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news

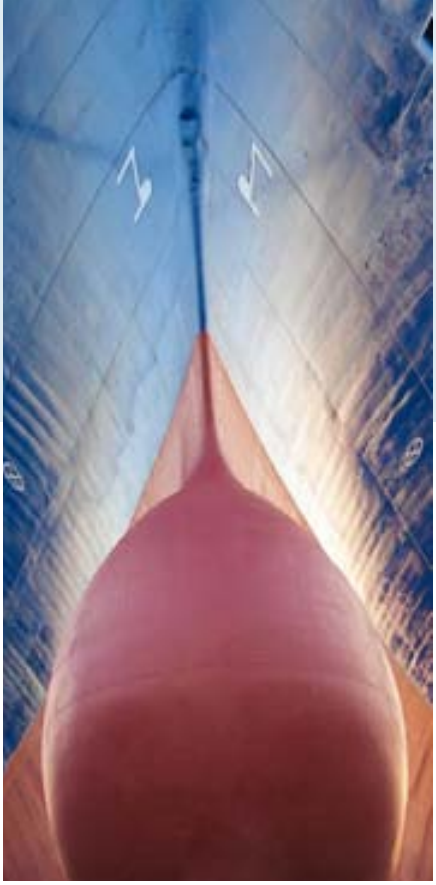

Photo: Dreamstime/ Viceandvirtue

INTEGRITY. Ships must have a GL-approved comprehensive planned maintenance system for the hull.

AUTHORISATION

Panama Flag Accepts GL's Extended Dry Docking Programme

THE PANAMA MARITIME AUTHORITY has authorised GL to offer its extended dry docking (EDD) programme for vessels under the flag of Panama. The flag of Panama acknowledges the technological advancements enabling environmentally safe in-water inspections and maintenance and bringing about improvements in corrosion-resistant materials, including the endurance and effectiveness of coating technology.

The EDD scheme offers shipowners and ship operators the option to extend normal dry docking intervals by 2.5 years. It concentrates on newbuildings and young container vessels, general cargo and multipurpose vessels. The first five-year class renewal dry docking has been replaced with in-water surveys at 2.5-year and five-year intervals, with the first dry docking taking place after 7.5 years. The sequence continues until a second dry docking is performed when the vessel is 15 years old, after which the docking schedule reverts to the normal schedule.

Shipowners who implement the current technological options can take advantage of this without undermining quality or safety. As well as the obvious savings in docking costs, other benefits for shipowners include reduced off-hire periods and more flexible options for arranging inspections and meeting charter party requirements.

Entry requirements include flag state programme approval and class notation IW (in-water). All ships participating in the EDD programme must have a GL-approved comprehensive planned maintenance system for the hull as well as for machinery. In addition, the ship must be fitted with a shaft bearing and sealing system of approved design and regular monitoring procedures must be implemented.

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CHRISTENING. Franz and Heidi Beckenbauer.

CLASSIFICATION

"E.R. Bayern" 7,000th Ship with GL Class

GERMANISCHER LLOYD (GL) HAS REACHED another milestone in its continuous growth strategy. On 31. March 2011, 7,091 vessels with a total gross tonnage (GT) of 96 million tonnes were under the regular technical supervision of GL.

The ship crossing the 7,000-ship yardstick last autumn was the Capesize bulk carrier "E.R. Bayern" of German owner E.R. Schiffahrt. This was a milestone in the history of GL. In only three years, GL's fleet has grown by 20 million GT.

The 93,186 GT Capesize bulk carrier "E.R. Bayern" was built by Hyundai Heavy Industries in South Korea. The 292 m long, 45 m wide ship flies the Liberian flag. The next advised goal is the 100 million GT mark.

WEBSITE. In German, English, Chinese – and now in Korean.

LAUNCH

Korean Website

FOR NEARLY 35 YEARS GL HAS used its technical expertise and knowledge to serve the Korean shipbuilding community. A recently launched Korean language sub-site hopes to further strengthen that connection by providing clients in Korea with the latest updates on GL's classification and maritime services.

GL opened its first Korean office in Busan in 1977. Today, a total of 149 staff members work for GL Korea, including surveyors and plan approvers, offering services focused on newbuildings, classification, maritime systems and components, fleet in services and maritime solutions. The new Website serves as a platform to showcase GL's major maritime services.

www.gl-group.com/kr

MARITIME SOFTWARE

Aegean Bunkering: 52 Vessels will be Equipped

IN ORDER TO IMPROVE THEIR STRATEGIC and operational ship management activities, Greek oil and shipping company Aegean Bunkering Services decided to implement GL's fleet management software suite GL ShipManager and GL FleetAnalyzer.

GL's software unit GL Maritime Software will provide its integrated ship/fleet management software for 52 vessels of Aegean Bunkering's fleet. Aegean Bunkering will install the Technical Management and Procurement System modules of the GL ShipManager suite in their offices and on board their vessels. The modules will enable the company to manage their tasks more time and cost-effectively, provide increased transparency of all vessel data and help to keep operations in line with industry requirements such as ISM and TMSA. With the addition of GL FleetAnalyzer, powerful reporting and analysis of the entire fleet is possible.

FLEET MANAGEMENT. Better results due to GL software solutions.

Aegean Bunkering is part of Aegean Marine Petroleum Network Inc., a leading international marine fuel logistics company. Aegean Bunkering owns and operates one of the largest double-hull bunkering fleets in the world.

GL has certified the company's commitment to environmental management in accordance with the international ISO 14001:2004 standard.

SHIP DESIGN

Containership Optimisation Yields Significant Fuel Savings

THE LINES OF A 9,000 TEU CONTAINERSHIP series were significantly improved in a joint venture with the Chinese design office Maric and GL's subsidiary FutureShip. Shipowners Schulte Group (Germany) and Costamare Inc. (Greece) requested the design review in order to optimise the vessel's efficiency.

As a result, a smaller-than-anticipated main engine could be installed. Fuel consumption was reduced by more than ten per cent and CO_2 emissions cut by more than 90 tonnes per day. FutureShip's optimisation procedure generated 15,000 different hull designs and numerically evaluated them based on computational fluid dynamics, where the flow around the ship is simulated to determine the required propulsion power. The optimisation expenses for the series of six ships will be amortised within the first few days of operation. The containership series will be built in China: delivery of the first ship is scheduled for 2013.

PROGRESS. Optimising of the ship design will help to cut CO_2 emissions by more than 90 tonnes per day.

Competitive Attitude

Govert Jan van Oord is Managing Director of Acta Marine, a renowned provider of tug and workboat services. *nonstop* spoke with van Oord about his business, the market and the prospects for the future

NONSTOP: Mr van Oord, what is it like to run a company so highly specialised in small, purpose-built vessels?

VAN OORD: We are a typical specialised niche player in the maritime industry. It is a niche that fits us well. Our vision is to remain focused on this niche regardless of outside opportunities. You see, there is a certain temptation to deviate from the core disciplines that are our strengths. We like to live the entrepreneurial spirit and move forward, but we firmly believe we should stick with what we do best. There are many projects in many different regions requiring the use of very small craft. This is our vocation.

Managing a fleet of small boats is a challenge, especially when they are deployed in regions as far away as West Africa or the Caspian Sea. Small boats generate comparatively small returns so the supply chain and the logistics have to be very efficient. We very much depend on our clients, a fact that brings about certain challenges, as well. We generate about 80 per cent of our turnover with seven clients.

NONSTOP: How do you protect your vessels against piracy and other risks?

VAN OORD: First of all, we select our clients very carefully. We only work for international contractors who take good care of their own people and equipment. We check their safety record up front, and we evaluate the risks involved in each and every project. Of course there must be adequate insurance coverage, and we must operate in a responsible manner to keep our own people out of trouble. Sometimes it is necessary to take additional measures, such as hiring a local agency or security specialists to protect an operation. Security is also a matter of instinct. You have to trust your gut feeling. If an assignment doesn't feel right in some way we don't accept it. I have to admit our company has been doing well enough to say no whenever the risk associated with a job seemed too high for us. Luckily we have never encountered any serious problems.

NONSTOP: How do you assess risk levels?

VAN OORD: There are different types of risk and different ways of mitigating them: evaluating the accident risk level, performing a risk assessment, conducting a business risk analysis that includes questions such as: Who is the client? Can he pay? Will he pay? Is it a short-term contract or rather a long-term one? Are there any geopolitical challenges involved?

There has to be a level of trust. The reliability of the charterer is important. We have never had any legal difficulties with our charterers. We foster long-lasting relations with our clients by providing the service level they expect. Loyalty in both directions is key. We would not let a long-term customer down just because we can get a better charter next door. Our business model relies on a long-term perspective; and, as a family-owned business, we can afford to take that position.

NONSTOP: How did you survive the economic and financial crisis?

VAN OORD: The crisis did not really hit us. Our workboats were on charter. There were many infrastructure projects worldwide, such as in the Middle East. We have been involved in the Nord Stream pipeline project from Russia to Germany in the Baltic Sea, and in the JadeWeserPort as well as the Marks Flake port expansion project in Rotterdam.

Apart from these infrastructure-related projects it is the need for energy that drives our business. There has been healthy investment in offshore renewable projects which require many workboats. In fact, 2009 and 2010 have been the best years for Acta Marine so far. We grew healthily and seized the opportunity to modernise the company, streamline our processes and introduce a new management system.

What we did see was a certain slowdown. Two years ago we had a greater number of two-year charter contracts. Today, charters are typically limited to less than one year. This might be a sign that there is some overcapacity in the market. Clients have more choice and can pick whom they like best. In the end it is a question of the quality you are able to provide. We always make sure we fulfil the clients' expectations. Our motto is: "We deliver what we promise."

NONSTOP: How do you maintain your competitive edge?

VAN OORD: First of all, we make sure our workboats are in class, well maintained, suffer no breakdowns and meet the environmental requirements. We ensure the professionalism of the crews in handling the given tasks and operating the vessel. Projects can be very different, and our crews have to be flexible, ready to adjust to the requirements of the project, and improve the overall performance.

We train our crews on board. Acta Marine has plenty of experience to offer, which translates into value-added services for our clients. Training typically works like this: First we check the trainee's records, then we train them on the job, monitoring progress from our personnel office. Nobody is good at everything, and tasks vary depending on the vessel type. We are large enough to offer everything, and small enough to know our crews very well so we can assign specific jobs to specific individuals. We try to put everyone where they perform best, because if one of our crew members fails, we fail.

NONSTOP: How many employees do you have?

VAN OORD: 100 on our own payroll and 100 through crewing agents. Besides the majority of our Dutch seafarers, our staff hail from Indonesia and the Baltic states, much like in other parts of the shipping world. We believe in holding on to good people and investing in our crews, because it will make them want to be part of us. We try to keep a crew on the same vessel or group of vessels for as long as possi- ▷

NICHE PLAYER. Govert Jan van Oord is Managing Director at the independent maritime service provider Acta Marine in Den Helder.

PHILOSOPHY. Manpower is essential. "We are large enough to offer everything, and small enough to know our crews very well so we can assign specific jobs to specific individuals," says van Oord.

Photos: Acta Marine

▷ ble. Long-term contracts make it easier to achieve this. You also need to have a strong shore-based organisation to support the crews.

NONSTOP: How do you deal with technical breakdowns?

VAN OORD: Our technical department with its engineering helpdesk always keeps in touch with our crews. If a crew has a mechanical problem or breakdown they call us, and we try to guide them through the repair process. We have a special component numbering system and keep pictures of each and every machine in our online application so our technical staff can access this information from all over the world. If necessary, our technicians are ready to fly out at any time to solve a problem directly. We also maintain good relations with our clients so we can ask for their help when something goes wrong. Then, when the problem has been solved, I always analyse the causes and enter the results into our management system.

NONSTOP: So you have an assessment of what went wrong?

VAN OORD: Precisely. Learning is essential. It is important to take time for an evaluation of the root causes of an incident so we can prevent it from happening again.

NONSTOP: How about your growth plans?

VAN OORD: We want to continue growing without compromising quality. Mergers have helped us, and we integrated the operating companies we acquired to have one consistent brand, one profile and one management. An organisation has to be ready structurally to cope with the workload and new challenges.

When we were a smaller company, everybody knew everything and everybody else. But we have evolved considerably, and I have to admit that I am no longer able to remember all the details about every one of our 40-some vessels. Expanding meant we needed to delegate certain tasks and responsibilities and invest in adequate systems. We had a lot to learn as our company grew bigger. Thanks to our investment we also grew in revenues and have more, larger and better vessels now.

NONSTOP: You mentioned your new management application. Did you have it implemented by an IT services provider?

VAN OORD: The new management ICT application was custom-designed for us. It is a web-based application, so our staff can always access the latest status on our projects and vessels, wherever they are in the world. The development and implementation was a joint effort of our own IT staff and an external firm.

Of equal importance was the development of our new quality management system. GL performed the ISO 9001:2008 certification for us and frequently provided guidance and advice during the development. GL understands our business and the typical challenges of a shipowner and operator.

We want to continue growing without compromising quality.

GOVERT JAN VAN OORD
Managing Director, Acta Marine

NONSTOP: How is the offshore wind market changing your business?

VAN OORD: Nowadays clients have long checklists and orders, feedbacks, etc. Offshore wind is big business at the moment in Europe. The challenge for our type of work has been that it is not very clearly regulated: firstly, there are no industry standards on what is required and secondly, wind farms tend to go further and further offshore. That means that small workboats are no longer sufficient; we need larger construction and support units. The vessels now under construction will receive proper classification as offshore support vessels.

NONSTOP: Looking at the future, what might be topics of a discussion five or ten years from now?

VAN OORD: The internationalisation of our company is definitely a long-term topic. We would like to continue growing, maybe by setting up hubs or partnering with local companies. There are many market opportunities outside of Europe. The best opportunities in the emerging markets are more or less closed so we need local partners.

Regulation and labour will always be major topics. Another issue is the ILO's Marine Labour Convention MLC 2006. It has an unfavourable side effect on us, because our vessels typically operate from a base port. For our 24-hour service, we have always two alternating crews who stay in a hotel rather than on board. This results in many restrictions for us, because in EU territory, only EU staff is allowed. These restrictions can be difficult to handle, because they affect our flexibility. On the other hand, the internationalisation of the market leads to internationalisation of the crews and the company itself.

We also want to make sure our internal organisation will be ready for the challenges of the future. Financially we are very healthy, and we have the right size to tackle more complex problems. ■ **OM**

ACTA MARINE

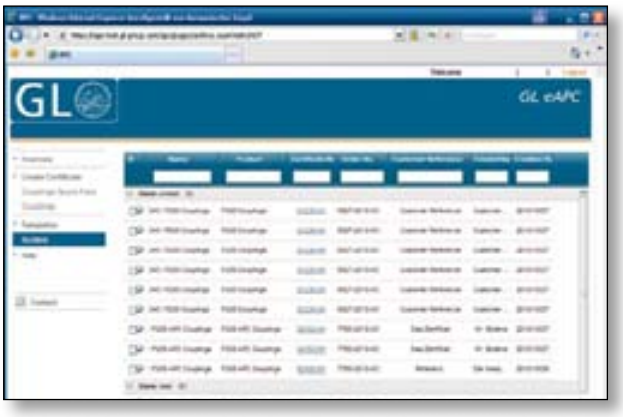
Company Profile

Acta Marine is an independent maritime services provider. It owns and operates more than 40 workboats for coastal waters. A substantial number of these workboats have an operating draft of less than 1.5 metres. As such, ultra-shallow-water projects are a unique specialty of Acta Marine. Furthermore, Acta Marine has a 50% interest in Coastal Carriers, a company that owns offshore pontoons. Vessels and crews are at work all around the world, mainly on projects in the dredging and marine construction and offshore energy industries.

WORKBOAT. The Dutch are specialised in shallow-water projects.

Acta Marine was formed in 2005 when predecessors Rederij Waterweg and Van Stee Survey and Supply joined forces. In 2010 Acta Marine became the single trade name for all activities.

TRACTION. The supplier from Uetersen, Germany, is specialised in the manufacture of high-performance winches.



TRANSFORMATION. The data acquisition system of HATLAPA is being prepared for the integration of the "GL eAPC" online tool.

One Hundred Times a Proven Alternative

Test it yourself: GL's Alternative Product Certification (APC) accelerates the inspection processes at the customer's works. Marine equipment supplier HATLAPA is the 100th user

The inspection of materials, parts and components is one of the core competencies of a classification society. Certification of a specified product quality is essential for the manufacturers of components and systems, as well as for shipping companies and yards, to ensure reliable and safe ship operation. In addition to the direct certification of products, Germanischer Lloyd also offers its customers an alternative route to product certification.

This "Alternative Product Certification" (APC) for maritime components, which was presented by GL to its customers in the supply industry for the first time two years ago, is enjoying increasing acceptance. With this procedure, the manufacturing facility is included in the testing of its own products and in the documentation of the test certificates, under observance of the relevant GL guidelines.

Following the introduction of this procedure in 2008, one hundred European, Japanese and Korean companies have decided to implement this modular certification system. Customer number 100 is the firm "HATLAPA Uetersener Maschinenfabrik GmbH & Co. KG". For over 90 years, the company has been active as a manufacturer of marine components; it will now be producing and testing its air compressors in accordance with the APC methodology.

Starting with Compressors

"APC offers us many economic benefits. The lead times of our products are reduced, we can offer faster delivery of short-notice orders, and we achieve better utilisation of the test-bench resources," reports Hans-Peter Lange, Quality Manager at HATLAPA. At present, only the HATLAPA starter compressors are being certified in this way, but Lange confirms that more products are to follow.

Since January 2011, manufacturers have also been able to optimise their certification processes further by means of the "GL eAPC" online tool. In the pilot phase of the system, users were impressed by the simple web interface. The throughput times have been reduced once again, because the data is sent directly to GL. This ensures faster and more

PRODUCTION. The company's main facility produces steering gear, compressors and deck machinery.

PRESENTATION. Hans-Peter Lange and Kay Nolte (HATLAPA) receive APC approval from Ulf Würdemann and Tobias Neumann-Overholthaus (GL).

efficient issuing of the certificates. Predefined templates, and the possibility of using existing certificates as templates, shorten the time needed to enter the information. In addition, "GL eAPC" contains an archive of all the customer's APC certificates, and these can be accessed on the GL server at any time. "We are not using the electronic version of APC yet, but technical steps have been taken for electronic data acquisition within our company to make sure that this will be possible in future," adds Hans-Peter Lange.

For the makers of components, parts and materials, the modular structure of the test procedure permits great flexibility in terms of the certification depth as well as cost reductions through the shorter lead times. On the basis of a document review and a quality audit by Germanischer Lloyd, the manufacturing processes are examined and the optimisation potential is identified. The basis for approval is given by the GL Guidelines for the Inspection of Mechanical and Electrotechnical Engineering Products. After the initial approval, the procedures agreed upon with GL are monitored continuously through regular audits. ■ **SG**

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PROFILE

Anchor Winches and More

Established in 1919, the family-run company HATLAPA produces all kinds of compressors, steering gear and deck machinery for the shipbuilding industry at its head office in Uetersen near Hamburg – such as the unique double-drum towing winch for the rescue tug "Nordic" (see page 26). Parts of the large steering gear systems are manufactured directly in South Korea, where HATLAPA has its own factory with a workforce of 45.

The company is managed by its two partners – Dr Alexander Nürnberg and Jörg Tollmien – and employs 400 permanent staff and 40 trainees.

Photos: Hatlapa

On Course for MLC, 2006 Implementation

The upcoming Maritime Labour Convention, 2006 is a challenge to the entire maritime community. At the GL Academy, experts are on hand to explain the implications and consequences

The Maritime Labour Convention, 2006 (MLC, 2006) is nearing implementation. According to the latest information the new convention is expected to enter into force approximately by the end of 2012.

Until then, some 55,000 seagoing vessels from 500 GT on upwards – excluding traditional, navy and fishing vessels – will have to obtain certification to ensure compliance with the international requirements for the working and living conditions of seafarers. Ships will be obligated to carry a Maritime Labour Certificate and a Declaration of Maritime Labour Compliance documenting how the shipowner has implemented the relevant national regulations based on MLC, 2006.

The GL Academy's Implementation Workshop – ILO Maritime Labour Convention held by Jörg Schwinning, master mariner and long-time corporate maritime consultant, informs industry representatives about the implications and requirements of the MLC. Besides covering the basic concepts of the ILO MLC, 2006, the workshop familiarises the participants with the practical implementation, providing detailed information on the consequences of the convention for crews, ship managers and crewing agents.

Particular attention is paid to those areas of the Maritime Labour Convention, 2006 that are to be transposed into national law by all flag states that are members of the

Photo: Eberhard Petzold/fotodock.de

BACKGROUND

The Appendices To the Convention: Two Important Documents

The appendices to the convention include two sample documents: a Maritime Labour Certificate and a Declaration of Maritime Labour Compliance (DMLC). The certificate will be issued by the flag state (or a Recognized Organization authorised to carry out inspections) to any ship flying its flag once the flag state itself or the RO has verified that the labour conditions on board comply with the national laws and regulations implementing the convention. Certificates will be valid for five years subject to periodic inspections.

The declaration is attached to the certificate. Part I, drawn up by the competent authority (flag state), summarises the national laws and/or regulations that implement the list of 14 basic criteria derived from the MLC standards. Part II, drawn up by the shipowner or the ship manager responsible for the operation of the ship, outlines the measures taken to ensure that the national requirements stipulating the implementation of the convention will be adhered to on board between inspections. The list of 14 mandatory inspection areas to be checked at foreign ports whenever an inspection occurs can be found in the appendices to the convention. Compliance with the mandatory conditions must be confirmed by the flag state for the ship to retain its certification.

ILO. The two-day GL Academy workshop also provides participants with opportunities to exchange ideas and discuss controversial issues.

Compliance and Enforcement

Among the topics addressed by attendees of MLC workshops held to date were the provisions on liability and compensation for claims of death, personal injury and abandonment of seamen. The cruise ship sector has special concerns in this respect because the convention uses a very broad definition of the term "seafarer", one that extends to all types of staff working on ships. In other words, the convention applies not only to seamen but also to staff working in non-maritime on-board functions such as hospitality and catering. Mr Schwinning emphasises that inspections always focus on the individual ship; there are no onshore office visits required. Inspectors are to verify that conditions on board conform to the convention and the relevant national requirements of the respective flag state. This is done by collecting evidence through interviews, examinations, tests and inquiries. An inspector may require corrective action for any non-conformances found.

"The comprehensive enforcement and compliance system established by the convention is based on cooperation ▷

Photo: Fotolia/Carabay

WORKER PROTECTION. "Seafarers have human rights too" was the headline of a commentary on the International Labour Organization (ILO) convention when it was passed.

STRUCTURE. *The MLC, 2006 comprises three separate, yet interrelated parts: the articles, the regulations and the code. The articles and regulations comprise the core rights and principles as well as the basic obligations of ILO members ratifying the convention. The code contains details for the implementation of the Regulations, consisting of Part A (mandatory standards) and Part B (non-mandatory guidelines).*

▷ among all ratifying states," Mr Schwinning emphasises. "It is designed to enhance compliance by operators and ship-owners while strengthening the enforcement of standards through mechanisms engaging all levels." The convention contains provisions for matters such as:

- On-board and onshore complaint procedures for seafarers
- Supervision of conditions on ships by their ship-owners and shipmasters
- The jurisdiction of flag states and their control over their ships
- Port State inspections of foreign ships.

Drawn up by the ILO through the tripartite efforts of representatives of shipowners, governments and seafarers, the MLC, 2006 defines a uniform standard for the working and living conditions of seafarers. Furthermore, it endeavours to create fair competitive conditions for shipowners while giving individual countries a certain flexibility in implementing the guidelines.

Benefits for Ratifying Countries

No ship will be at a disadvantage because its country has ratified the MLC, 2006. In fact, the convention contains a "no more favourable treatment clause" stipulating that ships from all countries, irrespective of their ratification status, will be subject to inspection in any country that has ratified the Convention, and to possible detention if found to be non-compliant with the minimum standards of MLC, 2006. On the other hand, ships from ratifying countries will benefit from a certification system that avoids or reduces the likelihood of lengthy delays caused by inspections in foreign ports. The DMLC and ML Certificate are prima facie evidence of compliance but nevertheless any ship, even a certified vessel, can be subject to a port state control inspection if clear grounds exist. Non-certified vessels, on the other hand, can be inspected at each single port.

No Universal Interpretation

It is the responsibility of the ratifying member states to ensure global implementation and enforcement. While most flag states will likely delegate the inspection and certification duties to Recognized Organizations (ROs), the ultimate responsibility remains with the respective flag state. Mr Schwinning points out that there is no universal interpretation of MLC, 2006. Rather, it is up to each signatory country to transpose the MLC, 2006 requirements into national law, thereby establishing its own interpretation and form of implementation.

The flexibility provided for by MLC, 2006 will therefore result in a certain variety of interpretations by flag states. Flag state administrations can resort to guidelines specifically developed to help them implement their ship inspection and certification duties under MLC, 2006. ■ **NL**

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Ballast Water How-to

In advance of a new IMO convention, GL has published a model booklet for effective ballast water management

A booklet providing standard operational guidance for the planning and management of ballast water and sediments was recently released by Germanischer Lloyd. The 129-page publication describes safe procedures for handling ballast water in accordance with international as well as regional regulations. Special attention is given to ballast water treatment procedures and safety issues as more and more vessels are equipped with treatment systems.

Ballast water is essential for the safe and efficient operation of ships, controlling the trim, draft and stability of the ship as well as the stresses it must withstand. However, aquatic organisms and pathogens contained in ballast water are potential hazards to human health, property, resources and the environment as well as a threat to biodiversity.

The International Maritime Organization (IMO) has responded to these hazards by introducing its Guidelines for ballast water management plans (MEPC Res.127(53)) and the control and management of ballast water (IMO Res.A.868(20)), along with its "International Convention for the Control and Management of Ships' Ballast Water and Sediments". The convention will become effective twelve months after ratification by 30 states representing 35 per cent of the total world merchant shipping tonnage. Several states have already established national standards on ballast water exchange procedures and have specified the necessary documentation based on the convention.

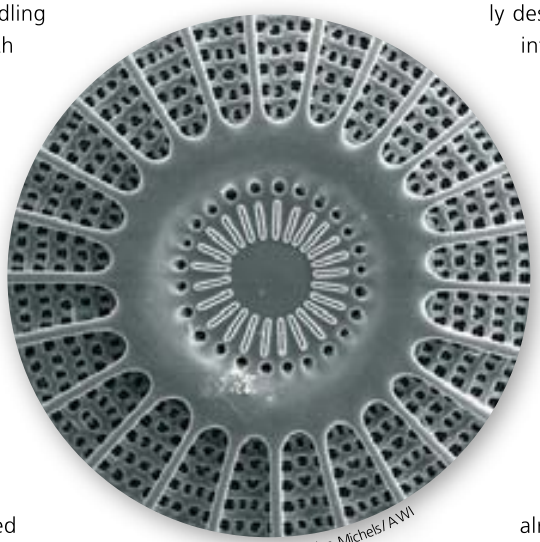

Photo: Jan Michels/AWI

DISPERSAL. *Ship ballast water is believed to be responsible for global dispersal of alien biota. Diatoms are among the most abundant biotic components.*

Guidance to Ship-owners and Operators

GL's updated Model Booklet for Ballast Water Management offers guidance to shipowners and operators in developing ballast water management (BWM) Plans. The purpose of a BWM plan is to minimise the risk of transferring unwanted organisms into the environment when discharging ballast water. A BWM Plan must be carefully designed for the particular ship it is intended for. The booklet therefore aids operators in custom-tailoring a BWM plan to suit each vessel's particular outfit and capability. It also instructs them how to update the plan once a ballast water treatment plant has been installed.

The Booklet details treatment procedures and covers various methods of exchanging ballast water, including the sequential, flow-through and dilution methods. A new section addresses vessels already equipped with ballast water treatment systems. The content and level of detail of this Model Booklet have been matched to the requirements for the GL Ballast Water Management class notation "BWM". It goes beyond the minimum "plan approval only" standard which is sufficient for compliance with the IMO requirements. ■ **SG**

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The Engine of Progress

125 years of motor shipping: from humble beginnings to completely replacing of the steam engine

APPRECIATION. Stamp with the likeness of Nicolaus August Otto.

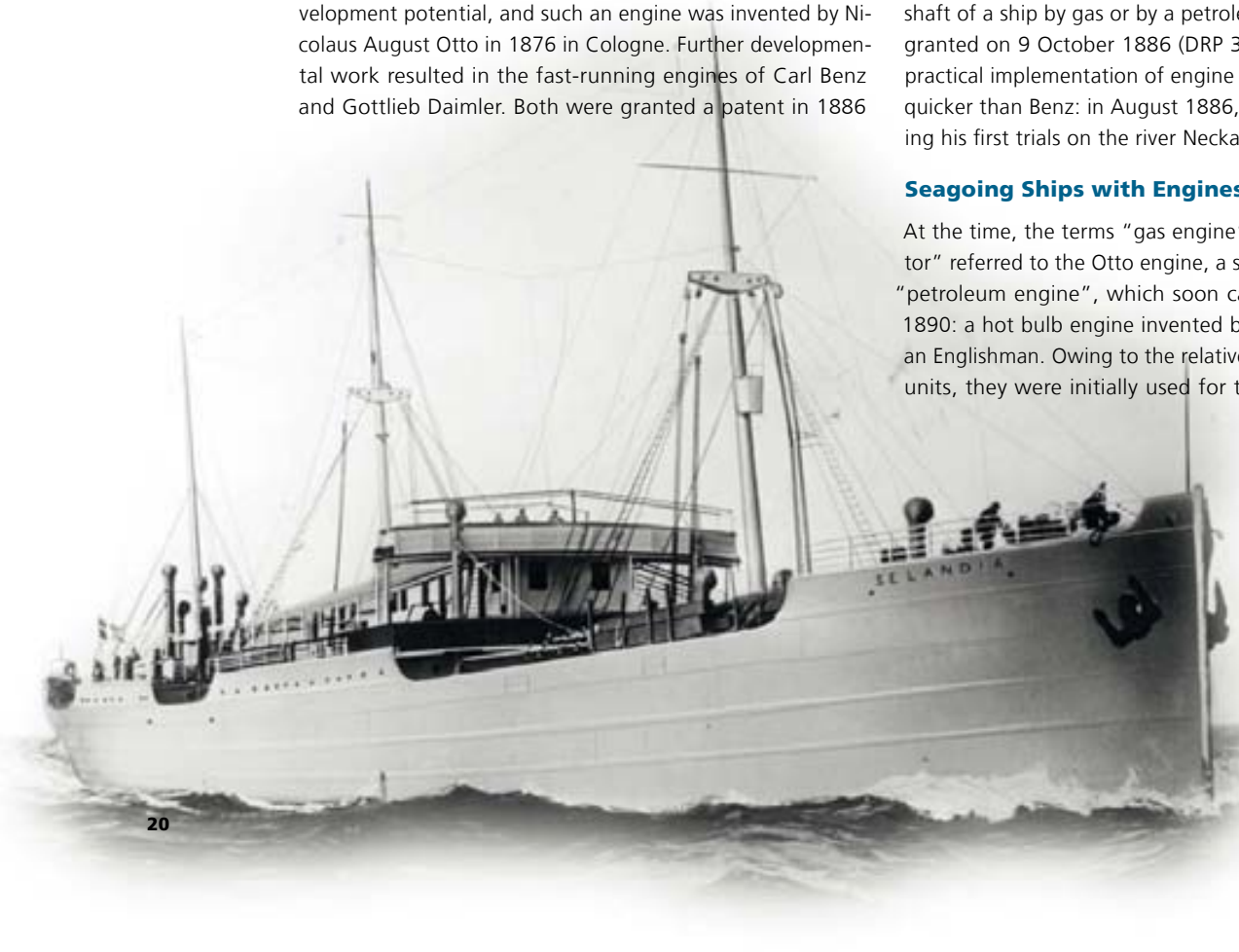
Hand, wind, steam and motor power: the four basic types of marine propulsion are familiar to all maritime experts. Exactly when the combustion engine was first used for ship propulsion is, however, largely unknown. This is not particularly surprising, seeing that it took more than 50 years for the diesel engine to finally replace the steam engine. The diesel engine was not the forerunner in the history of motorised shipping, as is wrongly stated in various sources; this was in fact the Otto engine.

The decisive factor for the success of the combustion engine as a marine drive was finding a motor type with development potential, and such an engine was invented by Nicolaus August Otto in 1876 in Cologne. Further developmental work resulted in the fast-running engines of Carl Benz and Gottlieb Daimler. Both were granted a patent in 1886 with a direct reference to their use for ship propulsion. The specification of Deutsches Reichspatent DRP 37435 "Automobile fuelled by gas", issued to Benz & Cie. on 29 January 1886, states: "This construction is intended for the operation mainly of light carriages and small boats, such as those used to carry 1 to 4 persons." One year later, Benz was already building ship drives, thus establishing a tradition in the city of Mannheim.

While the Benz patent was generally directed at powering road vehicles, Gottlieb Daimler soon afterwards applied for a patent describing a "device for driving the propeller shaft of a ship by gas or by a petroleum engine", which was granted on 9 October 1886 (DRP 39367). In respect of the practical implementation of engine technology, Daimler was quicker than Benz: in August 1886, he was already conducting his first trials on the river Neckar.

Seagoing Ships with Engines

At the time, the terms "gas engine" and "gas-powered motor" referred to the Otto engine, a spark ignition device. The "petroleum engine", which soon came into use, was from 1890: a hot bulb engine invented by Herbert Akroyd Stuart, an Englishman. Owing to the relatively low power of the first units, they were initially used for the propulsion of inland



SEA TRIALS. A Benz boat with an Otto engine in the harbour of Mannheim.

PIONEER. The first seagoing motor vessel was the "Selandia" in 1912.

FOUNDATION STONE. The patent for Benz' motor car already mentioned the operation of small boats.

SULZER ENGINES. The "Monte Penedo" – the first merchantman built in Germany with a diesel engine.

waterway vessels. The hot bulb engines, which primarily operated in two-stroke mode, soon offered adequate power for small seagoing ships and proved reliable for fishing vessels and as an auxiliary drive for sailing ships. This type remained in use up until the 1930s.

During the transitional phase from the Otto to the diesel engine, efforts were made to find suitable alternative combustion processes over a period of more than two decades. Besides the hot bulb engine, a type developed by Jan Brons of the Netherlands may be regarded as the precursor of the antechamber engine. Using more advanced designs, the firm Gasmotoren-Fabrik Deutz equipped many fishing vessels and other small ships for several decades. Other methods were tried but did not lead to sustained success.

Produced from 1893 to 1897 at Maschinenfabrik Augsburg (which later became MAN) with considerable support from Heinrich von Buz and Friedrich Krupp in Essen, the diesel engine was first used for ship propulsion in 1903. Up to the "Selandia" in 1912, which is regarded as the first seagoing motor vessel, other manufacturers produced various marine diesel engines, primarily for inland waterway vessels, some also without a reversing facility. This led to the first diesel-electric transmission in 1904 with "Vandal", a Russian river tanker of 750 tonnes.

With his "rational heat engine" of 1893, Rudolf Diesel pursued the aim of developing a power plant to "supersede the steam engines and all known combustion engines". However, more than 60 years were to elapse from the birth of this grand idea up to full replacement of the steam engine in shipping. The first main prerequisite for ship operation at large output levels was the ability to reverse the running direction of the engines, which was achieved in 1910.

At the time, the propulsion plants employing diesel engines were still quite large and very heavy. Compressed air was used to blow the fuel into the combustion chamber. Here an air compressor was needed to achieve a much higher pressure for the air than was possible by the compression of the engines.

Breakthrough for the Diesel Engine

It was only the hydraulic injection of fuel developed by Motorenfabrik Deutz in 1921 for large engines that brought about decisive change. Marine diesel engines became lighter, smaller and could be operated at higher speeds. This leap in innovation also allowed the construction of much more powerful units. Another factor was that the structure of the marine diesel engine had, until then, primarily followed the steam engine. The engines produced by Burmeister & Wain in Copenhagen were exceptions to this rule. The application of the B&W design principles and hydraulic fuel injection gave the diesel engine its breakthrough as a marine drive.

The final step towards attaining diesel engines of high power, as used today, was taken by Alfred Büchi of Switzerland with the exhaust-driven turbocharger developed in 1905. When it then also became possible to produce powerful turbochargers, which were needed for operation with two-stroke diesel engines, the ambitious goal of Rudolf Diesel was ultimately achieved in the mid-1950s – and, even then, the development of the marine diesel engine still did not end there. ■ **HJR**

Photo: Mondhe

Chinese Cranes for Greece

North of Shanghai: GL Noble Denton is providing Chinese manufacturer ZPMC with quality assurance services at the for the production of gantry cranes bound for the port of Piraeus

CONTROL. As Project Manager at GL Noble Denton, David Chang is responsible for the inspection of the cranes.

Two hours' drive out of Shanghai, the public bus crosses over the mighty Yangtze River via the Jiangyin Bridge. From the crest of this three-kilometre colossus of steel and concrete, hundreds of tugs and barges can be seen struggling upstream against the flow of the Yangtze. On the far bank, there is Nantong, the first major city located north of Shanghai. Marked by ports, factories and shipyards, Nantong is home to seven million people. The best industrial locations are to be found directly on the Yangtze. This is where David Chang is heading.

Chang is "Manager Crane Technology" at the GL Noble Denton office in Shanghai. In the bustling industrial city of Nantong, he and his colleagues are supervising the building of the rail-mounted gantry cranes for the Greek port of Piraeus. The manufacturer is the firm "Shanghai Zhenhua Heavy Industries Co., Ltd", better known by the abbreviation ZPMC. In the office made available to GL by ZPMC, Chang exchanges his everyday clothing for the blue-grey work overall.

On the premises of ZPMC, more than a dozen cranes have already been assembled to such a degree that they are able to stand on their own four legs. Surrounding the assembly areas, various components lie ready: the stairway handrails, steps, ladders and prefabricated parts of the supporting structure. In the background, there are hangar-like halls in which the smaller components can be manufactured under protection from the elements. Between the cranes, men ride around on bicycles to their workstations.

Extensive Tests

The two cranes for Greece are almost finished and are now waiting, already painted a deep blue, for the inspection by David Chang and his colleagues. A heavy-lift vessel to take the cranes to Europe is berthed only a few hundred metres away. GL Noble Denton has been entrusted with comprehensive monitoring of the production on site – from material verification and a large number of intermediate inspections, right up to the last inspection before shipment. ▷

GIANT. The gantry cranes, already painted a deep blue, go through a comprehensive test programme.

ZPMC. *Shanghai Zhenhua Heavy Industries is the largest manufacturer of cranes and large steel structures in the world and has eight production bases located in Shanghai, Nantong and Jiangyin.*

▷ In addition, there is also the loading and final acceptance test before commissioning at the customer's premises, Piraeus Container Terminal S.A., a subsidiary of COSCO Pacific, which is one of the world's largest operators of container terminals.

A Big Player

The port of Piraeus is Greece's largest seaport and one of the top ten harbours in Europe. The crane supplier ZPMC is a leading manufacturer, not only within China. The company is specialised in the construction of heavy steel structures; according to the firm's information, ZPMC has a world market share of over 75 per cent. All around Shanghai, there are eight own factories covering a total area of 6,670 hectares and ten kilometres of own quays, five of which are suitable for oceangoing vessels. ZPMC has more than 30,000 employees, including some 2,000 engineers and technicians. Standing almost 38 metres high and 29 metres wide, the cranes for the port of Pi-

STS Cranes for Piraeus – Key Specifications

- **TYPE OF STRUCTURE:** ship-to-shore container crane
- **RATED CAPACITY:** under telescopic spreader: 65 t
- **TYPE OF CONTAINERS TO BE HANDLED:** 20'/40'/45'
- **RAIL GAUGE:** 30.5 m
- **OUTREACH:** 65 m
- **BACKREACH:** 22 m

Photos: Mondhe

SAFETY. A ship-to-shore container crane must transfer enormous loads in rapid succession. To protect people, goods and equipment from accidental damage, safe operation of the gantry must be guaranteed at all times.

The GL Noble Denton team of Crane Technology Manager David Chang gives the lifting gear a thorough examination in every phase of manufacture. This includes tests under real-life conditions.

raeus run on railway tracks. As Electric Surveyor, Mei Yi Yuan is still busy testing the function of the small auxiliary hoist next to the main winch: for the static test, the small crane – rated at three tonnes – must hold a load of 3.75 tonnes for several minutes. Later, in the dynamic test, the auxiliary crane will have to lift and lower a 3.1-tonne load up to the maximum lifting height. In total, the tests will take about half a day. Mei records all the measurements on his notepad.

Passed!

In the meantime, David Chang has climbed the walkways up to a height of 38 metres, when suddenly firework rockets shoot up into the sky and hundreds of crackers go off below his vantage point. Entire clouds of black powder swirl around Chang's head – the workers of ZPMC are celebrating the completion of the frame structure for a crane only a dozen metres away. Familiar with the noise and smoke, Chang carries on inspecting his own crane: he climbs into the cabin, where he has the operator's seat with the control joysticks and the glass floor under him, and then he examines the superstructure with the thick drum holding the steel cables.

Finally, he decides that all is well. The crane is able to leave the quay at ZPMC on time and on course for its final destination: Piraeus. There, a ZPMC employee is already waiting to commission the lifting gear. Once again, GL will also be on site to monitor this important last step.

GL Noble Denton is also involved in the further expansion of the container terminal in Piraeus: eight rail-mounted gantry cranes are already in operation, and three more ship-to-shore container cranes are to be handed over to the customer in September. ■ **MF**

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A Knight in Shining Armour

In cooperation with Germanischer Lloyd, P+S Werften has built the safest ocean rescue tug in the world: the "Nordic"

At the beginning of the year, Germany took delivery of what is probably the world's safest and most sophisticated emergency towing vessel (ETV). This unique powerhouse is called the "Nordic" and is normally positioned, ready for action day and night, north of the island of Norderney. In case of stormy weather, the tug weighs anchor and moves farther north, closer to the main shipping routes, so as to be ready to assist any ship that may be in distress in the German Bight. Every four weeks, the 16-man crew is relieved.

Classed by Germanischer Lloyd, the tug is a special design from mast top to keel. With a length of 78 metres and moulded beam of 16.4 metres, this purpose-built ship is specially equipped for rescuing disabled vessels. Two diesel engines, each with 20 cylinders, produce a total output of 17,200 kilowatts at maximum continuous rating. With a speed of about 19.5 knots (36 km/h), the "Nordic" can reach any distressed ship in the German Bight within two hours.

Thanks to a bollard pull of more than 200 tonnes, the ship offers the capability of towing even the largest cargo vessels. The primary instruments of salvage are the two main towing winches, each of which accommodates 1,200 metres of towline, 80 millimetres thick. A towing connection must be long, to ensure that the hanging cable can absorb the forces caused by the excessive relative movements of the ships in heavy seas. Two bow thrusters and one stern thruster give the ship its excellent manoeuvrability and station- ▷

CRISIS MANAGER. The "Nordic" is equipped with two power pumps capable of spraying a content of 1,200 m^3 an hour from a distance of 120 m.

Photo: Peter Andryszak


NORDIC

keeping ability. The key innovation of the ship, built by the P+S Werften facility in Wolgast (formerly Peene Werft), is its gas protection plan. The "Nordic" can also be deployed in hazardous atmospheric conditions, e.g. in the event of a tanker casualty with the cargo emitting noxious or flammable vapours. Unless the crew and vessel are specially protected, such accidents may make the rescue operations extremely difficult or impossible.

Overpressure against Toxic Gases

Since it is never possible to know exactly what substances may be set free in such cases, filter systems on board the rescue ship would not provide adequate safety. For the "Nordic", therefore, the concept of atmosphere-independent gas protected operation (GPO) was chosen. Under emergency conditions, clean air is continuously pumped into the interior spaces, leading to a slight overpressure which keeps out toxic gases. To achieve this pressurisation, vital areas are fitted with airlocks to create a closed "citadel" and the ship must carry a sufficient supply of compressed air in bottles, enough for up to 18 hours of operation.

However, the machinery must also be able to function within an environment containing flammable gases. Engines with special gas protection were already available, but not with the high performance required for the project. "MTU was the only manufacturer who could promise us timely development of a gas protected engine, due to their many years of experience in this specialised field," explains Carsten Wibel, project manager for "Coastal Protection" at the firm Bugsier. MTU took the strongest engine in its 8000 series – developing 8,600 kilowatts – and developed it into a propulsion unit offering gas protected operation – the MTU 20V8000 M71L GSB, certified according to the GL Rules I-1-12 for "Chemical Recovery Vessels".

The most important part of the propulsion plant is the ship automation system Callosum, which monitors the main and auxiliary engines and also controls the transition from the normal state to gas protected operation. In this protected mode, sensors monitor all critical areas with special predefined requirements. For example, the air temperature after compression must not be allowed to rise above 135 degrees Celsius. If this value is exceeded, a temperature alert is triggered, after which the engine is reduced to the power level

EMERGENCY. In the case of high amounts of toxic or gas emissions, the "Nordic" is switched to gas protection mode.

BOLLARD PULL. Two electrohydraulic winches of the german supplier Hatlapa are able to cope even with heavy vessels.

Photos: Peter Andryszak

permitted for gas protected operation. Intake air and exhaust gases are cooled. In addition, the system watches over the reliable firing of all cylinders, to ensure that no gas/air mixture passes unburnt into the exhaust system.

Flame Arrester and Fast-Closing Valve

Following extensive tests at the PTB (Physikalisch-Technische Bundesanstalt – the national metrology institute) in Brunswick, the engine was subjected to a conclusive test run lasting several days in Friedrichshafen, using a gas/air mixture containing about one per cent propane. "The trickiest point was to find out whether the electronic control unit is also able to govern the engine output in gas protected operation reliably and within a very short space of time if the engine draws in explosive gases together with its combustion air," explains Ralph Michael, who co-supervised the test run on behalf of GL.

The engine is additionally equipped with a flame arrester and emergency air shut-off flaps in the charge air duct. These quick-acting closures are activated should it become necessary to shut down the engine without delay. In this way, the air supply is cut off abruptly. The safety of this innovative engine demands a trade-off: to observe the compressor outlet temperature limit of 135 degrees Celsius, the output must be reduced from 8,600 kilowatts to 4,000 kilowatts in gas protected operation. The two auxiliary engines can also run in gas protected mode.

The "Nordic" is owned by Arbeitsgemeinschaft Küstenschutz (ARGE, see right). The new ETV is operated by Bugsier. When at its standby base, the "Nordic" falls under the responsibility of the Waterways and Shipping Office in Cuxhaven but, in the event of a ship accident, the Central Command for Maritime Emergencies takes over control, which then also covers the multi-purpose vessels "Mellum" and "Neuwerk". These tugboats also operate with engines in gas protected mode. ■ **HS**

ARGE.
A consortium of the tugboat and salvage companies Bugsier (Hamburg), Fairplay (Hamburg) and URAG Unterweser Reederei (Bremen), together with the helicopter service firm Wiking (Bremen/Mariensiel).

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Virtual Shipbuilding

How can the maritime industry make the most of the increasing benefits of virtual simulations? This and many other topics were addressed at the COMPIT conference in early May in Berlin

The 10th annual International Conference on Computer Applications and Information Technology in the Maritime Industries offered industry representatives and maritime computing experts an opportunity to network and learn about the latest trends in the industry.

Using advanced simulation technology to generate competitive advantage in the shipbuilding industry was a key topic at the conference. Current efforts in ship design software and on-board applications development focus on boosting fuel efficiency and reducing emissions.

Recent developments in computational fluid dynamics (CFD) and the increasing affordability of highly parallel computing environments to run such simulations mean that designers can begin working with these tools at a much earlier stage of the design process. With prices falling and computing speeds increasing, the use of CFD in ship operation is becoming more attractive, opening up a host of new possibilities for further enhancements. The push for ever greater fuel efficiencies and a greener shipping industry will inevitably lead to new hull designs and other innovations. CFD, if shown to be effective and cheaper, might even take the place of expensive tank testing.

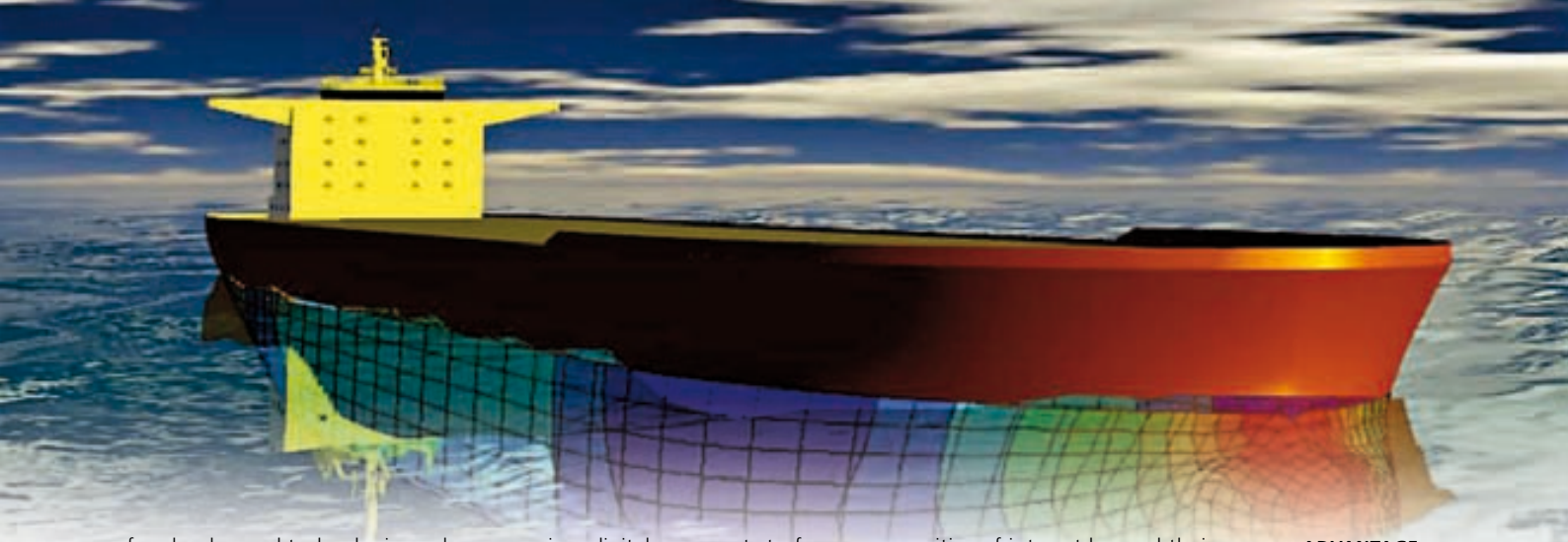
FELICITATION. GL COMPIT Award laureate 2011 Denis Morais (left) receives the award from Albrecht Grell, Executive Vice President Maritime Solutions, Germanischer Lloyd.

Pushing PDMs to the Next Level

Product data models (PDMs) are 3-D data models of a ship that contain additional information, such as the thickness of the plates at the time the vessel was built as well as after five years of operation. PDMs are not used to their full potential as yet and should be used on a broader basis, covering the entire lifecycle of a ship. Consistent lifecycle product data modelling has become a reality in part, but as several presentations at the COMPIT showed, expanding these models to encompass not only the lifespan of a ship but also organisational structures is a challenge waiting to be conquered.

When adopted throughout an organisational hierarchy and used along the entire lifeline of a product, product data models have the potential to create many efficiencies in the maritime industry. 3-D models simplify ship operation and maintenance, allowing employees to identify, locate, and communicate problems regarding a vessel with greater accuracy. In newbuilding too, enabling employees to view a 3-D rendering is a more effective method of communicating with workers than using 2-D drawings, which can be hard to interpret.

The winner of the COMPIT Award, Denis Morais, presented a paper titled "Driving the Adoption of Cutting-Edge Technology in Shipbuilding", which explored the potential



ADVANTAGE. PDMs contain additional information about a ship such as the plate thickness.

use of such advanced technologies as laser scanning, digital prototyping and Shop Floor 3D in the shipbuilding industry. The paper looked at the particular challenges faced by the industry in adopting such technologies, and how new developments might allow shipbuilders to deploy such technologies more cost-effectively.

Taking a cross-industry approach, the paper looked at innovation adoption across the aerospace, automotive and shipbuilding industries, and suggested that rapid adoption of leading-edge technologies was not so common in the maritime world. The penetration of such technologies through maritime organisations, allowing employees at all levels to make use of and have input into the models, will result in designs being optimised for more efficient production.

Social Networks and Cloud Computing

Another trend on the rise is the use of social networks for sharing information and building virtual teams. Often portrayed as a negative influence upon productivity, experts are now considering the potential benefits of social networking applications for the industry. Social networks can enable experts to form communities of interest beyond their own industries; they promote transparency and foster teamwork. Social networks by their very nature expose participants to new information through content sharing, which can spark innovative ideas. Cloud computing offers a way of making resource-hungry, costly software solutions more widely available. A distributed software model and Software-as-a-Service pricing will allow smaller design teams and shipbuilding companies to use these applications in a manner appropriate for their specific needs. Smaller projects will benefit from more extensive modelling, resulting in further design efficiencies.

COMPIT, with 90 experts from 20 countries, and almost 50 papers presented, provided valuable insights into the future of the maritime industry. GL would like to thank the presenters and participants and is looking forward to being part of next year's COMPIT. ■ **OM**

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BACKGROUND

Overview of the Main Trends

- Product data models (PDM) are broadening in scope and starting to be used over more stages of a ship's lifecycle. Certain issues associated with this technology, such as the protection of intellectual property, are being addressed and technical solutions are evolving.
- As the scope and sophistication of simulation increase, the model generation process can be automated to a greater extent, and more complex simulations can be used at earlier design stages.
- Integrated design environments are being expanded, adding simulation functionality and optimisation.
- Boosting efficiency and reducing emissions, both during the design stage and in on-board applications, are major focal areas of software development.
- Web-based cooperation is expanding with "social computing" being supported by major vendors.
- The autonomy of maritime robots is improving. Advances in individual and swarm intelligence are opening up new applications in surveying and search tasks as well as in offshore, oceanographic and navy applications.

Photo: Dreamstime

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Dates at a Glance

May

27. – 28.05.2011
7. Nationale Maritime Konferenz
Wilhelmshaven, Germany
www.bmwi.de

30.05. – 01.06.2011
Commercialising LNG Fuelled Shipping 2011
Hamburg, Germany
www.lng-fuelledshipping.com

June

06.06.2011
1st Blue Shipping Summit 2011
Athens, Greece
www.mareforum.com

08. – 09.06.2011
Design and Operation of Tankers
Athens, Greece
www.rina.org

08. – 09.06.2011
European Dynamic Positioning Conference
London, UK
www.rivieramm.com

08. – 09.06.2011
H2Expo
Hamburg, Germany
www.hamburg-messe.de

09. – 10.06.2011
IFSMA Annual General Assembly
Halifax, Canada

14. – 15.06.2011
The 6th Annual Ship Recycling Conference (informa)
London, UK

14. – 17.06.2011
Brasil Offshore
Macae, Brazil

14. – 16.06.2011
Seawork International 2011
Southampton, UK

15. – 17.06.2011
Asia Green Shipping Summit
Singapore, Singapore

15. – 17.06.2011
MS&D
Hamburg, Germany

16.06.2011
2nd European Maritime Research and Innovation Policy Conference 2011
Brussels, Belgium

Better Economics with a Safer Tanker – BEST-plus

A novel Aframax crude oil tanker design concept

Background and Motivation

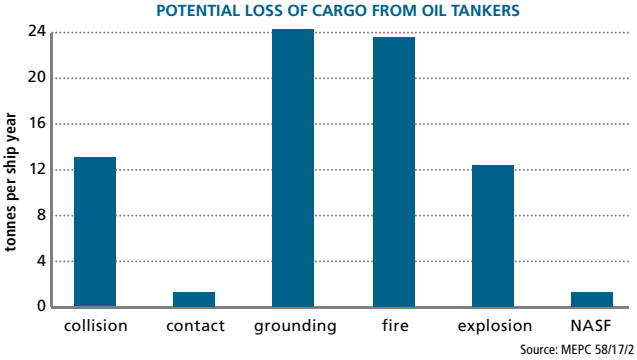
Oil tanker safety has improved over the last decades and this has been documented in a recent Formal Safety Assessment (FSA) study for large oil tankers submitted to the IMO. The risk picture for modern oil tankers shows that the risk to the environment is dominated by collision, grounding and fire. The FSA study suggested considering larger double hull widths and double bottom heights as potential cost-effective risk control options.

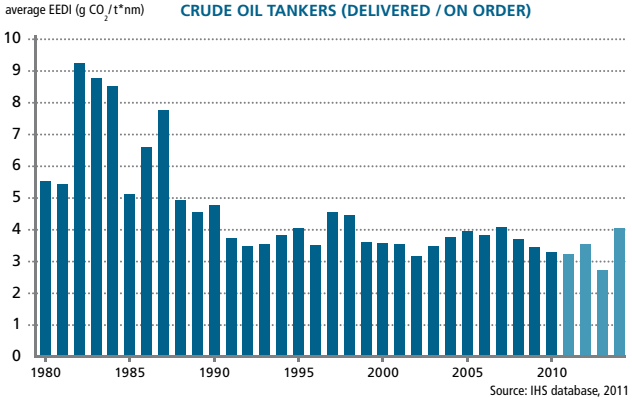
Since the introduction of the double hull concept, oil tanker design has not evolved, and changes have recently been driven primarily by improving production at the ship yards. Little attention has been paid to the product's performance over the lifecycle and, in particular, the fuel-efficiency – as measured by the EEDI – has not improved in the last 20 years, despite the general improvement in systems and their efficiency. The recently developed Energy Efficiency Design Index (EEDI), which is planned as a future mandatory newbuilding standard, is a simple but accurate measure of a vessel's inherent fuel efficiency, which compares CO_2 emissions to transport work.

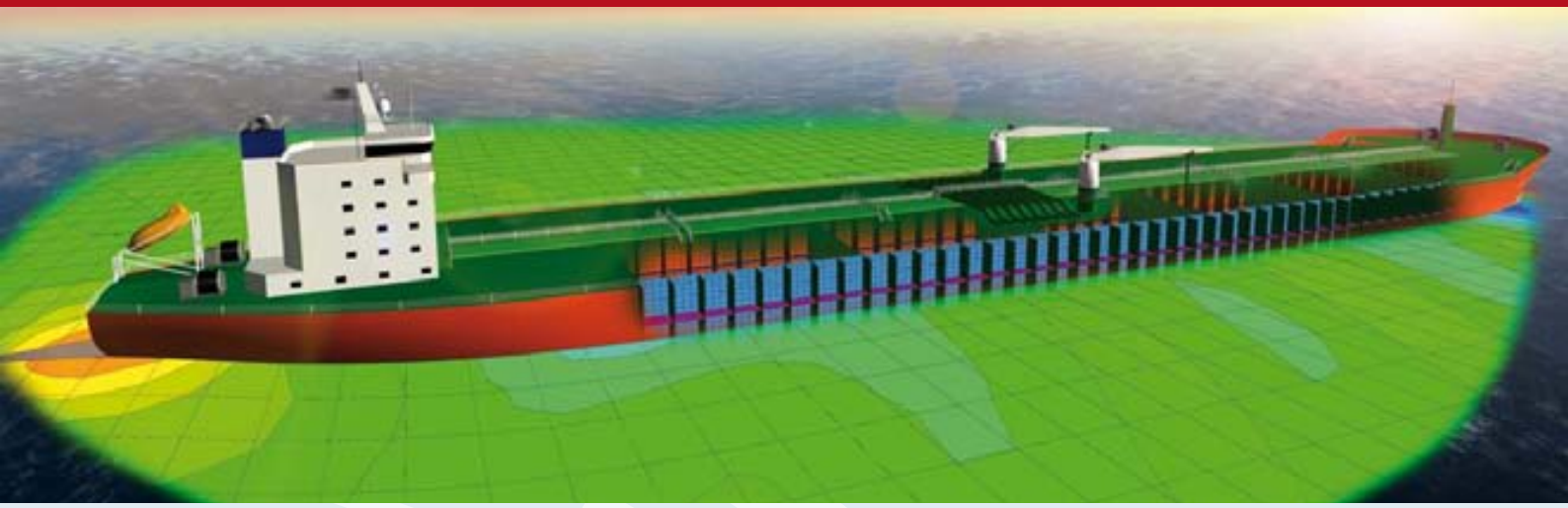
Although oil tankers are considered to be among the most energy efficient vessels today, with an EEDI value ranging from 2 to 6 g CO_2 / (t*nm), they emitted approximately 115 million tonnes of CO_2 in 2009, which is an 8 per cent increase compared to 2007. The current share of oil tanker CO_2 emissions is approximately 12 per cent of the total CO_2 emissions from international shipping.

In response, Germanischer Lloyd and the National Technical University of Athens (NTUA) teamed up in 2008 to develop a novel Aframax tanker design concept, which won the Lloyd's List Greek Shipping Award for technical achievement in 2009. GL also received feedback from shipyards and oil tanker operators regarding the desired features of new tanker designs, and these were incorporated in the new design concept called BEST-plus. BEST-plus enhances the attractiveness of the initial design concept by also integrating hydrodynamic optimisation of the hull form and, thus, reducing fuel consumption and emissions.

GL and NTUA again cooperated on the new design concept, and were supported by FRIENDSHIP SYSTEMS – a GL company and provider of the FRIENDSHIP-Framework Computer Aided Design (CAD) and Computational Fluid Dynamics (CFD) integration platform.



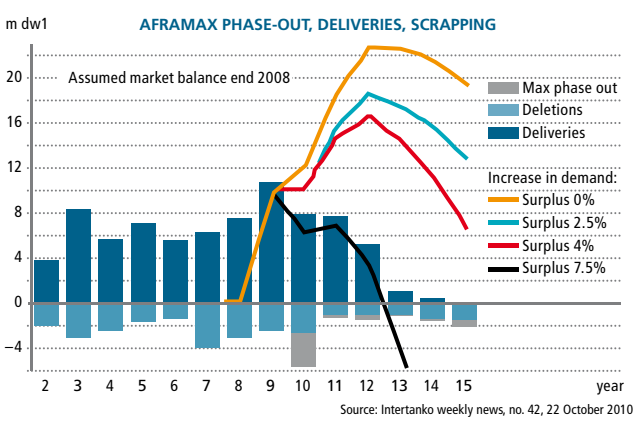




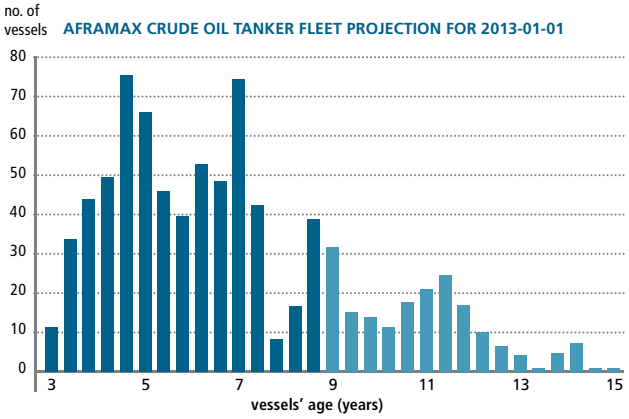
Market Analysis and Design Scenario

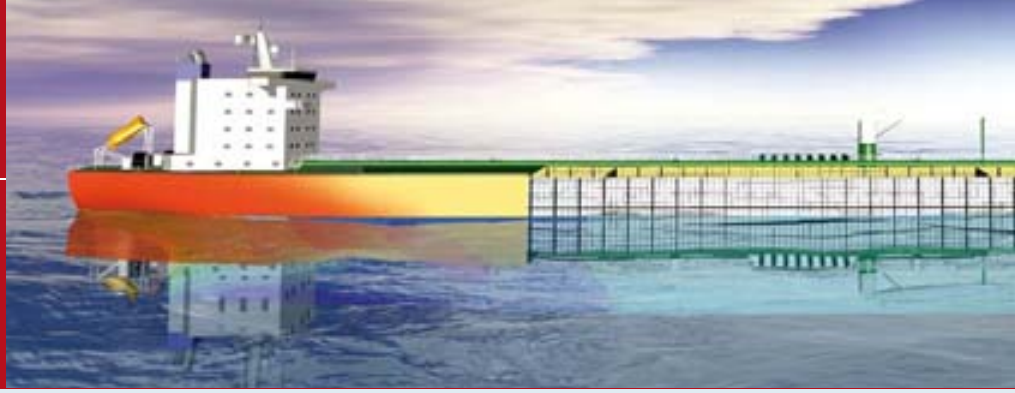
Based on current growth rates, oil transport demand is expected to be lower than available oil tanker supply for the next couple of years. However, even small changes in demand will open up opportunities for new Aframax tankers starting in 2014. This was recently documented by the International Association of Independent Tanker Owners (INTERTANKO). A second analysis based on Fairplay data shows that approximately 20 per cent of existing Aframax tonnage will be older than 15 years in 2012, and this could trigger replacement activities. The novel BEST-plus design concept anticipates this possible demand for new tanker tonnage by integrating only available technologies.

The novel design concept targets the typical Aframax oil tanker trades in the Caribbean Sea. Facilities in the main U.S. ports and the U.S. Emission Control Area (ECA) set the operating conditions. If a Mexican ECA would be implemented as well, approximately 30 per cent of the total transit distance for this trade would be inside of an ▷



Source: Intertanko weekly news, no. 42, 22 October 2010





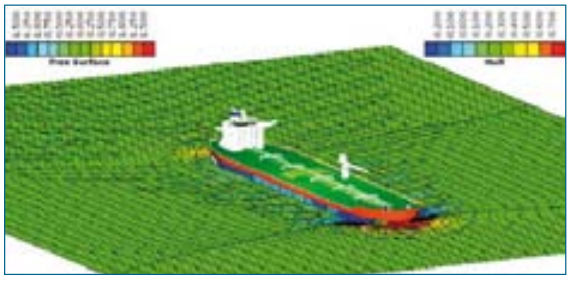
▶ ECA. The current design assumes the use of MGO as fuel when sailing in an ECA. LNG as ship fuel, or the use of scrubbers, are considered as alternatives to the basic design concept. The need for relatively high speed, which has been mentioned by ship operators active in this trade, must be considered with regard to the upcoming EEDI requirement to ensure superior competitiveness of the vessel.

Design Targets – Safer, Greener, Smarter

The design concept addresses the need for safer shipping by reducing the oil outflow in case of an accident. It contributes to greener shipping by improving energy efficiency and, thus, reducing CO_2 emissions per unit transport. In addition, the design offers smarter shipping by reducing fuel costs with an optimised hull form, and by increasing revenues with greater cargo capacity.

Design Approach

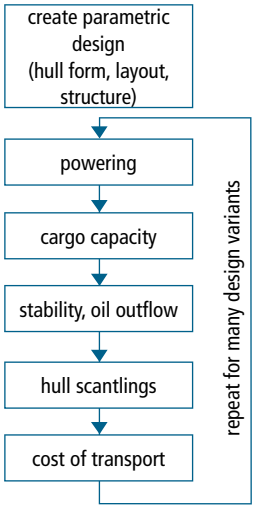
The design approach used an advanced optimisation environment, which integrates tools to predict required propulsion power, stability, oil outflow index, cargo capacity and hull structural scantlings according to IACS CSR. This was achieved through the linking of the FRIENDSHIP-Framework with SHIPFLOW, NAPA and POSEIDON, and by using parametric models for the hull form, layout and structure, respectively.



HYDRODYNAMIC ASSESSMENT WITH SHIPFLOW

STRUCTURAL ASSESSMENT WITH POSEIDON-CSR

OPTIMISATION FLOWCHART



Resulting Design – Simply the BEST

The resulting design concept features a best-in-class cargo capacity with unrivalled speed performance. The main particulars are comparable with those of similar-sized Aframax tankers. The optimisation targeted speed at three different drafts, a cargo capacity taking due account of cargo volume and mass, hull structural mass, cargo oil tank and ballast tank layout as well as double hull width and double bottom height, which determine the oil outflow volumes in accidents. Related design parameters were systematically varied and approximately 2,500 design variants were generated and assessed.

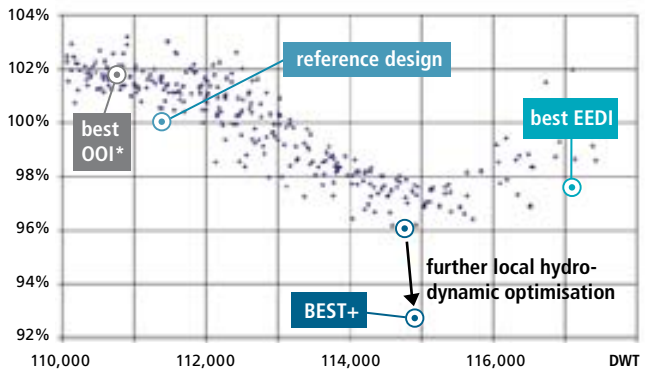
Cost of transport (ratio of annual capital, fuel and other operating costs to annually transported cargo mass), normalised with respect to the reference design, was used as the primary target function for the optimisation. Capital costs are based on a typical newbuilding price of 58 million US dollars and 25 years lifetime. Fuel costs are computed according to a dedicated roundtrip model (with HFO at 500 USD/t and MGO at 800 USD/t) for the Caribbean trade. Other operating costs are constant (approx. 3 million USD/year) and based on Moore Stephens, Opcost 2009.

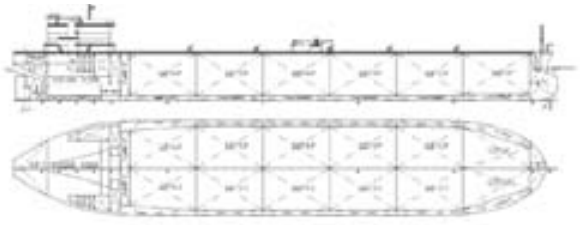
The reference design for comparing cost of transport is an existing pre-CSR tanker, which was used as reference in our 2008 study. Compared to the reference design, a seven per cent improvement in cost of transport was realised due to the better hull form for the best design variant. It is noted that many design variants are optimal in a Pareto frontier analysis, which means that the selection of one variant for the final design depends on the weighting of the different optimisation targets. Therefore, depending upon the choice of the designer, a design optimised for oil outflow, for EEDI, or for cost-of-transport might be selected.

A Design for Smarter Shipping

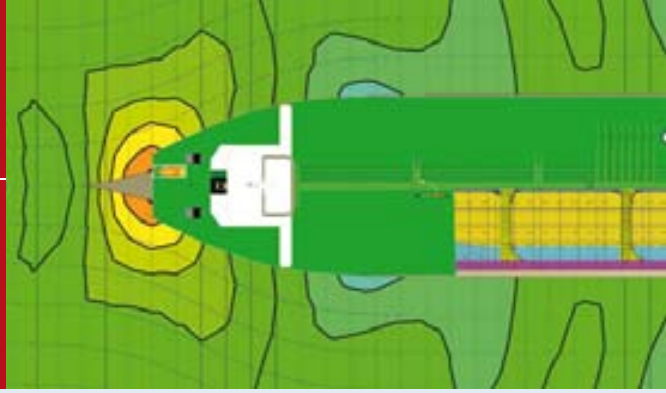
The resulting hull form facilitates a speed of 15.6 knots at design draft with a 95 per cent confidence interval. ▻

NORMALISED COST OF TRANSPORT

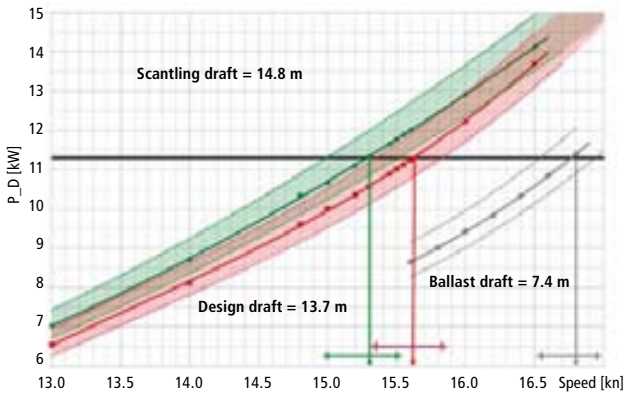




DWT	114,923	t	**DB height**	2.1	m
Cargo volume	129,644	m^3	**DBH COT 1**	2.75	m
Loa	250	m	**DB width**	2.65	m
Beam	44	m	**Oil outflow index**	0.0142	
Depth	21.5	m	**Speed at Td**	15.6	kn
Design draft	13.7	m	**Speed at Tb**	16.8	kn
Cb	0.85		**EEDI**	3.2814	g CO_2 / (t*nm)

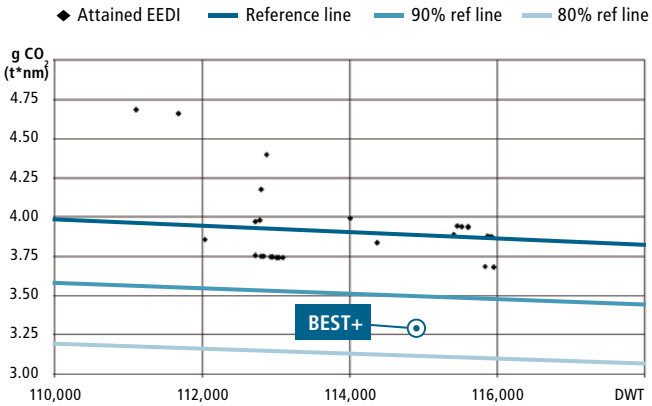


SPEED / POWER CURVE DELIVERED POWER P_D



Ranges indicate 95 per cent confidence intervals.

EDDI OF AFRAMAX CSR OIL TANKERS



Source: data for attained EEDI from Fairplay database

▻ The speed at ballast draft of 7.4 metres is 16.8 knots. This represents a favourable speed increase when compared with recently built vessels of the same size. With a standard main engine for Aframax oil tankers, a MAN 6S60MC-C, the fuel consumption is comparable to similar vessels.

A Design for Greener Shipping

With this high speed and large cargo capacity, the vessel easily meets future EEDI requirements. Indeed, the attained EEDI value is merely 84 per cent of the latest published reference line value for this ship size. This means the vessel would be in compliance with EEDI regulations even if the first reduction to the required EEDI had already begun. At current estimates, this will happen at the earliest on 1 January 2015.

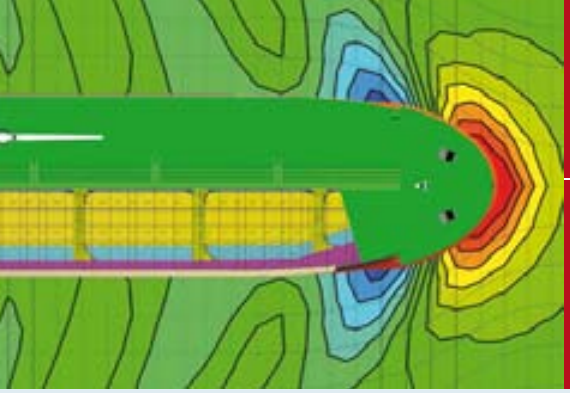
Although a vessel contracted before EEDI has entered into force does not formally need to comply, competitive vessels entering the market, e.g. in 2017, will be more energy-efficient and, therefore, more likely to attract cargo than older vessels with lower energy-efficiency. The new BEST-plus design concept will remain highly competitive.

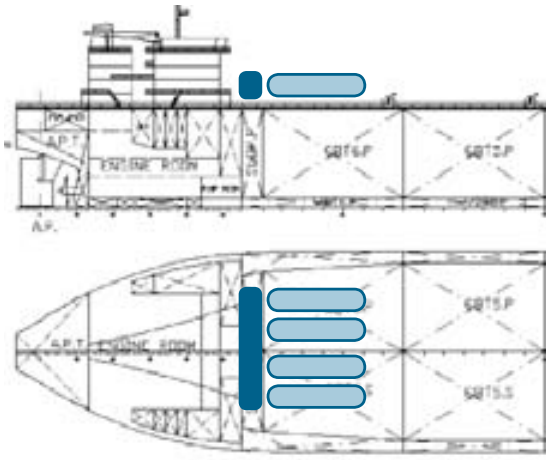
A Design for Safer Shipping

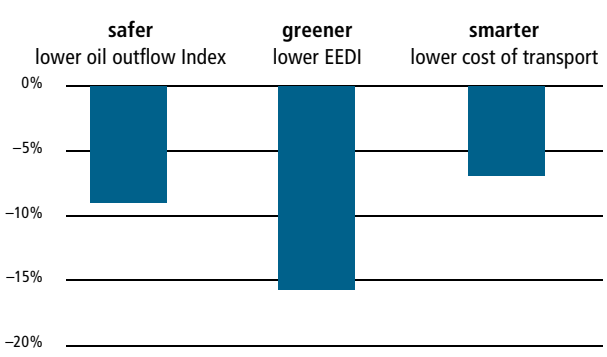
To reduce oil outflow in accidents, the double hull side width was eventually set to 2.65 metres. In addition, to further reduce cargo tank penetration in grounding events, the inner bottom of the cargo oil tank 1 was raised from 2.10 metres to 2.75 metres. To ensure structural continuity, an inclined inner bottom is proposed between two frames. Work is continuing to evaluate the hull structure with finite element analysis according to IACS CSR.

LNG as Ship Fuel

Using LNG as ship fuel reduces SO_x by 90 per cent and CO_2 emissions by 20 per cent. In addition, with LNG prices to-







MORE INFORMATION ABOUT GL BEST-PLUS?

To learn more about the design concept, the tools, and the methodologies used in the development of the BEST-plus design concept, please contact GL's Strategic Research & Development or your regional GL headquarters.

day, a price-parity with HFO is considered to be possible in the medium-term. Oil tankers with their relatively large deck area offer sufficient space for the installation of the required gas tanks and for the gas preparation room. In our case, about 2,000 m³ are needed to facilitate two roundtrips.

However, the LNG-as-fuel supply is limited today and will only gradually be built up. The second challenge is the significant additional capital expenditure, which is estimated to be around 20 per cent of the typical newbuilding price of an Aframax oil tanker.

Outlook

The novel Aframax oil tanker design concept – created using an advanced optimisation framework – has the lowest cost of transport and the highest speed of comparable designs, and features a low EEDI and a low oil outflow index – simply the BEST. With a possible market upswing due to expected replacement needs for older tonnage, and by integrating only existing technologies, the novel design concept looks attractive for those shipowners who want to stay ahead of their competitors for the next decade. ■ **PCS**

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THE BEST-PLUS TEAM. From left to right: Prof. Apostolos Papanikolaou (NTUA), Dr Stefan Harries (FRIENDSHIP SYSTEMS), Dr Pierre C. Sames (GL), Mattia Brenner (FRIENDSHIP SYSTEMS), Prof. George Zaraphonitis (NTUA), Marc Wilken (GL).

Photo: AIDA Cruises

Safety behind the Scenes

Modern cruise ships are huge. Built for several thousand passengers, they are entire floating cities. The continuing boom of the cruising industry has prompted a number of regulatory updates to enhance passenger safety

Most passengers on board a cruise ship are probably unaware of the existence of the International Maritime Organization, let alone its activities to ensure passenger safety. The cruising industry has been growing steadily for many years and responded to the rising demand by building progressively larger, more luxurious cruise ships. With more passengers on board, more attention must be given to the assessment of potential risks. The Safety of Life at Sea (SOLAS) Convention was amended in due course to reassure the public about the safety of their holidays at sea. The guiding philosophy for this move was that the regulatory framework should place greater emphasis on the prevention of accidents, and that future passenger ships should be designed for improved survivability so that, in the event of an incident, passengers can stay safely on board as the ship proceeds to port. This "Safe Return to Port" amendment was implemented when the new regulation entered into force on 1 July 2010.

A Special Support Application

The regulation stipulates that every newly built cruise ship must be able to reach port safely after a fire or flooding incident up to a specified level of damage. It must provide safe areas for passengers pursuant to the concept of the ship being its own lifeboat.

Andreas Ullrich and Daniel Povel have been directly involved in the development of Germanischer Lloyd's service providing assistance to shipyards and owners in implement-

Photo: Hapag-Lloyd Cruises

NEWBUILDING. The "Europa 2" of Hapag Lloyd Cruises will comply with the new regulation.

FLEET. AIDA Cruises is very involved in environmental protection and passenger safety.

Photo: Soon Wee Meng | Dreamstime.com

FALL-BACK. The ship should be its own best lifeboat. Real lifeboats are called into action only in extreme emergency.

ing the new requirements. Dr Povel has developed a special support application through FutureShip, a GL company.

Dr Povel says discussions with yards and owners on the Safe Return to Port concept should be initiated "before the contract is signed. That means we have to be involved as of a very early stage in the newbuilding project." He recommends incorporating the Safe Return to Port requirements during the design phase of a new ship, rather than trying to adapt the design later. While it might be possible to adapt an existing ship to implement some of the requirements, it would hardly be possible to meet all of them, "especially if there is no redundant propulsion system on board."

Ullrich adds that even if it were technically possible to implement all of the requirements on board a ship in service, it would be a costly exercise involving major reconstruction. Separating systems into individual compartments, for example, would be a harrowing task, Dr Povel explains. "Trying to change that in an existing vessel design will turn the entire design concept upside down."

There are synergies, he says, between the Safe Return to Port concept and the Redundant Propulsion class notation. The latter requires the availability of redundant propulsion for 72 hours following an incident. As for the Safe Return to Port regulation, it depends on the area of operation whether 72 hours of emergency propulsion are sufficient in a given case or not. The destination port also needs to be suitable for the vessel.

The Safe Return to Port regulation addresses what could be described as small incidents affecting limited sections of the ship, such as a specific cabin area on one deck only in one main vertical zone. In the case of a big fire on the car deck, for example, the ship may still need to be evacuated, generally at the master's discretion, Dr Povel emphasises.

The new rules are a step forward for the IMO, he adds, because they take a more holistic approach compared to the old, purely prescriptive requirements. All things considered, however, it is always better to keep the passengers on board if at all possible, rather than using the lifeboats. The implementation of the Safe Return to Port requirements will enable ships to cope with a wider range of incidents on board without the need to evacuate.

Distinctions between Ship Types

Besides the safety benefits to owners, the existence of redundant systems on board may improve operational reliability and even improve the energy efficiency of the ship.

GL has several clients in the cruise ship business, among them Aida Cruises and Hapag Lloyd. The latter is currently having a new ship built by STX at Saint Nazaire, France, which will comply with the new regulation.

The solutions chosen to comply with the Safe Return to Port requirements may vary according to the ship type in question. Ullrich explains that while most passenger ships have passenger areas arranged over their full length, that is not necessarily the case on a ro-ro passenger ship so it may be more difficult to find sufficient space for safe areas than on a cruise ship. This might ultimately lead to new design concepts for future RoRo passenger vessels. The space occupied by more complex and redundant systems may result in a certain loss of lane metre capacity. ■ **SS**

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SOLAS.
IMO was formed to fulfil a desire to bring the regulation of the safety of shipping into an international framework, for which the creation of the United Nations provided an opportunity. Hitherto such international conventions had been initiated piecemeal, notably the Safety of Life at Sea Convention (SOLAS), first adopted in 1914 following the "Titanic" disaster (photo: lifeboat).

Risk Analysis for Offshore Wind Farms

Within the next decade, numerous offshore wind farms will be installed worldwide, especially in Europe and North America. For German areas in the North Sea and the Baltic Sea, up to 25 gigawatts of total power is to be installed.

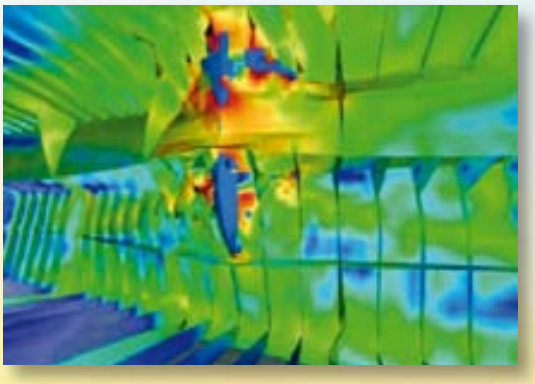
This exceeds the power output of numerous typical nuclear power plants. It is necessary to study the effects of these wind farms with respect to the safety of shipping in order to estimate the related risks to people, ship traffic and the environment.

Risk = Probability × Consequence

In formal safety assessment, a risk R is defined as the product of the probability or frequency f and the consequence c of the undesired event: $R = f \cdot c$

Considering the ship collision risk for an offshore wind farm, f is the ship collision frequency and c is the amount of oil spilled. For approval in Germany, detailed risk analyses have to be submitted to enable the authorities to evaluate a proposed offshore wind farm based on clear and traceable criteria. Additional salvage tugs or ship traffic control can reduce the risk. Such risk control measures can be evaluated with respect to their efficiency in order to achieve the highest safety standard for people and the environment.

Additionally, risk analyses provide the necessary safety information for insurers and operators of wind farms. Within the approval process, the authorities will examine compliance with acceptance levels for collision frequency and risk, based on calculated collision frequencies (often expressed as average time between collisions) and oil spill quantities. The



TECHNOLOGY. Sophisticated simulations assess the consequences of collisions.

A comprehensive understanding of risk relevant causes and effects is essential for the assessment of offshore wind farms. Sophisticated simulations help to prevent collisions with vessels

effects of risk control measures can be quantified and thus have a direct influence on the acceptance of wind farms.

GL has performed several risk analyses, and also took part in the approval processes on behalf of planners in Germany. Since the seventies, a variety of approaches for calculating the collision frequencies of ships with other ships, platforms, bridges or lighthouses were developed, and over the last decade some were adapted to the collision of ships with wind farms. The methods used by GL were developed in various research projects and are constantly being enhanced. A new guideline for these risk analyses will be released in 2011.

Separate Consideration Required

Two different scenarios must be distinguished:

- collision of powered ships with offshore installations
- collision of drifting ships with offshore installations.

This distinction is necessary because the two scenarios differ in cause, progress and outcome. Because of the divergent nature of the events, different calculation methods are necessary to calculate the frequencies of those events. For the collision risk analysis, different input data is required. Most important are the ship traffic, meteorological and hydrological data for the investigated sea area.

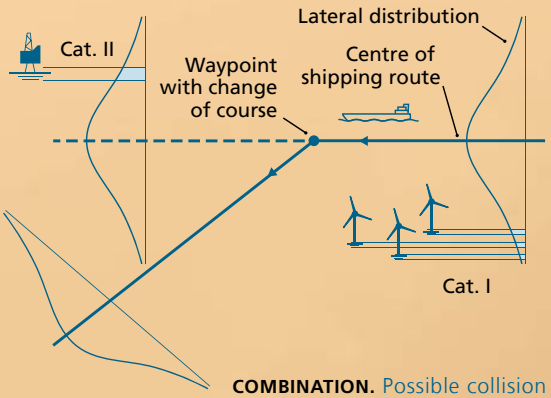
The method for powered vessels follows proposals developed at the Danish Technical University. Two collision categories are considered:

- Expected navigational inaccuracies or, for example, wind and waves, meaning the vessels will be more or less off track (lateral displacement);
- some ships fail to change course at a waypoint. ▷

VARIABLES. GL developed a computer program to calculate the effects of a combination of wind, current and wave forces, etc.

COEXISTENCE. Vessels and offshore wind farms use the same environment – accidents should be avoided.

Photo: Dreamstime/Rodiks



COMBINATION. Possible collision categories for offshore structures. The combination of ship, wind, current and waves is important.

▻ Collisions of a powered ship with an obstacle are possible if two conditions are fulfilled simultaneously:

- The ship is on a collision course with the obstacle.
- The officer of the watch undertakes no correction of the erroneous course. The probability of this condition is modelled by a so-called causation factor.

Monte-Carlo Simulations for Drifting Ships

The causation factor depends on the risk control measures planned for the offshore installation. Figures are taken from statistical accident data and were harmonised by various experts including GL. The collision frequency can be derived from the probabilities of these two conditions. The probability of a ship being on a collision course with an offshore wind farm follows from the traffic distribution function in a shipping area and the dimensions of the ship and offshore installation.

Disabled ships drift depending on wind, wave and current forces as well as time dependent tide/current forces. These are largely random variables. The aim is to find the probability of those particular combinations of wind, current, waves, ship size and ship type that result in a collision between a ship and an offshore platform or wind farm. For this reason, GL developed a computer program to calculate this probability.

The method is based on a Monte Carlo simulation, where a multitude of possible combinations of the random input variables is analysed, reflecting the real-world probabilities of occurrence for each random variable. A lot of runs are performed with new start conditions for each run. Counting the number of runs with collisions and dividing this number by the number of simulation trials results in the collision probability for disabled ships.

A collision involving a drifting vessel can be prevented by self-repair, emergency anchoring or salvage tugs. The first two measures are controlled by the crew of the disabled ves-

TWO TYPES. Collision risk for powered and drifting vessels. The risk control measures are planned for the offshore installation.

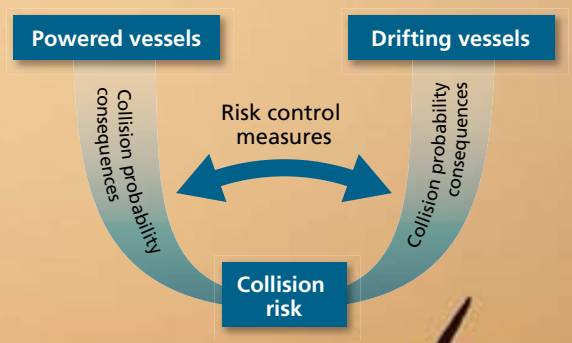
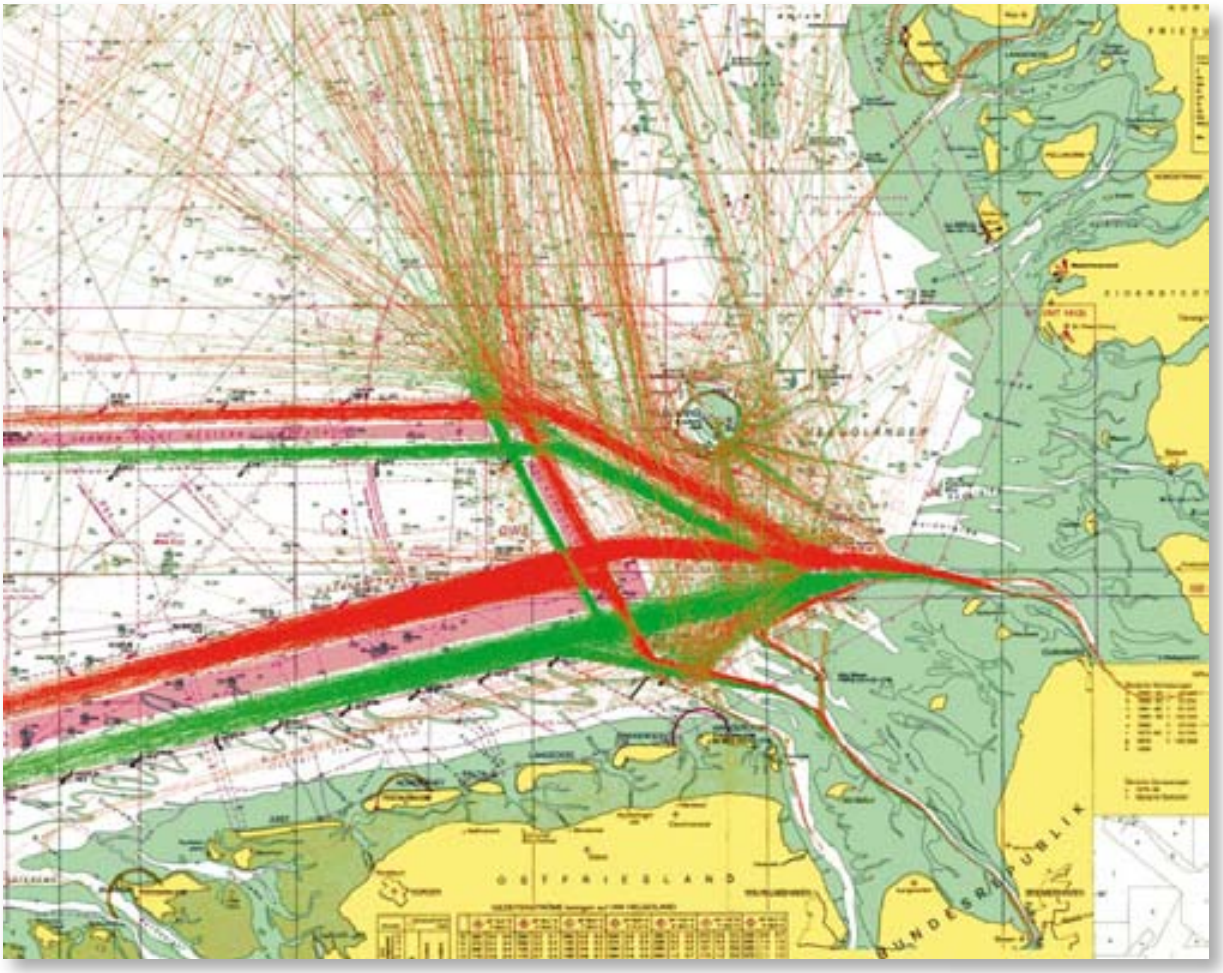


Photo: Dreamstime/Centrill



COMPLEXITY. Sea chart of the German Bight with shipping traffic data from AIS recordings.

sel drifting towards the offshore installation. Therefore, the only external risk control measure is the salvage by tugs with sufficient bollard pull to stop drifters in the sea area. In the risk analysis, various numbers of salvage tugs with different bollard pulls can be included.

Ship traffic data including distributions by ship type and ship size have been recorded for the North Sea and Baltic Sea and are now readily available for collision risk analyses. AIS (automatic identification system) data gives additional details to update databases for such analyses.

Consequences Determined in Simulations

The consequences of a collision have to be determined by sophisticated simulations. The simulations yield expected damages and subsequently expected oil spills. If necessary, the offshore wind farm structures can be redesigned to become more "collision friendly". The approach used extensive experience gathered for tanker safety (ship-ship collisions), both for the simulation technology and collision-friendly structural designs.

Cost-effective Adaptation

A rational and transparent approach allows safety assessment and cost-effective adaptation of designs. In summary, the combination of collision risk analysis and collision consequence analysis leads to a comprehensive understanding of risk relevant causes and effects for the assessment of offshore wind farms. Preventive actions increasing both active and passive safety can be assessed regarding their effect in early planning stages. ■ **DP**

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Photo: Dreamstime

GL Academy – Dates at a Glance

Selected seminars in 2011 – information and registration: www.gl-academy.com

JUNE

21. – 25.06.11
Superintendent Training Course
Makati City, Philippines

21. – 22.06.11
Handling and Transport of Dangerous Goods
Piraeus, Greece

21.06.11
ISM for Ship Management Personnel
Istanbul, Turkey

22. – 23.06.11
Insurance for Ship Operation
Mexico City, Mexico

23.06.11
STCW 2010 Implementation Workshop
Piraeus, Greece

24. – 25.06.11
TMSA Workshop – Risk Assessment, Change Management, Incident Investigation
Makati City, Philippines

24.06.11
Anchor Handling
Ciudad del Carmen, Campeche, Mexico

24.06.11
Port State Control
Singapore, Singapore

27. – 28.06.11
Company/Ship Security Officer (CSO/SSO) Training Course
Hamburg, Germany

30.06.11
Advanced Maritime Accident Investigations and Analysis
Hamburg, Germany

30.06.11
ISPS Internal Auditor for Shipping Companies
Lisbon, Portugal

JULY

05. – 06.07.11
Internal Auditor ISM/ISO 9001:2008 for Shipping Companies
Madrid, Spain

07. – 08.07.11
TMSA Workshop – Risk Assessment, Change Management, Incident Investigation
Genoa, Italy

07.07.11
Ship Recycling for Shipyards and Suppliers
Madrid, Spain

12.07.11
STCW 2010 Implementation Workshop
Limassol, Cyprus

14.07.11
Ballast Water Management
Halifax, Canada

21. – 22.07.11
Designated Person Ashore (DPA) Training Course
Naples, Italy

22.07.11
Air Pollution from Ships in Practice
Limassol, Cyprus

25.07.11
Introduction to Crewing
Norfolk, VA, United States

25. – 26.07.11
Fuel Saving
Lima, Peru

27. – 28.07.11
Consideration of Local Ship Vibration in the Design Process
Singapore, Singapore

Imprint

nonstop, issue No. 1/2011, May 2011 **Frequency** nonstop is published three times a year **Published by** Germanischer Lloyd SE, Hamburg **Editorial Director** Dr Olaf Mager (OM), Corporate Communications & Branding **Managing Editor** Steffi Gößling (SG) **Authors of this issue** Simon Adams (SA), Michael Franken (MF), Nora Luttmer (NL), Stefanie Normann-Birkholz (SNB), Dr Daniel Povel (DP), Hans-Jürgen Reuß (HJR), Dr Pierre C. Sames (PCS), Henning Sietz (HS), Sandra Spears (SS), Zhang Li (ZL) **Design and Production** printprojekt, Schulterblatt 58, D-20357 Hamburg **Layout** Lohrengel Mediendesign **Translations** Eugen Klaußner, Andreas Kühner **Prepress** Fire Department **Printed by** Media Cologne

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Vision

"We will be the most respected international technical advisor and trusted partner by being world-class in all we do."

We will achieve our vision:

- Through our unique combination of technical expertise, business understanding and client relationships
- By drawing on our global network to grow and consolidate our reputation within all of our markets
- Through our exceptional people, their creativity, ambition and drive

Mission

Safer

We drive a safety culture that prevents loss or harm to people and assets

Smarter

We use our expertise, our wealth of experience and our comprehensive global network to deliver superior results

Greener

We apply our learning to inspire our clients and colleagues to lower their environmental impact and help shape a greener future

Values

Enhance Trust.

Embrace Change.

Deliver Results.

GL

Photo: Nasa

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0E003 2011-05