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the magazine for customers and business partners

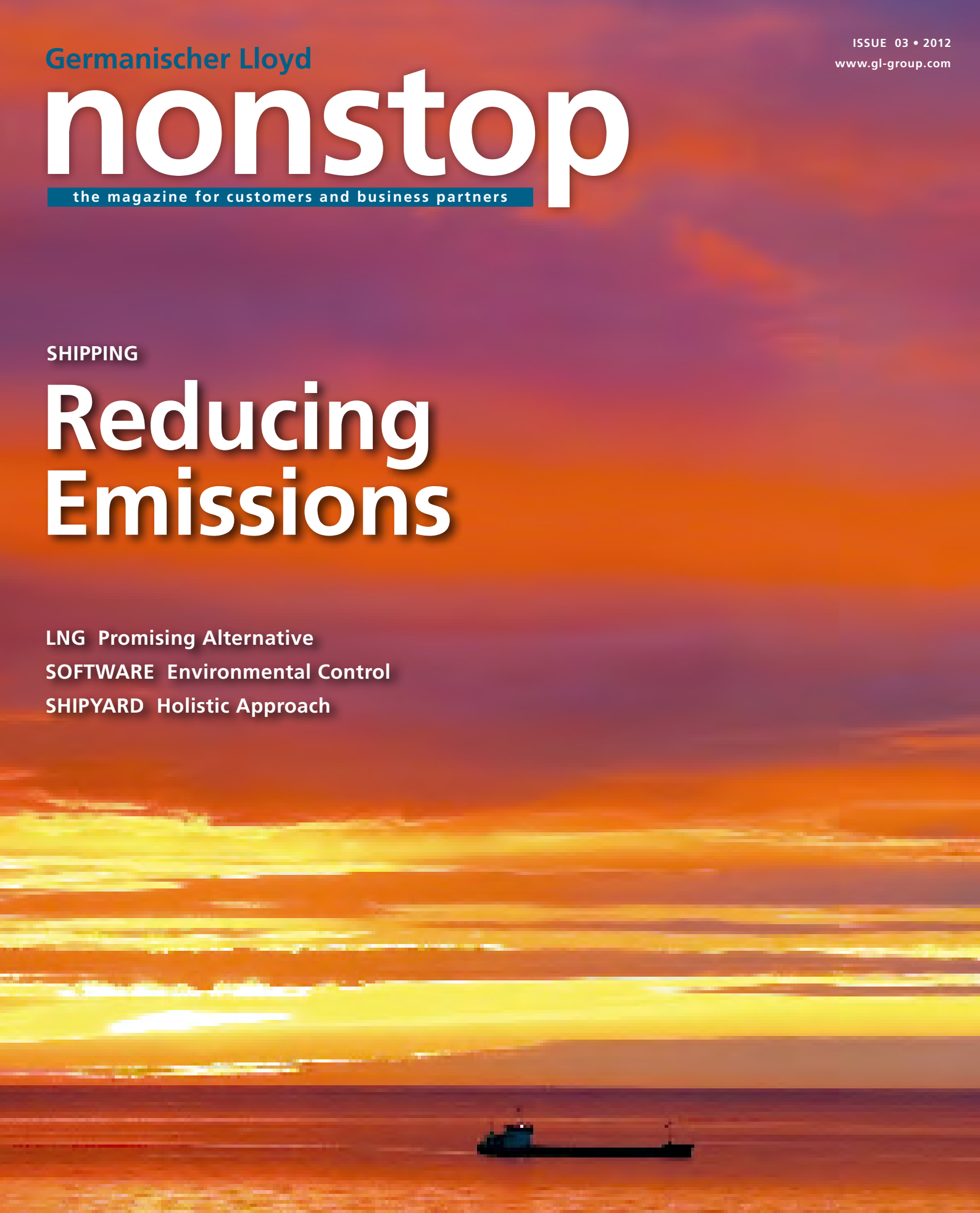
SHIPPING

Reducing Emissions

LNG Promising Alternative

SOFTWARE Environmental Control

SHIPYARD Holistic Approach



Germanischer Lloyd

You are facing the challenge of global emission reduction – while cost-pressure continues to rise. The GL EmissionManager uses all the existing voyage and operational data reported to shore in a smarter way – to allow a structured collection and analysis of environmentally relevant data. This can then be certified as proof of green shipping for your business and demanding customers.

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Dear Readers,

Erik van der Noordaa

THE EXPECTATIONS ARE HIGH, the challenges enormous: when the maritime industry comes together in Hamburg for SMM, the world's leading trade fair, efficiency enhancement and emission reduction in shipping will dominate the agenda. Stricter environmental regulations are forcing the shipping companies to look for alternative modes of propulsion. A promising approach is the use of liquified natural gas. The "Potential Pioneers" (page 14) for the implementation of LNG technology are small container feeders operating primarily in emission control areas. The additional installation costs will pay off rapidly, as shown by a GL study.

GREAT INTEREST was also generated through a study by the GL subsidiary FutureShip. The concept for a "zero-emission ship" proved to be so compelling to the Scandlines shipping company that a totally clean double-ended ferry is being developed jointly with FutureShip (page 10). The first ferries are to ply the Fehmarn Belt as early as 2017. With its project partner Hamburg Süd, GL has almost reached the finishing line. The shipping company is aiming for a sustainable reduction in the pollutant emissions of its entire fleet, for which it needs all the environmentally relevant data from everyday ship operations. The new software package GL EmissionManager is to be implemented on the Hamburg Süd ships before the year is out (page 20). Ships complying with mandatory or voluntary environmental standards can likewise tap into a new service offered by GL. The "Environmental Passport – Operation" provides certification for owners and operators that the total emissions and data capture procedures meet the GL guidelines (page 18).

OVERCAPACITIES IN SHIPBUILDING, weakening growth in the global economy – the maritime industry is searching for new areas of business. Attractive prospects are opening up in the offshore segment. Thanks to its strong customer focus, Flensburger Schiffbau-Gesellschaft has made good inroads here. In respect of innovation, optimisation and quality assurance, "The Yard That Reinvents Itself" (page 32) also relies on the expertise provided by GL.

POWERFUL SIMULATION TECHNOLOGY makes it possible to test the construction and operation of ships and offshore installations with ever increasing precision. In this field too, GL has substantial "virtual experience" (page 23) that yields benefits for people, the environment and the equipment. An impressive demonstration of this is the largest wind turbine installation ship in the world: construction of the "Pacific Orca" was supported by GL, not only with computer-aided simulations. Design, engineering, consulting and classification – the GL Group played a segment-spanning role in this project (page 36).

REACHING GOALS TOGETHER: We would be delighted to embark on a journey with you – by partnering, we can make a contribution towards increased safety, efficiency and environmental compatibility in the maritime industry.

Yours sincerely,

ERIK VAN DER NOORDAA
Chairman of the Executive Board, Germanischer Lloyd SE

contents

Photo: FSG

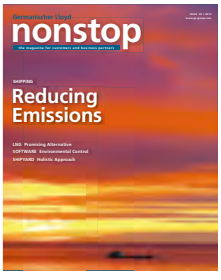
Photo: Dreamstime/Bowie15, GL

Photo: Hapag-Lloyd

Photo: Evergas

market

gl world



Cover Photo: Dreamstime/Redtc

Lift It Up

Swire Pacific Offshore Operations (SPO) took delivery of the third-generation wind turbine installation ship (WTIS): the "Pacific Orca". The company's first wind-farm installation vessel was built at Samsung Heavy Industries in Geoje, South Korea. With a length of 161 metres, a breadth of 49 metres and a depth of 10.4 metres, "Pacific Orca" is the world's largest ship designed to install offshore wind turbines. It is capable of carrying and installing twelve 3.6 MW units.

With its combined expertise in the maritime, renewable energy and offshore oil & gas sectors, the GL Group was able to provide a single source for all of the "Pacific Orca's" engineering and assurance needs (read more on page 36).

SPO's Managing Director, Neil Glenn, said: "We are confident that the vessel will deliver the high quality performance and service levels that our offshore wind customers are looking for." "Pacific Orca" will be operating for Danish utility company DONG Energy.

FOR FURTHER INFORMATION:

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EXPERTS. GL surveyors assigned to GL Geoje, Korea, which is headed by Dario Brkic. From left: Michael Mitsakos, Niksa Guic, Mario Polanda, Lev Zhegurov and Anoop Venugopal.


PACIFIC ORCA

news

SAFETY. At the German navy training centre in Mürwik, cadets can practise for work aboard "Gorch Fock".

HAPAG-LLOYD

Competitive and Sustainable

THE NEW "HAMBURG EXPRESS", built at Hyundai Heavy Industries' Ulsan shipyard in South Korea and named in mid-August, is a GL-classed container vessel with a capacity of 13,200 TEU, and the first in a series of ten newbuilds. Two sister ships will enter service later this year, with the other seven due to be completed in 2013.

Owner Hapag-Lloyd ordered GL's ECO-Assistant for all newbuilds to optimise their trim and ballast water quantity. ECO-Assistant has been installed in the loading computer to support optimisation during the cargo planning phase. Furthermore, FutureShip installed a monitoring device to report system usage and any deviations from the optimum.

"Hamburg Express" will operate on the G6 Alliance's Loop Four which calls at Hamburg, Rotterdam, Southampton, Singapore, Yantian, Ningbo and Shanghai. Replacing an 8,000 TEU unit, the new vessel brings Hapag-Lloyd's fleet to 147 ships and a total capacity of 674,000 TEU.

"With the modern, extremely efficient newbuilds in the Hamburg Express class, we are not only ensuring the future competitiveness of Hapag-Lloyd but also pursuing our strategy of sustainable growth in line with the market," said Michael Behrendt, CEO of Hapag-Lloyd, during the naming ceremony in Hamburg. The 366 m "Hamburg Express" will practise "slow steaming", running well below 20 knots. One refill of the fuel tank costs eight million US dollars.

FOR FURTHER INFORMATION:

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Photo: Hasenpusch

NEW CLASS. The naming ceremony of "Hamburg Express" took place in Hamburg on 17 August 2012.

NAVY SAILING SHIP

New Training Mast

MAST AND RIGGING is the name of a new training mast installed at the Mürwik navy training centre near Flensburg, Germany, where officer cadets will be able to become accustomed to the working height and conditions on board the navy training vessel "Gorch Fock". The scaled-down mock mast will also allow the training centre to check and, where appropriate, improve the cadets' physical abilities. The mast and rigging installation was fully certified by GL. In addition, GL was entrusted with inspecting and approving the so-called PSA attachment points which provide comprehensive fencing for the practising cadets to protect them from falling.

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EARLY WARNINGS. Car carrier "CSAV Rio Blanco" is a trial ship for GL MachineryManager.

Photo: www.ship-hunters.be

WELDING

Call for Papers

THE COUNTDOWN IS ON: the 14th Special Conference on Welding in Shipbuilding, organised by the German Welding Society (DVS), the Training and Research Centre for Welding Technology in Hanover (SLV Nord), and GL, will take place from 24 to 25 April 2013. Papers on the topics of equipment engineering, pressurised equipment and power generation as well as monitoring, non-destructive testing and inspection of welded structures may be submitted until 15 September.

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GL ACADEMY

Focus on Efficiency

RISING FUEL PRICES and stricter environmental regulations are forcing the shipping industry to take action. But what does the introduction of the Energy Efficiency Design Index really mean? What are the advantages of gas as a ship fuel? How can a certified energy management system help improve our carbon footprint? The GL Academy offers new seminars on different energy efficiency-related topics. "Our energy efficiency seminars have been developed in direct response to market needs," says Vice President Susanne Schreeck, Head of GL Academy.

FOR FURTHER INFORMATION:

www.gl-academy.com/en/1996.php

SOFTWARE

On-Board Test

THE FIRST PROTOTYPE of the GL MachineryManager software was installed on board "CSAV Rio Blanco". The car carrier is owned and managed by German shipping company F. Laeisz. GL MachineryManager is a single, fleet-wide monitoring platform for on-board equipment. It combines visual inspection results with online and offline condition measurements to warn crew members and superintendents when the condition of any piece of equipment begins to deteriorate.

Manfred Zimmermann, Superintendent at F. Laeisz, commented: "My first impression of GL MachineryManager is that it fits into our systems well. I am curious to see how the readings will develop over time and to what extent they will impact our maintenance and uninterrupted in-service periods."

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LNG

Environmental Performance

GL HAS UNDERTAKEN its first ever Clean Shipping Index (CSI) verification, issuing a Statement of Compliance to the product tanker "Bit Viking". The statement confirms that the data submitted by owner Tarbit Shipping meets the requirements of the Index, an essential step to ensure the usefulness and transparency of the data provided for the new project. GL was authorised to perform verification checks for the CSI. "Bit Viking" is the world's first ship in service whose main machinery has been converted to burn LNG.

Photo: Tarbit Shipping

ZERO EMISSION

The Future of the Fehmarn Link

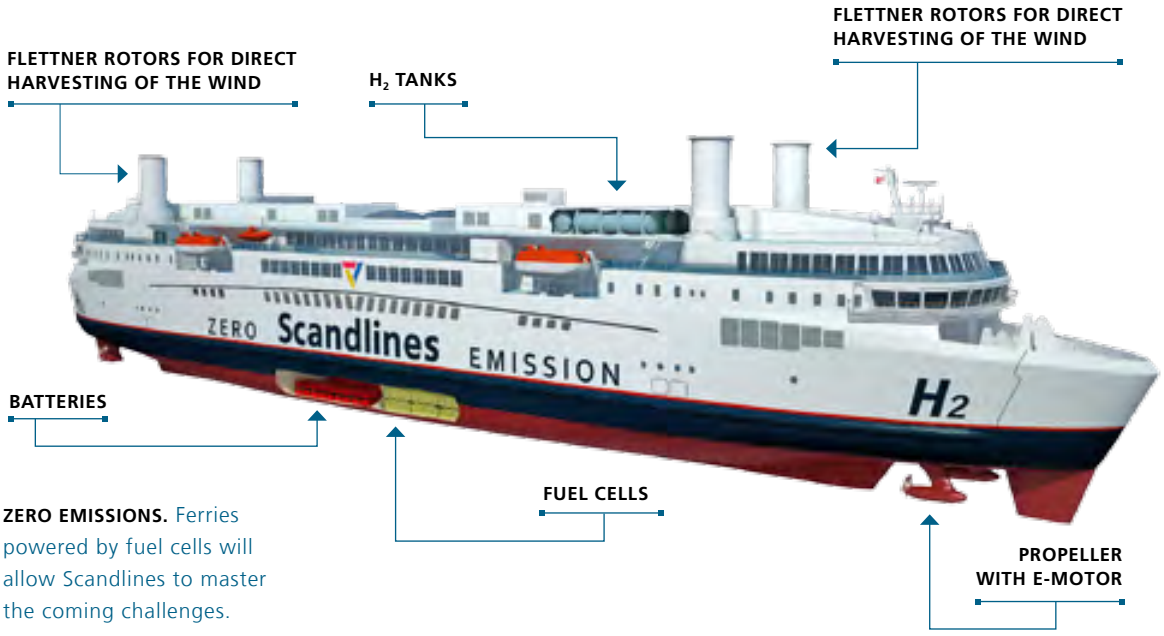
GL subsidiary FutureShip has developed a zero-emission propulsion concept for shipping company Scandlines. This trailblazing technology could be implemented on the Baltic ferries within the next five years

Optimising the lay times in port would yield fuel savings of up to 30 per cent," says Fridtjof Rohde. What, cutting bunker costs while tied up at the quay? But, as a naval architect at the design consultancy FutureShip, he is able to explain the seeming paradox immediately: "If you're quick with your harbour processes, you can afford to lower the speed at sea. This reduces the fuel consumption and hence the pollutant emissions of ships."

In the world of international container shipping, "slow steaming" has long become widespread practice. With the optimisation of hulls and innovative designs, FutureShip played an appreciable role in the successful implementation of the concept. Together with shipping company Scandlines, this subsidiary of GL is going one step further: the development of double-ended ferries that are totally emission-free.

At present, Scandlines maintains a large number of ferry connections in the Baltic Sea. The most profitable link ▶

Illustrations: FSG, Selestron76 | Dreamstime.com



ZERO EMISSIONS. Ferries powered by fuel cells will allow Scandlines to master the coming challenges.

▷ is the so-called "Vogelfluglinie", which connects Puttgarden on the island of Fehmarn with Rødbyhavn in Denmark along the bird migration route. With a distance of 18.5 km, the crossing takes only about 45 minutes. A total of four double-ended ferries ply back and forth. Every 30 minutes, a ship departs from each of the two ports – 24/7, 365 days per year.

However, the shipping company's business model is coming under pressure. Firstly, Denmark is planning to build the Fehmarn Belt tunnel, which would make ferry connections obsolete to a great extent. And, secondly, stricter emissions regulations are to apply in the Baltic from 2015: ships will only be able to steam through the so-called Emission Control Areas (ECAs) on low-sulphur diesel (0.1 per cent maximum). This fuel will be much more costly than the heavy fuel oil in general use today.

Reason enough to think about possible solutions for the future. So, when GL presented the study for its "Zero-Emission Ship" last year, this aroused the interest of Scandlines – after which the ship operator decided to develop a prototype with "a very clear and simple goal: zero emissions." The FutureShip engineers took a completely new course and approached the matter in a holistic way: from fuel production, through energy conversion and storage, and up to optimisation of the ship design. For example, the surplus electricity generated by wind turbines in northern Germany and Denmark is to be used to produce hydrogen. This can be

CRUNCHING NUMBERS. *Ten years ago, the calculations for a single-hull shape often took a week or more, even with the aid of CAD programs, but now the modern high-performance computer recently installed at Germanischer Lloyd in Hamburg is able to whip through no less than 40,000 design variants in a single weekend. This ensures that the FutureShip engineers are able to find the ideal hull shape.*

FS "Deutschland" VS Zero-Emission Ferry

Average consumption and emission values of a zero-emission ship, per crossing:

Photo: Scandlines

0.95 t	Heavy oil	0.00 t
2.96 t	CO_2	0.00 t
0.03 t	SO_X	0.00 t
0.05 t	NO_X	0.00 t

Average consumption and emission values of a Scandlines fuel cell ferry, per crossing:

Illustrations: FSG

PUTTGARDEN. The ferry rail terminal on the Baltic island of Fehmarn is part of the "Vogelfluglinie" ferry link.

Photo: Scandlines

transformed back into electrical energy by the fuel cells on board the ship in order to supply the electrical pod drives. Any excess electricity is stored in batteries to cover peaks in demand. Modern hull lines, optimised propeller shapes and efficient procedures in port play a vital role in reducing the overall energy needs.

Available Technology

The resulting design is no less than spectacular. With this, Scandlines can indeed show that there is a viable alternative to the tunnel. Alone the construction of the tunnel, according to calculations by Scandlines, will cause 80 million tonnes of climate-killing carbon dioxide. This does not yet include the emissions of all the vehicles driving through the tunnel. Also not to be forgotten: a building outlay of about ten billion euros, and an enormous impact on the environment.

For GL, this design project was an ideal platform to show what is already possible today with modern – and above all, available – technology. "Short-sea applications are simply predestined for our zero-emission concept," says Rohde. The energy requirement of the Scandlines ferries is lower; moreover, it is possible to bunker more often. On the other hand, ships that have to cover large distances would be much more difficult to "get green" – the total energy requirement is too high.

First and foremost, the need is for propulsion and also for the catering operations. Diesel engines and gas turbines had to be ruled out, with a mix of photovoltaic systems, fuel cells and Flettner rotors crystallising out as being the most suitable solution. The design process yielded a double-ended ferry with space for 1,500 passengers and 2,200 lane metres for vehicles. Located on deck, the hydrogen tanks can accommodate 140 cubic metres – enough for a passage of 48 hours.

Deep down in the belly of the ship, where they do not take up space unnecessarily, the fuel cells offer a rated power of 8,300 kilowatts and the storage batteries a capacity of 2,400 kilowatt-hours. The nominal speed of the ferries is set at 17 knots – the parameter used for sizing the fuel cells. To accelerate up to 18 knots, the four three-megawatt pod drives draw additional current from the batteries.

A Tonne Less Fuel

The energy balance is compelling. Whilst today's diesel-powered ferries burn about a tonne of fuel per crossing and expel about three tonnes of CO_2 in addition to sulphur and nitrogen oxides, the new ferry is entirely emission-free. The power provided by the Flettner rotors was not even included in the energy balance. Rohde estimates this "bonus" to be about ten per cent: "It is a windy area," is his justification for the large number. With regard to capital expenditure, the new ferries would only cost about 25 per cent more than a conventional design. "The technology is there – it just has to be applied to shipping," says FutureShip expert Rohde.

If the building order were to be placed next year, the Fehmarn Belt could be crossed with zero emissions as early as 2017. By contrast, construction work for the mammoth tunnel project would have just begun. ■ **DH**

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Early Adopters Ahead!

Emission Control Areas require alternative propulsion systems. An extension to the GL-MAN joint study assesses the costs and benefits of container feeder vessels using LNG or scrubber technology

Shipowners contemplating LNG as a future ship fuel because of its lower emissions and anticipated attractive pricing face a number of questions regarding the costs and possible benefits associated with this technology. Exhaust gas treatment systems are considered by many as a feasible alternative solution.

On 1 January 2015, new, strict emission limits will enter into force in Emission Control Areas (ECAs). Container feeder vessels operating in these areas are seen as potential early adopters of LNG technology. For this reason they are the focus of the current study, an extension of the GL-MAN joint study on costs and benefits of LNG as a ship fuel for container vessels as published in May 2012.

Approach

This study assesses the costs and benefits of both LNG and scrubber technology, as applied to six differently sized feeder vessels in comparison with a reference vessel using marine

fuel oil, which is or will be required by existing and upcoming regulations in various regions of operation.

The costs of implementing these technologies are compared with the expected benefits resulting from fuel cost differences. The underlying model assumes that the lowest-cost fuel available is used at any given time. To account for the space requirements of the respective technology, the benefit is reduced proportionately.

Main Assumptions

The same main assumptions were used for this study as for the GL-MAN joint study, on LNG for large container vessels. However, in the present study LNG tank volumes were chosen to give the selected vessels full roundtrip endurance on the relevant routes. This effectively reduces uncertainties associated with the LNG supply infrastructure. The calculated ▷

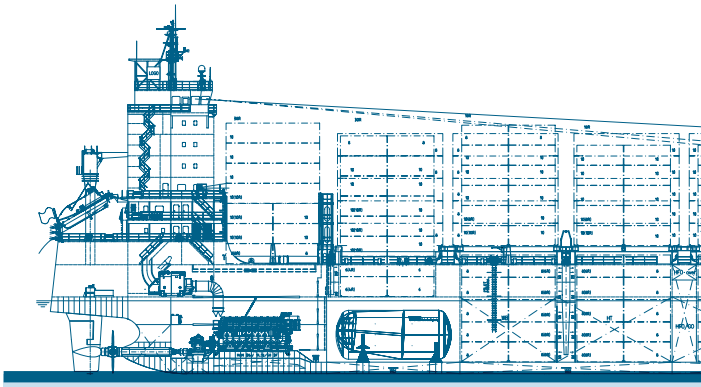
Ship Size Variants and Route Profiles

Six representative container feeder vessel sizes were selected for the study. Roundtrip lengths were selected for three intra-European trades with different ECA exposure levels.

TEU	Speed (knots)	Main engine power (kW)	Round-trip (nm)	Default ECA share
900 TEU	18	7,500	2,600	100.0%
1,250 TEU	18	9,000	2,600	100.0%
1,550 TEU	19	10,500	4,000	85.0%
1,800 TEU	19	11,500	4,000	85.0%
2,100 TEU	20	13,000	5,300	65.0%
2,500 TEU	20	14,500	5,300	65.0%

Photo: (c) Pilens | Dreamstime.com

FEEDER. The smaller the size of the vessels the shorter is the payback time for LNG technology.



costs for on-board LNG systems cover the tanks, the bunker station, gas preparation equipment, gas lines and the engine. Type C tanks were assumed for all vessels in this study.

LNG. *Liquified natural gas (predominantly methane, CH_4) is natural gas that has been converted to liquid form for ease of storage and transport by cooling it to –162 °C.*

The fuel price scenario (see chart on page 23) from the GL-MAN joint study was used in this study, as well. Small-scale LNG distribution costs of 4 USD/mmBTU were added to the current wholesale LNG price in northern Europe.

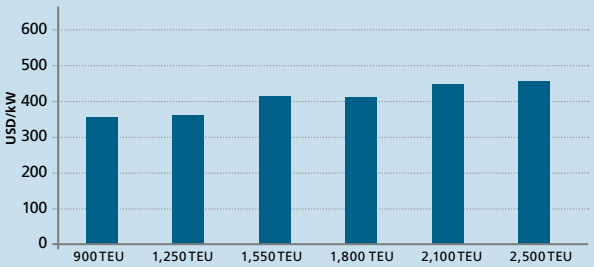
Results

The annual cost advantages compared to the reference vessel can be computed using the assumptions described above for each technology and vessel size. For a 1,250 TEU vessel using LNG or scrubber technology the study predicts significant annual cost advantages and rapid payback from 2015 onwards for ships operating exclusively inside ECAs.

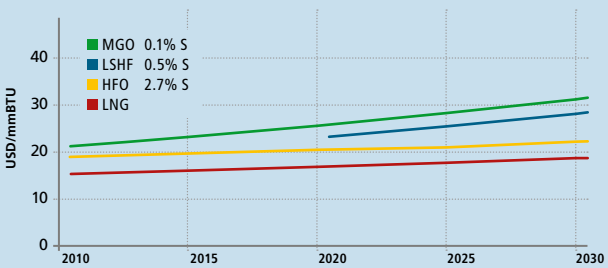
The benefits of technologies such as LNG or scrubbers depend strongly on their usage. The higher the ECA exposure, the shorter the payback time for all vessel sizes. Payback time is shorter for the smaller container vessels (900 TEU and 1,250 TEU) since the capital investment needed for their LNG systems is smaller than for larger vessels.

The LNG tank accounts for the largest portion of the additional investment. In this study, all vessel sizes are assumed

Specific Additional Costs for LNG Installation

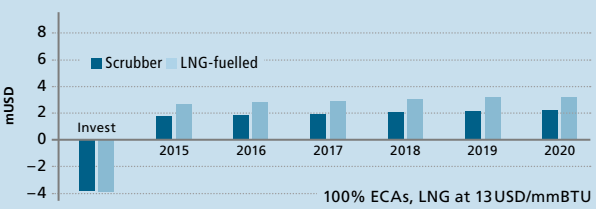


Fuel Price Scenario

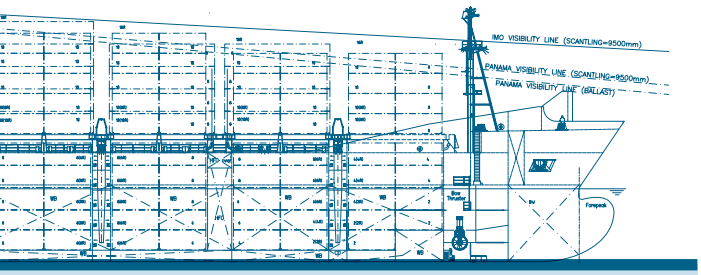


Annual Cost Advantage for 1,250 TEU Container Vessel

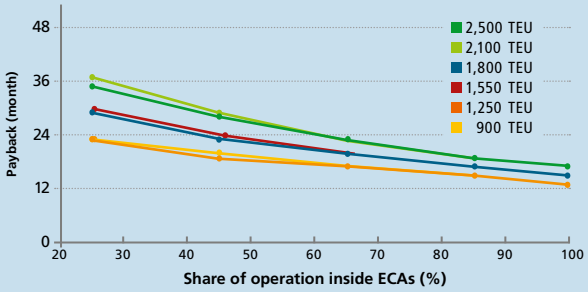
compared to standard vessel using standard fuels



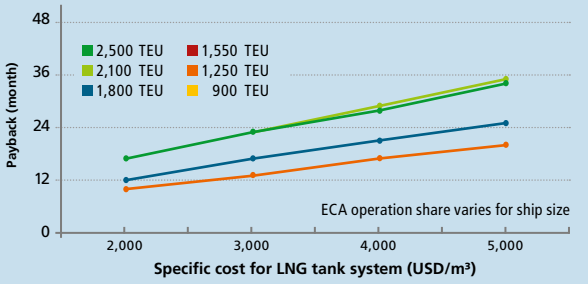
LNG. About 20 per cent of the current feeder fleet is younger than five years and considered suitable for a conversion.



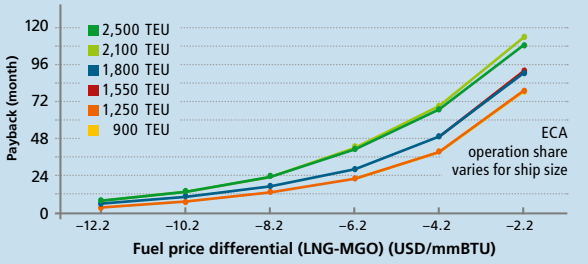
Payback for LNG System (Start in 2015)



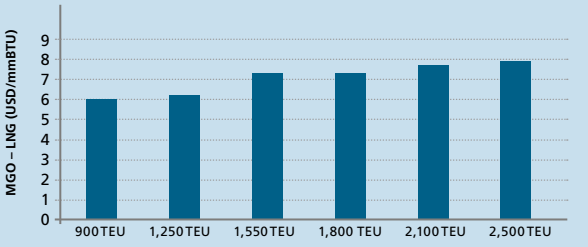
Payback for LNG System (Start in 2015)



Payback for LNG System (Start in 2015)



Fuel price differential
to make LNG systems more attractive than scrubber systems



Source: GL container feeder vessel advanced propulsion roadmap

Photo: © Nightman1965 | Dreamstime.com

to be equipped with type C tanks. Payback time roughly doubles with a doubling in specific LNG tank system costs. Changes in LNG distribution costs will significantly affect the payback scenarios. Within ECAs, the fuel of choice is MGO, and the price difference between MGO and LNG is the key factor determining the payback time for LNG technology. At current prices, the difference is significant enough to yield rapid payback for all vessel sizes. Payback is similar for vessels with identical ECA exposure levels.

Conclusions

Using LNG as a ship fuel can be assumed to result in lower emissions and, given the right circumstances, lower fuel costs. For container feeder vessels mostly operating inside ECAs, the relative attractiveness of LNG as a ship fuel compared to scrubber systems mainly depends on LNG price levels. At a difference of 6 to 8 USD/mmBTU or more between MGO and LNG, an LNG system will be more profitable than a scrubber system.

Newbuilding vs Conversion

Roughly 20 per cent of the current container feeder fleet consists of ships less than five years old, making them potential candidates for conversion to LNG. However, only vessels equipped with electronically controlled two-stroke main engines or engines similar to dual-fuel four-stroke engines can be converted easily.

In general, a conversion to LNG is anticipated to be more costly than the additional investment for an LNG system on board a newbuild. The extra cost of labour and the loss of earnings during the conversion period may add 15 to 20 per cent to the additional investment cost for an original LNG system; payback time will increase accordingly.

Acknowledgements

This study was conducted using the model and key assumptions from the GL-MAN joint study on LNG as a fuel for large container vessels. Analyses for specific vessels on specific trading routes are available on request. ■ **PCS**

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Environmental Passport, Please

Ship emissions to air and sea are subject to existing and upcoming regulations. A new GL service systematically documents and verifies ship operational emissions

The International Maritime Organization (IMO) has established regulations for ship emissions on an international level. Port authorities and independent industry organisations have introduced additional emission reporting requirements of their own. Voluntary standards such as the Environmental Ship Index (ESI, coupling port dues to emission levels), Clean Ship Index (CSI), and Clean Cargo Working Group (CCWG) are increasing the pressure on shipowners and operators to report their true emissions. To do so, operators not only need transparent, reliable instruments to monitor emissions but also an independent body to certify the results.

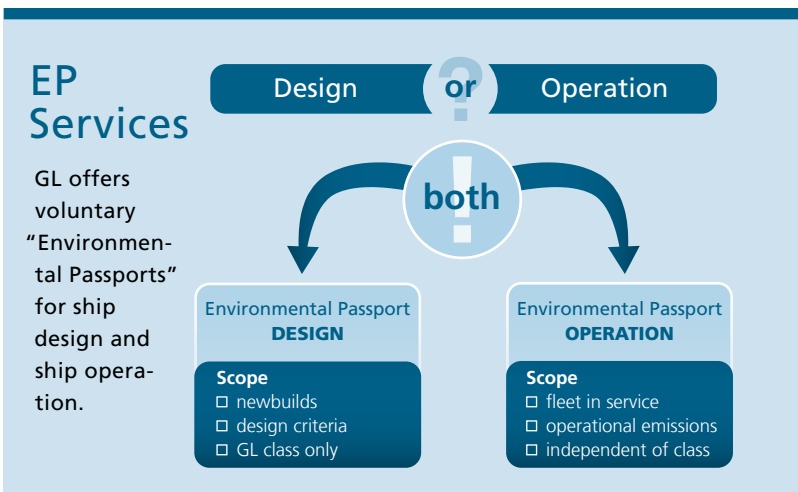
With its new "Environmental Passport – Operation" service, GL offers first-hand expertise and experience to address this challenge. The service certifies a ship's emission inventory for a one-year reporting period. Emission data is accumulated during voyages, and consolidated over the reporting period. Following verification and checking against applicable thresholds, GL will then certify the data. The procedure and related requirements are documented in the new Environmental Service System guidelines published on 1 September 2012.

GL originally launched its Environmental Passport (EP) service in 2002, offering GL-classed vessels an EP class notation on a voluntary basis. This class notation indicates that the legal environmental requirements in force at the time of certification are being exceeded. Due to its focus on design criteria, this service is most relevant for newbuilds. GL's future EP service will differentiate between an "Environmental Passport – Design" (EP-D), the traditional offering, and an "Environmental Passport – Operation" (EP-O). The Environmental Passport – Operation Certificate is offered independent of ships class. GL-classed ships can also obtain EP-O as a class notation.

As an independent, third-party verification, Environmental Passport – Operation documents the owner's and operator's commitment to achieving sustainable ship operation. The Environmental Passport programme thus provides the maritime industry with a means to demonstrate its efforts towards reducing its environmental footprint in terms of both design and operation.

Emission Inventory Certification

GL's Environmental Passport – Operation requires an emission inventory that summarises emissions to water and air based on predefined categories. It accounts for regular, i.e. non-accidental, emissions under normal ship operating conditions, including CO_2, SO_x, NO_x and refrigerants emitted to air, and ballast water, garbage and bilge water into the sea. The Environmental Passport – Operation certificate covers the respective vessel's worldwide operation over a specific period. The Environmental Passport – Operation service also includes computation of the IMO Energy Efficiency Operational Indicator (EEOI), provided that additional cargo data is made available. An extra page of the certificate can be used to record the EEOI value.



The vast majority of this data is readily available today in one form or another, be it in electronic log abstracts produced for the charterer and/or operator of the vessel, or be it in official record books used to record legal compliance data as required under MARPOL.

For efficient certification it will be necessary to provide this data in a consolidated electronic way, using a GL-defined electronically retrievable format. Optionally, GL provides an advanced software tool – GL EmissionManager – for data acquisition (read more on page 20).

While the overall verification process is identical for both options, the GL EmissionManager option offers the advantage of automating the processing of results: log abstract reporting is replaced, data is sent to a server automatically, and a report generator forwards the filtered data to the responsible staff in the operator's office. Implausible data are identified immediately and sent back to the ship for verification and correction. The GL EmissionManager is thus a perfect data handling tool, enabling entirely new data structuring as well as repeated and systematic recombination of data.

Data requirements specific to the emission categories, as well as procedures for determining emission values from other collected information, are described in detail in the new guidelines for the GL Environmental Service System.

SEEMP. *The Ship Energy Efficiency Management Plan's monitoring requirements are ideally fulfilled by the Environmental Passport – Operation.*

The Environmental Passport – Operation certificate ultimately confirms that the emission inventory and the data collection process both conform with the GL guidelines. To verify the data submitted, GL performs a statistical analysis and plausibility checks. Data consistency is further verified through office and/or on-board audits.

The Environmental Passport – Operation Certificate can be issued for all ships independent of class. This means that operational emissions of an entire fleet, whether consisting of owned or chartered vessels, can be certified. Furthermore, the EP-O certificate conforms to the monitoring and documentation requirements of related environmental management standards, such as ISO 50001 and ISO 14001. It thus provides an ideal reporting basis for the implementation of SEEMP. ■ **TM**

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SERVICE. Emission data from ship voyages are accumulated, consolidated and verified by GL.

Environmental Challenges

Hamburg Süd has joined forces with GL in order to improve its monitoring of vessel operations, consumption and emissions. The GL EmissionManager serves as a sustainable solution to create a wide-ranging environmental information system

Ocean-going vessels are the most efficient mode of transport. However, reducing the emissions to air (SO_x, NO_x, CO_2), soil (waste, chemicals) and water (ballast water, coating) is an on-going challenge for the global shipping industry. The use of modern IT can play a major role in managing the operational data that is key to this process. In 2011, German shipping company Hamburg Süd and Germanischer Lloyd (GL) agreed to develop an innovative data management system to systematically capture all ship operation information that is environmentally relevant. A first prototype was released in April 2012.

The GL EmissionManager ship management software is designed to systemise and structure reports that are traditionally recorded in less coordinated ways. Operational and voyage-related data, such as noon, departure, arrivals and stoppage reports, is recorded and analysed, and environmental information, on factors such as fuel, emissions to air, garbage, sludge, ballast water and chemicals is extracted.

The system consists of two parts, a software component that collects information (EM Recorder) and a GL GreenServer at Germanischer Lloyd, where the data is analysed and certified and where different reports are produced. In addition, the GL GreenServer forwards the data to in-house databases at Hamburg Süd.

The first step in implementing the system consistes of the EM Recorder on a computer on each participating vessel. The software collects environmentally important data in the form of voyage and operation reports. "Each report has a standard form containing relevant fields," explains Dr Frank Dubielzig, an environmental control specialist at Hamburg Süd. For example, the port departure report contains fields regarding the cargo load, fuel, position and more, whereas in the garbage report the crew can enter information about the amount and type of garbage and kind of disposal.

"While in the early stages of the project, the relevant data still has to be entered by the crew manually, it is planned that in later versions of the tool at least parts of the data would be entered automatically through the connection of the Emission Management Recorder to other systems of the ship," Dubielzig says.

Once all data for a report is collected, the master can immediately submit the report to the GL GreenServer at GL via the EM Recorder in the form of an e-mail with an attachment. If desired, he can also collect several reports and send them all together. "In order to enable all-encompassing environmental controlling and reporting, a lot of traditionally relevant information such as position, distance sailed and fuel consumed is needed," says Dubielzig. "Consequently, the GL EmissionManager allows reporting of this traditional information in a much more systematic and structured way. As a result, other departments such as Marine Operations benefit from the development of the software."

Easy to Handle

Hamburg Süd and GL have tried to make the GL EmissionManager easy to operate so that it creates no extra work for the crew. "Through a single click of a button the numerous standard forms are transferred from the EM Recorder to the GL GreenServer, which tracks all reports," says Dubielzig. "The system checks that no reports are missing. If the GL GreenServer, for example, receives an end of sea passage report, it automatically checks that all prior reports have been sent. If a report is missing, the vessel and the office are notified and further enquiries can be made." In addition, stand-

Photo: Hamburg Süd

ard event e-mails are automatically sent from the vessel to the GL GreenServer in order to signify standard events, such as port departure.

These standard event e-mails are transferred onwards from the GL GreenServer to a variety of recipients at Hamburg Süd or to the corresponding agents. The master can define additional recipients through the EM Recorder. Data fed into the GL GreenServer is aggregated and analysed. "In addition," explains Dubielzig, "some data, such as fuel consumption and distance sailed, is combined for standard environmental reports, for example the report to the CCWG. Once a year, we have to send a report including the fuel consumption of our entire fleet to the Clean Cargo Working Group," says Dubielzig. "At the moment, putting together this report is a substantial amount of work for the staff. However, we are looking forward to the point where the report is compiled automatically through the GL GreenServer."

CCWG. *The Clean Cargo Working Group is an organisation of shippers and carriers aiming at environmentally friendly transportation.*

The GL GreenServer at GL is controlled through a web interface, where Hamburg Süd staff on shore can log in. This way, information can be added or corrected, and additional reports can be generated, for example, about the ship efficiency of a particular vessel, a specific service or of the whole fleet. From the GL GreenServer the information is transferred to Hamburg Süd's own system, where it can be combined with data from internal sources, such as customer data. "This way," explains Dubielzig, "client-specific carbon footprints can be assembled. In addition, the shipping company can choose to have its data certified by GL through the GL GreenServer."

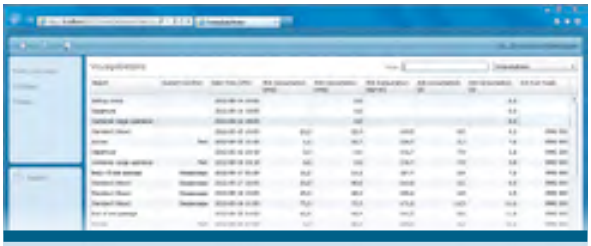
Safeguard for Data Quality and Integrity

Hamburg Süd is expecting the implementation of the new software system to yield considerable benefits, particularly the ability to assess the CO_2 emissions and break down the overall output into individual values, such as the emissions per cargo load on a specific voyage.

The company is also keen to use this tool in order to calculate data, such as the real capacity utilisation, and to use it to replace the traditional ship-to-shore reporting and to further standardise and structure the reporting process. "This new reporting process is a safeguard for highest data quality and integrity," says Dubielzig. "Through event-triggered reporting, plausibility and completeness checks, we will ensure that all data is correct and complete." Furthermore, the system is designed to store and automatically reuse information that has been entered already, avoiding duplicated work for the crew.

A further simplification is achieved through smart default values. For example, the "remaining distance" field in a voyage report is set with a default value, which is obtained through the automatic calculation of the "remaining distance" (last report minus the entered value of "distance sailed" since this last report). If needed, the master can overwrite the smart default values manually. ▸

HAMBURG SÜD. The shipping company operates a total of 160 vessels. In 2011, Hamburg Süd transported more than 3,100,000 TEU of cargo.



Solution for Lower Emissions

The GL EmissionManager is the new emission data management solution from Germanischer Lloyd that allows you to:

- Set up comprehensive emission reporting for your entire fleet
- Benefit from comprehensive fleet analysis capabilities across all your operational and voyage data
- Improve the data quality and integrity to meet the highest certifiable standards

And all that by using the data you already have as the solution replaces the traditional ship-to-shore reporting.

Photo: Hamburg Süd

▷ The new system simplifies the workload for both the crew on board and staff in the office. The crew on board will benefit from a central-unit data input facility that unifies all the formats and data collection transfer methods used prior to the implementation of the GL EmissionManager. The staff in the office also benefit from a reduction in manual data handling and analysis. Hamburg Süd is further hoping to benefit from the guided workflow for reporting.

In addition to the emissions software, the GL FleetAnalyzer, GL's business intelligence system for shipping companies, can be used to apply structured information in an aggregated manner, for management reporting and statistics forms. "This," says Dubielzig, "allows a fleet-wide view as well as a flexible drill-down 'slicing and dicing' functionality for analysis and reporting. These innovative features make the system very attractive for us at Hamburg Süd."

"Our Environmental Control Department at Hamburg Süd can avail itself of a larger amount of data and information on environmentally relevant processes. There are, however, also other departments that are interested in this data, such as Marine Operations and Line Management, which can then access a more detailed and comprehensive data basis."

In addition, the GL EmissionManager provides the shipping company with a variety of key performance indicators such as g CO_2/TEUkm. These key performance indicators help to assess the environmental performance of just one vessel, a group of vessels or the entire fleet. We can also choose different parameters such as SO_2 emission per TEUkm or fuel oil consumption per TEU. This is a great tool for us, and allows us to drill down to the areas where we want to improve," says Dubielzig.

The collection of environmentally relevant data is simplified and aggregated, which eases the workload and provides a broad base for additional analysis. "I am very happy with the amount of data that will be provided. This will enable us to conduct a greater variety of analyses," he says."We are also well set up to deal with future environmental regulations and stakeholder demands."

A Fleet-Wide Roll-Out Planned

After the first prototypes of GL GreenServer and EM Recorder were tested in May 2012, Hamburg Süd began planning the roll-out of the GL EmissionManager system for its entire container fleet as well as for the shipping company's chartered vessels, wich is scheduled for the beginning of 2013. "We have already spoken to the first charter shipping company about the implementation of the GL EmissionManager and the feedback was very positive," says Dubielzig.

GL FLEET-ANALYZER. *Business intelligence software that extracts data from operational systems for tailor-made decision-making support.*

GL and Hamburg Süd are already planning future enhancements to the solution, including automatic data tapping, such as machinery data, from other ship systems. "At the moment this is still a big problem, which will hopefully be solved through the GL EmissionManager in the near future," explains Dubielzig.

In addition, Hamburg Süd is planning to integrate data from other sources, such as tonnage centres, weather data service providers and fleet tracking providers, which will allow several additional forms of analysis. Furthermore, the amount and range of plausibility checks is going to be enhanced. "It can help us to identify environmental improvement areas and it helps us to collect all the relevant information in order to set environmental targets,"Dubielzig concludes. And, it helps to sensitise staff on board and on shore, and builds up awareness for environmental issues. "In order to gauge the potential for emission reduction and reach these aims, comprehensive data is needed – this is what the GL EmissionManager aims at". ■ **JC**

The article is an excerpt from *Digital Ship*.

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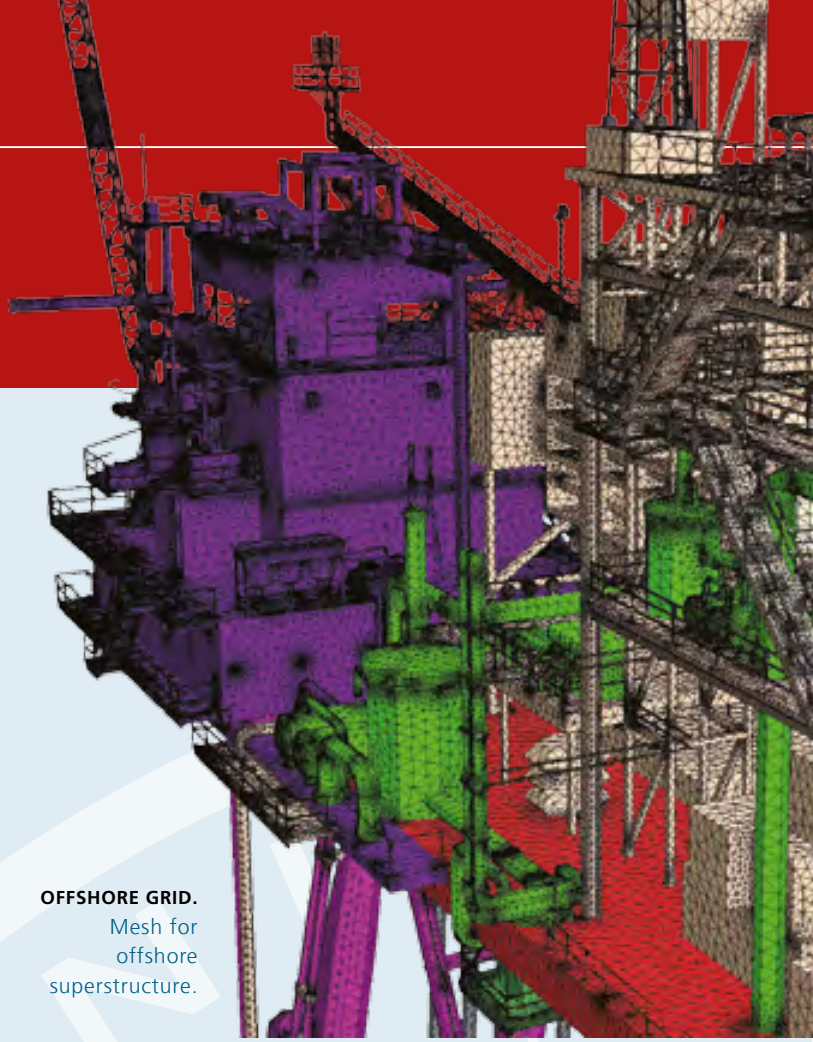
Offshore Structures

The Power of Virtualisation

By Dr Volker Bertram, Senior Project Manager, GL Group, and R.V. Ahilan, Managing Director, UK, GL Noble Denton

Montage: Dreamstime/Bowie15, GL Group



OFFSHORE GRID. Mesh for offshore superstructure.

Traditionally, the design and operation of ships and offshore structures were based on experience. This is still true to some extent, but we increasingly rely on "virtual experience" gained from computer-based simulations. Thanks to advances in computer hardware and software technology, the scope and depth of these simulations expanded vastly over the past decade. Today, engineers can draw on a wide range of applications for design as well as decision support. Simulations can be used to minimise the environmental impact of ships and offshore structures, ensure high availability and confirm compliance with regulations. Furthermore, it allows bolder, innovative designs and procedures without exposing people or assets to risks.

Studying Structural Integrity

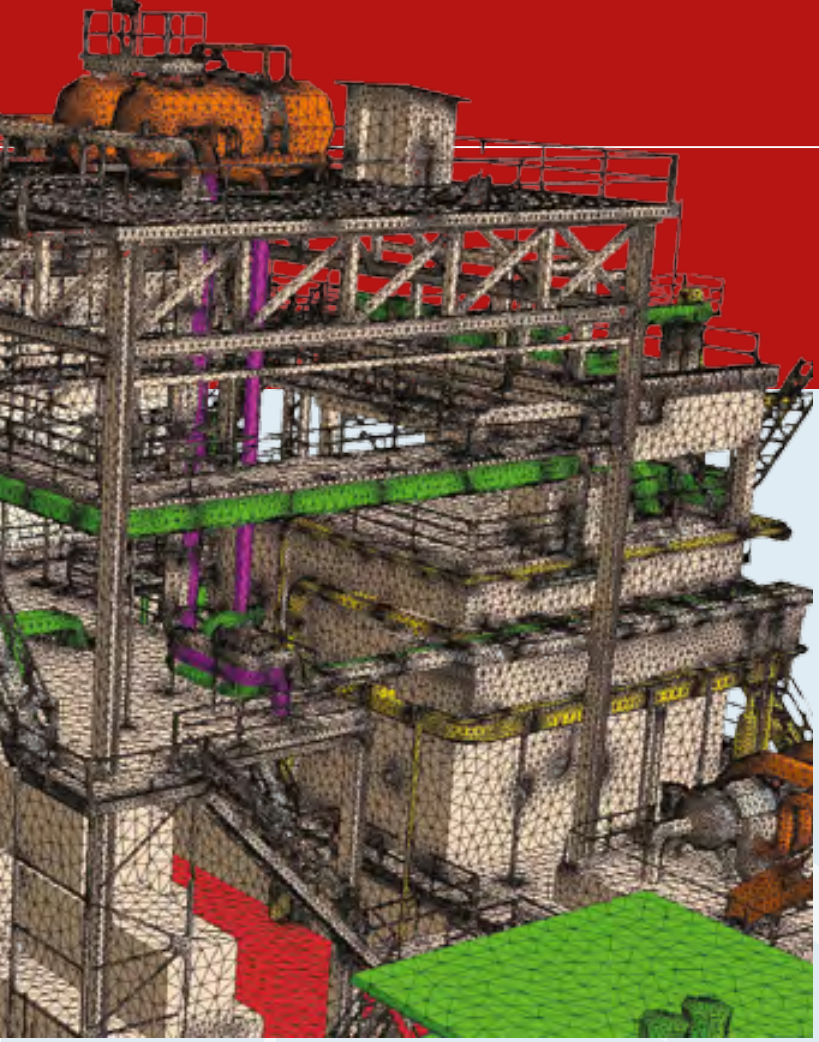
But that does not mean simulation has become a tool for everyone. On the contrary, the evolution of virtualisation goes hand in hand with an increase in complexity. As more factors come into play and the level of sophistication rises, the expertise required to produce meaningful results with simulation applications grows proportionately.

Accidents such as the "Exxon Valdez" oil spill and the "Deepwater Horizon" disaster have changed the way the offshore industry assesses risk. Beyond the physical damage and loss of assets, companies may face liability claims, criminal prosecution, damage to their reputation and possible loss of business. Regulation bodies and classification societies have responded to major incidents by imposing tighter rules and restrictions. Technical, environmental and occupational safety have moved centre stage.

Simulation is a powerful tool to ensure structural resilience and safe operation. It enables engineers to check design strength under a wide variety of conditions, including rare events and worst-case scenarios such as the highest wave to be expected in a particular region within 100 years. Risk-based design has become a buzzword in the industry. In general, simulation experts will proceed along client specifications or common industry practice.

Since load assumptions are usually the most significant uncertainty in structural assessment, the actual structural analysis is often preceded by a series of case-specific simulations to determine load distributions. These include long-term wave load distributions for fatigue analysis, extreme wave scenarios, and impact loads associated with slamming and sloshing. For specific applications, in particular ship springing and whipping as well as sloshing in tanks with very flexible membranes, it is even possible to account for the effect of the structural response on fluid dynamics.

Strength analysis is a mature discipline applied widely in the design of offshore structures. For elastic analyses of components of ships, offshore structures and subsystems, such as gearboxes, engines, cranes, risers, pipelines, etc. finite element analysis (FEA) is a common global strength assessment method. Offshore platforms and floating production, stor-

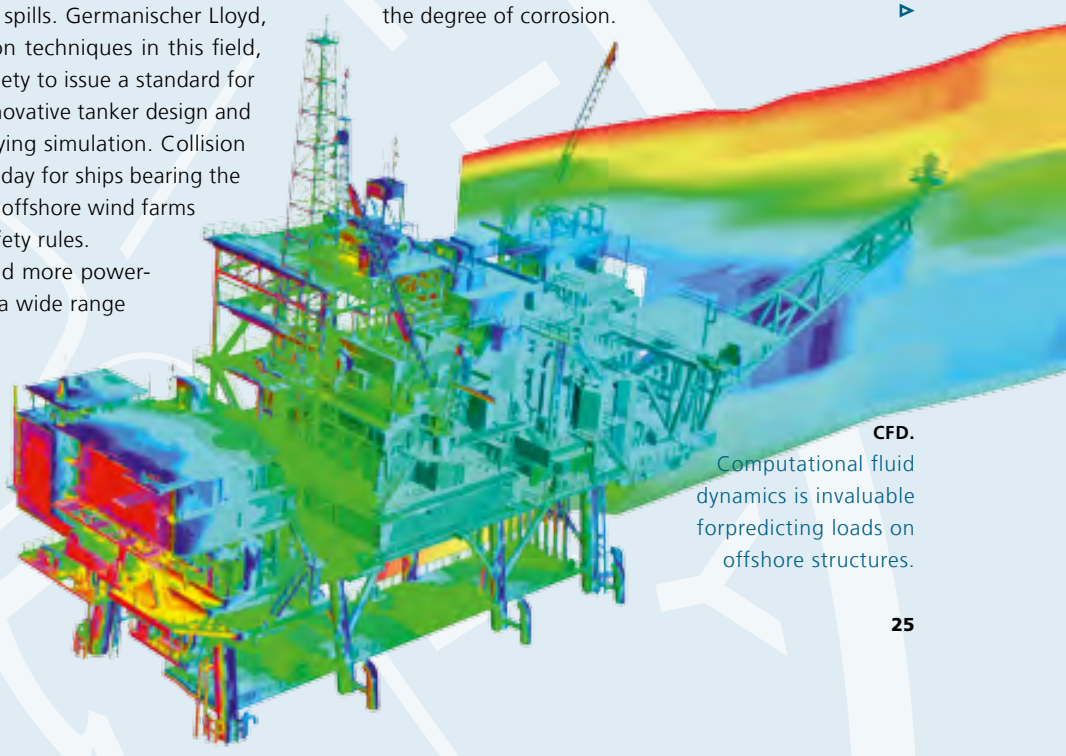


age and offloading vessels (FPSO) require additional, more sophisticated analyses to establish their material fatigue strength and collision resistance, an especially important aspect for the prevention of oil spills. Germanischer Lloyd, an early adopter of simulation techniques in this field, was the first classification society to issue a standard for evaluation and approval of innovative tanker design and construction methods employing simulation. Collision analysis is standard practice today for ships bearing the COLL class notation as well as offshore wind farms subject to specific collision-safety rules.

Simulation technology and more powerful computers have spawned a wide range of applications and fields of study that used to be out of reach, too costly or not sufficiently accurate in the past. Many modern operational guidelines and accident response procedures depend on enhanced simulation techniques. In particular, computational fluid dynamics (CFD) simulations are extremely helpful in studying the consequences of specific types of accidents and identifying the best response strategies.

Towing Damaged Structures

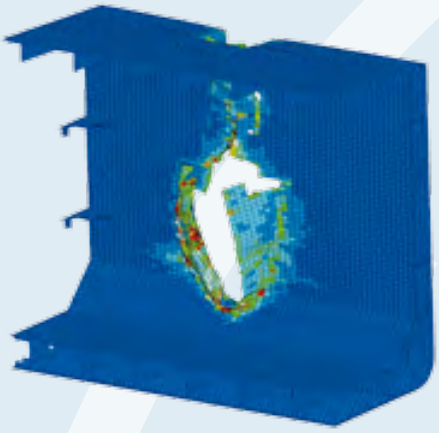
Following a collision, it is often necessary to tow a damaged structure to a repair site. Typically, the initial accident will impair the strength of the structure but may also affect residual freeboard and stability. All this needs to be accounted for when preparing for towage. CFD simulations of towed systems manoeuvring in waves provide an excellent method for understanding the navigational implications, and finite elements analysis simulations can be applied to determine stress distributions in the damaged structure, giving due consideration to the actual condition of the hull, including the degree of corrosion. ▷



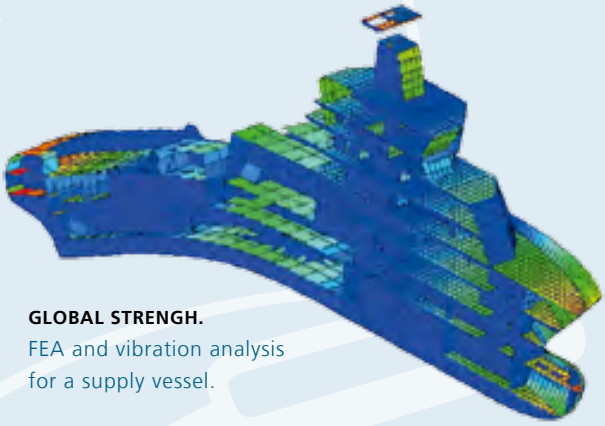
CFD. Computational fluid dynamics is invaluable forpredicting loads on offshore structures.

TOWING.
Ocean tugs towing base offshore oil drilling platform.

Photo: Stanislav Komogorov | Dreamstime.com



ENGINEERING TOOLBOX.
Collision analysis using non-linear finite element methods.



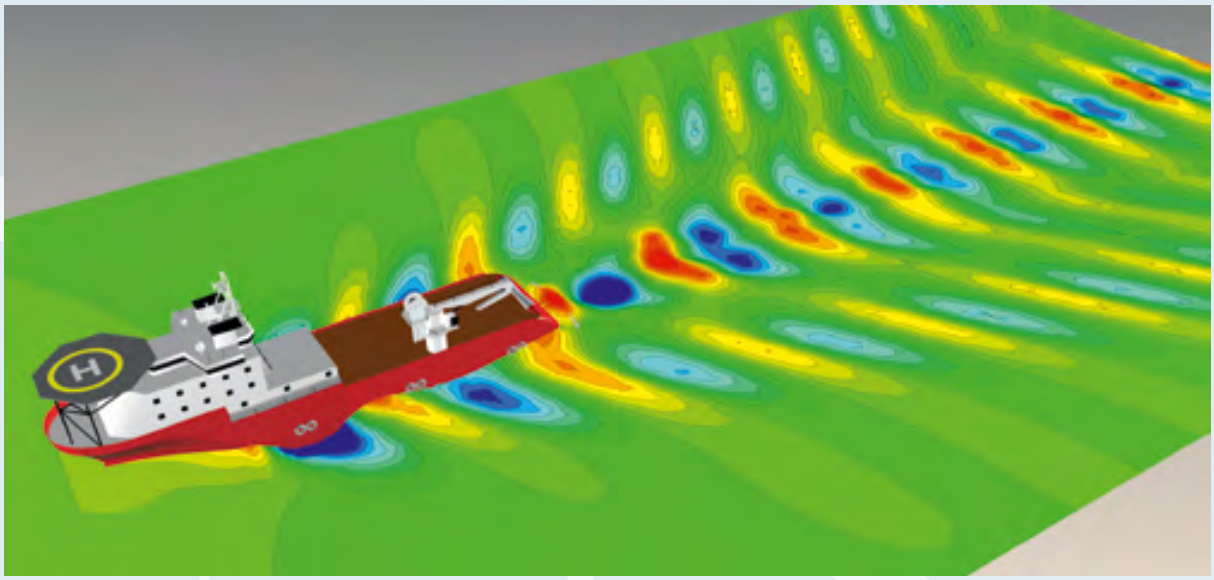
GLOBAL STRENGH.
FEA and vibration analysis for a supply vessel.

Predicting Oil Spills and Gas Dispersion

CFD can be used to simulate the complex flow behaviours of interacting fluids which differ in density and viscosity, such as oil and water in the case of an oil spill. Where waves or sloshing come into play, air may be included in the simulation as well. The same techniques and software applications can be used to study gas dispersion, such as gas leaks in closed spaces or the behaviour of smoke near crew quarters or helidecks on a drilling platform. Factors such as thermal processes, including buoyancy, and the extreme temperatures or flow speeds typically associated with explosions can all be accounted for.

Understanding fires

Fire simulations involve additional complexities. So-called zone models are employed to subdivide the areas under in-

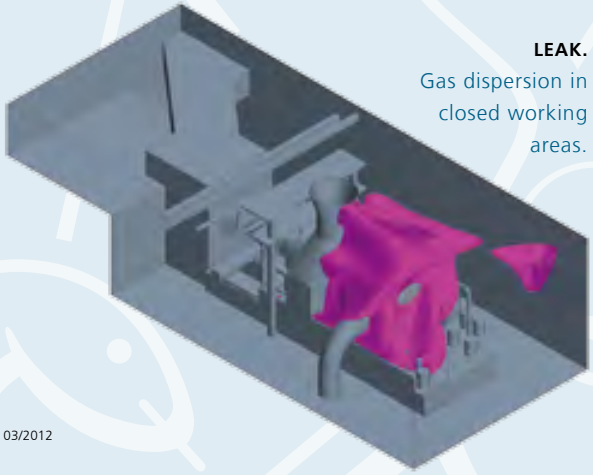


SHAPE.
Flow analysis for offshore supply vessels hull optimisation.

vestigation into individual zones characterised by uniform conditions. This approach makes it easier to examine time-dependent scenarios. Additional CFD models can yield detailed information about fire growth, temperatures, heat fluxes and concentrations of chemicals.

Improving Availability

Apart from disaster prevention and accident response, ensuring the availability of offshore structures is a key concern for operators and other stakeholders, especially in view of the exorbitant cost of downtime this industry must cope with. There are three categories of ensuring availability of offshore structures: Design for Availability, which mainly addresses system robustness; monitoring for availability, a discipline focused on condition-based maintenance to avoid downtime; and troubleshooting, the rapid identification and elimination of failures during operation. Simulation plays a crucial role in all three categories.



LEAK.
Gas dispersion in closed working areas.

"DESIGNING FOR AVAILABILITY" is a concept not only applied during the design stage of offshore systems and subsystems but also in the development of operational procedures, which play a key role in ensuring availability. Failure mode and effects analysis (FMEA) is a common formal risk assessment method used to determine, in combination with seakeeping simulations, important parameters such as operational limits (mainly sea conditions) for installation, maintenance and operation of offshore installations and supply ships. Modern CFD simulation applications are even capable of representing waves for analysis.

Determining the fatigue life of offshore structures is another critical area where FEA simulations have become ▷

OFFSHORE RIG. Environmental safetyconcerns design an operation.

Photo: Trondur | Dreamstime.com

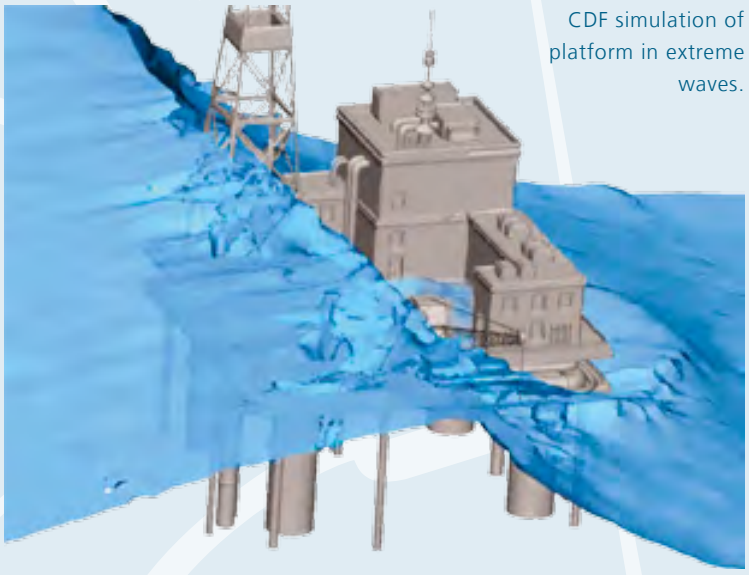
indispensable. By assessing critical aspects of structural strength during the design stage, engineers can detect and correct potential weak spots early, thereby avoiding costly changes at a later time. Similar analyses are highly recommended for offshore structures when planning to exceed the original design life.

"MONITORING FOR AVAILABILITY" as part of a condition-based maintenance strategy means keeping track of the degradation of specific system elements to predict and plan their replacement as precisely as possible and avoid unscheduled downtime. In an environment as conducive to corrosion as sea water, this approach is sometimes more economical than designing structures for complete avoidance of replacements. Increasingly, engineers combine traditional hull condition monitoring with structural FEA models to assess the residual strength of partially corroded structures. This combined approach makes it possible to reuse data models while cutting response times as well as costs for the user. The results form the basis for defining risk-based inspection schemes.

"TROUBLESHOOTING" maritime structures frequently means identifying the causes of vibration. Alternating flows or vortices occurring behind a local structure, typically an appendage or hull opening, may cause vibrations. On complex systems such as ships or FPSOs, such vortex-induced vibrations are difficult to analyse. CFD and vibration analysis techniques can save both time and costs when conducting these investigations.

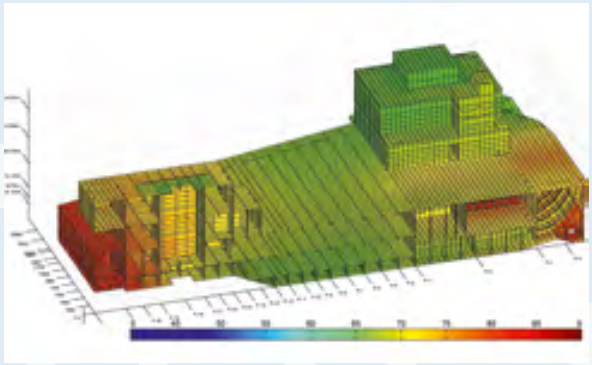
Ensuring Compliance

The offshore industry, in particular the oil and gas sector, is under close scrutiny by authorities and pressure groups alike. High-profile accidents invariably lead to additional regulations. In this environment, simulations play a vital role, especially so in the design and approval phase. Today, simulations are widely accepted by national authorities as "engineering proof of compliance". International regulations addressing occupational health and safety, such as the ILO's 2006 Maritime Labour Convention, limit the permissible exposure of onboard personnel to noise and vibration. Three-dimensional

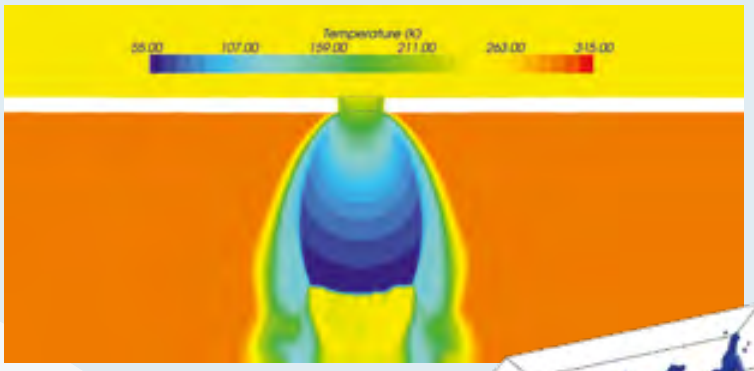


SCENARIO. CDF simulation of platform in extreme waves.

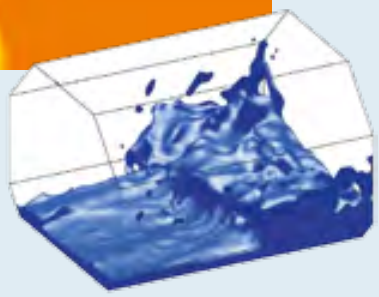
finite element analysis, the current standard choice for maritime vibration analysis, has its limitations when analysing structure-borne noise. Statistical energy analysis is more efficient because it relies on averaged data over a frequency band.



VIBRATION. Structure-borne noise analysis for a jack-up structure in transit avoids problems during operation.



HOT BLAST. Temperature distribution in supersonic gas leak – Real-life fire testing (below) supplies vital data for simulation.



INTERACTION. Sloshing simulation using free-surface CFD.

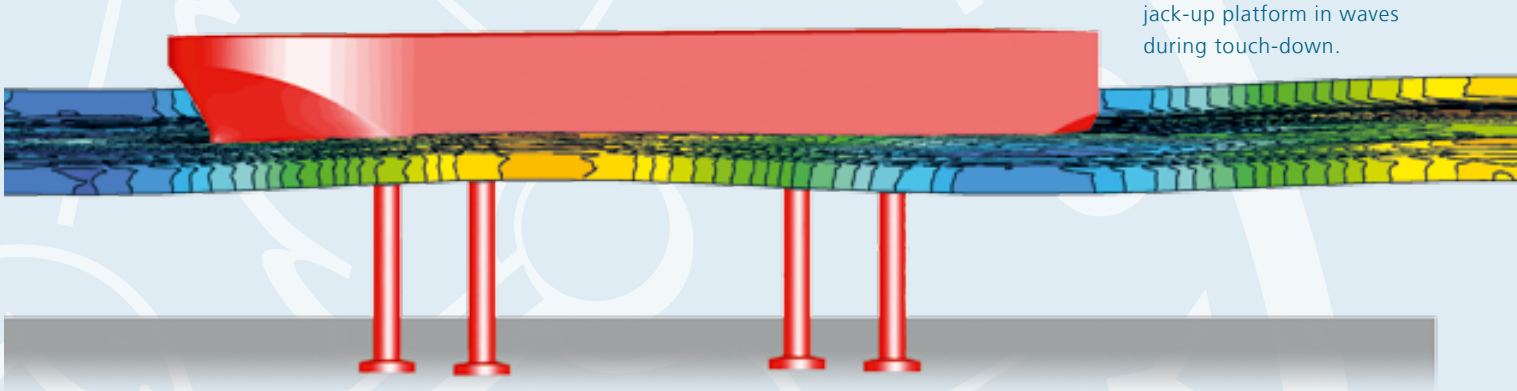
Simulation complexity increases significantly when human behaviour must be accounted for, e.g. in evacuation simulations. This requires discrete event simulation (DES) techniques. Germanischer Lloyd and TraffGo have developed the evacuation simulation application AENEAS which represents the ship or offshore habitat as a simplified grid of different types of "cells" (accessible floor, doors, stairs, obstacles/walls). Humans are represented by simple "expert systems", so-called intelligent agents. AENEAS enables yards, operators and authorities to ensure compliance with IMO MSC.1/Circ. 1238.

Enabling Innovative Designs and Procedures

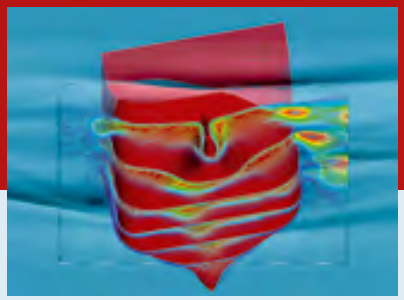
Facing numerous new technical challenges, the offshore industry has been under increased pressure to innovate. Innovation unlocks new riches but also involves the risks associated with venturing into technologically unknown territory.

Whenever we leave our "comfort zone" of experience moving to new designs or procedures, simulations give us most valuable insight and "virtual experience", ensuring that envisioned concepts are not only feasible but also ▷

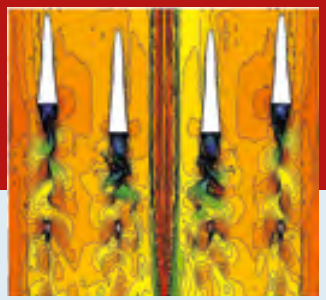
WAVES. Simulation of a jack-up platform in waves during touch-down.



OSV. Comparison of two offshore supply vessels in virtual seaway.



STRUCTURAL STRENGTH. CFD simulations give load histories for fatigue strength analyses on bilge keels.



CYLINDRICAL STRUCTURES. CFD simulation for vortex-induced vibrations at propeller shafts.

efficient and safe. This approach applies to installations, individual equipment and procedures alike.

For example, modern design practice employs computer fluid design and formal optimisation to derive optimum hull shapes as well as platform and appendage designs. OSVs (offshore supply vessels) are good candidates for formal hull optimisation, but fuel efficiency, stability, and seakeeping must be reflected in the optimisation model to find good trade-offs.

As all examples demonstrate that advanced simulation applications and techniques are a powerful set of tools for engineers to understand and predict the properties and behaviour of complex offshore structures and ships operating in the challenging maritime environment, and to design equipment for high reliability and availability in an efficient and cost-saving manner. However, working with modelling tools requires specific expertise to find the balance between level of detail and resources, and to unlock the full potential of virtualisation.

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Photo: Dreamstime

GL Academy – Dates at a Glance

Selected seminars in 2012 – information and registration: www.gl-academy.com

SEPTEMBER

18. – 19.09.2012
Implementation Workshop ILO Maritime Labour Convention
Makati City, Philippines

19. – 21.09.2012
Avaliador e Multiplicador Interno ONA
Brasília, DF, Brazil

24. – 26.09.2012
Internal Auditor of an Integrated Management System acc. to ISM Code, ISO 9001, ISO 14001 and BS OHSAS 18001
Kathmandu, Nepal

24. – 28.09.2012
Curso de Formación Auditor/ Auditor Líder de Sistemas de Gestión de la Calidad
Lima, Peru

25.09.2012
Ultimas enmiendas a las Normativas Marítimas
Madrid, Spain

25. – 26.09.2012
Implementation of an Environmental Management System according to ISO 14001 for Shipping Companies
Makati City, Philippines

OCTOBER

01. – 02.10.2012
Application and Implementation of an SEEMP
Genoa, Italy

04.10.2012
How Lean is your Safety Management System (SMS)?
Madrid, Spain

05.10.2012
Design for Production
Singapore, Singapore

07. – 11.10.2012
Superintendent Training Course
Dubai, United Arab Emirates

08. – 10.10.2012
Company/Ship Security Officer (CSO/SSO) Training Course
Singapore, Singapore

09.10.2012
EEDI in Practice – Energy Efficiency Design Index
Istanbul, Turkey

09. – 10.10.2012
Application and Implementation of an SEEMP
Madrid, Spain

09. – 10.10.2012
Handling and Transport of Dangerous Goods (IMDG Code Training)
Piraeus, Greece

09. – 11.10.2012
Train the Trainer for Shipping Companies
Genoa, Italy

11. – 12.10.2012
Dry Docking – Planning and Preparation for Superintendents
Piraeus, Greece

11. – 12.10.2012
TMSA Workshop – Risk Assessment, Change Management, Incident Investigation
Singapore, Singapore

12.10.2012
Emergency Preparedness and Crisis Management
Istanbul, Turkey

12.10.2012
Voyage Optimisation
Hamburg, Germany

16. – 17.10.2012
Application and Implementation of an SEEMP
Copenhagen, Denmark

22.10.2012
Fuel Saving
Busan, Republic of Korea

23.10.2012
Bulk Carriers – Technical and Operational Aspects
Piraeus, Greece

23.10.2012
Gas as Ship Fuel
Madrid, Spain

24.10.2012
Averias en la Estructura del Casco
Lima, Peru

24.10.2012
Ballast Water Management
Riga, Latvia

25. – 26.10.2012
Vetting Inspections
Naples, Italy

30. – 31.10.2012
Designated Person Ashore (DPA) Training Course
Tokyo, Japan

NOVEMBER

06. – 07.11.2012
Dealing Successfully with the Press in Maritime Emergencies
Hamburg, Germany

07. – 08.11.2012
Application and Implementation of an SEEMP
Singapore, Singapore

12. – 14.11.2012
Port Facility Security Officer (PFSO) Training Course
Piraeus, Greece

The Yard That Reinvents Itself

Flensburger Schiffbau-Gesellschaft is conquering new niche markets and focusing tightly on expanding its shipbuilding expertise. The global market leader in ferry construction has now opened an office in Hamburg with 40 experts

SHIPBUILDING SITE. Since its establishment in 1872, FSG has delivered some 750 newbuildings.

Many shipyards, and not only those in Germany, are suffering from a distinct decline in newbuilding orders. Not so Flensburger Schiffbau-Gesellschaft (FSG). With ten ships, its orderbook is comfortably full. In December 2011, FSG received an order from Oceanex of Canada for a combi-ferry 210 metres in length. "The Oceanex contract came at exactly the right time," says Broder Hinrichsen, Head of the Technical Department at FSG. "We were starting to run low on orders."

But this is hardly the case any more: in early 2012, the Dutch company Rolldock ordered two multifunctional project cargo ships – to be classified by Germanischer Lloyd. In June, the order of two offshore vessels was announced while Caledonian Maritime Assets Limited (CMAL) signed for a RoPax ferry.

Second String to the Bow

For RoRo ferries, Flensburger Schiffbau-Gesellschaft is still the number one worldwide. However, the decline in transport volume and, with it, the order situation in this segment prompted FSG to build up a new business unit. "Entering the offshore segment was certainly not easy. Nevertheless, we were able to convince the customers of our competence, innovative energy as well as our proven budget and delivery reliability," says Hinrichsen. Here the firm's recipe for success is the persistent customer focus yielding custom-fitted solutions. "We make every effort to analyse the transportation requirements of our customers in great detail," says Hinrichsen.

ROPAX. *A combi-carrier used for transporting both passengers and cargo, especially cars and trucks.*

Above all, FSG is now reaping the profits of its excellent reputation. The trust placed in the performance capability of the yard for superior design and production plays an important role in order placement, as does increasingly the schedule reliability: "In this respect, we can point to our perfect delivery record. Over the past twenty years, we have always handed over the ship on time or early," Hinrichsen is proud to say.

This is also a matter of organisation. The design office is located on the yard premises. "We do not believe in external sourcing and prefer to keep the entire value chain within the company," Hinrichsen explains. The benefits are clear: "In this way, we can react very quickly and flexibly to the wishes of the customer."

The yard's high level of consulting competency has compensated for the lack of references in the offshore segment. "Naturally, we do not reveal our technical secrets before a customer has signed the contract," says Hinrichsen. But even during the preliminary planning discussion potential

"All of our customers are interested in constantly reducing the environmental footprint of their ships."

BRODER HINRICHSEN
Head of Technical Department, FSG

Photos: FSG

customers must face complex questions related to ship design, such as the conflict between seagoing behaviour and resistance. "Our solutions are firmly based on a holistic approach. The customers are impressed, above all by how deeply we immerse ourselves in technical issues," explains Hinrichsen, who has a doctorate in naval architecture. "According to the experience gained thus far in the offshore segment," says Hinrichsen, "FSG's business partners soon come to think: 'The shipbuilders in Flensburg are really on top of their game.'"

High Technical Demands

The British firm WesternGeco, one of the largest providers of geophysical services in the exploration for natural resources, has ordered two seismic surveying ships from FSG. These special-purpose ships are able to search for crude oil and natural gas reserves under the seabed. They are designed for operations in Arctic regions. As far as efficiency, comfort, reliability, and operational reliability are concerned, they are amongst the most modern newbuildings in their market segment.

Offshore ships usually have to be outfitted with a large amount of equipment and, owing to the highly specific operational area, are produced in very small series. "The stringent technical requirements fit in well with our engineering capabilities," says Hinrichsen, as leader of FSG's development team. "Our customers in the offshore industry have to master very specialised transport tasks. That simply can't be done with predatory pricing."

Added to that, some operators have had bad experience with Asian yards. As Hinrichsen notes: "When the budget runs off track, the quality is below spec, and the delivery date is postponed repeatedly, you will find that the financial benefits can evaporate very quickly. With complex ship designs in particular, contract and delivery reliability is of paramount importance."

Before the WesternGeco order was placed, the exploration company subjected FSG to a concentrated one-week audit process. The audit result, backed up by detailed technical discussions, then culminated in the award. For the yard, this means a full workload up until the middle of 2014.

Hinrichsen addresses the strategic objectives of the shipyard's customers: "We analyse the technical condition of the fleet, suggest operational improvements, and calculate the amortisation period for newbuildings. In contract negotiations, it has become more and more important to calculate the return on investment. We have made considerable investments in this field, and can compute the financial ▶

ROLLDOCK WEIGHTLIFTER. Two of the multifunctional project cargo ships are currently under construction at FSG. Delivery of this innovative and highly adaptable heavy-lift carrier is planned for 2014. The concept allows loading of the GL-classed ships in three different ways.

▷ advantages of each individual aspect for our customers with great accuracy."

The order received from the Scottish shipping company CMAL shows how thoroughly FSG analysed and optimised the fundamental economic conditions for this operator of a ferry link between Stornoway and Ullapool in the northwest of Scotland. The new 116-metre RoPax ferry is designed for 24-hour operation and will be fitted with a hybrid drive. Upon delivery in 2014, it is to replace two old ferries by offering space for 700 passengers and 143 cars or 20 trucks.

"As soon as we get into the details of construction planning, we can give our clients adequate advice and achieve a good design," asserts Hinrichsen. This is where the philosophy of the company pays off: "We rely on our own research and development, because we can only succeed against the competition from Asia if we keep the shipbuilding know-how inside the enterprise and develop the innovations ourselves." High-quality production alone is no longer enough for today's customers.

In Flensburg, there is one engineer for every three yard workers – this ratio is surely unique worldwide for a shipyard. "Our goal is to analyse the customer's entire transportation process of the customer and to give the shipping companies vessels that operate as reliably and profitably as possible over the entire lifecycle," Hinrichsen points out.

Building a new ferry costs from 50 to 60 million euros. The decisive factor is the overall cost for an operational period spanning several decades. Optimisation of the ship is not the only objective. The conditions prevailing at the port terminal and the hinterland connections must also be taken into account. "Installing a ramp that is custom-fitted for the actual terminal to be used by the ferry can significantly reduce the turnaround time in port. The shipping company saves time in total for the crossings, which means the ship can steam at a slower speed and hence consume less fuel. Over a number of years, this adds up to big savings," is Hinrichsen's reasoning.

Well Equipped for Building Special Ships

FSG's head of technology is opposed to the outsourcing of development work and design activities, because it leads not only to increased effort in terms of coordination but also to errors, delays and a frequent lack of clear-cut responsibilities. Consequently, the Flensburg experts prefer to rely on themselves – and have critical calculations checked by a classification society, such as Germanischer Lloyd.

For Hinrichsen, it is clear that a yard only has a future in these difficult times if it is able to set technological standards, generate real benefit for the customers, and deliver outstanding quality. In the building of special-purpose ships, FSG is well prepared to face the trend towards much more complex, equipment-intensive units that are built in small series or as one-offs.

If this strategy is vindicated, the number of engineering hours may be expected to increase further in relation to the production hours. Engineering services are becoming in-

CONRO. *Ships of this type can transport containers and RoRo cargo at the same time. The first unit of this class was the "Atlantic Span", built in 1967.*

Flensburger Schiffbau-Gesellschaft in Figures

740 *employees in Flensburg*
40 *experts at the office in Hamburg*
10 *newbuildings by the end of 2014*
3–4 *ferries per year*

Photos: FSG

FREIGHT FERRY. The specialisation in RoRo vessels has given FSG an enviable reputation, not only in this segment.

creasingly important. In May 2012, the yard opened an engineering office in Hamburg – also in response to the growing demand for greener ships. The international environmental regulations, such as MARPOL Annex 6, have sent important signals to the industry.

"All of our customers are interested in constantly reducing the environmental footprint of their ships," Hinrichsen declares. For this reason, FSG is working on its own research projects and also participating in publicly funded projects – specifically with respect to the safe operation of ships with LNG (liquified natural gas). Especially for ferries shuttling between two ports, LNG may soon establish itself as the more economical alternative. The cost of supply and the expenses for the necessary infrastructure are manageable and will pay off within a short space of time.

Hinrichsen also sees massive potential saving in energy management on board. The focus cannot be placed merely on the optimization of individual components, however. By implementing intelligent controllers, substantial savings can be attained for the entire system. Here he spotlights an important aspect: "The ship of the future will still be powered by some sort of liquid fuel. A 'rechargeable battery' solution is not on the horizon," he remarks. And yet, the ship as a mode of transport need not fear competition. Moving commodities by sea still makes economic and ecological sense.

As a naval architect with a passion for innovation, Hinrichsen sees the future of his industry as lying in the continuous improvement of the overall ship system: state-of-the-art computation and simulation methods still offer a great deal of optimisation potential, even for steel ships. "In my view, the available methods and procedures are not being exploited fully. There is still a lot of leeway for achieving savings without reducing the deadweight tonnage of the vessels and jeopardising the technical safety of the ship," asserts Hinrichsen.

Expectations for the Class

Innovation, optimisation, quality assurance – for all this, FSG also needs the specialised support of a classification society. "Our expectation is that the class must be fully on board with our engineering philosophy. We need the class as a technical partner with whom we can examine, on an equal footing, the technical solutions and their compatibility with the construction rules," says Hinrichsen.

An intensive technical discussion during the plan approval phase is just as important as having far-sighted and experienced surveyors on site who display a high degree of flexibility and interest in joint solutions. But the class is much more than just a technical sparring partner. "For strength, flow and vibration calculations, we sometimes use the class to confirm our results or to just check them to be on the safe side."

"We feel assured when we have achieved the correct results. But it is almost as assuring when we find that GL has come to a different conclusion. Then we can check our assumptions and calculations," Hinrichsen muses pragmatically, following up with a request of classification societies in general: "They should not get into basic design. That is not their main task. A classification society should focus on the technical safety of newbuildings." ■ **OM**

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"PACIFIC ORCA". The third-generation wind turbine installation vessel was delivered recently.

Where It All Comes Together

European offshore wind energy is booming – 132 new turbines worth 523.2 megawatts were put on line during the first six months of the year. But to go on, the industry needs innovative offshore service vessels

JAN SCHREIBER. GL's new Ship Type Expert for Offshore Service and Working Vessels.

Wind turbine installation is a highly specialised activity requiring custom-built ships: aptly called Wind Turbine Installation Ships (WTIS). *nonstop* spoke with GL expert Jan Schreiber about pioneering projects, newly developed rules and future challenges.

NONSTOP: Recently, the wind turbine installation ship "Pacific Orca" was delivered by Samsung Heavy Industries to Swire Pacific Offshore Operations. What makes this ship special?

JAN SCHREIBER: First of all, she is the largest wind farm installation ship ever built, with a length of 161m, a breadth of 49 m and a depth of 10.4 m. Her capacity is enormous: She is capable of carrying and installing up to twelve wind turbine units of the 3.6 MW class. Furthermore, the "Pacific Orca" can install foundations and erect turbines in water depths of up to 60 m. Looking at future projects, this WTIS will also be able to install very large wind turbines with a rated output of 10 MW. Another impressive feature is the ship's ability lift herself up to 17m above sea level. This minimises the impact of waves and wind during installation operations.

NONSTOP: How did GL contribute to this project?

SCHREIBER: This was a truly collaborative project involving several business segments of GL Group. Our colleagues from GL Noble Denton undertook the engineering and design work for the legs, spud-cans and the jacking system, including FMEA, as well as integration of these components into the ship's hull. They also provided the shipyard consultancy and

site-specific assessment services. FutureShip, a GL company, carried out the global strength and fatigue analyses for the ship afloat and was responsible for owner consultancy. And GL as a classification society conducted the in-place analysis in jacked-up mode and provides the classification services for the "Pacific Orca".

NONSTOP: Did GL have to develop a new set of classification rules specifically for this special ship type?

SCHREIBER: Yes. GL had published new rules for Hull Structures of Offshore Service Vessels as early as 2010. These rules have recently been supplemented by a set of classification rules for Crew Boats and Offshore Wind Farm Service Craft. This was done to consolidate all relevant GL rules, international codes and recommendations applicable to the classification of crew boats into one coherent framework. Using this compendium, designers developing vessels for the needs of their clients will be able to rely on one single collection of rules and guidelines with full confidence that their design will comply with classification requirements.

NONSTOP: Are these rules being applied in any current projects as yet?

SCHREIBER: Just recently we announced that the new "WindServer" wind farm service trimarans designed by Fjellstrand for World Marine Offshore will be classed by GL. This project comprises two 30m and four 25m ships. Their designer improved access to offshore installations in difficult weather conditions, enhanced fuel efficiency, reduced the running costs and, most importantly, ensured the safety of the personnel on board, all pursuant to GL's rules. The boats will have a service speed of 25 knots and the capacity to carry 25 and 12 service personnel, respectively. The trimarans are scheduled to go into service as early as March 2013. ■ **SG**

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TRIMARANS. The Fjellstrand WindServer will be classed by GL.

TRIANEL. The GL Group is deeply involved in the project.

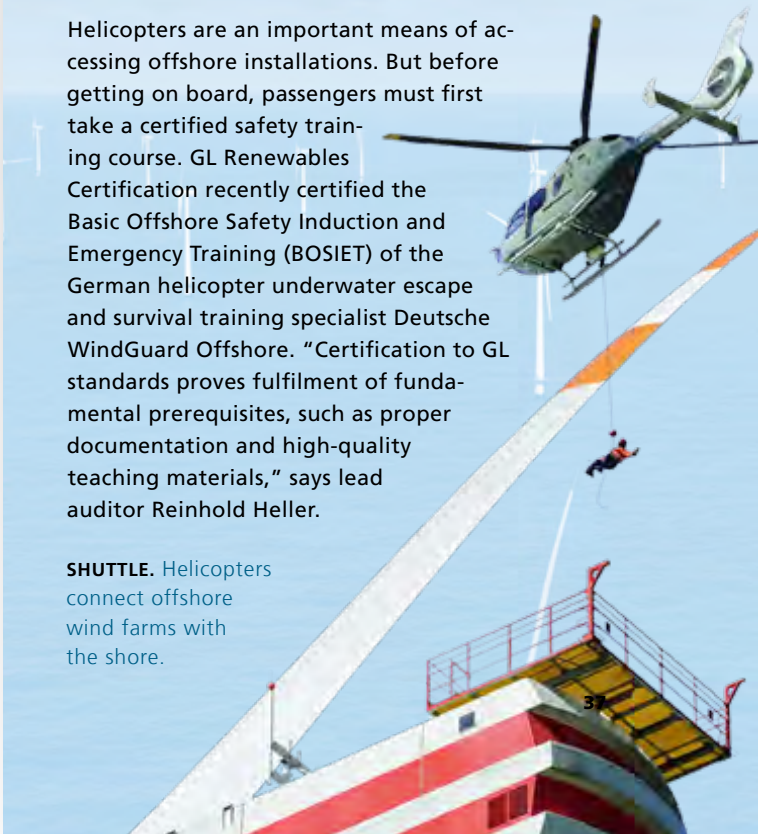
Offshore but Centre Stage

By the end of 2012, the first German households will be tapping "green" electricity from a major new wind farm built 45 kilometres offshore the North Sea island of Borkum. The 400 MW "Trianel Windpark Borkum", spread over 56 km², is the first large-scale municipal offshore project in Europe. GL Garrad Hassan has played a significant role in its development.

When completed, the 80 five-MW wind turbines of the wind farm will be capable of generating 750 GWh annually, enough electricity to power nearly 400,000 households. The GL Group was initially contracted for some project risk work and technical studies as well as a review of the capital costs of the project. However, the role expanded over time. Today, GL is providing project management services for the core project, ensuring that all contractors deliver their part of the work on time.

Safety First

Helicopters are an important means of accessing offshore installations. But before getting on board, passengers must first take a certified safety training course. GL Renewables Certification recently certified the Basic Offshore Safety Induction and Emergency Training (BOSIET) of the German helicopter underwater escape and survival training specialist Deutsche WindGuard Offshore. "Certification to GL standards proves fulfilment of fundamental prerequisites, such as proper documentation and high-quality teaching materials," says lead auditor Reinhold Heller.



SHUTTLE. Helicopters connect offshore wind farms with the shore.

Photos: alpha-ventus, Dreamstime/Halberg, Fjellstrand, Trianel/WeserWind

Back to the Front Line

Evergas, building up a new fleet of top-quality specialised ships, is about to reshuffle the gas tanker market. Vice President Ralph Juhl explains how the Danish company pushes innovative concepts to accomplish its ambitious goals

The future has begun: the delivery of Evergas' innovative gas tanker "JS Caesar" marked the starting point of the company's drive to regain its leading position in the gas transport market. "This ship type is unique," says Ralph Juhl, Vice President of Evergas. The Danish gas shipping specialist was originally known under the name of Eitzen Gas, then Eitzen Ethylene Carriers. Following the acquisition by the Luxemburg-based Jaccar Holdings the company changed its name to Evergas in 2011.

Unrivalled Features

"JS Caesar" is the first of a series of six full-pressure, 5,000-cubic-metre LPG tankers. "The vessel was built to the highest standards – for the benefit of our customers in the oil and gas business as well as for the people onboard," says Juhl.

"JS Caesar" was built by the Chinese shipyard Nantong Sinopacific Offshore and Engineering Co., Ltd. Its technical management was entrusted to Hartmann Reederei, Leer, Germany, the company that also fronted the vessel's design and building supervision. Classed by GL, the newly built ship was delivered this spring.

The owner's enthusiasm with the performance features of the vessel is palpable: "We've achieved a service speed of 13 knots with a consumption of only 9.54 tonnes of fuel per day. This is excellent fuel efficiency, considering the speed and size of the vessel," Juhl says. The ship's fuel consumption is 18 per cent lower than that of comparable standard designs. As a result, its CO_2 emissions are low enough to meet the EEDI (rules of March 2012) requirements, and its nitrous and sulphur oxide (NO_x and SO_x) emissions are fully in line with the MARPOL and EU directives. The series of vessels will be delivered able to achieve EEDI phase III compliance in accordance with the 2025 requirements.

In addition, an on-board ballast water treatment system further confirms the environmental footprint of the ship. "The utmost has been done to optimise this vessel. The efforts made by the entire team from GL, Sinopacific, the Hartmann Group, Jaccar Holdings and other stakeholders were highly successful: in terms of efficiency and operational features the vessel meets all of the upcoming requirements, and it does so at a very cost-competitive level," says Mr Juhl.

By adopting a highly innovative full-press bilobe cargo tank, the vessel gains an additional cargo capacity of around 700 cubic metres, compared to similar standard designs. ▷

Ralph Juhl, Vice President

The Danish citizen has been in shipping since 1983, when he commenced his seagoing career which he ended in 1997 as a deep sea captain. After that, Mr Juhl joined Tschudi & Eitzen Ship Management and stayed in the Eitzen Ship Management regime for ten years. Mr Juhl held various positions in the global ship management group as a manager, director and vice president. He then worked independently as a consultant for three years, special focussing on technical organisations and ship management strategies. In 2010 Mr Juhl was employed by Eitzen Gas as Vice President with special responsibility for the company's own vessels and the extensive newbuilding programme.

Photos: Evergas

▷ This also made it possible to reduce the lengtn to 99.9 metres, which suits the size requirements of some major ports in Europe.

"At the Jaccar Group, our corporate philosophy is to inspire people to grow," says Mr Juhl. "We firmly believe if you enable people to do a good job, they will grow and they will perform at their maximum level, which is in the interest and to the benefit of everybody."

"Amid a competitive market," he says, "Evergas really has to look into the needs of its customers. We must offer the oil companies a ship that is sustainable and attractive by meeting their commercial needs."

EEDI. *The Energy Efficiency Design Index will enter into force as a mandatory standard for all new ships on 1 January 2013.*

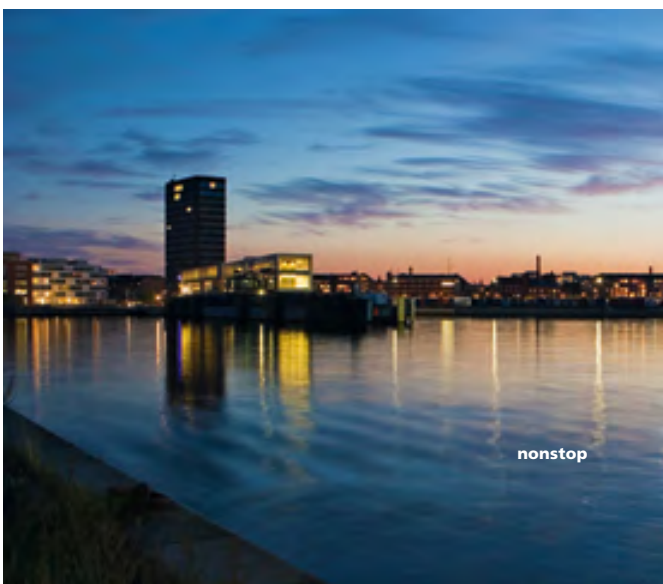
A Corporate Family

Yet building a ship solely for high operating efficiency is not enough. Advanced ship design means that the interests of the sailors on board must be accounted for as well. "JS Caesar" is a gas tanker that fulfils both criteria in an exemplary manner.

The new-build features fully automated systems and a one-man bridge control layout. The living and working conditions for the crew are very comfortable and up to a very high standard. Each and every crew member has a single cabin with its own bath and toilet, a desk and other facilities, all in full accordance with the MLC Convention. "Of course we must first and foremost live up to our customers' commercial expectations. But the crew is just as important to us because they work at the forefront, representing the company. We want to create the right conditions to retain our crew by treating them as colleagues and by involving them as part of the company. To us they are more than employees – they are individuals, and they are part of our corporate family," says Juhl.

Evgenios Koumoudhis, Area Manager of GL Greater China, did not want to miss out on the naming and delivery ceremony of the vessel. "It is a great honour to be part of this unique, innovative project that is fully competitive in every respect," he said. In turn, Evergas VP Juhl expressed

Photo: Kontraframe.dk



EVERGAS. Headquarters of the Danish gas shipping specialist in Copenhagen.

Photos: Evergas

CHRISTENING. On 23 May, "JS Caesar" was delivered to Evergas by its builder Nantong Sinopacific Offshore and Engineering Co., Ltd. in China. Classified by GL, the vessel will be technically managed by Hartmann Reederei, Germany. Two more vessels of the series were delivered at the end of June (photo above).

"JS Caesar"

MAIN DIMENSIONS
Loa: 99.90 m
Lbp: 92.50 m
Beam: 17.40 m
Depth: 11.70 m
Design Draft: 7.00 m
Scantling Draft: 7.06 m
Deadweight: 4,986 mt

TANK CAPACITIES
Cargo: 5,027 m³
Heavy Fuel Oil: 686 m³
Marine Gas Oil: 176 m³
Fresh Water: 218 m³
Water Ballast: 1,929 m³

SPEED AND CONSUMPTION
Service Speed with 15% sea margin: 13 kn
Main engine fuel oil consumption per day at 85% MCR: 9.54 t/day
Endurance: approx. 10,000 nm

his appreciation of GL as a project partner, saying that "GL's involvement gives us a certainty that we've done the right thing. Absolutely." Mr Juhl added that "recognised and tested service" was what Evergas expects in a project more than anything else. "We think we can get that from GL," he emphasised. "GL is our guarantee that a vessel will be in good condition for shipping." Beyond classification services, GL also offers technical management support through a planned maintenance system for the new ship.

Successful Partnership

The potential for further cooperation is considerable. For instance, Evergas is working closely with GL's maritime consultancy subsidiary FutureShip on optimising the hulls and propellers of their eight 12,000-cubic-metre LEG carriers now under construction at Sinopacific. The results of the fuel consumption calculations are encouraging.

Currently "JS Caesar" is operating on a long-time charter in the eastern mediterranean and the black sea. The other two new LPG carriers will be deployed by a European oil company for trade in Northern European waters. In addition to the five LPG carriers under construction, Evergas is in the process of building eight 12,000-cubic-metre LEG carriers to reinforce its existing fleet of five ethylene carriers. Furthermore, Evergas in planning to order four more vessels whose size has not been determined as yet. These vessels will be deployed on trade routes worldwide, including the Middle and Far East.

Undoubtedly the exceptional quality of this new fleet is a solid foundation for Evergas to attract more customers and achieve its ambitious goals. The vessels themselves represent a new trend in the maritime industry. "Customers are increasingly demanding high-quality ships, and shipowners must follow suit," said Juhl. Quite obviously Evergas is on the right track. ■ **ZL**

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Photo: Dreamstime

Rules for Classification and Construction

Our latest brochures, rules and guidelines are available on request. Order forms are available on the Internet: www.gl-group.com > Rules & Guidelines

I – Ship Technology

Part 1 – Seagoing Ships
Chapter 11
Bridge Arrangement and Equipment on Seagoing Ships 2012-07-01

Part 6 – Offshore Service Vessels
Chapter 1
Hull Structures 2012-08-01

VI – Additional Rules and Guidelines

Part 2 – Loading Gear
Chapter 2
Loading Gear on Seagoing Ships and Offshore Installations 2012-08-01

Part 7 – Guidelines for the Performance of Type Approvals
Chapter 2
Test Requirements for Electrical/Electronic Equipment and Systems 2012-09-01

Part 11 – Other Operations and Systems
Chapter 3
Guidelines for Sea Trials of Motor Vessels 2012-08-15

Part 12 – Environmental Protection
Chapter 1
Guidelines for the Environmental Service System 2012-10-01

Dates at a Glance

For further dates and additional information, see www.gl-group.com/events

September

19. – 22.09.2012
Monaco Yacht Show
Monaco

October

23. – 26.10.2012
Shiptec China
GL participation: stand No. 1107
Dalian, China

24. – 26.10.2012
SNAME Annual Meeting & Expo 2012
Providence, Rhode Island, USA

November

13.11.2012
Turkish Shipping Summit 2012
Istanbul, Turkey

27. – 29.11.2012
Intermodal Europe
Amsterdam, The Netherlands

27. – 29.11.2012
Seatrade Middle East Maritime
GL participation: stand No. Q7, Halls 5,6,7
Dubai, UAE

December

04. – 07.12.2012
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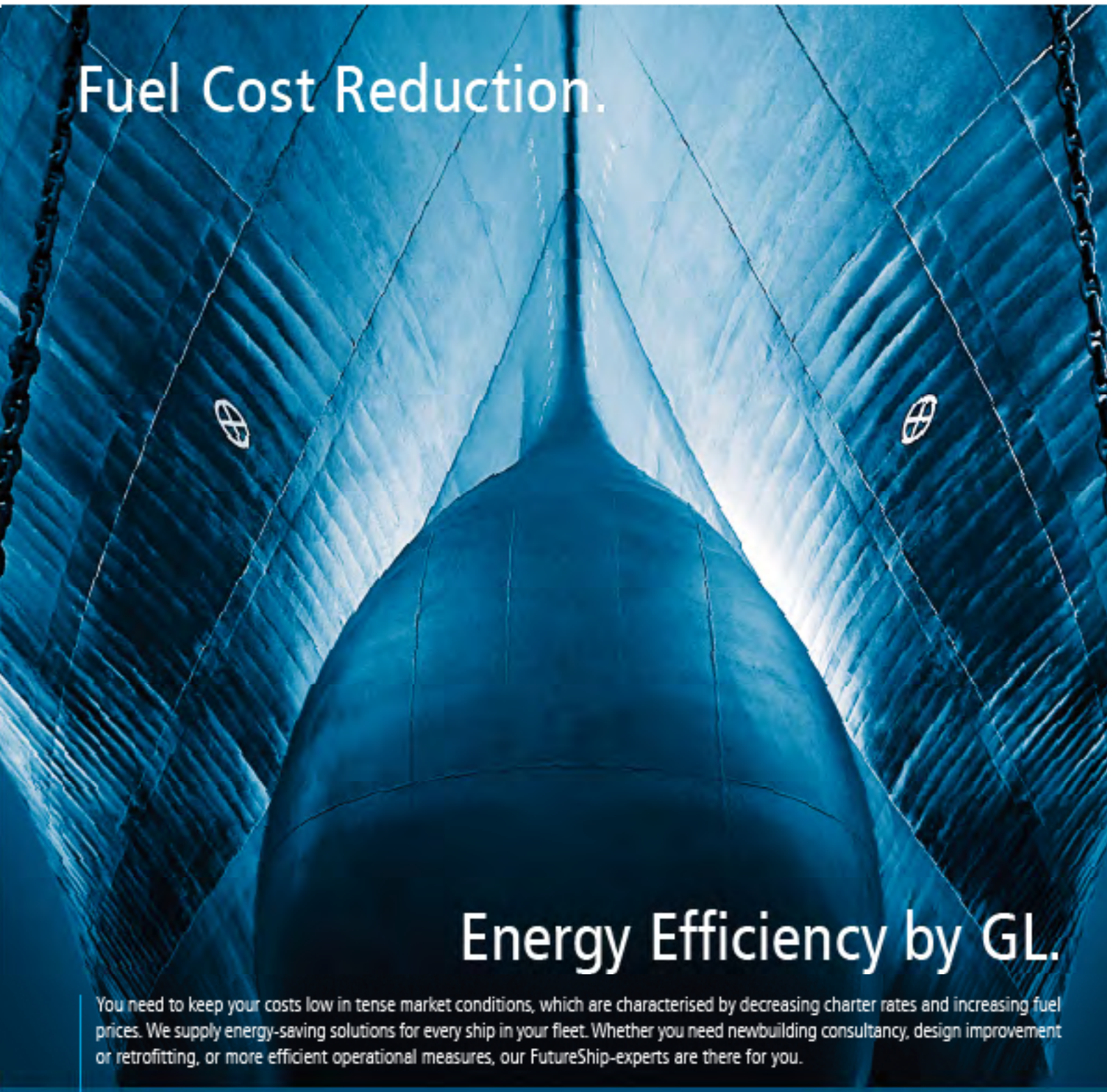

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